October 29, 2024

Via E-Mail

Kevin Greener
New Jersey Department of Environmental Protection
401 E. State St.
7th Floor, East Wing
P.O. Box 402
Trenton, NJ 08625-0402
Phone: (609) 292-2885
Fax: (609) 292-7695

CC: David Pepe, Director, Office of Permitting and Project Navigation, New Jersey DEP
Kandyce Perry, Director, Office of Environmental Justice, New Jersey DEP
Ken Ratzman, Assistant Director, Air Quality Regulation and Planning, New Jersey DEP
Joel Leon, Section Chief, Bureau of Stationary Sources, New Jersey DEP
Mayra Reyes, Environmental Engineer, Bureau of Stationary Sources, New Jersey DEP

Re: Comments on PVSC Significant Modification Title V Draft Permit

On behalf of the Ironbound Community Corporation ("ICC"), Earthjustice submits the following comments on the New Jersey Department of Environmental Protection's ("DEP") draft modification of the Passaic Valley Sewerage Commission's ("PVSC") Title V operating permit (the "Draft Permit") that would allow PVSC to operate a new methane gas-fired Standby Power Generating Facility ("SPGF" or "gas plant") at the PVSC facility located at 600 Wilson Avenue, Newark, Essex County, NJ 07105. These comments incorporate the comments and expert report previously submitted to PVSC as part of the Administrative Order 2021-25 ("AO-25") process, attached hereto.[1] As explained further below, the proposed permit modifications will contribute to adverse cumulative stressors in the overburdened Ironbound community where PVSC is located, and DEP's proposed special Environmental Justice Law ("EJ Law") conditions will fail

[1] *See* ICC, Comments on PVSC Standby Power Generation Facility AO-25 Compliance Statement (July 1, 2022) [hereinafter ICC AO-25 Comments] (attached as Ex. 2); Expert Report of Bill Powers, Clean Alternative Emergency Power Supply for PVSC (July 1, 2022) [hereinafter Powers Report] (attach. 1 to ex. 2, ICC AO-25 Comments).

to adequately mitigate PVSC's contribution to these adverse cumulative stressors. Accordingly, DEP should deny the requested permit modification.[2]

I. BACKGROUND

A. The SPGF Will Add to Already Disproportionate Burdens in an Overburdened Community.

PVSC proposes to build what would be the fourth natural-gas-fired power plant to be constructed in the overburdened Ironbound community. The Ironbound is a roughly four-square mile neighborhood in Newark, New Jersey, that is home to about 50,000 primarily Black and Brown working-class residents. As a whole, the Ironbound bears a disproportionate environmental burden compared to the rest of New Jersey. Under New Jersey's EJ Law, the entirety of the Ironbound is considered "overburdened" – many of the census tracts within the neighborhood meet all three criteria.[3] The two overburdened census tracts closest to PVSC's facility are adverse for 23 and 21 of the 26 environmental and public health stressors that DEP measures under the EJ Law.[4] Both tracts have non-cancer risks from air toxics more than twice as high as the geographic point of comparison, and a cancer risk from air toxics nearly twice as high as the geographic point of comparison.[5] One tract also has roughly four times the ground level ozone as the geographic point of comparison.[6] Further, more than 4,000 facilities with environmental permits are located within the two zip codes that encompass the Ironbound.[7] These two zip codes also have the first and second-highest number of EJ Law regulated facilities in the state (collectively, 44 facilities in both), and if the zip code 07032 (which is located across the Passaic River from the Ironbound) is added, then the total number of facilities goes up to 55.[8] By

---

[2] Commenters note that DEP denied their written request for a 30-day extension of the October 29, 2024, comment deadline, and DEP denied their subsequent request to reconsider that denial, despite the plain language of AO-25 that "*all* public comment periods" under AO-25, like this one, "*shall* be extended by an additional thirty (30) days upon the written request of member(s) of the overburdened community" "irrespective of minimum timeframes as may be established under applicable regulations." DEP, *Administrative Order No. 2021-25* (Sept. 20, 2021), https://dep.nj.gov/wp-content/uploads/ej/docs/njdep-ao-2021-25-environmental-justice.pdf (emphasis added).

[3] DEP, *2022 Overburdened Communities under the New Jersey Environmental Justice Law in Newark City, Essex County* (June 1, 2022), https://dep.nj.gov/wp-content/uploads/ej/docs/newark-city-essex-county-obc.pdf; *see also* N.J.S.A. 13:1D-158 (defining "overburdened community" as "any census block group, as determined in accordance with the most recent United States Census, in which: (1) at least 35 percent of the households qualify as low-income households; (2) at least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or (3) at least 40 percent of the households have limited English proficiency.").

[4] DEP, *Overburdened Community Stressor Summary: Block Group 340130074001* (July 31, 2021) [hereinafter OBC Summary, 340130074001] (attached as Ex. 3); DEP, *Overburdened Community Stressor Summary: Block Group 340139801001* (July 31, 2021) [hereinafter OBC Summary, 340139801001] (attached as Ex. 4).

[5] OBC Summary, 340130074001, *supra* note 4 (ex. 3); OBC Summary, 340139801001, *supra* note 4 (ex. 4).

[6] OBC Summary, 340130074001, *supra* note 4 (ex. 3).

[7] *See DEP DataMiner,* NJDEP, https://njems.nj.gov/DataMiner (last updated Mar. 26, 2024) (follow "search by site" then "search by ZIP code" and enter "07114" and "07105").

[8] These numbers were calculated using data from the EJMAP tool on DEP's website. *EJMAP: Facilities*, DEP, https://experience.arcgis.com/experience/548632a2351b41b8a0443cfc3a9f4ef6/page/Facilities/ (last visited Oct. 17, 2024). A screenshot of the EJMAP results for facilities in these zip codes is attached as Ex. 5.

comparison, no other zip code in the state has more than 16 facilities covered by the EJ Law, and no other municipality (covering multiple zip codes) has more than 24 such facilities.[9]

The Environmental Protection Agency's ("EPA") EJScreen Tool also shows that the area ranks around the 90th percentile or higher for nearly every environmental justice index.[10] For example, it is in the 94th percentile state-wide for toxic air releases and the 92nd percentile for nitrogen dioxide ("NOx") and particulate matter ("PM") 2.5 emissions,[11] all of which would be exacerbated by the SPGF.

The SPGF will result in an increase in emissions at PVSC's facility, adding to PVSC's already permitted emissions and further burdening an already overburdened neighborhood. The proposed permit would allow PVSC to emit 16 tons of hazardous air pollutants ("HAPs"), 107 tons of carbon monoxide ("CO"), about 80 tons of volatile organic compounds ("VOCs"), nearly 70 tons of NOx, 18 tons of PM_{10}, and about 3 tons of $PM_{2.5}$ per year into the community.[12] Despite the promises of emission reductions during the EJ Law review process, there is no pollutant whose emissions would decrease under the Draft Permit – instead the Draft Permit allows emission increases for HAPs, NOx, CO, sulfur dioxide ("SO_2"), VOCs, PM_{10}, $PM_{2.5}$, acrolein, ethylene dibromide, formaldehyde, and ammonia.[13]

These emissions will pose serious health risks to the community. At least ten of the HAPs that PVSC is allowed to emit – at levels as high as 4.4 tons per year ("tpy") for chloroform – are carcinogenic.[14] VOCs and NOx are precursors to ground-level ozone, which can irritate the respiratory tract, reduce lung capacity, and aggravate lung diseases like asthma, emphysema, and

---

[9] These numbers were calculated using data from the EJMAP tool on DEP's website. *EJMAP: Facilities*, DEP, *supra* note 8.

[10] EPA, *EJ Screen Community Report: User Specified Area in Newark, NJ* (Oct. 8, 2024) (obtained via https://ejscreen.epa.gov/mapper/) (attached as Ex. 6).

[11] *Id*.

[12] DEP, Draft Air Pollution Control Operating Permit Significant Modification for Passaic Valley Sewerage Commission, Permit Activity No. BOP210002, Program Interest No. 07349 at § A, tbl. 1 (pdf p. 4) (updated Aug. 29, 2024) [hereinafter Draft Permit].

[13] *Id.*

[14] *Id.* at § A, tbl. 3 (pdf p. 5); N.J. Dep't of Health, *1,3-Butadiene: Hazardous Substance Fact Sheet* (December 2016), https://www.nj.gov/health/eoh/rtkweb/documents/fs/0272.pdf [https://perma.cc/2A8X-XP7V]; Agency for Toxic Substances and Disease Registry ("ATSDR"), *ToxFAQs for Dichlorobenzenes* (Aug. 2006), https://www.atsdr.cdc.gov/toxfaqs/tfacts10.pdf [https://perma.cc/YC84-DZ7B]; EPA, *Acetaldehyde: Hazard Summary* (updated Jan. 2000), https://www.epa.gov/sites/default/files/2016-09/documents/acetaldehyde.pdf [https://perma.cc/5E4P-W638]; Nat'l Toxicology Program, Dep't of Health and Human Serv., *Acrylonitrile* (2021), https://ntp.niehs.nih.gov/sites/default/files/ntp/roc/content/profiles/acrylonitrile.pdf [https://perma.cc/Y8AC-TWZ9]; ATSDR, *Public Health Statement for Benzene* (Aug. 2007) https://www.atsdr.cdc.gov/ToxProfiles/tp3-c1-b.pdf [https://perma.cc/JS4W-NP5C]; Nat'l Inst. of Health, *15th Report on Carcinogens: Chloroform* (Dec. 2021), https://www.ncbi.nlm.nih.gov/books/NBK590753/ [https://perma.cc/GF3L-4JMW]; EPA, *Ethylene Dibromide (Dibromoethane)* (Jan. 2000) https://www.epa.gov/sites/default/files/2016-09/documents/ethylene-dibromide.pdf [https://perma.cc/G5L7-DBFY]; EPA, *Ethylene Dichloride (1,2-Dichloroethane)* (Jan. 2000) https://www.epa.gov/sites/default/files/2016-09/documents/ethylene-dichloride.pdf [https://perma.cc/D32D-CW2D]; *Formaldehyde and Cancer Risk*, Am. Cancer Soc'y, https://www.cancer.org/cancer/risk-prevention/chemicals/formaldehyde.html [https://perma.cc/UZ27-87XX] (last revised Sept. 10, 2024); ATSDR, *Styrene - ToxFAQs* (June 2012) https://www.atsdr.cdc.gov/toxfaqs/tfacts53.pdf [https://perma.cc/A9ZX-8Y3V].

chronic bronchitis.[15] This is particularly concerning because one in four children in Newark have asthma, and asthma is the main reason that children in Newark miss school.[16] PM_{10} and $PM_{2.5}$ are health hazards because they can aggravate respiratory diseases like asthma and chronic obstructive pulmonary disease in the short term.[17] Further, chronic exposure (like the exposure experienced by people living in areas with high PM levels – such as the Ironbound) to $PM_{2.5}$ is associated with reduced lung function and even premature death.[18]

Both PVSC and the proposed SPGF will also contribute to the density and proximity stressor category. Under the Environmental Justice Rules ("EJ Rule"), DEP considers the mere presence of multiple permitted pollution sources within a community as a stressor – stating that "the presence of these facilities, particularly when located in abundance due to historic siting inequities, constitutes a source of environmental stress on a community."[19] As the Draft Permit itself shows, a permitted source may still release harmful pollutants into the surrounding community even when it complies with its permit conditions.[20] The two block groups closest to PVSC's facility are adverse for all three density and proximity stressors that DEP measures, with more than four times as many permitted air pollution sources per square mile as the geographic point of comparison.[21] Under the proposed permit, the SPGF will be yet another permitted source of air pollution impacting these already overburdened communities.

Because the SPGF would contribute to the adverse cumulative environmental and public health stressors that the Ironbound faces, DEP should deny PVSC's permit modification under the EJ Law.[22] Rather than serving a compelling public interest, the SPGF is an unnecessary polluting facility that will unjustly force the residents of the Ironbound to bear further disproportionate environmental impacts.

B. The AO-25 Process Showed Nearly Uniform Opposition Within and Outside of the Ironbound, and DEP's EJ Decision Was Inadequate.

On March 30, 2022, PVSC held an AO-25 public hearing on its proposed permit modification. According to PVSC's AO-25 Compliance Statement ("Compliance Statement"), 202 people

---

[15] *Ground-level Ozone Basics*, EPA, https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation [https://perma.cc/7889-VSDE] (last updated May 14, 2024); *Health Effects of Ozone Pollution*, EPA, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution [https://perma.cc/9YW3-XV9W] (last updated Apr. 9, 2024).
[16] EPA, *Citizen Science Project in Ironbound Community, Newark, NJ* (Jan. 2017) https://19january2017snapshot.epa.gov/air-sensor-toolbox/community-air-monitoring-where-you-live-epa-region-2_.html [https://perma.cc/SJX6-NH4T].
[17] *Inhalable Particulate Matter and Health (PM2.5 and PM10)*, Cal. Air Res. Bd., https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health [https://perma.cc/U4XM-CP44] (last updated 2024).
[18] *Id*.
[19] Environmental Justice Rules, 55 N.J.R. 661(b), 705 (Apr. 17, 2023).
[20] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13) (showing nonzero emissions levels from the proposed SPGF).
[21] OBC Summary, 340130074001, *supra* note 4 (ex. 3); OBC Summary, 340139801001, *supra* note 4 (ex. 4).
[22] N.J.S.A. 13:1D-160(c).

attended and 53 people spoke at the public hearing.[23] Only three speakers, all of whom worked for construction trade organizations that may benefit from the planned gas-plant construction, voiced their support for the SPGF.[24]

PVSC's September 9, 2022, Response to Comments mischaracterized testimony at that hearing opposing the SPGF as testimony supporting it. For example, Ellie Gruber explicitly testified: "We oppose the plans for the PVSC standby power generation facility in the Ironbound section of Newark," yet PVSC incorrectly tagged her statement with (among other tags) the tag "support for SPGF."[25] Similarly, Lana McCrea stated: "To say to solve that problem we need to pollute [the Ironbound] more. . . . We need to pollute your community more. . . . That is galling and unacceptable to me, it is not acceptable to not do a full analysis of the cumulative impact[,]" yet PVSC tagged her testimony as "support for SPGF."[26] Jasmine Crenshaw stated: "Earth Justice [sic] is here to stand with community partners calling for the withdrawal of PVSC['s] application of the new gas power plant," yet PVSC also tagged her testimony as "support for SPGF."[27] Finally, Ray Nichols stated: "We're here to question the need for three massive gas-powered generators," and yet PVSC tagged his testimony as "support for SPGF."[28] This mischaracterization of speakers' testimony is concerning and has likely led to the overestimation of support for the facility.

Further, PVSC received 446 written comments during the AO-25 process.[29] Of those comments, 442 were in opposition to the SPGF and only four were in support.[30] This means that 99.1% of these commenters opposed the SPGF, demonstrating near unanimous opposition. Commenters consistently pointed to the environmental justice concerns associated with the SPGF and stated that PVSC should not be allowed to further add to the heavy environmental burden already shouldered by the Ironbound.[31]

As PVSC's proposal has moved through the permit approval process, elected representatives and other community leaders have also consistently opposed the SPGF in PVSC Board meetings[32] and in communications with PVSC. For example, a coalition of elected officials across Newark

---

[23] PVSC, *PSVC Response to Comments*, 1 (Sept 9, 2022), https://dep.nj.gov/wp-content/uploads/ej/pvsc-response-to-comments.pdf [hereinafter PVSC Response to Comments]; DEP, *Administrative Order No. 2021-25*, *supra* note 2.
[24] Those speakers were: William Healey, Abby Adams, and Lino Santiago. PVSC, *PVSC Compliance Statement Public Comments*, 1 (Sept 9, 2022), https://dep.nj.gov/wp-content/uploads/ej/pvsc-compliance-statement-public-comments.pdf [hereinafter Public Comments].
[25] *Id*. at 1.
[26] *Id*. at 4.
[27] *Id*. at 10.
[28] *Id*. at 11.
[29] PVSC Response to Comments, *supra* note 23, at 1.
[30] Public Comments, *supra* note 24, at 15-100.
[31] *See generally id.*; PVSC Response to Comments, *supra* note 23, at 9-15.
[32] *See*, *e.g.*, Matt Kadosh, *DEP Permit Hearing Set on Newark Gas Plant Plans as Opposition Mounts*, TapInto Newark (Sept. 19, 2024) https://www.tapinto.net/towns/newark/sections/east-ward/articles/dep-permit-hearing-set-on-newark-gas-plant-plans-as-opposition-mounts [https://perma.cc/TN8D-T96Q] (discussing testimony by residents opposing the SPGF during a PVSC board meeting).

joined with concerned community organizations to submit a letter to PVSC's Board, urging PVSC to withdraw its application for the SPGF because building the plant in the Ironbound would be "unjust and unnecessary" and exacerbate environmental injustices.[33] The letter's signatories included: Newark Mayor Ras Baraka, Senate Majority Leader Teresa Ruiz, Essex County Executive Joseph DiVincenzo Jr., every legislator representing Districts 28 and 29, every Newark Municipal Councilmember, and 49 different organizations.[34] Similarly, Faith in New Jersey submitted an open letter to the PVSC Board from 76 faith leaders in the state, urging the members of the Board to vote not to move forward with the SPGF proposal.[35] Despite this continued vocal and consistent opposition, PVSC and DEP have kept moving this proposal forward.

On July 18, 2024, DEP issued its decision under AO-25 ("EJ Decision") regarding the special conditions that DEP would impose on the PVSC permit under the EJ Law ("EJ Conditions"). DEP's EJ Decision ignored many commenters' concerns and, as explained further below, failed to impose sufficient conditions on the SPGF proposal. Although commenters submitted extensive evidence showing that PVSC could meet its emergency power needs with solar power and battery storage and that PVSC had overestimated its power requirements in order to justify the methane-fired power plant as its only option, DEP simply restated PVSC's erroneous claims that a renewable alternative would not suffice – without addressing any evidence to the contrary.[36] Similarly, the EJ Decision's list of special EJ Conditions appears to simply incorporate as-is the conditions that PVSC itself proposed in its AO-25 Compliance Statement, without any amendments, improvements, or criticism of PVSC's proposals.[37] While DEP touted the fact that these EJ Conditions would result in facility-wide emission reductions, the EJ Decision failed to disclose that even with these reductions, the SPGF permit modification will still increase overall emissions from PVSC.[38] Instead, the EJ Decision deceptively looked at emissions from only one of the three permitted operating scenarios (covering less than a quarter of the SPGF's permitted yearly operations) to make it seem like the facility's overall potential to emit would decrease, when this is not the case.[39] And, as discussed in Section III, the reductions fail to go far enough by still allowing PVSC to release excessive emissions and continue operating unnecessarily polluting equipment. DEP had the opportunity to set a high standard for the implementation of

---

[33] Letter of Sen. M. Teresa Ruiz et al. to PVSC (July 19, 2024) (attached as Ex. 7).
[34] *Id*.
[35] Letter of Charlene Walker, Faith in N.J. et al. to PVSC (Sept. 18, 2024) (attached as Ex. 8).
[36] *In the matter of PVSC, Project ID # 07329, BOP 190004, Title V Air Operating Permit Modification and Renewal, BOP210002, SPGF*, Env't Justice Decision and Imposition of Special Conditions Pursuant to AO-25 at 6 (July 18, 2024), https://dep.nj.gov/wp-content/uploads/ej/ej-decision-pvsc-backup-power-facility-20240718.pdf [hereinafter EJ Decision].
[37] *See* PVSC, *SPGF AO 2021-25 Compliance Statement* at 2-3, 31-32, 44-47 (Mar. 30, 2022), https://dep.nj.gov/wp-content/uploads/ej/njdep-ao-2021-25-compliance-statement.pdf [hereinafter Compliance Statement].
[38] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13).
[39] *Compare* EJ Decision, *supra* note 36, at 12, tbl.4 (considering emissions from 288 hours per year of testing and maintenance operating scenario only) *with* Draft Permit, *supra* note 12, at § D, 19 (pdf p. 32) (GR2 EJ Special Conditions, Ref. 1) (allowing additional operating scenarios for storm preparation (960 hr/yr) and emergency operation).

the EJ Law by denying PVSC's proposal to add to the Ironbound's disproportionate environmental burden, or at the very least imposing strict controls to minimize the SPGF's impacts, but DEP's EJ Decision ultimately failed to live up to the ideals of the EJ Law and wrongly allowed PVSC's application to move forward.

On October 1, 2024, DEP held a public hearing on the instant Draft Permit, where the public's opposition continued. DEP accepted comments online and in person from a total of 31 commenters.[40] The number of commenters or attendees may have been higher if not for the large police presence at the hearing that may have dissuaded community members from attending or speaking in person. Nevertheless, not a single commenter supported the SPGF.[41] Commenters again pointed to the disproportionate burdens that this plant would have on the Ironbound, and noted that the permit will allow an increase in many emissions from PVSC – adding to the poor air quality in the community.[42] It is with this consistent and overwhelming opposition to the proposal in mind that DEP should review the public comments on this Draft Permit, and ultimately deny PVSC's requested modification.

II. DEP SHOULD DENY THE PERMIT MODIFICATION APPLICATION BECAUSE NON-POLLUTING ALTERNATIVES CAN MEET PVSC'S EMERGENCY POWER NEEDS.

DEP should deny PVSC's outdated and uneconomical proposal to build a new, polluting power plant in the most overburdened neighborhood of the state. As we explained in our AO-25 comments and accompanying expert report, and further explain below, zero-emitting alternatives exist to PVSC's ill-conceived SPGF proposal that are both better for PVSC and better for the people of the Ironbound. There is no need for DEP to join in PVSC's bad decision-making by approving the requested permit modification.

A. DEP Has the Authority to Deny PVSC's Permit Modification Application.

The Air Pollution Control Act ("APCA"), and by extension the federal Clean Air Act, grant DEP the authority to deny this air permit application. As the D.C. Circuit has stated, under the Clean Air Act, "states generally have 'the power to determine which sources w[ill] be burdened by regulation and to what extent[.]'"[43] The APCA vests that regulatory authority in DEP, granting DEP the power to control the issuance of permits under the Act.[44] The Act clearly anticipates the possibility that DEP may deny permits, stating that permits may not be issued unless the applicant for the permit has demonstrated that the facility will operate in accordance with the APCA and any regulations issued under it.[45] And DEP's implementing regulations plainly state

[40] Michael Sol Warren, *DEP urged to block proposed Newark power plant*, NJ Spotlight News (Oct. 3, 2024), https://www.njspotlightnews.org/2024/10/dep-urged-to-block-proposed-newark-power-plant/ (attached as Ex. 9).
[41] *Id*.
[42] *Id*.
[43] *Env't Comm. of Fla. Elec. Power Coordinating Grp., Inc. v. Envtl. Prot. Agency*, 94 F.4th 77, 93 (D.C. Cir. 2024).
[44] N.J.S.A. 26:2C-9.
[45] *Id.* 26:2C-9.2(b).

that DEP's final decision on an application for a permit modification may be a denial of that permit.[46] Accordingly, DEP has the authority to deny the permit modification that PVSC has applied for, and DEP must exercise that authority here.

Further, under the EJ Law and the EJ Rule, DEP would *have to* deny PVSC's permit application. The EJ Law and EJ Rule state that DEP must deny a permit for a new or expanded facility[47] where the facility cannot avoid causing or contributing to one or more adverse stressors within an overburdened community.[48] The exception to this requirement is where there is no reasonable alternative and the proposed modification would serve a compelling public interest.[49] In this case, DEP readily admits that the proposed modification would contribute to adverse stressors within the community because it would result in increased emissions of a variety of pollutants.[50] Thus, under the EJ Rule, the only way that DEP would be able to approve this application would be if PVSC could demonstrate that the SPGF will primarily serve the environmental, health, or safety needs of the Ironbound, is necessary to serve those needs, and there are no reasonable alternatives to the SPGF to serve those needs.[51] As many commenters demonstrated in their AO-25 comments, and as ICC and Earthjustice have demonstrated here, the SPGF is not necessary to meet the needs of the Ironbound, and there are reasonable, less-polluting alternatives to the SPGF. Thus, if the EJ Rule were applied to this application, DEP would be required to deny it.

The only reason that the EJ Rule does not apply here is because of DEP's own delay in issuing the EJ Rule and because of DEP's decision to move PVSC's initial application through the AO-25 process despite discrepancies that should have required PVSC to re-submit. The EJ Law was passed in September of 2020 and did not fully go into effect until DEP issued implementing rules.[52] But DEP took nearly three years to issue its regulations – finalizing the EJ Rule on April 17, 2023, and stating that the Rule would not apply to complete applications submitted before that date.[53] DEP wrongly treated PVSC's application as complete on July 2021.[54] The completeness determination happened despite the fact that PVSC's AO-25 Compliance Statement submitted later contained many fundamental differences from the permit modification that PVSC submitted – including a proposal for the potential combustion of hydrogen not

[46] N.J.A.C. 7:27-22.13(b).
[47] The EJ Rule defines a new facility as any facility that commences operation after the Rule's publication date or a facility that has a change in use. N.J.A.C. 7:1C-1.5. Under this definition, the SPGF would qualify as a new facility even though it will be constructed on PVSC's pre-existing site.
[48] N.J.S.A. 13:1D-160(c); N.J.A.C. 7:1C-5.2(b).
[49] N.J.S.A. 13:1D-160(c); N.J.A.C. 7:1C-5.2(b); *see also* N.J.A.C. 7:1C-3.3(a)(11); *id.* 7:1C-5.3.
[50] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13).
[51] N.J.A.C. 7:1C–5.3(b).
[52] N.J.S.A. 13:1D-157 to 13:1D-161.
[53] Environmental Justice Rules, 55 N.J.R. 661(b) (Apr. 17, 2023); N.J.A.C. 7:1C–2.1(c).
[54] DEP, *Public Hearing Notice: Passaic Valley Sewerage Commission* (March 31, 2022) https://dep.nj.gov/wp-content/uploads/ej/njdep-ao-2025-21-public-hearing-notice.pdf (stating that the complete application was submitted in July 2021).

contained in PVSC's permit application.[55] DEP itself noted these substantial discrepancies,[56] but failed to require PVSC to resubmit its application to correct the issues. Had PVSC been required to submit an application correcting the discrepancies, or had DEP otherwise deemed the July 2021 application incomplete or issued the EJ Rule more quickly, the application likely would have been subject to the EJ Rule and DEP would have been required to deny it.

B. DEP Should Deny PVSC's Permit Modification Application Because Non-Polluting Alternatives are Far Superior to the Proposed Gas Plant.

i. Battery Storage is Cheaper than the SPGF.

As ICC and Earthjustice's AO-25 comments demonstrated, PVSC can rely on solar power and battery storage to provide the emergency power that PVSC may need in the unlikely event that it loses grid power in a future storm.[57] Not only would PVSC have sufficient space to install adequate battery storage, but it would also save 70% of the projected costs of building the SPGF.[58] While the SPGF would cost $118 million, an adequately-sized battery storage system would only cost around $36 million.[59] And PVSC can use its promised Federal Emergency Management Agency ("FEMA") funding for solar and battery storage instead of the gas plant.[60] In fact, PVSC could further use the battery storage system to save money by using the battery system to provide non-polluting power at peak times on the grid, earning payments for its contributions to the grid and using those payments to offset the costs of the system.[61]

ii. Battery Storage is More Reliable than the SPGF.

Unlike the SPGF – which has a longer startup and shutdown period, as discussed below – battery storage could instantly and seamlessly provide electricity to PVSC's facility and power it in isolation from the grid until power is restored.[62] With a well-designed system, the shift could take milliseconds.[63] Further, because battery storage does not require external fuel to continue providing power, it is not vulnerable to the same types of disruption as the SPGF, which relies on an off-site methane pipeline system to operate. Grid managers are already using batteries where fossil fuel solutions fail because of batteries' inherent flexibility and reliability.[64]

---

[55] Compliance Statement, *supra* note 37, at 2-3, 30-32, 44-46, 49.
[56] Letter from David Pepe, Supervisor, Off. of Permitting & Project Navigation at DEP, to Gregory A. Tramontozzi, PVSC at 2 (Mar. 2, 2022) (attach. 2 to ex. 2).
[57] ICC AO-25 Comments, *supra* note 1, at 27-28 (ex. 2).
[58] *Id.* at 28.
[59] *Id*.
[60] *See B.11. Secondary Power Source*, FEMA, https://www.fema.gov/grants/mitigation/guide/part-12/b/11 [https://perma.cc/8YAH-B849] (last updated Mar. 7, 2024) (listing solar and battery storage as eligible projects).
[61] ICC AO-25 Comments, *supra* note 1, at 28 (ex. 2)
[62] Powers Report, *supra* note 1, at 12 (attach. 1 to ex. 2).
[63] *Id*.
[64] Aaron Schwartz et al., *Clean Energy 101: How Batteries Can Support Grid Reliability*, Rocky Mountain Inst. (July 31, 2024), https://rmi.org/clean-energy-101-how-batteries-can-support-grid-reliability/ [https://perma.cc/5VV8-QHLJ].

Natural gas supplies can be disrupted. A FEMA report evaluating the vulnerabilities of critical infrastructure after Hurricane Sandy states, in no uncertain terms: "Natural gas supplies can be interrupted during high-wind, flood, or earthquake events. Also, natural gas services are often intentionally shut down prior to a storm event to reduce the risk of fires and explosions. Because of this, *natural gas should not be used as a fuel for providing emergency power* to critical facilities unless the facility can confirm that natural gas service will not be interrupted."[65] The report went on to say that "[i]f a generator receives fuel only from a source that may be interrupted, the fuel source is not considered reliable."[66]

Indeed, Sandy caused roughly 1,300 gas leaks in New Jersey Natural Gas's supply lines – leading to cuts in service to 28,000 customers.[67] Similarly, the National Grid gas distribution network was "heavily damaged by coast flooding" during Sandy – causing suspensions as well.[68] While PVSC's response to these reliability concerns has been to simply point to contractual provisions that purport to guarantee that its natural gas supply would not be interrupted during a storm,[69] such a piece of paper is no match for the storm surges that can take out an entire gas system. This is especially so given that up to a quarter of PSE&G's gas network is made up of leak-prone cast iron and unprotected steel pipes.[70] And PVSC has provided no rationale why, if a storm is strong enough to take down the electricity grid (which is the justification for the construction of the SPGF), such a storm would not also be strong enough to break pipes and shutdown gas service, as has happened in the past.

In addition, natural gas turbines are too slow to start up and shut down and too vulnerable to malfunctions to be effective and reliable. For example, the long timeframe that PVSC states is necessary to start up the SPGF and prevent malfunction shows that the SPGF is not reliable as an emergency power source. While batteries can be started up virtually instantly, leaving no down time or lags in connection,[71] PVSC's Compliance Statement states that the SPGF could take "several hours" to fully integrate its electrical production into PVSC's operations and that any power fluctuations during that time could damage PVSC's equipment.[72] It seems that this unreliability during post-startup time is why PVSC asked to be allowed to start up 48 hours prior

---

[65] FEMA, *Emergency Power Systems for Critical Facilities: A Best Practices Approach to Improving Reliability, FEMA P-1019* at 5-8 (Sep. 2014), https://www.fema.gov/sites/default/files/2020-07/fema_p-1019_final_02-06-2015.pdf [https://perma.cc/H79W-Y3TQ] (emphasis added).
[66] *Id*. at 5-6.
[67] *Superstorm Sandy Slams Northeast's Coastal LDCs*, Natural Gas Intelligence (Nov. 5, 2012), https://www.naturalgasintel.com/superstorm-sandy-slams-northeasts-coastal-ldcs [https://perma.cc/C7JP-KBD6].
[68] *Id*.
[69] *See* PVSC Response to Comments, *supra* note 23, at 30, 39.
[70] Testimony of Joseph Accardo, Deputy Gen. Couns. & Chief Regul. Off., PSE&G Serv. Corp. regarding N.J. Draft Energy Master Plan at 5 (Sept. 24, 2018), https://www.nj.gov/emp/pdf/moderngrid/2018-09-20%20-%20PSEG%20-%20EMP%20-%20Building%20a%20Modern%20Grid%20Presentation.pdf [https://perma.cc/6N8K-SXVG].
[71] Powers Report, *supra* note 1, at 11-12 (attach. 1 to ex. 2).
[72] Compliance Statement, *supra* note 37, at 18.

to a storm event, even though the turbines it plans to use reach full load in just 12 minutes.[73] Further, recent studies indicate that gas-fired power plants can malfunction up to 10% of the time they are running – and that the greatest number of malfunctions occurs in the first 400 hours of an operation period.[74] Because it may only be used for a few days at a time, PVSC's plant will likely always be running within the first 400 hours of operation, and thus be particularly vulnerable to malfunctions. Any power source that may take hours to start up, can damage equipment throughout the course of its interconnection, and will primarily operate only in times when it is most vulnerable to malfunction is not a reliable source of emergency power.

iii. Battery Storage Can Meet PVSC's Emergency Power Needs.

As demonstrated in ICC and Earthjustice's comments on PVSC's Compliance Statement and the accompanying report by Bill Powers, PVSC's statement that it requires 34 megawatts ("MW") of power for two weeks is overblown. As the report demonstrated, a more realistic assumption for PVSC's power needs is 15MW for 12 hours – a need easily met through the use of on-site solar power and battery storage.[75] PVSC can and does power down to roughly 11 MW of energy usage,[76] and even on days when it is not powered down it still uses only about 23 MW of power rather than 34 MW.[77] Further, PVSC's Compliance Statement indicated that – rather than losing power for two weeks – it was only disconnected from the grid for roughly two days.[78] Any delay in resuming operations after the facility was reconnected to the grid was a result of PVSC's decision to undertake a gradual process of clearing out facility areas and resuming operations – which was entirely separate from the facility's access to the electrical grid.[79] Thus, PVSC's energy needs would not be anywhere close to the 34 MW for two weeks it claims is necessary.

Rather than engaging with these findings and seriously considering the fact that it was wrongly eliminating alternatives to the SPGF based on faulty assumptions, PVSC's Response to Comments provided a blanket statement that the SPGF "was designed appropriately with respect to potential hazards, required electrical load, and length of operation time," without any additional factual support.[80] This is not an adequate response, but DEP nevertheless unquestioningly accepted PVSC's conclusory statement that it needed 34 MW of power for two weeks and that battery storage would be insufficient to meet this need.[81] DEP must not move forward with this Draft Permit until PVSC's assumptions regarding its energy needs are

---

[73] *See* Siemens, *SGT-600 Gas Turbine Proposal for: Passaic Valley Sewerage Commission (PVSC)* at pdf p. 130 (Sept. 19, 2018), https://nj.gov/comptroller/sandytransparency/contracts/pdf/18488_siemens_proposal.pdf [https://perma.cc/3PRF-ME6Y].
[74] Amal El-Berry et al., *Reliability Analysis of Gas Turbine Power Plant Based on Failure Data*, Int'l J. Mech. & Mechatronics Eng'g 13, 22 (2020) (attached as Ex. 10).
[75] *See* Powers Report, *supra* note 1, at 2 (attach. 1 to ex. 2).
[76] *Id.* at 9-10.
[77] Compliance Statement, *supra* note 37, at 33.
[78] *Id.* at 5-6, 8.
[79] *Id*. at 8.
[80] PVSC Response to Comments, *supra* note 23, at 37.
[81] EJ Decision, *supra* note 36, at 6.

adequately reviewed. The necessity of the SPGF is premised upon PVSC's exaggerated power estimates, but these incorrect assumptions will result in an unnecessary gas plant that will needlessly pollute an already heavily overburdened community.

Indeed, PVSC's half-hearted consideration of battery storage alternatives should not be taken at face value. PVSC submitted its Compliance Statement to build the SPGF even before the deadline for its request for proposal ("RFP") seeking renewable alternatives. It issued an RFP in February 2022,[82] but rather than waiting to evaluate the responses after the March 31, 2022, deadline, PVSC submitted its Compliance Statement on March 30, 2022. The Compliance Statement itself does not appear to evaluate any of the actual proposals received, but instead only references statements made by stakeholders during the process.[83] Further, in its September 2022 Response to Comments, PVSC simply states that the plans received during the RFP are still "under review."[84] Additionally, the RFP itself also had issues; for instance, PVSC overestimated both the amount of power it would need and the length of time for which it would need emergency power.[85] PVSC's half-hearted consideration of non-polluting alternatives thus seems largely pretextual, and suggests that PVSC has not been engaging in good-faith efforts to satisfy its emergency power needs in a way that does not pollute the Ironbound.

iv. Grid Hardening and Green Infrastructure Lessen the Need for On-Site Emergency Power Generation.

In our AO-25 comments, ICC and Earthjustice emphasized that PVSC's assumptions about the need for a gas-fired power plant ignored the grid and infrastructure improvements made since Hurricane Sandy. PSE&G has spent over $4.8 billion to harden and modernize the electrical grid after Hurricane Sandy – drastically increasing the reliability of the system and winning awards for its resiliency.[86] PSE&G has raised the substations surrounding PVSC (such as the Port Street Substation, Waverly Substation, and Bayonne Substation) to be even higher than the highest levels of flooding observed during Hurricane Sandy.[87]

However, PVSC largely ignored these efforts in its Response to Comments – it mentioned the risks associated with a grid shutdown without noting the work to reduce the risks of electrical grid outages.[88] Further, PVSC wrongly wrote off the grid hardening efforts. It stated that PSE&G

---

[82] PVSC, *Request For Proposals For a Renewable Energy Power Generation System* at 5 (Feb. 2022) (attach. 3 to ex. 2).
[83] Compliance Statement, *supra* note 37, at 43-44.
[84] PVSC Response to Comments, *supra* note 23, at 7.
[85] PVSC, *Request For Proposals*, *supra* note 82, at 5 (attach. 3 to ex. 2).
[86] *See* PSE&G, *A Decade after Superstorm Sandy, New Jersey's Infrastructure is Considerably More Prepared for Hurricane Season* (June 9, 2022), https://nj.pseg.com/newsroom/newsrelease303 [https://perma.cc/PT93-QULV] (detailing PSE&G's $4.8 billion investment in infrastructure hardening and modernization).
[87] PSE&G, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program*, att. 1 at p. 2 (Mar. 30, 2018), https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2106258 (select document titled "2018-03-30 - PSE&G'S ES ELECTRIC AND GAS RATES 2018 - FILING").
[88] PVSC Response to Comments, *supra* note 23, at 22.

could not guarantee the facility would not lose power, but did not adequately discuss how unlikely such a situation had become as a result of the massive investments in grid hardening.[89]

Further, PVSC and the municipalities it serves have invested and will continue investing in green infrastructure and sewer separation projects that would reduce the flow of stormwater that enters the PVSC sewer system during storm events, thereby reducing the electricity needs for PVSC to operate its equipment during storms. PVSC's own Combined Sewer Overflow ("CSO") Long Term Control Plan calls for millions of dollars to be spent on projects throughout the service district that would reduce the wet weather flow to PVSC.[90] The RainReady Newark program, for example, will allow Newark to capture 85% of runoff through green infrastructure,[91] and Newark is expected to have an 87% reduction in CSO volume after implementation of the Long Term Control Plan.[92] Advocates continue to fight for additional green spaces to capture rainwater and reduce flooding opportunities as a result of hardscapes.[93] All of these efforts will lead to significantly less stormwater runoff and flooding – lowering the risk that PVSC will face the same environmental and energy pressures that it did during Sandy.

These factors add to the many determinants described above, and all call into question the necessity of the SPGF and provide ample support for DEP to deny this ill-conceived proposal to build yet another polluting facility in the most overburdened community in the state.

III. ASSUMING DEP APPROVES THE PERMIT MODIFICATION, MANY MORE CONDITIONS ARE REQUIRED IN ORDER TO PROTECT THE IRONBOUND.

While DEP must deny PVSC's requested permit modification, as explained above, in the event DEP chooses to move forward with the proposed modification, DEP must amend and strengthen numerous aspects of the Draft Permit before it could pass muster under the EJ Law.

A. The Draft Permit is Inadequate and Does Not Protect the Ironbound from PVSC's Contributions to Adverse Stressors.

Under the EJ Law, New Jersey is to "correct" the "historical injustice" of "the legacy of siting sources of pollution in overburdened communities" and "limit the future placement and expansion of" "facilities which, by the nature of their activity, have the potential to increase

---

[89] *Id.* at 39.
[90] PVSC, *PVSC Treatment District Regional Long Term Control Plan* at 7, tbl. ES-3 (Oct. 2020), https://dep.nj.gov/wp-content/uploads/dwq/pdf/cso/cso_siar_pvsc_20201001.pdf (attached as Ex. 11).
[91] Newark Dep't of Water & Sewer Utilities, *Newark Announces the Green Infrastructure Program to Increase the City's Resilience to Flooding and Stormwater* (May 2024), https://water.newarknj.gov/waterandsewer-blog/rain-ready-newark-green-infrastructure-program [https://perma.cc/JS5Q-TAM8].
[92] Sewage Free N.J., *Newark Long Term Control Plan Fact Sheet* (Dec. 2020), https://sewagefreenj.org/wp-content/uploads/2020/12/Newark-Fact-Sheet-Dec.-2020.pdf [https://perma.cc/L3DF-MFWF].
[93] Emma Uk, *Community activists leverage efforts for green infrastructure*, Public Square Amplified (Oct. 1, 2022), https://www.publicsq.org/climate-environment/black-water-the-community-push-for-green-infrastructure-is-just-the-beginning [https://perma.cc/Y5AN-YHGX].

environmental and public health stressors . . . in overburdened communities."[94] As the Governor's Office explained, the EJ Law is "aimed at reducing pollution in historically overburdened communities and communities of color . . ."[95]

But the Draft Permit does not satisfy the EJ Law's directive to reduce pollution in overburdened communities. It would do just the opposite. The proposed changes will increase PVSC's VOC emissions by 1.34 tpy, NOx by 2.21 tpy, CO by 4.09 tpy, SO_2 by 0.670 tpy, total suspended particles ("TSP") by 2.78 tpy, PM_{10} by 2.78 tpy, $PM_{2.5}$ by 2.78 tpy, total HAPs by 0.267 tpy, acrolein by 0.0110 tpy, ethylene dibromide by 0.0000911 tpy, formaldehyde by 0.256 tpy, ammonia by 1.31 tpy, and 23,000 tpy of CO_2 equivalent.[96] There is no pollutant whose emissions would decrease under the Draft Permit.[97]

And while the Statement of Basis explains that eventual compliance with the EJ Conditions may result in some emission reductions – reductions that are not reflected in the current permit, but should be, *see* Section III.B, below – the Draft Permit would still result in emission increases even if the EJ Conditions' emission reductions were taken into account. Subtracting the EJ Condition emission decreases from the SPGF emission increases still results in a net increase of 0.09 tpy for VOCs, 0.68 tpy for SO_2, 2.46 tpy for TSP, 2.56 tpy for PM_{10}, 2.64 tpy for $PM_{2.5}$, 0.2 tpy for HAPs, and 14,200 tpy for CO_2 equivalent.[98]

More can and should be done to ensure that the permit achieves the EJ Law goal of *reducing* the emissions burden on the Ironbound. As further explained in the following section, we therefore urge DEP to (1) improve the proposed SPGF conditions, (2) improve the proposed EJ Conditions, and (3) adopt new EJ Conditions, that can result in real emission reductions at the facility.

Commenters submit these comments not only as comments on the proposed SPGF conditions and EJ Conditions, but also as comments on PVSC's renewal into the 2020–2025 permit term, for which DEP has apparently denied the public an opportunity to comment. PVSC submitted a permit renewal application in 2019 to renew the current operating permit, which has an expiration date of October 6, 2020.[99] Despite EPA and DEP regulations requiring DEP to have acted on this permit within 18 months,[100] the permit renewal application remains pending, and

---

[94] N.J.S.A. 13:1D-157.
[95] Press Release, Off. of N.J. Gov. Phil Murphy, Governor Murphy Announces Nation's First Environmental Justice Rules to Reduce Pollution in Vulnerable Communities (Apr. 17, 2023), https://www.nj.gov/governor/news/news/562023/20230417a.shtml [https://perma.cc/S2SG-VT9M].
[96] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13); DEP, Statement of Basis for Passaic Valley Sewerage Commission Title V Operating Permit Significant Modification, Permit Activity No. BOP210002, Program Interest No. 07349 at 2, tbl. 1 (Nov. 16, 2022) [hereinafter Statement of Basis].
[97] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13).
[98] *Compare* Statement of Basis, *supra* note 96, at 2, tbl. 1 *with id.* at 2-3, tbl. 2.
[99] Draft Permit, *supra* note 12, at 1; Passaic Valley Sewerage Commission, Program Interest No. 07349, Title V Operating Permit Renewal Application (July 12, 2019).
[100] 40 C.F.R. § 70.7(a)(2); N.J.A.C. 7:27–22.13(a)(1).

PVSC has been operating under an application shield ever since. PVSC's permit renewal application has thus been pending for over 5 years, with no clear timeframe for when DEP will act on that renewal. Under DEP's previous policy, no matter the timing of DEP's approval of this 2019 application, approval would have resulted in a renewal into the 2020–2025 permit term; but DEP recently issued a new policy under which DEP's approval will now result in renewal into a 5-year term starting on the date of DEP's final action on the permit, which will presumably happen no sooner than 2025.[101] This means that DEP has in effect granted renewal into the 2020–2025 permit term without providing an opportunity for public comment, as required by the Clean Air Act.[102] Commenters therefore submit these comments for the permit renewal that never happened, without prejudice to their ability to submit additional comments once DEP acts on the pending 2019 renewal application.

DEP's new renewal policy not only denies the public the opportunities to comment that are envisioned by the Clean Air Act, but also delays application of the full protections of the EJ Rule. As noted above, the EJ Rule does not apply to applications that are complete for review prior to April 17, 2023.[103] Under the timetable envisioned by the Clean Air Act and DEP's regulations, PVSC would have had to submit its renewal application for the 2025–2030 term by October 6, 2024, and the full EJ Rule would apply to the permit when DEP acts on that renewal in 2025.[104] But because of DEP's new policy and unlawful withholding of action on the permit renewal, it will be years before the full EJ Rule applies to the permit – or even a decade or more, if DEP takes 5 years or more to act on PVSC's next renewal application, just as DEP has taken over 5 years to act on the 2019 application. The possibility that the full EJ Law will first apply to PVSC's permit some 15 years after the 2020 passage of the Law is untenable. DEP should apply the full protections of the EJ Rule now.

B. DEP Must Set Facility-Wide Emission Limits that Reflect the Expected Emission Reductions from the EJ Conditions.

DEP must set facility-wide annual emission limits for all the pollutants that the PVSC facility emits and ensure that those emission limits reflect the expected emission reductions from the proposed EJ Conditions. DEP's Statement of Basis promises that its proposed EJ Conditions will result in a certain amount of emission reductions at the facility,[105] but those emission reductions are nowhere to be found in the Draft Permit. To rectify this, DEP should set

---

[101] *See* Danny Wong, Bureau Chief, Bureau of Stationary Sources, DEP, Mem. regarding Operating Permit Renewals – Expiration Dates at 1 (June 20, 2022), https://dep.nj.gov/wp-content/uploads/boss/permitting-guidance/operating-permit-renewals.pdf (noting DEP "will now set the permit expiration date five (5) years from the issuance date of the renewed operating permit [which] is different from [DEP's] past practice of setting the expiration date in five-year intervals from the Initial operating permit issuance date.").

[102] *See* 40 C.F.R. § 70.7(h) (requiring opportunity for public comment at every permit renewal, which is to happen every 5 years, given 5-year permit term of 40 C.F.R. § 70.6(a)(2)).

[103] N.J.A.C. 7:1C–2.1(c).

[104] *See* N.J.A.C. 7:27–22.30(c) (noting that renewal applications are considered timely if submitted "at least 12 months prior to expiration of the operating permit.").

[105] Statement of Basis, *supra* note 96, at 2-3.

facility-wide emission limits that incorporate the EJ Condition emission reductions. For example, DEP should set a facility-wide limit no higher than 102.1 tpy for CO (calculated from the Draft Permit's facility-wide potential to emit of 107 tpy minus the expected EJ Condition reductions of 4.85 tpy), in addition to any emission-unit specific annual emission limits that already exist in the permit (like the 35.26 tpy CO emission limit for the sludge heat treatment boilers).[106] DEP has issued permits with facility-wide pollutant emissions in the past,[107] and should do the same here. Otherwise, the supposed emission reductions from the EJ Conditions would be unenforceable. Indeed, DEP's EJ Decision repeatedly represented that these would be "mandatory emission reductions,"[108] but a quick glance at the permit shows that there is nothing "mandatory" about the supposed emission reductions from the EJ Conditions. If setting such facility-wide emission caps means that PVSC must complete some or all of the EJ Conditions before it can begin to operate the SPGF, then that is exactly what the EJ Law contemplates – no increases in stressors in cumulatively adverse overburdened communities, *see* Section III.A above.

C. The Draft Permit Must Make the EJ Conditions Permanent.

DEP must ensure that the permit clearly states that all EJ Conditions are permanent, as DEP has promised. In the EJ Decision, DEP stated that the EJ Conditions would be "indefinite in their effect," "shall not be superseded by[] all other relevant conditions as may be required pursuant to applicable law, regulation, or agreement," and "shall survive any future permit modifications and must be applied to any and all later [DEP] authorizations related to the facility[.]"[109] But nowhere in the text of the Draft Permit does it indicate that the EJ Conditions are "indefinite", must "survive," and cannot be "superseded" in future permit amendments. While the Draft Permit posted on DEP's website does include the EJ Decision at the end as an attachment, that is insufficient, since there is no guarantee that the EJ Decision attachment will remain in all future PVSC permits. For example, important permitting documents like PVSC's preconstruction permit have since fallen by the wayside and are not readily accessible to the public.[110] Since it is perhaps likely that the EJ Decision attachment would meet the same fate, it is necessary for the Draft Permit itself to incorporate language indicating the permanence of the EJ Conditions.

The importance of this permanence language is underscored by the history of PVSC's gas plant proposal – specifically, PVSC's attempts to overbuild capacity beyond its emergency power

---

[106] Draft Permit, *supra* note 12, at § D, 70 (pdf p. 81).
[107] *See, e.g.*, DEP, Air Pollution Control Operating Permit for Newark Energy Center, Permit Activity No. BOP240001, Program Interest No. 08857 at § D, 10-15 (pdf pp. 23-28) (May 8, 2024) (attached as Ex. 12) (setting facility-wide emission limits for all of the pollutants emitted at the facility).
[108] EJ Decision, *supra* note 36, at 7, 9, 11-13.
[109] *Id.* at 12-13, 16.
[110] *See, e.g.*, Draft Permit, *supra* note 12, at § D, 25, 27-28, 47, 60, 62, 66-70, 72-73, 75, 77-78, 81 (pdf pp. 38, 40-41, 60, 73, 75, 79-83, 85-86, 88, 90-91, 94 (referencing operating permit conditions that derive from the preconstruction permit).

needs. PVSC initially applied to run the SPGF as a peaker and for demand response, and chose the 3-gas turbine, 84 MW gas plant design at that time.[111] While PVSC later rejected the peaker and demand response uses by the time of the AO-25 hearing, and now ostensibly only needs the SPGF to meet its stated 34 MW emergency power needs,[112] PVSC's design did not change accordingly. PVSC, for example, could have changed the design to smaller-scale gas engines that are more appropriate for backup power,[113] but did not do so. PVSC is therefore overbuilding a gas plant with a capacity that is almost 2.5 times its stated emergency power needs. PVSC is thus another permit modification application away from being allowed to use the SPGF more and more. If nothing in the permit says that the EJ Conditions are permanent, PVSC may very well succeed in obtaining that future permit modification.

DEP included the EJ Conditions in the permit to supposedly counterbalance the emission increases that it is allowing in an overburdened community, but the EJ Conditions are of little comfort if they can be amended away in some years' time and if their emission reductions are not enforceable in the meantime. And while DEP attempted to garner the public's trust – in the face of overwhelming disapproval and community concerns, *see* Section I.B above – by insisting that the EJ Conditions would be mandatory and permanent, that trust would be lost if the final permit DEP issues does not explicitly state that the EJ Conditions are mandatory and permanent. For all the reasons stated above, it is imperative that DEP incorporate the EJ Conditions' emissions reductions into the permit as enforceable limits, along with language stating that the EJ Conditions shall not be superseded or removed in any future permit amendment.

D. The Draft Permit's Unlawful Affirmative Defense Provisions Must be Removed.

The Draft Permit contains unlawful affirmative defense provisions that must be deleted. General provisions 2(c), 10(a), and 10(b) state that PVSC will be able to assert an affirmative defense if the facility does not comply with its mandatory emissions limits in cases of emergency or during startup, shutdown, or malfunction, but these blanket regulatory affirmative defenses are unlawful.[114]

In 2023, EPA finalized a rule to delete the affirmative defense provision from 40 C.F.R. § 70.6(g) – the federal provision on which permit provision 10(a) relies[115] – in order to comply with a D.C. Circuit decision holding that EPA did not have the authority to create a blanket affirmative

---

[111] Compliance Statement, *supra* note 37, at 22-24.
[112] *Id.*
[113] *See* Michael Fluegeman, *Understanding Backup Power Generation System Options*, FacilitiesNet (Dec. 13, 2018), https://www.facilitiesnet.com/powercommunication/article/Understanding-Backup-Power-Generation-System-Options--18159 [https://perma.cc/JB67-W77H]; Michael A. Devine, Caterpillar, *Engines? Turbines? Both? Choosing Power for CHP Projects* at 6, 8 (Aug. 2023), https://www.finning.com/content/dam/finning/en_gb/Documents/Industries/ElectricPower/CatWhitePapers/Cat-White-Paper-Choosing-Power-For-CHP-Projects.pdf [https://perma.cc/Y9DU-S8AP].
[114] Draft Permit, *supra* note 12, at § B, 6, 7 (pdf p. 6, 7).
[115] *Id*.

defense provision for equipment malfunctions through a regulation.[116] Permit provision 10(a) therefore no longer has any legal basis and must be deleted.

EPA's 2023 rulemaking additionally stated that other affirmative defense provisions in state law are similarly "inconsistent with the EPA's interpretation of the enforcement structure of the Clean Air Act (CAA or the Act) in light of prior court decisions from the U.S. Court of Appeals for the D.C. Circuit,"[117] so states are required to delete their state-law affirmative defense provisions.[118] General provisions 2(c) and 10(b) are such provisions – they rely on N.J.A.C. 7:27-22.16(l), but EPA has specifically found that N.J.A.C. 7:27-22.16(l) relies on the same unlawful reasoning as 40 C.F.R. § 70.6(g), and thus must be deleted.[119] Other states have begun deleting unlawful affirmative defense provisions from their draft permits in light of the new EPA rule,[120] and DEP must follow suit and delete the unlawful general provisions 2(c), 10(a), and 10(b).

E. SPGF Gas Plant Conditions

i. The Draft Permit's Provision to Eventually Transition the SPGF to Burning Hydrogen is Ill-Conceived and Would Worsen Air Quality in the Ironbound.

As explained in our AO-25 comments and accompanying expert report,[121] and explained in more detail below, burning hydrogen in the SPGF is dangerous, wasteful, and can be even more polluting than burning methane gas. **DEP should therefore remove the EJ Condition that instructs PVSC to initiate a "transition" to burning "green hydrogen or another technically feasible renewable energy source."**[122] **At the very least, DEP should require a public comment period on any such "transition."** The White House Environmental Justice Advisory Council has stated in no uncertain terms that the burning of hydrogen in environmental justice communities runs counter to the principles of environmental justice.[123] So to label PVSC's

---

[116] Removal of Title V Emergency Affirmative Defense Provisions From State Operating Permit Programs and Federal Operating Permit Program, 88 Fed. Reg. 47029, 47029 (July 21, 2023); *Nat. Res. Def. Council v. EPA*, 749 F.3d 1055, 1063 (D.C. Cir. 2014).
[117] Removal of Title V Emergency Affirmative Defense Provisions From State Operating Permit Programs and Federal Operating Permit Program, 88 Fed. Reg. at 47029.
[118] *Id.* at 47030.
[119] Draft Permit, *supra* note 12, at § B, 6, 7 (pdf p. 6, 7); EPA, *Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs*, EPA-HQ-OAR-2016-0186-0002, at 2, tbl. 1 (June 3, 2016), https://www.regulations.gov/document/EPA-HQ-OAR-2016-0186-0002 (attached as Ex. 13).
[120] *See, e.g.*, Iowa Dep't of Nat. Res., *Responsiveness Summary for Title V Operating Permit 97-TV-003R4 DRAFT*, at pdf pp. 17-18 (July 24, 2024) (attached as Ex. 14).
[121] *See* ICC AO-25 Comments, *supra* note 1, at 23-27 (ex. 2); Powers Report, *supra* note 1, at 1-2, 11 (attach. 1 to ex. 2).
[122] Draft Permit, *supra* note 12, at § D, 23 (pdf p. 36).
[123] White House Env't Just. Advisory Council, *White House Environmental Justice Advisory Council Recommendations: Climate Planning, Preparedness, Response, Recovery and Impacts Workgroup* at 16, 19 (Sept. 20, 2023), https://www.epa.gov/system/files/documents/2023-09/WHEJAC%20Recommendations%20on%20Climate%20Planning%2C%20Preparedness%2C%20Response%2C%20Recovery%20and%20Impacts%20.pdf [https://perma.cc/7DMW-FMSH]; White House Env't Just. Advisory Council, *White House Environmental Justice Advisory Council Recommendations: Carbon Management Workgroup*

potential transition to hydrogen as an "EJ Condition" here is tantamount to doublespeak. DEP must not use environmental justice as a pretext to permit PVSC to burn hydrogen.

1. Burning hydrogen would increase adverse stressors in the Ironbound and put residents in additional danger due to hydrogen's reactivity.

Hydrogen combustion can cause more health-harming pollution than burning fossil gas. General Electric conducted a study on combustion turbines that found burning a mixture of equal volume hydrogen and fossil gas emitted 35% more NOx than fossil gas alone.[124] Meanwhile, another study predicted that burning pure hydrogen instead of methane would result in over six times more NOx emissions.[125] NOx causes heart and respiratory damage, impairs lung growth in developing children, and can cause premature death, in addition to being an ozone precursor.[126] Yet DEP still proposes to require PVSC to blend hydrogen with natural gas as early as 120 days after the SPGF is commissioned.[127] PVSC has stated that it expects hydrogen to eventually make up between 65 to 100% of the gas being burned.[128] This means PVSC's hydrogen proposal would have the exact opposite impact from what is intended, with increased NOx emissions contributing to the ozone stressor in the Ironbound and pushing all of Northern New Jersey closer to extreme ozone nonattainment, the highest federal nonattainment classification.[129] And if the permit continues to lack adequate NOx control efficiency at the SPGF after a transition to hydrogen – as the Draft Permit proposes now for methane burning, *see* Section III.E.i.4 below – then that enormous increase in NOx emissions from hydrogen-burning will be largely uncontrolled. It is also worth noting that while PVSC's AO-25 Statement indicates its plan to burn 65 to 100% hydrogen, DEP's calculated emission reductions from the EJ Conditions assume the use of only 5% hydrogen,[130] which obfuscates the ballooning of NOx emissions that will result from the actual intended hydrogen use.

---

at 2, 4-6 (Nov. 17, 2023), https://www.epa.gov/system/files/documents/2023-11/final-carbon-management-recommendations-report_11.17.2023_508.pdf [https://perma.cc/NCQ5-7TUS].

[124] Jeffrey Goldmeer & John Catillaz, Gen. Elec., *Hydrogen for power generation*, 14 (2022), https://www.gevernova.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/future-of-energy/hydrogen-for-power-gen-gea34805.pdf [https://perma.cc/N7RP-BD35].

[125] Sasan Saadat & Sara Gersen, Earthjustice, *Reclaiming Hydrogen for a Renewable Future*, 18 (2021), https://earthjustice.org/wp-content/uploads/hydrogen_earthjustice_2021.pdf [https://perma.cc/F33K-XZVP] (citing Cellek Mehmet Salih & Ali Pınarbaşı, *Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen- Enriched Natural Gas and Hydrogen as Fuels*, 43 Int'l J. of Hydrogen Energy 1994, 1205 (2018)).

[126] *Nitrogen Dioxide & Health*, Cal. Air Res. Bd., https://ww2.arb.ca.gov/resources/nitrogen-dioxide-and-health#:~:text=In%20addition%2C%20a%20number%20of,asthma%2C%20and%20intensified%20allergic%20response [https://perma.cc/TYD2-XRAU] (last accessed Oct. 28, 2024).

[127] Draft Permit, *supra* note 12, § D, 23 (pdf p. 36).

[128] Compliance Statement, *supra* note 37, at 32.

[129] Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Areas Classified as Serious for the 2008 Ozone NAAQS, 87 Fed. Reg. 60926, 60927-28 (Oct. 7, 2022).

[130] Statement of Basis, *supra* note 96, at 3 (calculating emission reductions from "5% H2 in CTG Fuel"); *see also* Compliance Statement, *supra* note 37, at 45, 49.

Lastly, hydrogen's highly flammable, explosive, odorless, and colorless nature makes it all the more dangerous and ill-advised to transport, store, and utilize so close to a residential area. Advocacy groups across the country have cautioned against the rollout of hydrogen in anything but the most hard-to-decarbonize sectors.[131] In addition to the NOx and ozone health concerns that using hydrogen or hydrogen blends poses to communities, hydrogen is also extremely flammable. The small size of hydrogen molecules makes the substance incompatible with existing pipeline and fuel containment infrastructures, making leaks into the surrounding community much more likely.[132] If improperly transported or stored, these leaks can accumulate in confined spaces at dangerous concentrations, greatly increasing the risk of explosion.[133] This is even more concerning when considering a congressional report found "hydrogen needs much less air to burn. If a hydrogen gas cloud in an open area encounters a source of ignition (e.g., a spark) it will quickly burn its way back to its source" which could "readily result in accelerated flames and conditions that can lead to transition to detonation."[134] New Jersey is all too familiar with the dangers of hydrogen – dangers that DEP cannot now overlook – given the 1937 Hindenburg Disaster that occurred in Lakehurst, New Jersey, when the airship exploded after experiencing a hydrogen leak that reacted with the atmosphere.[135] Both science and history show that the use of hydrogen at these quantities is a veritable landmine that should never be placed within a stone's throw of a residential neighborhood. The risk is simply not worth it.

2. Natural gas burning facilities cannot easily be retrofitted to burn hydrogen.

Turbines created to run on methane cannot be used to burn pure hydrogen and will require expensive retrofitting, reconfiguration, and rebuilding to accommodate hydrogen. Hydrogen is the smallest known molecule with an energy density that is a third that of fossil gas. It is also significantly more flammable than methane, with an upper explosion limit of 75% compared to methane's 15%.[136] This results in hydrogen having a flame speed nine times faster than natural gas, which is known to cause the flames to travel backward into burners and damage the combustor, just one example of the many incompatibilities between hydrogen and natural gas

---

[131] *See* Ill. Clean Jobs Coal., *ICJC Hydrogen Work Group Recommendations to Illinois Hydrogen Economy Task Force* at #6, p. 4 (2023) (attached as Ex. 15); Saadat & Gersen, *supra* note 125, at 32 ("Further, policymakers should understand the limits of green hydrogen's economic potential. Green hydrogen is not a useful tool for sectors that can decarbonize by transitioning to electric technologies and relying on a renewable power grid. . . . [P]olicymakers should focus on supporting green hydrogen in sectors that lack feasible electric options . . .").
[132] Accufacts Inc., *Report: Safety of Hydrogen Transportation by Gas Pipelines* at 6 (Nov. 28, 2022) (attached as Ex. 16).
[133] *Id*.; *see also* Ill. Clean Jobs Coal., *ICJC Hydrogen Work Group Recommendations*, *supra* note 131, at p. 5.
[134] Paul W. Parfomak, *Pipeline Transportation of Hydrogen: Regulation, Research, and Policy, R46700*, Cong. Rsch. Serv. at 2-3, (Mar. 2, 2021), https://crsreports.congress.gov/product/pdf/R/R46700 (citations omitted).
[135] Thomas Paone, *Dealing with the Aftermath of the Hindenburg Disaster*, Nat'l Air & Space Museum (May 6, 2022), https://airandspace.si.edu/stories/editorial/aftermath-hindenburg [https://perma.cc/8WAK-3HLU].
[136] Goldmeer & Catillaz, *supra* note 124, at 14.

systems.[137] Burning high-hydrogen blends or even pure hydrogen in a gas turbine will require different fuel delivery piping and components, different gas turbine controls, ventilation systems, and enclosures, and different selective catalytic reduction ("SCR") systems for NOx removal.[138]

Moreover, PVSC is planning to install turbines designed for fossil gas with the intention of retrofitting them to burn hydrogen in a process that could take up to 10 years according to its Compliance Statement.[139] While the particular turbines PVSC has purchased claim to have the capacity to burn blends of up to 75% hydrogen by volume,[140] if PVSC really does intend to burn 100% hydrogen down the line, its turbines would not be able to burn blends with such high percentages of hydrogen. So not only would the turbines need to be updated, but the remainder of the system – such as the piping, vents, and more – would also need to be retrofitted to withstand the stress of hydrogen burning. Given that the expected useful life of these turbines is "20 years or more[,]"[141] PVSC would be refurbishing the turbines less than halfway into their useful life. If PVSC is indeed planning to burn hydrogen, the cost-effective route would be to install turbines that can safely burn hydrogen from the start – but PVSC's apparent inability to do so, in addition to the numerous concerns and hinderances laid out above, casts further doubt on its hydrogen-burning proposal.

3. Green hydrogen is expensive, difficult to transport, and can strain freshwater resources

While DEP is requiring PVSC to transition to burning "green hydrogen" – meaning hydrogen fuel produced by splitting water molecules using solar, wind or some other renewable energy[142] –only approximately 0.02% of global hydrogen is currently produced using "green" energy.[143] This is mostly because green hydrogen is prohibitively expensive, with some studies citing costs between $3 to $7 per kilogram of green hydrogen.[144] For comparison, fossil fuel based hydrogen, which is even worse for human health and the environment, costs between $1.25 to $2 per

[137] *Id.* at 16; *see also* Elec. Power Rsch. Inst., *Hydrogen-Capable Gas Turbines for Deep Decarbonization* at 3 (Nov. 2019), https://h2fcp.org/sites/default/files/3002017544_Technology-Insights-Brief_%20Hydrogen_Capable-Gas-Turbines-for-Deep-Decarbonization.pdf [https://perma.cc/L5UV-6STU].
[138] Saadat & Gersen, *supra* note 125, at 24-25 (citing Goldmeer & Catillaz, *supra* note 124).
[139] Compliance Statement, *supra* note 37, at 32.
[140] *See id.* at 22 (noting that PVSC selected Siemens model STG-600 CTGs for the project); *see* Draft Permit, *supra* note 12, at pdf p. 325; *see also SGT-600 gas turbine*, Siemens Energy, https://www.siemens-energy.com/us/en/home/products-services/product/sgt-600.html#/ [https://perma.cc/D76U-2H7W] (last visited Oct. 26, 2024) ("Hydrogen up to 75%" is listed under the "High fuel flexibility" tab.).
[141] Compliance Statement, *supra* note 37, at 19.
[142] Just Solutions, *Hydrogen Energy: A Critical Review to Ensure Community and Climate Benefits* at 6 (Feb. 2024), https://justsolutionscollective.org/wp-content/uploads/2024/02/JS_EJframework_FNL2_Digital-1.pdf [https://perma.cc/FYP4-DVFG].
[143] Saadat & Gersen, *supra* note 125, at 6-7.
[144] Roxana T. Shafiee & Daniel P. Schrag, *Carbon abatement costs of green hydrogen across end-use sectors*, 8 Joule 1-9, 1 (2024) (attached as Ex. 17).

kilogram.[145] Stated differently, "green hydrogen currently costs $500–1,250 [per ton of carbon abatement] across all sectors."[146] Before the cost of green hydrogen can be brought down, the costs of renewable energy in general must be reduced.[147] Unless buildout of renewables increases exponentially, causing the cost of renewable energy to plummet, green hydrogen will likely remain prohibitively expensive. Cost prohibitions aside, the very production of green hydrogen is inherently wasteful, since it diverts direct power from renewable energy to produce a secondary source that then provides indirect power. This is peak inefficiency, creating an unnecessary intermediary to the powering process. The inefficiency of using solar energy to produce hydrogen is even more stark when considering that the direct use of solar would only further the energy resiliency goal that PVSC claims to be trying to achieve, seeing as the round trip efficiency range of batteries powered by solar and other clean energies is 85–90% while hydrogen only has an average efficiency of 24–35%.[148] All these factors taken together, PVSC's plan to transition to green hydrogen in a decade is highly improbable. Instead, the most likely scenario is that PVSC will either continue utilizing only natural gas, or a blend of fossil fuel-based hydrogen and natural gas,[149] which would be even more detrimental to the neighboring communities.

There is also the question of how PVSC purports to obtain this green hydrogen to power its turbines. PVSC claims it does not have the requisite space to add enough on site renewable energy solutions to cover its backup energy needs, while simultaneously claiming that it will be able to generate enough solar power to produce green hydrogen on site via electrolysis instead of simply harnessing the solar energy to power the facility directly.[150] If PVSC does anticipate being able to produce enough solar energy to create the green hydrogen it would need to power its turbines on site, it should simply skip the green hydrogen and just use solar power. And while PVSC's AO-25 Compliance Statement suggests that it may produce hydrogen from the facility's "waste streams" such as, presumably, digester methane,[151] any hydrogen so produced would not be "green" and should not be allowed under the permit.

If the hydrogen cannot be produced on site, it must be delivered by ship, truck, rail, or pipeline, but all these methods pose their own problems. While hydrogen can be liquified and transported by ship, liquification is both costly and energy intensive as it must be kept extremely cold to

---

[145] Saadat & Gersen, *supra* note 125, at 17; *see also* Blaine Friedlander, *Touted as clean, 'blue' hydrogen may be worse than gas or coal*, Cornell Chronicle (Aug. 12, 2021), https://news.cornell.edu/stories/2021/08/touted-clean-blue-hydrogen-may-be-worse-gas-or-coal [https://perma.cc/Q9FK-CLBH].
[146] Shafiee & Schrag, *supra* note 144 (ex. 17).
[147] Saadat & Gersen, *supra* note 125, at 17-18.
[148] Dan Esposito, *Hydrogen Policy's Narrow Path: Delusions & Solutions*, Energy Innovation at 18 (Aug. 27, 2024), https://energyinnovation.org/wp-content/uploads/2024/08/Hydrogen-Policys-Narrow-Path-Delusions-and-Solutions.pdf [https://perma.cc/M66Y-N69C].
[149] Compliance Statement, *supra* note 37, at 32
[150] *Id.* at 45-46.
[151] *Id.*

remain stable.[152] Transport by truck or rail would also be impractical, as the compressed tube trailers needed to transport hydrogen are expensive and can only carry small volumes over a limited distance.[153] Moreover, unless these trucks were themselves electric, they would also be contributing additional diesel emissions to the Ironbound, a community that is already overly saturated with truck traffic and diesel emissions. Lastly, while pipelines would solve some of the logistical challenges faced by the aforementioned methods of transport, the current pipeline infrastructure for natural gas is incompatible with hydrogen due to the molecular differences, necessitating the buildout of entirely new infrastructure that is estimated to cost up to 68% more than existing conventional pipelines.[154]

Regardless of the method of transport, the hydrogen must also then be stored on site for use during any future natural disaster. However, the same issues hydrogen faces for transport persist for storage. Hydrogen requires immense amounts of space to be kept in its gaseous state. Alternatively, storing hydrogen in a liquified or pressurized state presents similar issues of temperature, energy conversion loss, and costs as the previously mentioned transportation options.[155] It is particularly worth noting that PVSC presumably has enough hydrogen storage on site for 4 hours' worth of energy only – far less than the two weeks' worth of energy PVSC purports to need.[156]

Lastly, producing green hydrogen using electrolysis requires an immense amount of freshwater. Between 15 to 20 liters total are needed to produce 1 kilogram of green hydrogen, making it a very water intensive form of energy.[157] As climate change worsens and its impacts deepen – impacts PVSC is trying to avoid by installing backup generation on site, yet choosing to do so in the most climate-change perpetuating way with natural gas – freshwater will become more scarce. As freshwater resources are lost to desertification, shifting rain patterns, and saltwater intrusion, it would be both irresponsible and unethical to divert freshwater away from local communities to subsidize the production of green hydrogen.[158] If PVSC does indeed intend to create its own green hydrogen via electrolysis on site, the Irondbound would once again bear the brunt of PVSC's operations as freshwater is diverted from its neighborhoods and into the facility, a scenario that is even more alarming in the event of a natural disaster during which freshwater becomes even harder to come by.

---

[152] Saadat & Gersen, *supra* note 125, at 20.
[153] *Id.* at 19-20.
[154] *Id.* at 19.
[155] *Id.* at 20.
[156] Compliance Statement, *supra* note 37, at 44 (rejecting proposal for on-site hydrogen storage because it could only provide 4 hours' worth of energy).
[157] Saadat & Gersen, *supra* note 125, at 20 (citing Energy Transitions Comm'n, *Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy*, at 61 (Apr. 2021), https://energy-transitions.org/wp-content/uploads/2021/04/ETC-Global-Hydrogen-Report.pdf).
[158] Just Solutions, *Hydrogen Energy: A Critical Review*, *supra* note 142, at 7.

PVSC's obstacle-ridden hydrogen fuel proposal is unworkable. A report by Energy Innovation warns that using hydrogen for power generation is a "terrible" prospect, and that "[r]egulators should dismiss proposals to co-fire hydrogen with natural gas at existing power plants or to build new "hydrogen-ready" power plants . . . [since] [t]hese proposals risk giving electric utilities an excuse to continue operating or building fossil fuel power plants with no actionable plan for cost-effectively cleaning up their portfolio, thereby delaying the transition to a decarbonized electricity generation mix."[159] Viewed in the aggregate, PVSC's proposal seems to be just that: unactionable and a delay to decarbonization. The addition to the stressors in the Ironbound together with all the hazards, inefficiencies, and logistical impossibilities of burning hydrogen in natural gas turbines reveals a clear picture: PVSC must not be allowed to burn hydrogen.

4. The permit must not allow the SPGF to burn biogas or other forms of "renewable" natural gas.

DEP's hydrogen EJ Condition would require PVSC to transition to "green hydrogen or another technically feasible renewable energy source."[160] **The Draft Permit must at the least change this "renewable energy source" language to ensure that the SPGF does not burn false solutions like biogas that are deceptively touted as "renewable," but can have emissions that equal or exceed those of natural gas.** While other New Jersey regulatory programs classify the combustion of methane that is captured at a landfill or is generated from the anaerobic digestion of food waste and sewage sludge as "renewable energy,"[161] and while industry proponents greenwash this methane as "renewable natural gas,"[162] emissions from burning "renewable" methane can exceed emissions from burning fossil-derived methane. EPA's AP-42 emission factors estimate that, in some instances, the combustion of landfill gas or digester gas can have higher emissions of CO, VOCs, NOx, particulate matter, SO_2, and HAPs (like 1,3-Butadeine, acetaldehyde, benzene, and toluene) than the combustion of fossil-derived methane.[163] Replacing the combustion of fossil-based methane with the combustion of "renewable" methane thus is not an emission-reduction measure cognizable under the EJ Law, especially when the replacement methane may have even higher emissions than the original. So

---

[159] Esposito, *Hydrogen Policy's Narrow Path*, *supra* note 148, at 18.
[160] Draft Permit, *supra* note 12, § D, 23 (pdf p. 36).
[161] *See, e.g.,* N.J.A.C. 14:8–2.5(b).
[162] *See* David Roberts, *The false promise of "renewable natural gas"*, Vox (Feb. 20, 2020), https://www.vox.com/energy-and-environment/2020/2/14/21131109/california-natural-gas-renewable-socalgas [https://perma.cc/K62T-UD3V]; *see also* Sasan Saadat et al., Earthjustice, *Rhetoric vs. Reality: The Myth of "Renewable Natural Gas" for Building Decarbonization* (July 2020), https://earthjustice.org/wp-content/uploads/report_building-decarbonization-2020.pdf [https://perma.cc/25EH-HTS5].
[163] Alpha-Gamma Tech., Inc., *Emission Factor Documentation for AP-42 Section 3.1 Stationary Gas Turbines* at 37-46, tbls. 3.4-1, 3.4-3, 3.4-4 (Apr. 2000), https://www.epa.gov/sites/default/files/2020-10/documents/b03s01.pdf [https://perma.cc/3GRA-BC8P] (prepared for EPA Off. of Air Quality Planning & Standards); *see also* Valerio Paolini et al., *Environmental impact of biogas: A short review of current knowledge*, 53 J. of Env't Sci. & Health 899, 901 (2018) (attached as Ex. 18) (noting that "the NOx emission level of biogas [combustion] is, in general, higher than for natural gas engines"); *see also* Michael J. Kleeman et al., *Air Quality Implications of Using Biogas to Replace Natural Gas in California* (May 2020), https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-034.pdf [https://perma.cc/79TH-4592] (prepared for Ca. Energy Comm.).

just like DEP should not consider replacing polluting methane with polluting hydrogen to be an "EJ Condition," so too should DEP not consider replacing one type of methane with another an "EJ Condition."

ii. DEP Must Improve Other Conditions Related to the SPGF Gas Plant.

Aside from the hydrogen EJ Condition described above, many of the Draft Permit's other conditions concerning the SPGF are inadequate, especially given that in its first permitting act under the EJ Law, DEP is proposing to approve a fourth gas plant in one of the most overburdened communities in the state. Improvements to these conditions can and must be made so that maximum protections are provided until the SPGF is replaced with a zero-emitting power source, *see* Section II above.

First, **PVSC should require the SPGF to use non-polluting emission control technology like carbon adsorption instead of an oxidation catalyst.** DEP is proposing to approve the use of an oxidation catalyst at the SPGF for emission control.[164] Oxidation catalysts and other thermal oxidizers use combustion to control emissions like VOCs and HAPs, but the combustion process itself can result in the emissions of NOx, acid gases, metals like arsenic and mercury, and even new VOCs and HAPs not previously present in the exhaust.[165] Instead of this polluting pollution-control technology, the permit should require PVSC to use non-polluting odor and pollution control technologies like carbon adsorption, which can achieve 99% VOC control efficiency, greater than the paltry 60% required for the SPGF.[166]

Second, whether or not carbon adsorption is used, **the Draft Permit must require higher NOx, VOC, and CO control efficiencies at the SPGF.** DEP is proposing to require NOx control of only 71%,[167] but SCR can achieve control efficiencies of 95% or more.[168] Similarly, the Draft Permit's 60% VOC and 65% CO destruction and removal efficiency requirement[169] is absurdly low considering that EPA recognizes catalytic oxidizer control efficiencies of 99.9% VOC and 98% CO.[170] Indeed, DEP's generally-applicable guidance requires all non-catalytic oxidizers to

---

[164] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13).
[165] EPA, *Chapter 2 Incinerators and Oxidizers* at 2-3, 2-5 (Nov. 2017), https://www.epa.gov/sites/default/files/2017-12/documents/oxidizersincinerators_chapter2_7theditionfinal.pdf [https://perma.cc/V7CW-PTKE].
[166] *See* EPA, *Chapter 1 Carbon Absorbers* at 1-1 (Oct. 2018), https://www.epa.gov/sites/default/files/2018-10/documents/final_carbonadsorberschapter_7thedition.pdf [https://perma.cc/9XNW-YDP2]; Draft Permit, *supra* note 12, at § D, 55, 134 (pdf pp. 68, 147).
[167] Draft Permit, *supra* note 12, at § D, 132 (pdf p. 145).
[168] *See, e.g.*, *SCR technology for reducing NOx emissions*, Yara, https://www.yara.us/chemical-and-environmental-solutions/nox-reduction-for-stationary-plants/nox-control-systems/scr-technology/ [https://perma.cc/DY7R-H8D7] (last visited Oct. 26, 2024) ("SCR Technology can achieve more than 95% NOx reduction."); EPA, *Air Pollution Control Technology Fact Sheet: Selective Catalytic Reduction (SCR), EPA-452/F-03-032* at 1 (2003), https://www3.epa.gov/ttncatc1/dir1/fscr.pdf [https://perma.cc/HKT3-MMQU].
[169] Draft Permit, *supra* note 12, at § D, 134 (pdf p. 147).
[170] EPA, *Air Pollution Control Technology Fact Sheet: Catalytic Incinerator, EPA-452/F-03-018* at 1 (2003), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1008OGZ.PDF [https://perma.cc/8PRM-BZP9]; EPA, *Air Pollution Control Technology Fact Sheet: Regenerative Incinerator, EPA-452/F-03-021* at 1 (2003), https://www3.epa.gov/ttncatc1/dir1/fregen.pdf [https://perma.cc/BYL4-5G7W].

have a "minimum design destruction efficiency of 99%[.]"[171] Given that this is a major source of pollution in an overburdened community, the required efficiency of all of PVSC's oxidizers should be at least 99%. And PVSC must be required to have enough catalyst to properly oxidize all pollutants of concern, especially formaldehyde, which the SPGF will emit at over 500 pounds per year.[172] To the extent lower control efficiencies are necessary during startup and shutdown periods because higher efficiencies are unachievable before the system is hot enough, then DEP should relegate the lower control efficiencies to the 25-minute startup and 10-minute shutdown operating scenarios only,[173] and apply control efficiencies of greater than 95% for the SCR and 99% for the oxidation catalytic/carbon adsorption for all other times.

Third, **the NOx, CO, VOC, and ammonia limits should all be no higher than 2 ppmvd.** The Draft Permit allows ammonia emissions up to 5 ppmvd, VOC emissions up to 4 ppmvd, CO emissions up to 3 ppmvd, and NOx up to 2.5 ppmvd during storm preparation mode or testing.[174] At other times, including presumably the emergency operation mode allowed by the EJ Conditions,[175] the Draft Permit allows CO emissions up to 250 ppmvd, VOC up to 50 ppmvd, and NOx up to 25 ppmvd.[176] DEP provides no explanation why permissible emissions in some operating scenarios should be orders of magnitude higher than in other operating scenarios. These limits can and should be lowered to no higher than 2 ppmvd for all operating scenarios. In 2017, Massachusetts permitted new natural-gas-burning turbines with NOx, CO, VOC, and ammonia limits of 2 ppmvd or lower,[177] and DEP should do the same here.

Fourth, **the EJ Conditions must remove or reduce the permitted amount of time prior to an expected storm event that PVSC is allowed to start up the SPGF.** The Draft Permit currently allows PVSC to operate the gas turbines up to 48 hours prior to a storm event that the New Jersey Office of Emergency Management anticipates may have the capability of disrupting power service to the facility.[178] But the gas turbines do not need 48 hours to ramp up – indeed, the Draft Permit itself recognizes this by limiting the turbine startup operating scenario to no more than 25 minutes.[179] And Siemens represented to PVSC specifically that the gas turbines that PVSC is proposing to install would be able to reach full load in just 12 minutes.[180] So the Draft Permit appears to assume a startup period that is *240 times* longer than how long it will actually take to start up the turbines. Moreover, it does not make sense for the Draft Permit to

---

[171] Mem. on Non-Catalytic Oxidizer Conditions from John Preczewski, Assistant Director, Air Quality Permitting Program, DEP to AQPP Permit Evaluators (June 25, 2007), https://dep.nj.gov/wp-content/uploads/boss/permitting-guidance/non_catalyticoxidizerconditions.pdf.
[172] Draft Permit, *supra* note 12, at § D, Reason for Application (pdf p. 13).
[173] *See id.* at § D, 160-163 (pdf pp. 173-176).
[174] *Id.* at § D, 157-159 (pdf pp. 170-172).
[175] *Id.* at § D, 19 (pdf p. 32) (GR2 EJ Special Conditions, Ref. 1).
[176] *Id.* at § D, 140, 155 (pdf pp. 153, 168) (U301 Three Nat. Gas Turbines, OS Summary, Refs. 9, 10, 49).
[177] *See* Letter from Susan Ruch, Mass. Dep't Env't Prot., to Louis DiBerardinis, Mass. Inst. of Tech., approving MIT Air Quality Plan at 20 (June 21, 2017) (attached as Ex. 19).
[178] Draft Permit, *supra* note 12, at § D, 19 (pdf p. 32) (GR2 EJ Special Conditions, Ref. 1).
[179] *Id.* at § D, 160 (pdf p. 173) (U301 Three Nat. Gas Turbines, OS2, OS6, OS10, Ref. 1).
[180] Siemens, *SGT-600 Gas Turbine Proposal for PVSC*, *supra* note 73, at pdf p. 130.

allow such a long storm preparation period while requiring PVSC to "exhaust" its solar and battery storage power *before* commencing the storm preparation period, as the EJ Condition requires.[181] This means that DEP is making PVSC empty its battery storage while it is still connected to the grid, so that it has *no* stored energy during the storm when it theoretically could lose grid power. This "exhaustion" provision only makes sense if DEP requires PVSC to use battery power once the grid connection is lost (and then, if it seems the battery power will be exhausted, resort to starting up the SPGF some 12 minutes before the battery is used up), instead of requiring PVSC to drain the battery before it needs it the most. This storm-preparation startup time must therefore be removed, or at least significantly shortened.

Fifth, **DEP should clarify the term "storm event" in the EJ Condition.** The definition of "storm event" is inadequately specific – stating only "storms determined by the New Jersey Office of Emergency Management as having the capability of disrupting power service to the facility."[182] But the Draft Permit provides no guidance about when or how the Office of Emergency Management determines what constitutes a storm event that has the capability to disrupt power to PVSC. And it is unclear at what point in time the "storm event" occurs for the purpose of calculating the 48 hours in advance of the storm event that PVSC may operate the SPGF – is it once the storm forms, once the storm reaches New Jersey, or when the storm is predicted to cause a potential power disruption to PVSC? DEP must clarify that the time should be calculated based on when PVSC may lose power, and not at any time before that.

Sixth, **DEP should lower the SPGF's allowable particulate matter emissions to be in line with EPA's recent limits for coal-fired power plants.** All of the SPGF's operating scenarios include a 4.41 lb/hr emission limit for TSP, PM_{10}, and $PM_{2.5}$ based on the vendor estimate of 0.014 lb/MMBtu.[183] But EPA's recent Mercury and Air Toxics Rule requires existing coal-fired power plants to meet a filterable PM limit of 0.01 lb/MMBtu.[184] The Draft Permit should have a filterable PM limit no higher than 0.01 lb/MMBtu or its equivalent, and, as explained below and required in the EPA rule, require PVSC to continuously monitor these filterable PM emissions.[185]

Seventh, **DEP's permit must require that PVSC continuously monitor SPGF emissions, at the very least for VOCs, NOx, CO, PM, ammonia, and formaldehyde, and increase reporting to assure compliance.** The Draft Permit's provisions regarding monitoring SPGF emissions are currently limited to one stack test for NOx every one or two years, a stack text once every 5 years for CO, and stack test only once upon initial startup for VOC, TSP, PM_{10}, $PM_{2.5}$, and ammonia,[186] with other pollutants like formaldehyde measured through calculations

---

[181] Draft Permit, *supra* note 12, at § D, 20 (pdf p. 33) (GR2 EJ Special Conditions, Ref. 2).
[182] *Id.* at § D, 19 (pdf p. 32) (GR2 EJ Special Conditions, Ref. 1).
[183] *Id.* at § D, 158-163, 166 (pdf pp. 171-76, 179).
[184] 40 C.F.R. Pt. 63, Subpt. UUUUU, tbl. 2 (requirements for subcategories 1, 2, 7).
[185] *See* 40 C.F.R. § 63.10022.
[186] Draft Permit, *supra* note 12, at § D, 137-139 (pdf pp. 150-152) (U301 Three Nat. Gas Turbines, OS Summary, Refs. 2-4); *see also* 40 C.F.R. § 60.4340(a) (explaining when annual stack test for NOx could be reduced to once every two years).

and not monitored at all.[187] This infrequent monitoring fails to meet the Clean Air Act standards that Title V permits "shall set forth . . . monitoring . . . and reporting requirements to assure compliance with the permit terms and conditions[,]"[188] and permitting authorities must include additional monitoring if needed to "assure compliance" even if the underlying requirement does specify some form of monitoring.[189] As EPA recently reiterated, "periodic stack testing alone is insufficient to assure compliance with short-term emission limits,"[190] but here DEP proposes periodic stack testing to be the only monitoring for many short-term "lb/hr" or continuous "ppmvd" emission limits. Nor has DEP fulfilled its duty under the EJ Law to add additional monitoring, recordkeeping, and reporting provisions as necessary to avoid contributions to disproportionate impacts in overburdened communities.[191] Especially since DEP is proposing to *increase* PVSC's allowable emissions by adding the SPGF,[192] the permit needs better monitoring and reporting provisions to not only ensure permit compliance, but also to allow PVSC, DEP, and the public to quickly identify and address any problems with the facility's operations that cause unusually high emissions. Continuous emissions monitoring systems ("CEMS") are particularly important for ammonia, since information about ammonia slip can help PVSC know how to finetune its emissions control.[193] And CEMS are important for formaldehyde, since gas plants emit more formaldehyde at lower temperatures,[194] and the nature of the SPGF's frequent startups and shutdowns means that it will disproportionately be operating at these lower temperatures. Indeed, DEP's own general guidance requires thermal oxidizers to continuously

---

[187] *See* Draft Permit, *supra* note 12, at § D, 145-148 (pdf pp. 158-161).
[188] 42 U.S.C. § 7661c(c).
[189] 40 C.F.R. § 70.6(c)(1); *see also Sierra Club v. EPA*, 536 F.3d 673, 677 (D.C. Cir. 2008) ("[A] monitoring requirement insufficient 'to assure compliance' with emission limits has no place in a permit unless and until it is supplemented by more rigorous standards.").
[190] *In the Matter of Covanta Delaware Valley LP, Delaware Valley Resource Recovery, Permit No. 23-00004,* Order on Pet. No. III-2023-10 at 12 (Nov. 2, 2023), https://www.epa.gov/system/files/documents/2023-11/covanta-delaware-valley-order_11-02-2023.pdf [https://perma.cc/LX3P-TJ7C] (citing *In the Matter of Oak Grove Management Company, Oak Grove Steam Electric Station*, Order on Pet. No. VI-2017-12 at 25–26 (October 15, 2021); *In the Matter of Owens-Brockway Glass Container, Inc.,* Order on Pet. No. X-2020-2 at 14–15 (May 10, 2021)).
[191] *See* EJ Rule, 55 N.J.R. at 681 (DEP explaining, in response to comments about the need for continuous monitoring and adequate reporting provisions, that "all conditions necessary to avoid a disproportionate impact will be incorporated in the Department's [EJ Law] decision and as enforceable conditions in all associated permits.").
[192] *See* Draft Permit, *supra* note 12, at § D, Reason for Application, #4 (pdf p. 13); *see also supra* Section I.A.
[193] *See Science Inventory, An Environmental Technology Verification (ETV) of Two Continuous Emission Monitors (CEMS) For Measuring Ammonia Emissions: SIEMENS AG LDS 3000, and OPSIS AB LD500*, EPA, https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NERL&dirEntryId=96244 (last revised June 6, 2005); *see also* Rhys Jenkins, *Solution for ammonia monitoring in CEMS and DeNOx applications*, Digital Refining (Nov. 2022), https://www.digitalrefining.com/article/1002843/solution-for-ammonia-monitoring-in-cems-and-denox-applications [https://perma.cc/FYN6-YYV2].
[194] *See* Elec. Power Rsch. Inst., *Formaldehyde and VOC Emissions from a General Electric LM6000 Combustion Turbine with SCR and CO Catalysts 1013170* at 2-3, tbl. 2-1 (Feb. 2006), https://www.epri.com/research/products/1013170 (attached as Ex. 20) (showing formaldehyde concentrations over 3 times higher at low loads versus high loads).

monitor total hydrocarbons in certain situations,[195] and to the extent that the SPGF is not technically covered by the guidance, DEP should nevertheless require continuous monitoring here, consistent with the EJ Law.

Lastly, **the permit should require that all stack tests are conducted during the type of operation expected to result in the highest emission level for the tested pollutant, even if that means operating at lower loads.** The Draft Permit requires stack testing to be conducted under "worst case" operating conditions,[196] but if this is interpreted to mean when the load is at its highest, then the stack test would undercount emissions for pollutants like formaldehyde that have higher emissions at lower loads.[197] This is particularly true considering emissions for all pollutants are often at their worst during startup and shutdown before emissions control technologies kick in. So, any stack testing of pollutants like ammonia, formaldehyde, VOCs, NOx, and CO should be performed during startup, shutdown, and whichever low-load or high-load steady-state operations are expected to result in the highest emissions. This load sensitivity is further reason why infrequent testing with long stretches of time between tests is unacceptable for adequate monitoring and compliance assurance. DEP must require CEMS for these pollutants to protect the health of neighboring overburdened communities.

F. Boiler and Heater Conditions

Aside from the SPGF, the Draft Permit allows PVSC to operate many other pieces of fossil fuel-fired equipment like 30 boilers and hot water heaters, 21 space heaters, and up to 6 emergency generators.[198] Of these, DEP's EJ Conditions require PVSC to decommission only 6 boilers (both of the operation and maintenance building natural gas boilers, both of the natural gas oxygen production boilers, and both of the natural gas grit and screening boilers) and one diesel emergency generator.[199] In each of these cases, the EJ Condition specifies, "If PVSC chooses to replace the equipment, the new equipment must be powered by a renewable energy source."[200]

The Draft Permit must change this "renewable energy source" language to ensure that the boilers and generators are not replaced with false solutions like biogas or hydrogen that are deceptively touted as "renewable," but can have emissions that equal or exceed the emissions of the current fossil fuel-fired equipment. As noted above, the burning of hydrogen and/or "renewable" natural gas both emit pollution that can even exceed pollution from burning

---

[195] Mem. on Monitoring of VOC Emissions Controlled by Oxidizers from Kenneth Ratzman, Assistant Director, Air Quality Permitting Program, DEP to Air Permit Evaluators (Nov. 21, 2016), https://dep.nj.gov/wp-content/uploads/boss/permitting-guidance/cems-for-oxidizers.pdf [hereinafter DEP CEMS Memo].
[196] *See* Draft Permit, *supra* note 12, at § D, 137-39 (pdf p. 150-52) (U301 Three Nat. Gas Turbines, OS Summary, Refs. 2-4).
[197] *See* Elec. Power Rsch. Inst., *Formaldehyde and VOC Emissions*, *supra* note 194, at 2-3, tbl. 2-1 (ex. 20).
[198] Draft Permit, *supra* note 12, at § D, Facility Specific Requirements Page Index (pdf pp. 11-12), Insignificant Source Emissions Table (pdf p. 205) & Equipment Inventory (pdf pp. 206-212).
[199] *Id.* at § D, 21 (pdf p. 34).
[200] *Id.*

fossil-derived methane.[201] So DEP should not allow such a one-to-one swap to count as an emission-reducing "EJ Condition." Indeed, DEP's estimates of the emission-reduction benefits of the so-called "decommissioning" of these boilers are suspiciously small – only a fraction of the emissions that the boilers currently emit, with some of DEP's expected emission reductions orders of magnitude smaller than the current emissions.[202] This suggests that the end game was never decommissioning these boilers, but rather mere replacement of one polluting fuel with another.

Instead of using vague language that may potentially allow PVSC to simply substitute the burning of one type of fuel with another, **DEP must require PVSC to replace all of its current fossil fuel-fired boilers and hot water heaters – not only those mentioned in the EJ Conditions – with non-combustion, electric alternatives**. By electrifying all its existing boilers, PVSC can abate at least 3.05 tpy of VOCs, 54.55 tpy of NOx, 47.01 tpy of CO, 15.85 tpy of SO_2, 6.372 tpy of TSP, and 6.372 tpy of PM_{10}.[203]

Commercially available, mature electrotechnologies can replace the existing fossil fuel-fired boilers and hot water heaters at the facility. Industrial heat pumps can provide industrial heat at high energy efficiency for operations at lower temperatures.[204] Electric boilers, meanwhile, can reach temperatures over 900 degrees Fahrenheit and are well suited to replace existing boilers at PVSC with operational temperatures that exceed 350 degrees Fahrenheit.[205] There are two types of electric boilers: resistance electric boilers and electrode boilers (which are more powerful).

The smaller of the two, resistance electric boilers can be rated up to 17 MMBtu/hr for heat input and 2,500 psi for pressure.[206] Resistance electric boilers can be configured to produce either steam or hot water. To achieve a heat input above 17 MMBtu/hr, two resistance electric boilers can be installed in parallel to double the heat input, or an operator can choose to install an electrode boiler. Electric resistance boilers are ideal for the replacement of smaller boiler and hot water heater equipment like the two wet weather pump station boilers (1.714 MMBtu/hr each), the two centrifuge facility hot water heaters (1.6 MMBtu/hr each), the two oxygen production building boilers (10.4 MMBtu/hr each), the two grit and screening boilers (1.701 MMBtu/hr

---

[201] *See supra* Section III.E.i.4.
[202] *Compare* Draft Permit, *supra* note 12, at § D, 42-43 (pdf pp. 55-56) (stating 2 O&M boilers emit 0.85 tpy VOC, 8.92 tpy NOx, 8.49 tpy CO, 3.93 tpy SO_2, 2.37 tpy TSP, 2.37 tpy PM_{10}) *with* Statement of Basis, *supra* note 96, at 2 (calculating "removal" of 2 O&M boilers would result in emission reductions of only 0.11 tpy VOC, 0.89 NOx, 1.01 tpy CO, 0.02 tpy SO_2, 0.19 tpy TSP, 0.19 tpy PM_{10}); *compare also* Draft Permit, *supra* note 12, at § D, 27 (pdf p. 40) (stating 2 oxygen production boilers emit 0.27 tpy VOC, 7.01 tpy NOx, 1.62 tpy CO, 11.5 tpy SO_2, 0.53 tpy TSP, 0.53 tpy PM_{10}) *with* Statement of Basis, *supra* note 96, at 2 (calculating "removal" of 2 oxygen production boilers would result in emission reductions of only 0.01 tpy VOC, 0.16 NOx, 0.14 tpy CO, 0 tpy SO_2, 0.02 tpy TSP, 0.02 tpy PM_{10}).
[203] *See* Table 2 in Exhibit 1, Boiler Electrification Tables.
[204] Fraunhofer ISI, *Direct electrification of industrial process heat. An assessment of technologies, potentials and future prospects for the EU* at 23, 26 (2024), https://www.agora-industry.org/fileadmin/Projects/2023/2023-20_IND_Electrification_Industrial_Heat/A-IND_329_04_Electrification_Industrial_Heat_WEB.pdf [https://perma.cc/VJ62-C9DU].
[205] *Id.* at 23-24; Draft Permit, *supra* note 12, at § D, Emission Unit / Batch Process Inventory, pdf pp. 375-77, 386-87; Fraunhofer ISI, *supra* note 204, at 23, 26.
[206] *See* Table 3 in Exhibit 1.

each), the two operation and maintenance boilers (24.5 MMBtu/hr each), and the 16 insignificant source (IS2) boilers and water heaters (<1 MMBtu/hr) on site.[207] If the 26 smaller gas-fired boilers and hot water heaters were electrified with resistance electric boilers, the additional electrical load requirements would be 25.75 MW.[208] The emissions abatement could reach 1.11 tpy of VOCs, 19.29 tpy of NOx, 11.75 tpy of CO, 15.43 tpy of SO_2, 2.902 tpy of TSP, and 2.902 tpy of PM_{10}.[209]

Electrode boilers are more powerful than resistance electric boilers. Electrode boilers can exceed 300 MMBtu/hr for heat input and 340,000 lb/hr for output.[210] Electrode boilers would be ideal for the replacement of the four largest boilers on site, the sludge heat treatment boilers which are rated at 67.1 MMBtu/hr each (only 3 of which run at once).[211] Electrification of the sludge heat treatment boilers could potentially abate 1.94 tpy of VOCs, 35.26 tpy of NOx, 35.26 tpy of CO, 0.42 tpy of SO_2, 3.47 tpy of TSP, and 3.47 tpy of PM_{10}.[212] Three electric sludge heat treatment boilers running simultaneously would require an additional electrical load of 59 MW.[213]

Boiler electrification can provide cost savings across the waste treatment process. When considering energy costs, long-term electricity and gas demand forecasting should be included. While the historic per-gigajoule cost of electricity in New Jersey has been higher than that of natural gas, this cost differential will change over time with industrial rates of electricity projected to become cheaper and natural gas projected to become significantly more expensive.[214] Electricity will become more competitive with natural gas in the long-term – a result of positive pressures on the gas system as customer base declines in the fossil-fuel phaseout and negative pressures on the electricity grid as renewable energy sources integrate.[215]

When quantified, the nonenergy co-benefits of electric boilers can exceed energy benefits by 2.5 times.[216] These nonenergy co-benefits of boiler electrification include but are not limited to: lower capital costs of equipment, emission reductions, lower permitting hurdles, improved operational control and faster ramp-up times, increased energy efficiency, smaller size footprint, lower maintenance costs and longer equipment lifetimes, and improved worker safety.[217] During procurement, the capital cost of an electric boiler can be 40% less than that of a natural gas boiler.[218] In terms of energy efficiency, the heat production efficiency of electric boilers is 99%,

---

[207] Draft Permit, *supra* note 12, at § D, Facility Specific Requirements Page Index (pdf pp. 11-12).
[208] *See* Table 2 in Exhibit 1.
[209] *See* Table 1 in Exhibit 1.
[210] *See* Table 3 in Exhibit 1.
[211] Draft Permit, *supra* note 12, at § D, Facility Specific Requirements Page Index (pdf p. 12).
[212] *See* Table 1 in Exhibit 1.
[213] The Draft Permit states only 3 sludge heat treatment boilers run at once. Draft Permit, *supra* note 12, at § D, Facility Specific Requirements Page Index (pdf p. 12). *See* Table 2 in Exhibit 1 for electrical load calculations.
[214] M. Jibran S. Zuberi et al., *Electrification of Boilers in U.S. Manufacturing*, Lawrence Berkeley Nat'l Lab'y, 45-46 (2021), https://escholarship.org/content/qt98r4r9r5/qt98r4r9r5_noSplash_016278e60333f3f05ce150b89cc9f28f.pdf [https://perma.cc/99FG-WGJZ].
[215] *See* Kingsmill Bond et al., *X-Change: Electricity*, Rocky Mountain Inst., 11 (2023), https://rmi.org/wp-content/uploads/dlm_uploads/2023/07/rmi_x_change_electricity_2023.pdf [https://perma.cc/89PR-WSY3].
[216] Edward Rightor et al. *Beneficial Electrification in Industry,* Am. Council for an Energy Efficient Econ., 7 (July 2020), https://www.aceee.org/sites/default/files/pdfs/ie2002.pdf [https://perma.cc/5CD9-XAA5].
[217] *Id.*
[218] *Id.* at 17.

almost perfectly converting energy to heat and much more efficient than the 89-97% efficiency of gas-fired boilers.[219] Electric boilers have better control systems, allowing for more exact temperature selection, faster ramp-up times, and low downtime.[220] Electric boilers are safer for workers since they do not contribute to indoor air pollution and do not risk gas leaks or explosions.[221] Electrification also lowers costs and delays associated with permitting, since electric heating equipment does not have end-use emissions that would necessitate permit modification applications.[222]

While DEP had done a cost analysis on boiler electrification as part of its Control and Prohibition of Carbon Dioxide Emissions proposed rule (in which DEP estimated the replacement cost of a natural gas-fired boiler with an electric boiler to be between $10,000 and $32,000 per boiler, and the electricity prices to be about 4.5 times higher than natural gas rates),[223] this analysis did not include the valuation of the co-benefits of electric boilers, long-term gas and electric price forecasting, nor potential cost savings from battery storage,[224] allowing for far cheaper electricity rates – and therefore should not control the instant permitting decisions. By switching to non-emitting boilers and avoiding nearly 60 tpy in VOC and NOx emissions, PVSC can also save over $700,000 dollars per year in avoided payments for its emissions that contribute to ozone in a severe – and soon to be extreme – ozone nonattainment area.[225]

In addition to boilers and heaters, PVSC should replace its natural gas-fired space heaters with heat pumps. By electrifying the space heating on site, PVSC can reduce its insignificant annual emissions, which currently total 9.2 tpy of NOx, 3.55 tpy of VOCs, and 0.2 tpy of particulate matter.[226] PVSC should review the space heaters on site, which all operate under 1 MMBtu/hr, and evaluate the feasibility of electrification.[227] Heat pumps can be up to 4.5 times more efficient than gas-fired furnaces, creating long-term energy cost savings.[228] Analysis shows

---

[219] Fraunhofer ISI, *supra* note 204, at 43, tbl.14.
[220] Carrie Schoeneberger et al*., Electrification potential of U.S. industrial boilers and assessment of the GHG emissions impact*, Advances in Applied Energy 5, 2 (2022) (attached as Ex. 21).
[221] Rightor et al., *supra* note 216, at 7.
[222] *Id.* at 17.
[223] Notice of Correction and Additional Public Comment Period, Control and Prohibition of Carbon Dioxide Emissions, 54 N.J.R. 228(a), 228 (Feb. 7, 2022).
[224] PVSC could potentially use any battery storage as a peak shaving resource and receive payments for its contributions to the grid. ICC AO-25 Comments, *supra* note 1, at 28 (ex. 2).
[225] *See* EPA Mem. from Scott Mathias, Director, Air Quality Policy Div., to Air Program Managers, Regions I-X regarding Clean Air Act Section 185 Fee Rates Effective for Calendar Year 2024 at 1 (Oct. 16, 2024) https://www.epa.gov/system/files/documents/2024-10/memorandum-sec-185-penalty-fees-for-year-2024_0.pdf [https://perma.cc/P5WH-RRTN] ("The fee rate for calendar year 2024 is $12,476.67 per ton of VOC and NOx emissions [into a severe or extreme ozone nonattainment area] . . .").
[226] Draft Permit, *supra* note 12, at § A (pdf p. 4).
[227] *Id.* at § D, Facility Specific Requirements Page Index (pdf p. 11).
[228] Lacy Tan & Jack Teener, *Now Is the Time to Go All In on Heat Pumps*, Rocky Mountain Inst. (July 6, 2023), https://rmi.org/now-is-the-time-to-go-all-in-on-heat-pumps/ [https://perma.cc/68QQ-3PU7].

that switching to a heat pump rooftop unit reduced energy consumption in U.S. commercial buildings by 10% and greenhouse gas emissions by 9%.[229]

G. Zimpro Sludge Heat Treatment Boilers and Zimpro Odor Control System Conditions

As with the SPGF, **DEP should require non-polluting emission and odor control technology like carbon adsorption at the Zimpro sludge heat treatment boilers and Zimpro odor control system.** The Zimpro odor control system currently uses two regenerative thermal oxidizers to control emissions and odors,[230] and DEP is proposing to require the installation of new oxidation catalysts at the existing Zimpro sludge heat treatment boilers through an EJ Condition.[231] But as noted above, thermal oxidizers use combustion to control emissions, which itself counter-productively creates new emissions.[232] Instead, the permit should require PVSC to use non-polluting odor and pollution control technologies like carbon adsorption, which can achieve 99% VOC control efficiency, higher than the 98% that the Draft Permit requires for the Zimpro odor control system.[233] And, as noted above, whether or not carbon adsorption is used, **the control efficiency should be increased to at least 99.9%,** since EPA recognizes control efficiencies of up to 99.9%.[234] And **emissions from all thermal oxidizers should be continuously monitored,** consistent with DEP's general guidance requiring thermal oxidizers to continuously monitor total hydrocarbons.[235]

Additionally, **the Draft Permit should require PVSC to reduce the Zimpro odor control system's emissions of butadiene and ethylene dichloride** – both of which can cause serious health effects. Chronic exposure to butadiene may cause lymph and blood cancer and reproductive harm.[236] Similarly, chronic exposure to ethylene dichloride may cause blood vessel, lung, and breast cancer, and may cause liver, kidney and potentially even brain and nerve damage.[237] Currently, the State of the Art levels for emissions of those two pollutants are 140 lbs/yr for butadiene and 1,600 lbs/yr for ethylene dichloride, respectively.[238] While the Draft Permit requires PVSC to reduce emissions from its boilers and eventually replace them, the Draft Permit has failed to require PVSC to adequately reduce the emissions from the Zimpro system

---

[229] Chris CaraDonna et al., *Impact Analysis of Transitioning to Heat Pump Rooftop Units for the U.S. Commercial Building Stock,* Nat'l Renewable Energy Lab'y, 1 (2023), https://www.nrel.gov/docs/fy23osti/85390.pdf [https://perma.cc/39KC-2HUK].
[230] Draft Permit, *supra* note 12, at § D, Facility Specific Requirements Page Index (pdf p. 11) & Control Device Inventory, 1 (pdf p. 332).
[231] *Id.* at § D, 22 (pdf p. 35) (GR2 EJ Special Conditions, Ref. 7).
[232] *See* EPA, *Chapter 2 Incinerators and Oxidizers*, *supra* note 165*,* at 2-3, 2-5.
[233] See EPA, *Chapter 1 Carbon Absorbers*, *supra* note 166, at 1-1; Draft Permit, *supra* note 12, at § D, 55, 134 (pdf pp. 68, 147).
[234] EPA, *Air Pollution Control Tech. Fact Sheet: Catalytic Incinerator*, *supra* note 170*,* at 1; EPA, *Air Pollution Control Tech. Fact Sheet: Regenerative Incinerator*, *supra* note 170, at 1.
[235] DEP CEMS Memo, *supra* note 195.
[236] N.J. Dep't of Health, *1,3-Butadiene: Hazardous Substance Fact Sheet*, *supra* note 14, at 2.
[237] N.J. Dep't of Health, *1,2-Dichloroethane: Hazardous Substance Fact Sheet*, 2 (Mar. 2010), https://nj.gov/health/eoh/rtkweb/documents/fs/0652.pdf [https://perma.cc/HL8B-PJ44].
[238] N.J.A.C. 7:27-17.9, tbls. 3A, 3B.

itself. The Draft Permit places a limit of 824 lbs/yr on the Zimpro system's butadiene emissions – nearly six times the State of the Art threshold.[239] And the Draft Permit limits the Zimpro system's ethylene dichloride emissions to 3,680 lbs/yr – over twice the State of the Art limit.[240] The State of the Art threshold reflects what is possible, and if it is possible to achieve these lower emission levels, then there is no better place to reduce these emissions than at PVSC's plant located within the Ironbound, a community already facing such a disproportionate burden. DEP should require PVSC to emit at or below the State of the Art threshold for these two dangerous chemicals.

In addition, **DEP should require continuous monitoring for the Zimpro boilers**. DEP's current Draft Permit gives PVSC the option of using CEMS for CO,[241] and only requires some monitoring done "by calculations annually" for most of the pollutants the Zimpro boilers emit, with one stack test being required every five years.[242] But this periodic stack test is insufficient to assure compliance with short-term emission limits,[243] like the many short-term "lb/hr" limits that apply to the Zimpro boilers. Requiring PVSC to "install and operate State-of-the-Art air pollution control devices, including, but not limited to, selective catalytic reduction (SCR) and oxidation catalyst (OC) systems by June 30, 2026"[244] at the boilers will not achieve lasting emissions reductions without consistent monitoring to ensure these technologies actually yield emission-reduction benefits. CEMS should be mandatory where the technology exists, and where it is unavailable, more frequent stack testing must be conducted under worst operating conditions.[245]

H. Influent Screw Pumps and Primary and Final Clarifiers Conditions

The Draft Permit must require PVSC to reduce its facility-wide emissions of styrene. The three different sources of styrene from the facility (influent screw pumps, primary clarifiers, and final clarifiers) collectively emit more styrene than DEP's State of the Art threshold.[246] Styrene is a hazardous chemical because it may potentially cause lung cancer, and can negatively affect

---

[239] Draft Permit, *supra* note 12, at § D, 52 (pdf p. 65); N.J.A.C. 7:27-17.9, tbl. 3A.
[240] Draft Permit, *supra* note 12, at § D, 51 (pdf p. 64); N.J.A.C. 7:27-17.9, tbl. 3B.
[241] Draft Permit, *supra* note 12, at § D, 49 (pdf p. 62) ("The permittee may propose, in the stack test protocol, to use CEMS data to satisfy the stack testing requirements, for CO, with EMS approval.").
[242] *Id.* at § D, 50-55 (pdf. pp. 63-68) (annual calculations considered sufficient for VOC, TXS, SO_2, TSP, PM_{10}, CO, NOx, HAPs, HCl, benzene, chloroform, ethylene dichloride, butadiene, acrylonitrile, vinyl acetate, and tetrachloroethane).
[243] *In the Matter of Covanta Delaware Valley LP, Delaware Valley Resource Recovery, Permit No. 23-00004,* Order on Pet. No. III-2023-10, *supra* note 190, at 12 (citing *In the Matter of Oak Grove Management Company, Oak Grove Steam Electric Station*, Order on Pet. No. VI-2017-12 at 25–26 (October 15, 2021); *In the Matter of Owens-Brockway Glass Container, Inc.,* Order on Pet. No. X-2020-2 at 14–15 (May 10, 2021)).
[244] EJ Decision, *supra* note 36, at 14.
[245] As stated above in Section III.E, this does not reference peak load, but rather moment like startup and shutdown when emissions control technology has not yet been triggered.
[246] Draft Permit, *supra* note 12, at § D, 87, 89, 94 (pdf pp. 100, 102, 107) (collectively 2,740 lbs/year); N.J.A.C. 7:27-17.9, tbl. 3A (State of the Art threshold of 2,000 lbs/year).

concentration, memory, balance, and learning ability.[247] While each of the three sources individually does not exceed the State of the Art threshold, the facility's total styrene emissions are nearly 50% greater than the State of the Art threshold.[248] Considering the negative public health impacts, styrene should be a pollutant of particular concern under the EJ Law process of considering where harmful emissions across the facility could be eliminated,[249] but DEP's Draft Permit fails to require any reduction in styrene emissions. In order to limit or eliminate the negative health effects associated with PVSC's styrene emissions, the Draft Permit should place stricter emissions limits on the sources of styrene across the facility.

I. Sludge Thickening Centrifuge

The sludge thickening centrifuge's scrubbers should have a higher hydrogen sulfide ("H_2S") destruction efficiency and be continuously monitored. PVSC is a constant source of foul odors that negatively affect the quality of life of the surrounding Ironbound community, and many of these are likely attributable to the H_2S emissions from the sludge thickening centrifuge.[250] The Draft Permit requires only 95% destruction efficiency for these H_2S emissions,[251] but this should be increased to a destruction efficiency of at least 99%, a level that EPA has recognized is achievable.[252] And the H_2S monitoring is limited only to a stack test conducted "once initially."[253] Instead, these emissions should be monitored continuously, since one stack test over the life of the emission unit is clearly insufficient, given that compacting can increase H_2S emissions over time and given that the surrounding community already suffers impacts from these odors.

J. Lime Silos and Lime Bins Conditions

The Draft Permit must have additional conditions to ensure that the lime silo and lime bin baghouses are functioning properly. The Draft Permit has no more than 10 conditions for each of these emission sources and baghouses, *none* of which have any monitoring, recordkeeping, or reporting requirements aside from annual dust collector maintenance and monthly visual emission inspection.[254] At a minimum, the current 20% opacity (30-min) requirements should be reduced to no higher than 7% opacity (6-min), in line with what EPA recently required for lime bins in its recent rule for lime manufacturing plants.[255] And the permit should require continuous

---

[247] N.J. Dep't of Health, *Styrene Monomer: Hazardous Substance Fact Sheet*, 2 (June 2016) https://nj.gov/health/eoh/rtkweb/documents/fs/1748.pdf [https://perma.cc/3MQH-NMT5].
[248] Draft Permit, *supra* note 12, at § D, 87, 89, 94 (pdf pp. 100, 102, 107) (collectively 2,740 lbs/year); N.J.A.C. 7:27-17.9, tbl. 3A (State of the Art threshold of 2,000 lbs/year).
[249] *See* EJ Decision, *supra* note 36, at 7.
[250] *See* Nat'l Rsch. Council, *Acute Exposure Guideline Levels for Selected Airborne Chemicals: Volume 9, Chapter 4 Hydrogen Sulfide* (2010), https://www.ncbi.nlm.nih.gov/books/NBK208170/ [https://perma.cc/N3MT-V283].
[251] Draft Permit, *supra* note 12, at § D, 101 (pdf p. 114) (U54, OS Summary, Ref. 1).
[252] EPA, *Air Pollution Control Technology Fact Sheet: Packed-Bed/Packed-Tower Wet Scrubber, EPA-452/F-03-015* at 1 (2003), https://www3.epa.gov/ttnchie1/mkb/documents/fpack.pdf [https://perma.cc/7AYG-7LM6].
[253] Draft Permit, *supra* note 12, at § D, 101-102 (pdf pp. 114-115) (U54, OS Summary, Refs. 1, 5).
[254] *Id.* at § D, 45, 56-58 (pdf pp. 58, 69-71).
[255] *Compare id. with* 40 C.F.R. Pt. 63, Subpt. AAAAA, tbl. 1 (#21), tbl. 4 (#6).

monitoring of baghouse pressure, continuous opacity monitoring, and work practice standards to ensure that the baghouse is functioning properly and there is no tear in the bags or other leaks. These are conditions that DEP already requires in permits for baghouses at other facilities,[256] and which EPA requires in federal rules concerning baghouses.[257]

K. Vehicle Spray Paint Booth Conditions

The Draft Permit allows PVSC to operate a vehicle spray paint booth with a 1.7 MMBtu/hr air heater.[258] This unit is permitted to emit 1.5 tpy of VOCs, 0.0405 tpy NOx, 0.034 tpy CO, and 0.685 tpy particulate matter.[259] It is not clear why on-site vehicle spray painting is a necessary component of PVSC's wastewater treatment operations – if vehicles need to be spray painted, that can happen somewhere that is not already one of the most over-polluted neighborhoods in the state, and if PVSC does indeed need to label vehicles on-site as part of its process, it can do so in a manner that doesn't add to PVSC's already substantial pollution burden. Accordingly, **the permit should require the decommissioning of the vehicle spray paint booth and the spray paint booth should be removed from the permit.**

L. Gasoline Tank and Vehicle Fleet Conditions

The permit should require PVSC to electrify its vehicle fleet and install electric vehicle ("EV") charging infrastructure to replace its underground storage tanks. PVSC's emissions include not only the emissions from the facility's fossil-fueled vehicle fleet, but also from the 2 underground storage tanks that PVSC is permitted to have on-site, totaling 16,000 gallons of gasoline storage.[260] The Draft Permit should require the removal of these underground storage tanks and replacement with EV charging infrastructure, and similarly require the replacement of PVSC's current fleet with electric vehicles.

As DEP explained in its Response to Comments on the EJ Rule, "[DEP] expects that, as facilities analyze and propose measures to avoid and minimize contributions to public health and environmental stressors, electrification of operations, including associated vehicles, will be a feasible and implementable compliance option."[261] Indeed, PVSC has already applied for funding through New Jersey's Clean Fleet Electric Vehicle Incentive Program to install electric vehicle charging equipment.[262] But this funding application, by itself, provides no guarantee of emission reductions – those guarantees would only come if DEP changes the Permit to require

---

[256] DEP, Draft Air Pollution Control Operating Permit Administrative Amendment for Covanta Essex Co., Permit Activity No. BOP190001, Program Interest No. 07736 at § D, 82 (pdf p. 94) (Oct. 18, 2019) (attached as Ex. 22).
[257] *See* 40 C.F.R. § 63.1626.
[258] Draft Permit, *supra* note 12, at § D, 78-91 (pdf pp. 91-94).
[259] *Id.* at § D, 78-79 (pdf pp. 91-92) (PM figure calculated by multiplying allowable 2.74 lb/hr particulate emissions by 500 hr/yr operation limit).
[260] *Id.* at § D, 33-38 (pdf pp. 46-51).
[261] EJ Rule, 55 N.J.R. at 729.
[262] PVSC Public Meeting Agenda at 4, 7 (administrative matter # A-20) (Sept. 19, 2024), https://www.nj.gov/pvsc/home/public/agenda/pdf/20240919.pdf [https://perma.cc/U6XV-VT9G].

the decommissioning of underground storage tanks and replacement of PVSC's fossil-fueled vehicles.

Zero-emission vehicle and charging infrastructure are readily available and can provide cost savings. As of August 2024, over 120 zero-emission truck models were available from over 40 manufacturers.[263] Many zero-emission truck types, including pickup trucks and refuse trucks, already have cost parity (for total cost of ownership) with their fossil-fuel counterparts.[264] Of course, cost savings are even greater when taking advantage of numerous state and federal incentives,[265] which PVSC has apparently already applied for.[266] Transitioning away from gasoline storage tanks and fossil-fueled vehicles towards zero-emitting alternatives is already feasible, and the permit should require PVSC to do so in order to guarantee these common-sense emission reductions.

[263] CALSTART, *Zero-Emission Trucks: The Facts* at 1 (Aug. 2024), https://calstart.org/wp-content/uploads/2024/08/ZETs-the-Facts-August-2024_Final.pdf [https://perma.cc/5U5X-S2UR]; *see also Zero-Emission Technology Inventory (ZETI)*, Global Drive to Zero, https://globaldrivetozero.org/tools/zeti/ [https://perma.cc/9WD7-RLML] (last accessed Oct. 28, 2024); Cal. Air Res. Bd., *Advanced Clean Off-Road Equipment List Fact Sheet* (Dec. 2023), https://ww2.arb.ca.gov/sites/default/files/classic/ZEE/2023%20ZEE%20List%2012282023%20TRB.pdf [https://perma.cc/6JSQ-NQYU].

[264] *ZEV cost: Total cost of ownership*, ZEV Transition Council, https://zevtc.org/tracking-progress/zev-cost-total-cost-of-ownership/ [https://perma.cc/HB7Z-PVSZ] (verified Mar. 13, 2024).

[265] *Electric Vehicle Incentive Programs*, NJ Clean Energy Program, https://njcleanenergy.com/ev [https://perma.cc/7ZCM-SWF4] (last visited Oct. 28, 2024); *see also* NJBPU, *New Jersey Electric Vehicles Infrastructure Ecosystem – Medium and Heavy Duty Straw Proposal* at 16-19 (Dec. 2022), https://nj.gov/bpu/pdf/publicnotice/Notice_MediumHeavyDutyStraw_Dec2022.pdf [https://perma.cc/G4JZ-BB46] (proposing additional incentives for charging infrastructure for private fleets located in Overburdened Communities like Newark); U.S. Dep't of Transp., *Federal Funding Programs*, https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-funding-and-financing/federal-funding-programs (last updated May 5, 2023).

[266] *See* PVSC Public Meeting Agenda, *supra* note 262.

IV. CONCLUSION

For the reasons stated above, DEP should deny PVSC's request to modify its permit to add a fourth gas plant to the already overburdened Ironbound community. In no case should DEP approve the Draft Permit as-is, without adding additional conditions as necessary to avoid PVSCs contribution to the many environmental and public health stressors that adversely impact the Ironbound.

Sincerely,

Jonathan Smith
Casandia Bellevue
Colin Parts
Cassidy Childs
Earthjustice
jjsmith@earthjustice.org
212-845-7379

Maria Lopez-Nuñez
Ironbound Community Corporation
mlopeznunez@ironboundcc.org

On behalf of the
Ironbound Community Corporation

EXHIBITS

Exhibit 1: Boiler Electrification Tables

Exhibit 2: ICC, Comments on PVSC Standby Power Generation Facility AO-25 Compliance Statement (July 1, 2022) & Attachments.

Exhibit 3: DEP, *Overburdened Community Stressor Summary: Block Group 340130074001* (July 31, 2021).

Exhibit 4: DEP, *Overburdened Community Stressor Summary: Block Group 340139801001* (July 31, 2021).

Exhibit 5: Screenshot of the Ironbound from *EJMAP: Facilities*, DEP, https://experience.arcgis.com/experience/548632a2351b41b8a0443cfc3a9f4ef6/page/Facilities/ (last visited Oct. 17, 2024).

Exhibit 6: EPA, *EJ Screen Community Report: User Specified Area in Newark, NJ* (Oct. 8, 2024) (obtained via https://ejscreen.epa.gov/mapper/).

Exhibit 7: Letter of Sen. M. Teresa Ruiz et al. to PVSC (July 19, 2024).

Exhibit 8: Letter of Charlene Walker, Faith in N.J. et al. to PVSC (Sept. 18, 2024).

Exhibit 9: Michael Sol Warren, *DEP urged to block proposed Newark power plant*, NJ Spotlight News (Oct. 3, 2024), https://www.njspotlightnews.org/2024/10/dep-urged-to-block-proposed-newark-power-plant/.

Exhibit 10: Amal El Berry et al., *Reliability Analysis of Gas Turbine Power Plant Based on Failure Data*, Int'l J. Mech. & Mechatronics Eng'g 13 (2020).

Exhibit 11: PVSC, *PVSC Treatment District Regional Long Term Control Plan* (Oct. 2020), https://dep.nj.gov/wp-content/uploads/dwq/pdf/cso/cso_siar_pvsc_20201001.pdf.

Exhibit 12: DEP, Air Pollution Control Operating Permit for Newark Energy Center, Permit Activity No. BOP240001, Program Interest No. 08857 (May 8, 2024).

Exhibit 13: EPA, *Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs*, EPA-HQ-OAR-2016-0186-0002 (June 3, 2016), https://www.regulations.gov/document/EPA-HQ-OAR-2016-0186-0002.

Exhibit 14: Iowa Dep't of Nat. Res., *Responsiveness Summary for Title V Operating Permit 97-TV-003R4 DRAFT* (July 24, 2024).

Exhibit 15: Ill. Clean Jobs Coal., *ICJC Hydrogen Work Group Recommendations to Illinois Hydrogen Economy Task Force* (2023).

Exhibit 16: Accufacts Inc., *Report: Safety of Hydrogen Transportation by Gas Pipelines* (Nov. 28, 2022).

Exhibit 17: Roxana T. Shafiee & Daniel P. Schrag, *Carbon abatement costs of green hydrogen across end-use sectors*, 8 Joule 1-9 (2024).

Exhibit 18: Valerio Paolini et al., *Environmental impact of biogas: A short review of current knowledge*, 53 J. of Env't Sci. & Health 899 (2018).

Exhibit 19: Letter from Susan Ruch, Mass. Dep't Env't Prot., to Louis DiBerardinis, Mass. Inst. of Tech., approving MIT Air Quality Plan (June 21, 2017).

Exhibit 20: Elec. Power Rsch. Inst., *Formaldehyde and VOC Emissions from a General Electric LM6000 Combustion Turbine with SCR and CO Catalysts 1013170* (Feb. 2006), https://www.epri.com/research/products/1013170.

Exhibit 21: Carrie Schoeneberger et al*., Electrification potential of U.S. industrial boilers and assessment of the GHG emissions impact*, Advances in Applied Energy 5 (2022)

Exhibit 22: DEP, Draft Air Pollution Control Operating Permit Administrative Amendment for Covanta Essex Co., Permit Activity No. BOP190001, Program Interest No. 07736 (Oct. 18, 2019).

Exhibit 1

EXHIBIT 1

Table 1. Specifications of Current Boilers and Water Heaters at the PVSC facilities.[1]

Boiler/ Water Heater	Model Information	Date of Install/ Modify	# of Boilers	Heat Input	Steam Output	Max Temperature	Annual Emission Limits (tpy)
Insignificant Source (IS2) Boilers and Hot Water Heaters	-	-	16	<1 MMBtu/hr	-	-	-
Wet Weather Pump Station Boilers #1 and #2	E12 and E13 – Superior, Model No. MS7-X, low NOx burner - Coen Model 650 OAF 26	2013	2	1.714 MMBtu/hr	1,731 lb/hr	375 °F	VOC: NOx: 0.98 CO: 0.82 SO_2: TSP: PM_{10}:
Centrifuge Facility Hot Water Heaters #1 and #2	E38 and E39 – PVI, Turbopower Model, Model No. 2000 N 300A-TP		2	1.6 MMBtu/hr	-	375 °F	VOC: NOx: 1.4 CO: SO_2: TSP: PM_{10}:
Sludge Heat Treatment Boilers #1-#4	E29-32 – Babcock and Wilcox, Model Type FM10-70, low NOx burner - Coen Model 650 OAF 26	1992	4	67.1 MMBtu/hr	50,000 lb/hr	382 °F	VOC: 1.94 NOx: 35.26 CO: 35.26 SO_2: 0.42 TSP: 3.47 PM_{10}: 3.47
Boilers set to be decommissioned under EJ conditions.							
Oxygen Production Building Boilers #1 and #2	E6 and E7 – Cleaver Brooks, Model No. CB-100-250	1981	2	10.4 MMBtu/hr	21,528 lb/hr	375 °F	VOC: 0.266 NOx: 7.01 CO: 1.62 SO_2: 11.5 TSP: 0.532 PM_{10}: 0.532
Grit and Screening Boilers #1 and #2	E10 and E11 – Weil McLain, Make = Model 88 Series 1, Model No. 1088	2004	2	1.701 MMBtu/hr	1,753 lb/hr	100 °F	VOC: NOx: 0.98 CO: 0.82 SO_2: TSP: PM_{10}:

[1] Draft Permit, *supra* note 12, at pdf pp. 11-12, 40, 42, 44-45, 55-56, 80-81, 85, 213-218, 232-235, 246-247, 270-271, 375-377, 386-387.

Operations & Maintenance Building Boilers #2 and #3	E106 and E107 – Cleaver Brooks, Model No. CBI-200-600-125	1996	2	24.5 MMBtu/hr	25,254 lb/hr	450 °F	VOC: 0.85 NOx: 8.92 CO: 8.49 SO_2: 3.93 TSP: 2.37 PM_{10}: 2.37

Table 2. Estimated Load Requirements from the Electrification of the Facility Boilers.[2]

Replacement with a Resistance Electric Boiler			
Boiler	Number of Boilers	Heat Input/ Power per Boiler	Total Electrical Load
Insignificant Source (IS2) Boilers and Hot Water Heaters	16	0.500 MMBtu/hr* 146.536 kW	2,344.576 kW
Grit and Screening Boilers	2	1.701 MMBtu/hr 498.514 kW	997.028 kW
Oxygen Production Building Boilers	2	10.4 MMBtu/hr 3,047.939 kW	6,095.878 kW
Operations and Maintenance Building Boilers	2	24.5 MMBtu/hr 7,180.241 kW	14,360.482 kW
Wet Weather Pump Station Boilers	2	1.714 MMBtu/hr 502.324 kW	1,004.648 kW
Centrifuge Facility Hot Water Heaters	2	1.600 MMBtu/hr 468.914 kW	937.828 kW
Subtotal	**26**		**25,750.44 kW** **25.75 MW**
Replacement with an Electrode Boiler			
Boiler	Number of Boilers	Heat Input/ Power per Boiler	Total Electrical Load
Sludge Heat Treatment Boilers	4 (3 running and 1 standby)	67.100 MMBtu/hr 19,665.069 kW	3 boilers: 58,995 kW (59.00 MW)
Total	**30**		**84,745.44 kW** **84.75 MW**

[2] Assumption has been made that the average heat input of the IS2 boilers is 0.5 MMBtu/hr.

Table 3. A non-exhaustive list of commercially available industrial electric boilers with model specifications.

Electrode Boilers

Model Number	Manufacturer	Maximum Heat Input	Maximum Output	Pressure Rating	Source
Model MVE Electrode Boiler	Cleaver Brooks	102MW (348 MMBtu/hr)	340,000 lb/hr	450 psig	Cleaver Brooks, Model MVE Electrode Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/electrode (last visited October 10, 2024).
BBJ Series	Vapor Power	34,000 kW (116 MMBtu/hr)	113,000 lb/hr	500 psig	Vapor Power, Electrode Boilers, https://www.vaporpower.com/products/electric-boilers/electrode-boilers/ (last visited October 10, 2024).
High Voltage Immersed Electrode Hot Water Boiler	ACME Engineering Products	68,000 kW (232 MMBtu/hr)	-	200 psi	ACME Engineering Products, High Voltage Immersed Electrode Hot Water Boiler, https://www.acmeprod.com/immersed-electrode-hot-water-boilers (last visited October 10, 2024).
High Voltage Immersed Electrode Steam Boiler	ACME Engineering Products	32,000 kW (109 MMBtu/hr)	107,000 lbs/hr	300 psi	ACME Engineering Products, High Voltage Immersed Electrode Steam Boiler, https://www.acmeprod.com/immersed-electrode-steam-boilers (last visited October 10, 2024).
High Voltage Jet Type Steam Boiler	ACME Engineering Products	65,000 kW (221 MMBtu/hr)	180,000 lbs/hr	500 psig	ACME Engineering Products, High Voltage Jet Type Steam Boiler, https://www.acmeprod.com/jet-type-steam-boiler (last visited October 10, 2024).

Sequoia Immersed Electrode Hot Water Boiler	AERCO	68,000 kW (232 MMBtu/hr)	-	200 psi	AERCO, Sequoia, https://www.aerco.com/products/hvac-hot-water-solutions/boilers/sequoia (last visited October 10, 2024).

Resistance Electric Boilers

Steam Boilers					
Model Number	**Manufacturer**	**Maximum Heat Input**	**Maximum Output**	**Pressure Rating**	**Source**
Electric steam boiler ELSB	Bosch	5105 KW (17.4 MMBtu/hr)	7,500 kg/h (16,535 lb/hr)	24 bar (348 psi)	Bosch, Electric steam boiler ELSB, https://www.bosch-industrial.com/global/en/ocs/commercial-industrial/electric-steam-boiler-elsb-19175285-p/ (last visited October 10, 2024).
Model S Electric Boiler	Cleaver Brooks	2250 KW (7.6 MMBtu/hr)	7,875 lb/hr	250 psig	Cleaver Brooks, Model S Electric Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/model-s (last visited October 10, 2024).
Model CR Electric Boiler	Cleaver Brooks	563 KW (1.9 MMBtu/hr)	1,969 lb/hr	250 psig	Cleaver Brooks, Model CR Electric Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/model-cr (last visited October 10, 2024).
Model HSB Electric Boiler	Cleaver Brooks	3375 kW (11.5 MMBtu/hr)	11,813 lb/hr	250 psig	Cleaver Brooks, Model HSB Electric Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/model-hsb (last visited October 10, 2024).

ST Electric Steam Boiler	Precision Boilers	4,000 kW (13.6 MMBtu/hr)	13,800 lb/hr	200 psi	Precision Boilers, ST Electric Steam Boiler, https://precisionboilers.com/boiler/model-st/ (last visited October 10, 2024).
STH Electric High Pressure Steam Boiler	Precision Boilers	1,800 KW (6.1 MMBtu/hr)	6,000 lb/hr	2,500 psi	Precision Boilers, STH Electric High Pressure Steam Boiler, https://precisionboilers.com/boiler/model-sth/ (last visited October 10, 2024).
STR16##, STR24##, STR30##, STR36##, STR42##, STR48##	Vapor Power	4320 kW (14.7 MMBtu/hr)	14,688 lb/hr	2,500 psi	Vapor Power, Electric Steam Boilers, https://www.vaporpower.com/products/steam-boilers/electric-steam-boilers/ (last visited October 10, 2024).
Hot Water Boilers					
Model Number	**Manufacturer**	**Maximum Heat Input**		**Pressure Rating**	**Source**
Model WB Electric Boiler	CleaverBrooks	3360 kW (11.46 MMBtu/hr)		250 psig	Cleaver Brooks, Model WB Electric Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/model-wb (last visited October 10, 2024).
Model LVR Electric Hydronic Boiler	CleaverBrooks	540 kW (1.8 MMBtu/hr)		160 psig	Cleaver Brooks, Model LVR Electric Hydronic Boiler, https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode/model-lvr (last visited October 10, 2024).
HWR16#, HWR24##, HWR36##, HWR42##	Vapor Power	4320 kW (14.7 MMBtu/hr)		415 psig	Vapor Power, Electric Hot Water Boilers, https://www.vaporpower.com/products/hot-water-boilers/electric-hot-water-boilers/ (last visited October 10, 2024).

Exhibit 2

July 1, 2022

Sent via email

John Rotolo, Chief Engineer
Passaic Valley Sewerage Commission
600 Wilson Avenue, Newark, NJ 07105
spgfproject@pvsc.com

CC: Shawn M. LaTourette, Commissioner, DEP
Sean Moriarty, Deputy Commissioner, Legal, Regulatory and Legislative Affairs, DEP
Kandyce Perry, Director of the Office of Environmental Justice, DEP
David Pepe, Director, Office of Permitting & Project Navigation, DEP

Re: Comments on PVSC Standby Power Generation Facility AO-25 Compliance Statement

On behalf of the Ironbound Community Corporation, Earthjustice submits the following comments on the Compliance Statement submitted under New Jersey Department of Environmental Protection ("DEP") Administrative Order No. 2021-25[1] ("AO-25") by the Passaic Valley Sewerage Commission ("PVSC") for its proposed Standby Power Generation Facility ("SPGF") gas-fired power plant. Attached to these comments is the expert report of Bill Powers of Bill Powers Engineering, LLC.[2] As explained further below, PVSC has ignored viable, renewable alternatives to instead propose to build a *fourth* gas plant in the already overburdened Ironbound neighborhood, and PVSC cannot move forward on the AO-25 process given the unclear, inaccurate, and incomplete project description it has provided the community.

The Ironbound Community Corporation ("ICC") is a 501(c)(3) nonprofit organization headquartered in the Ironbound neighborhood of Newark, New Jersey, where PVSC proposes to build the SPGF gas plant. ICC's mission is to provide residents with services, resources, and opportunities to lead healthy lifestyles and protect residents from air pollution and other harmful environmental impacts. The Ironbound neighborhood is a multi-ethnic, largely working-class neighborhood of 50,000 residents. The Ironbound composes most of Newark's East Ward, covering four square miles. The residential community, interspersed with industrial development, covers roughly one third of the neighborhood. ICC has offices and runs

[1] N.J. Dep't of Env't Protection Admin. Order No. 2021-25 (Sept. 20, 2021), https://www.nj.gov/dep/ej/docs/njdep-ao-2021-25-environmental-justice.pdf.
[2] Expert Report of Bill Powers, Clean Alternative Emergency Power Supply for PVSC ("Powers Report") (July 1, 2022) (attached here as Attachment 1).

programming at five locations in the Ironbound, all of which are less than three miles from the site of the proposed SPGF.[3]

DEP categorizes the Ironbound as an "overburdened community" under the New Jersey Environmental Justice Law ("EJ Law"), with much of the neighborhood meeting all three demographic criteria of the statute.[4] Ironbound residents are entitled to the protections provided by the EJ Law, as well as AO-25, which DEP issued to implement portions of the EJ Law during the pendency of the rulemaking process for its implementing regulations.

Decades of industrial development has concentrated polluting industries in the low-income communities of color of the Ironbound. Currently, the Ironbound is home to more gas plants than *any other neighborhood in the state*, with the 705 MW Newark Energy Center, 122 MW Newark Bay Cogen Plant, and the 81 MW Essex Generating Station all located in the neighborhood. The Ironbound is also home to the state's largest waste incinerator, one of the country's most contaminated superfund sites, and various industrial facilities including port infrastructure, scrap metal yards, an animal fat rendering plant, warehouses, and commercial flight paths. According to NJDEP's Data Miner Website, over 3,700 facilities with environmental permits are located within the two zip codes that cover the Ironbound.[5]

Indeed, the Ironbound and Newark more broadly are emblematic of communities that the EJ Law is designed to protect. As explained below, PVSC's AO-25 process is invalid given the inconsistencies in the project description it has provided the community. In addition, PVSC's proposal to burn fossil gas and/or hydrogen in combustion turbines is ill-conceived, and PVSC's need for emergency power could be more effectively and beneficially met by pursuing the renewable alternatives that PVSC arbitrarily rejected.

I. INCONSISTENCIES IN PVSC'S PROPOSAL MAKE THE COMPLIANCE STATEMENT UNCLEAR, INACCURATE, AND INCOMPLETE, AND THEREFORE INVALID.

PVSC cannot move forward with the current AO-25 process because the project description in the Compliance Statement is unclear, inaccurate, and incomplete. The Compliance Statement presents an internally inconsistent description of the project that also conflicts with

---

[3] *See* Ironbound Community Corporation, https://ironboundcc.org/.

[4] *See Overburdened Communities under the New Jersey Environmental Justice Law in Newark City, Essex County*, N.J. DEP'T OF ENV'T PROTECTION (June 1, 2022), https://nj.gov/dep/ej/docs/communities/essex-newark-city-maps-obc.pdf; *see also* N.J.S.A. § 13:1D-158 (defining "overburdened community" as "any census block group, as determined in accordance with the most recent United States Census, in which: (1) at least 35 percent of the households qualify as low-income households; (2) at least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or (3) at least 40 percent of the households have limited English proficiency.").

[5] *See DEP DataMiner*, N.J. DEP'T OF ENV'T PROTECTION, https://njems.nj.gov/DataMiner (last updated March 17, 2016) (follow "search by site" then "search by ZIP code" and enter "07114" and "07105").

PVSC's air permit application and may soon be made obsolete after PVSC's pending review of renewable alternatives. This misleading and indefinite information deprives the community of the "meaningful opportunity to participate" required by AO-25,[6] thereby rendering the AO-25 process invalid and unusable by DEP as part of the permit approval process.

AO-25 declares that "to further the promise of environmental justice, all New Jersey communities, and especially those disproportionately affected by environmental and public health stressors, must have a *meaningful opportunity* to participate in decision-making that affects their environment, communities, homes, and health."[7] AO-25 seeks to achieve this goal of "meaningful" public participation by implementing the EJ Law's enhanced public participation procedures. This goal is furthered by AO-25's directive that all data and information used to assess adverse cumulative environmental and public health stressors and to determine disproportionate impacts on overburdened communities should be "transparent, objective, [and] data-driven."[8]

Indeed, AO-25 purposefully furthers the "spirit, intent, and direction of . . . the Environmental Justice Law,"[9] which itself sought to guarantee the "meaningful opportunity" for overburdened community members to participate in decision making processes.[10] The EJ Law specifies that, to achieve this goal, "the permit applicant shall provide *clear, accurate, and complete* information about the proposed new or expanded facility [to the community] . . . and the potential environmental and public health stressors associated with the facility."[11] This information and the enhanced public process are required before DEP is able to consider the application complete.[12]

PVSC fails this basic requirement of AO-25 and the EJ Law by providing the community with information that is neither clear, nor accurate, nor complete. As outlined below, the Compliance Statement's project description is neither clear nor accurate because of its internal inconsistencies and because of discrepancies with PVSC's operative air permit application. In addition, the project itself is unclear, inaccurate, and incomplete because it may significantly change once PVSC completes its pending review of renewable alternatives. For these reasons, this AO-25 process is invalid and cannot serve as a basis for DEP to move forward on PVSC's permit application.

---

[6] *See* Admin. Order No. 2021-25, *supra* note 1 at 1.
[7] *Id.*
[8] *Id.* at 2.
[9] *Id.*
[10] *See* N.J.S.A. § 13:1D-157 ("The Legislature further finds and declares that . . . the State's overburdened communities must have a meaningful opportunity to participate in any decision to allow in such communities certain types of facilities which, by the nature of their activity, have the potential to increase environmental and public health stressors . . .").
[11] N.J.S.A. § 13:1D-160(a)(3) (emphasis added).
[12] *See* N.J.S.A. § 13:1D-160(a).

A. DEP Signaled that PVSC Cannot Move Forward on a Compliance Statement that Does not Reflect the Pending Permit Application.

The Compliance Statement provides the public with unclear and inaccurate information because the project outlined therein materially differs with the project outlined in PVSC's most recent and operative July 2, 2021 permit application ("Permit Application"). This AO-25 process is thus invalid and cannot serve as a basis for DEP to move forward on the permit application.

Many of the discrepancies between the Permit Application and Compliance Statement were highlighted in DEP's comments on a draft version of the Compliance Statement. In a letter dated March 2, 2022, DEP asked for clarification about the following project components that PVSC included in the Compliance Statement but not the Permit Application – DEP indicated that PVSC would have to include these components in an amended permit application if it sought to implement them:

1. Diesel generators for emergency electrical power;
2. Fire pump engines;
3. Renewable fuel sources; and
4. Additional upgrades to equipment at the facility for further emissions reductions.[13]

Specifically, DEP noted that "[t]he current application under review by the Department only indicates the use of natural gas [as] a fuel, not diesel generators and no indication of using renewable fuel sources," and that the additional equipment upgrades for emission reductions "are not part of any current permit application under review."[14] DEP also cautioned that, because these components were not included in the air permit application, DEP has not had the

[13] Letter from David Pepe, Supervisor, Office of Permitting & Project Navigation at N.J. Dep't of Env't Protection, to Gregory A. Tramontozzi, Passaic Valley Sewerage Comm'n (Mar. 2, 2022) at 2 ("DEP March 2 Letter") (attached here as Attachment 2) ("6. **Section V (Changes to Project Scope):** The response for Item 5 (first list, page 27) references the use of diesel generators for emergency electrical power and fire pump engines, along with renewable fuel sources. The current application under review by the Department only indicates the use of natural gas [as] a fuel, not diesel generators and no indication of using renewable fuel sources. Please clarify whether PVSC is proposing to change the way it currently operates its equipment and will modify its current application by submitting a revised application to the Department. 7. **Section V (Changes to Project Scope):** Items 4, 5, 6, and 8 (second list, pages 28-29) reference additional upgrades to equipment at the facility for further emissions reductions; however, these are not part of any current permit application under review. Please clarify whether PVSC is intending to reduce its allowable emissions and will modify its current application by submitting a revised application to the Department. If the proposed upgrades are to be considered as part of PVSC's efforts to address environmental and public health impacts to the host community, PVSC should clarify and provide schedule on when PVSC intends to implement these additional measures for emissions reductions.").

[14] *Id*. at 2.

opportunity to conduct a detailed technical review of the emission estimates presented to the community in the Compliance Statement.[15]

To the extent not already covered by DEP's letter, the Compliance Statement contains a number of additional components that were not included in the Permit Application, including:

5. Installation of all technically feasible solar onsite;
6. Installation of off-site solar;
7. Installation of 5 MW / 10 MWh of on-site battery storage;
8. The burning of up to 100% hydrogen in the turbines;
9. Infrastructure to produce green hydrogen on-site;
10. An undescribed "hybrid microgrid concept;"
11. Installation of advanced emission controls to existing plant equipment;
12. Installation of fuel management upgrades to existing boilers;
13. De-commissioning of boilers throughout the facility; and
14. De-commissioning of emergency diesel generators.[16]

None of these significant project components were included in last year's Permit Application.

Thus, PVSC is saying one thing to DEP (through the Permit Application) and another thing to the community (through the Compliance Statement), and it is unclear which description of the project the community should believe. If the rosier, less emitting, and less adverse description of the project in the Compliance Statement is the true project, then – as DEP has pointed out – PVSC has no pending permit application to review for that project, and the current AO-25 process is a superfluous fiction. If, on the other hand, the Permit Application is the true project that PVSC intends to pursue, then this AO-25 process is equally invalid for presenting the community with inaccurate information to mask over the true impacts of the proposed project.

Whether PVSC is misleading DEP, misleading the public, or both, the current Compliance Statement fails to provide the clear and accurate information necessary for meaningful public participation, and the instant AO-25 process cannot be used to render PVSC's air permit application complete.[17]

---

[15] *Id.*

[16] *See* Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project, AO 2021-25 Compliance Statement* at 2-3, 30-32, 44-46, 49 (Mar. 30, 2022) ("Compliance Statement").

[17] *See also* 54 N.J.R. 971(a) ("EJ Law Proposed Rule") ("Where an applicant materially changes . . . the EJIS or its related permit application after completion of the aforementioned public process, the Department will require an applicant to conduct additional public processes pursuant to N.J.A.C. 7:1C-4.").

B. The Compliance Statement is Rife with Internal Inconsistencies that Prevent Meaningful Community Participation.

In addition to the inconsistencies with other permit documents, as described above, the Compliance Statement is itself *internally* inconsistent, and thus does not provide the clear, accurate project description that is necessary for meaningful public participation and a valid AO-25 process.

The Compliance Statement's internal inconsistencies and ambiguities include the following:

1. The Compliance Statement states that "[e]nvironmental health stressors such as nitrogen oxides, carbon monoxide and volatile organic compounds will be reduced . . . . [and] [g]reenhouse gases will be reduced, providing an overall benefit to the environment."[18] But various other parts of the Compliance Statement admit that the proposed gas-fired power plant would *increase* emissions of all of these same pollutants.[19] PVSC misleads the community by suggesting that its proposed gas plant would reduce emissions, or that the newly proposed emission reduction measures of other plant equipment cannot be implemented without construction of the gas plant, when neither of these is true.

2. The Compliance Statement rejects using energy from Newark Energy Center because, among other reasons, "NEC is a natural gas-fired power plant. Accordingly, using NEC as a backup power source provides no reduction in PVSC's dependence on fossil fuels, such as there will be under PVSC's plan."[20] But "PVSC's plan" is to build a brand new, fossil-fuel burning power plant, which would increase PVSC's dependence on fossil fuels. The Compliance Statement's representations otherwise are misleading and misstate PVSC's intentions to the public.

3. The Compliance Statement says that PVSC anticipates using battery storage to supplement the proposed black start generators "to start the [gas turbines] in the event of total loss of utility power, and make use of the [black start generators] necessary only if the batteries fail."[21] But the Compliance Statement also says, "In case of total loss of utility power, one of the 2.5 MW standby black start generators will *automatically* start."[22] Thus, it does not appear that the battery storage would indeed replace the black start generators if these generators automatically start upon loss of utility power.

---

[18] Compliance Statement, *supra* note 16, at 55.

[19] *See id.* at 49 (noting that the estimated emissions of the gas plant would be 0.35 tons/year of NOx, 2.47 tons/year of CO, 0.27 tons/year of PM-10, 0.26 tons/year of VOCs, 0.06 tons/year of SO2, and 2,485.00 tons/year of GHG CO2e).

[20] *Id.* at 44.

[21] *Id.* at 31; *see also id.* at 3.

[22] *Id.* at 16 (emphasis added).

4. PVSC says that it cannot use energy from the Newark Energy Center because, among other reasons, "the NEC plant does not have black start capabilities and will not be available during a loss of power event."[23] But other parts of the Compliance Statement say that black start capabilities would be provided by battery storage and/or black start generators,[24] in which case black start capabilities from NEC would not be necessary. Again, it is unclear what PVSC's plans for black start are.

5. The Compliance Statement's Introduction promises, "During a year in which no emergency operation takes place, the SPGF will be offline for 353 days, operating for 12 days maximum, if not less."[25] But other parts of the Compliance Statement, including its table of annual operating hours, admit that there may be up to three additional operating days during non-emergency years (for a total of up to 15 operating days) because of the proposed participation in PJM's demand response program.[26]

6. The Compliance Statement says, "During a year in which emergency operation does take place, PVSC anticipated that the SPGF will operated for 41 days, meaning the plant will be offline for 324 days,"[27] but it is unclear how PVSC calculated those 41 days. The table of annual operating hours lists only 10 instances of storm preparation mode per year of up to 48 hours each,[28] which, when added to the 15 days of operation from testing/maintenance and demand response and depending on whether the 48 hours of storm preparation mode straddle 2 days or 3 days, would result in either 35 days or 45 days of operation – not 41 days.

7. When predicting the number of storm events per year, the Compliance Statement says, "If storm frequency continues to increase at the same rate as in the last nine years, then one would expect approximately 10 storm alerts per year at PVSC by the year 2030. (The life of the SPGF equipment is expected to be 20 years or more.)."[29] But even though the number of storm events would presumably continue increasing past 2030 and for the expected life of the equipment into the 2040's, the Compliance Statement's analysis does not assume any more than 10 storm events per year. It is unclear whether PVSC anticipates years with more than 10 storm events during the useful life of the equipment.

8. The Compliance Statement states that the SPGF project would add two fire pumps to the facility,[30] but then says that future emission reduction measures include "[i]nvestigat[ing] decommissioning all diesel fire pumps throughout the facility."[31] PVSC does not explain why

[23] *Id.* at 44.
[24] *See id.* at 31, 34.
[25] *Id.* at 2; *see also id.* at 30.
[26] *See id.* at 17, 21.
[27] *Id.* at 30.
[28] *See id.* at 21.
[29] *Id.* at 19.
[30] *See id.* at 15, 16, 26, 31.
[31] *Id.* at 46.

it is installing two new fire pumps now only to potentially remove them as an emission-reduction measure in the near future.

9. The Compliance Statement says that "the [turbines] will accept 65% hydrogen, with the goal of being 100% hydrogen capable by 2030."[32] But PVSC's emissions analysis considers only "use of up to 5% Hydrogen."[33] It is unclear whether PVSC's intention is to blend only 5% hydrogen or use up to 100% hydrogen.

10. The Compliance Statement does not reconcile its proposal to burn up to 100% hydrogen produced on site in the SPGF[34] with its rejection of a similar proposal because that proposal included only up to four hours' worth of hydrogen or other alternate fuels stored on-site.[35] In other words, even if PVSC could produce green hydrogen on-site, if there is no space to store more than four hours' worth, then hydrogen produced on site would not meet PVSC's design criteria of two weeks' worth of uninterrupted power.

11. The Compliance Statement's Alternatives Analysis says that a "plant-wide solar feasibility study" shows that an on-site "PV system's total maximum gross power output would be 10,629 kW, or 10.6 MW,"[36] but then says that "it would be feasible to install up to eight MW or solar panels at the facility."[37] PVSC does not explain the discrepancy about whether the amount of feasible on-site solar is 10.6MW or 8MW.

12. The Compliance Statement's Alternatives Analysis suggests there would be at least 8.5 acres available for on-site battery storage,[38] but then says that stacking all the batteries PVSC says it needs in just 1.5 acres would result in a structure that is too high.[39] PVSC does not explain why it considered a battery structure on 1.5 acres only when it says that 8.5 acres are available.

13. The Compliance Statement says that PVSC has committed to incorporating a "hybrid microgrid" concept,[40] but provides no details or even any explanation of what, exactly, this "hybrid microgrid" would consist of, rendering it impossible for the public to comment on this aspect of the proposal.

14. The flood modeling at the end of the Compliance Statement present maps and figures of expected flooding from *both* the storm event *and* any flooding that may be caused by system

---

[32] *Id.* at 32.
[33] *Id.* at 45; *see also id.*at 49.
[34] *See id.* at 32.
[35] *See id.* at 44.
[36] *Id.* at 34.
[37] *Id.* at 34.
[38] *See id.* at 33 ("The area allotted for the SPGF is 1.5 acres. Other available free space on the PVSC property totals seven acres.").
[39] *See id.*
[40] *See id.* at 3, 31, 45.

backups in the event of loss of power at PVSC.[41] Because PVSC doesn't disaggregate the flooding that would happen anyway because of the storm with the flooding that would be directly caused by a power failure, these maps and figures provide no useful information to the community about the reasonableness or need of the SPGF proposal.

Thus, the internal inconsistencies and ambiguities of the Compliance Statement itself prevent the community from having the clear, accurate information necessary for public participation.

C. PVSC's AO-25 Process Will Likely be Rendered Moot If PVSC Changes the Project After Completing its Review of Alternatives.

The Compliance Statement provides information that is neither clear, nor accurate, nor complete for the additional reason that the entire project may be significantly changed or supplanted after PVSC's pending review of renewable alternatives to the SPGF proposal.

In February 2022, PVSC issued its Request for Proposals for a Renewable Energy Power Generation System (the "RFP"). The RFP sought proposals for "behind the meter generation capacity" using renewable energy technologies, defined as "technology that does not rely on energy sources derived from fossil fuels, waste products from fossil fuels, or waste products from inorganic sources," that may or may not be accompanied by battery storage.[42] PVSC requested proposals for 34 MW of generation capacity capable of operating for two weeks in island mode – the same design criteria for the SPGF in the Compliance Statement – though PVSC noted that they would also accept proposals with lower capacity and/or lower duration.[43] PVSC's deadline for proposals was March 31, 2022.[44] As of April 18, 2022, PVSC indicated that it was still "in the process of reviewing" six responses to the RFP.[45] As of the date of these comments, PVSC has not publicly released the results of its review of the RFP.

Meanwhile, PVSC released its Compliance Statement on or about March 30, 2022 – before even the deadline for RFP submittals. As would be expected, the Compliance Statement contains no information about the results of this RFP process, which is not yet complete, nor description of final RFP submittals, which PVSC may not even have had at the time of drafting the Compliance Statement. Instead, the Compliance Statement includes only what appears to be ideas that RFP stakeholders informally shared with PVSC from meetings held during the process.[46] Despite the seemingly deliberative and non-final nature of these ideas for alternatives, PVSC summarily concludes that these alternatives are not "sufficient to represent a full

---

[41] *See id.* at 50–55.

[42] *See* Passaic Valley Sewerage Commission, Request For Proposals For a Renewable Energy Power Generation System ("RFP") (Feb. 2022) at 5 (attached here as Attachment 3).

[43] *Id.*

[44] *Id.* at 9.

[45] *See* Email from Michael D. Witt, General Counsel, PVSC, to Jonathan J. Smith, Senior Attorney, Earthjustice (Apr. 18, 2022) (on file with author).

[46] Compliance Statement, *supra* note 16 at 43-44.

replacement for the SPGF."[47] Nevertheless, PVSC admits that each stakeholder's proposal "provided ideas that can supplement the SPGF and help achieve the goal of reducing Greenhouse Gas emissions and meeting the New Jersey Energy Master Plan."[48]

Thus, despite PVSC's pending review of six proposed alternatives to the Compliance Statement's SPGF project, and PVSC's recognition that it is likely to adopt at least some components of these proposed alternatives, PVSC nevertheless moved forward with the AO-25 process for a proposal that is admittedly non-final and incomplete, and therefore does not present a clear and accurate description of PVSC's final project proposal, whatever that project proposal may be. PVSC's pending, incomplete review of the RFP for alternatives is thus an additional reason that the Compliance Statement fails to provide an opportunity for meaningful public participation, and cannot be used by DEP to move PVSC's Permit Application forward.

II. PVSC'S PROPOSAL TO BURN FOSSIL GAS OR HYDROGEN IS ILL-CONCEIVED, AND WILL CONTRIBUTE TO POLLUTION IN AN OVERBURDENED COMMUNITY.

A. PVSC's Proposal Would Contribute to Adverse Cumulative Environmental and Public Health Stressors in an Already Overburdened Community.

PVSC's proposed SPGF gas plant would contribute to adverse cumulative environmental and public health stressors in an overburdened community under the EJ Law.[49] DEP's proposed regulations for the EJ law ("EJ Law Proposed Rule") identify 26 potential stressors. In the two census blocks where PVSC is located (3401300074001 and 340139820001), DEP has identified the following 23 of those 26 stressors as adverse.[50]

1. Ground-Level Ozone (3-year average days above standard)
2. Fine Particulate Matter (PM2.5) (3-year average days above standard)
3. Cancer Risk from Diesel Particulate Matter (estimated cancer risk/million)

---

[47] *Id.* at 44.

[48] *Id.*

[49] *See* N.J.S.A. § 13:1D-158 (defining "environmental or public health stressors" to mean "sources of environmental pollution, including, but not limited to, concentrated areas of air pollution, mobile sources of air pollution, contaminated sites, transfer stations or other solid waste facilities, recycling facilities, scrap yards, and point-sources of water pollution including, but not limited to, water pollution from facilities or combined sewer overflows; or conditions that may cause potential public health impacts, including, but not limited to, asthma, cancer, elevated blood lead levels, cardiovascular disease, and developmental problems in the overburdened community.").

[50] Census block 340130074001 meets 22 of the 26 stressors evaluated by DEP and census block 340139802001 meets 21 of the 26 stressors. *See* DEP, Overburdened Community Stressor Summary, Block Group 340130074001 (Jun. 2, 2022) (attached as Attachment 4); DEP, Overburdened Community Stressor Summary, Block Group 340139802001 (Jun. 2, 2022) (attached as Attachment 5).

4. Cancer Risk from Air Toxics Excluding Diesel Particulate Matter (estimated cancer risk/million)
5. Non-Cancer Risk from Air Toxics (Combined Hazard Quotient)
6. Traffic – Cars, Light- and Medium-Duty Trucks (Annual Average Daily Traffic (AADT)-mile/square mile)
7. Traffic – Heavy-Duty Trucks (AADT-mile/square mile)
8. Railways (rail mile/square mile)
9. Known Contaminated Sites (weighted sites/square mile)
10. Soil Contamination Deed Restrictions (percent area)
11. Ground Water Classification Exception Area/Currently Known Extent Restrictions (percent area)
12. Solid Waste Facilities (sites/square mile)
13. Scrap Metal Facilities (sites/square mile)
14. Combined Sewer Overflows (count)
15. Drinking Water (count of public drinking water violations or exceedances, or percent of private well testing exceedances)
16. Lack of Recreational Open Space (population/acre of open space within 0.25 mile)
17. Lack of Tree Canopy (percent lack of tree canopy)
18. Impervious Surface (percent impervious surface)
19. Flooding (Urban Land Cover) (percent urban land use area flooded)
20. Emergency Planning Sites (sites/square mile)
21. Permitted Air Sites (sites/square mile)
22. NJPDES Sites (sites/square mile)
23. Education (percent without high school diploma)

This total of 23 stressors is significantly higher than the Combined Stressor Total for the state as a whole (13) or Essex County (15). Accordingly, the overburdened communities where PVSC is located are considered "cumulatively adverse" under the EJ Law Proposed Rule, and the full protections of the EJ Law would be triggered by any of the SPGF gas plant's potential contributions to these 23 adverse stressors.

As detailed below, the SPGF gas plant would indeed contribute to many of these stressors, and therefore would be subject to the full protections of the EJ Law.

1. The SPGF would contribute to adverse stressors measuring "concentrated areas of air pollution. "

The EJ Law Proposed Rule identifies five stressors measuring concentrated areas of air pollution: ground-level ozone, fine-particulate matter, cancer risk from diesel particulate matter, cancer risks from air toxics excluding diesel particulate matter, and non-cancer risk from air toxics.[51]

[51] EJ Law Proposed Rule, *supra* note 17 at 9.

As DEP explains,

- "Ground-level ozone" forms when volatile organic compounds ("VOCs") and nitrogen oxides ("NOx") react in the presence of sunlight.[52] Of the six criteria pollutants designated by EPA, ozone and particulate matter present "the most widespread and significant health threats," including irritation of the entire respiratory track, reduced lung capacity, and worsening existing conditions such as bronchitis, heart disease, emphysema, and asthma.[53]

- "Fine particulate matter" is manmade or natural particles found in the air, including dust, dirt, soot, smoke, and liquid droplets, formed in the atmosphere from the chemical reactions of other pollutants.[54] $PM_{2.5}$, in particular, can penetrate deep into the lungs and enter the bloodstream, adversely affecting the heart and lungs. Studies indicate a significant association between exposure to particle pollution and health risks, including premature death.[55]

- The "cancer risks associated with diesel particulate matter" measures the impact of diesel on human health. Diesel is a type of fuel derived from crude oil and biomass that is used in most freight and delivery trucks, boats, buses, trains, and construction vehicles.[56] Immediate health impacts from diesel exposure include irritation to the eyes, nose, throat, and lungs, headaches, lightheadedness, coughs, nausea, and severe asthma. Children, elderly people, and individuals with asthma, emphysema, and chronic heart and lung disease are particularly sensitive to this type of pollution.[57]

- The "cancer risks associated with air toxics, excluding diesel particulate matter" measures air toxics, excluding diesel particulate matter, that EPA classified as "carcinogenic to humans," "likely to be carcinogenic to humans," or "suggestive evidence of carcinogenic potential."[58] Industrial areas generally carry a higher environmental burden than purely residential neighborhoods, in terms of pollution and risks.[59] Carcinogenic air toxics are associated with industrial sources, so elevated exposures generally align with overburdened communities

[52] *Id.*
[53] *Id.*
[54] *Id.*
[55] *Id.*
[56] *Id.* at 10.
[57] *Id.*
[58] *Id.*
[59] *Id.*

who are affected by greater air toxics.[60] DEP proposes to measure this stressor in risk per million from 138 of the non-diesel $PM_{2.5}$ air toxics.[61]

- The "non-cancer risk from air toxics" stressor measures noncancer health impacts from exposure to 138 of the 180 air toxics identified by EPA in its 2017 Air Toxic Screen Assessment.[62] Health effects include impacts on the respiratory, immune, nervous and reproductive systems, and to the heart, liver, and kidney. The severity of impacts depends on the amount and length of exposure, as well as the nature of the chemical itself.[63]

In census block 3401300074001, DEP identified all five adverse stressors in the "concentrated air pollution category."[64] In census block 340139820001, DEP found four adverse stressors excluding "fine particular matter."[65]

The proposed SPGF would contribute to each of these stressors. The Permit Application calculates that the SPGF would emit 2.27 tons/year of NOx and 1.39 tons/year of VOCs, both of which contribute to ground-level ozone.[66] The Permit Application also estimates 2.86 tons/year of PM_{10} emissions.[67] Regarding cancer risk from diesel particulate matter, PVSC's proposal includes two 1640kW diesel fire pump engines with particulate matter emission estimates of 0.0077 tons/year.[68] Regarding health risks from the emission of air toxics, the Permit Application indicates that the SPGF would emit 0.27 tons/year of total hazardous air pollutants, 2.2 tons/year of ammonia, 0.011 tons/year of acrolein, 0.000091 tons/year of ethelyne dibromide, and 0.63 tons/year of formaldehyde.[69]

Thus, the SPGF plant would contribute to cumulatively adverse stressors measuring concentrated areas of air pollution.

---

[60] *Id.*
[61] *Id.*
[62] *Id.*
[63] *Id.*
[64] DEP, Overburdened Community Stressor Summary, Block Group 340130074001, *supra* note 50.
[65] DEP, Overburdened Community Stressor Summary, Block Group 34013982001, *supra* note 50.
[66] Passaic Valley Sewerage Commission, *Title V Operating Permit Significant Modification Application for Proposed Standby Power Generation Facility* ("Permit Application") (July 2, 2021) at 4-5 (Table 4-2) (excerpt attached as Attachment 6).
[67] *Id.*
[68] *Id.* at 5-2 (Table 5-3).
[69] *Id.* at 4-2 (Table 4-1).

2. <u>The SPGF would contribute to adverse stressors measuring "density and proximity."</u>

The EJ Law Proposed Rule identifies three stressors measuring density/proximity within the census block: emergency planning sites, permitted air sites, and NJPDES sites.

These stressors assess the potential impact that the density of permitted air sites, NJPDES sites, and emergency planning facilities may have on overburdened community.[70] While other stressors measure the impacts from these particular facilities – *i.e.*, air emissions, water pollution, and toxic releases—the *mere presence* of multiple pollution sources within a block group is itself a stressor.[71] The proposed regulations for the EJ Law recognize that the concentration of industrial facilities in a given geographic area represents a stressor.[72] Even when these facilities act in compliance with applicable requirements, there are still community impacts such as mobile source emissions, dust, odor, and noise.[73] Studies indicate a significant relationship between residential proximity to environmental stressors and adverse public health impacts ranging from adverse pregnancy outcomes to childhood cancers, asthma hospitalizations, stroke mortality, PCB toxicity, end-stage renal disease, and diabetes.[74]

The proposed SPGF would contribute to the "permitted air sites" stressor. Census block 340130074001 has 3.96 permitted air sites per square mile, over twice the county value and four times the state value.[75] Census block 340139802001 has 2.68 permitted air sites per square mile, nearly double the county value and three times the county value.[76]

Thus, the SPGF plant would contribute to cumulatively adverse stressors measuring density and proximity. When combined with the "concentrated areas of air pollution" stressor discussed above, the SPGF would contribute to at least six adverse stressors in a cumulatively adverse overburdened community.

B. PVSC's Proposal Relies on Unrealistic Assumptions about the Site's Energy Needs.

PVSC's assumptions about the amount and duration of the on-site standby energy that the site needs are unrealistic and have locked PVSC into the unnecessary gas plant proposal. The Compliance Statement explains that the project's design parameters are for "34 MW of net power . . . to support the entire PVSC electric load upon loss of utility power,"[77] and PVSC requires this

---

[70] *See* EJ Law Proposed Rule, *supra* note 17 at 19.
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] *Id.*
[75] DEP, Overburdened Community Stressor Summary, Block Group 340130074001, *supra* note 50.
[76] DEP, Overburdened Community Stressor Summary, Block Group 34013982001, *supra* note 50.
[77] Compliance Statement, *supra* note 16 at 14.

34 MW uninterrupted for 14 days' duration.[78] Based on these assumptions, PVSC says that "the SPGF must provide 34 MW times 336 hours, or 11,424 megawatt-hours (MWh) of electricity."[79] PVSC uses this incredibly high energy demand assumption as the main basis to reject proposals for less-polluting alternatives.[80]

But PVSC's assumptions about both the amount and duration of its electricity need are overstated. As explained below and in the attached expert report, a more realistic standby power energy need would be 15 MW for 12 hours, or 180 MWh.[81] This is an energy need that could easily be met using battery storage alone.

1. <u>PVSC is unlikely to require 14 days of onsite power.</u>

PVSC's design parameter of 14 days of uninterrupted power appears to be derived from the facility's experience during Sandy, but, according to the Compliance Statement, PVSC lost grid power during Sandy for only two days. The Compliance Statement explains that PVSC lost power around 9:00pm on October 29, 2012, but power was restored to PVSC substation 1 at 10:40pm on October 31, 2012.[82] Thus, it took two days – not two weeks – for PVSC to be reconnected to the grid. PVSC nevertheless says that the October 31 restoration of power did not, by itself, allow PVSC to fully restart because of damage to the power distribution system, flooding in the underground process galleries and tunnels, and the need for a gradual, stepwise process to restart the treatment systems.[83] Even so, after October 31, the limiting factor was no longer access to grid power, and the Compliance Statement provides no basis to think that during Sandy, two weeks' worth of standby power would have been any more beneficial to restarting PVSC's systems than just two days' worth of power.

Moreover, after Sandy, PSE&G spent over $2 billion to harden the grid and prevent power loss during future storms as part of its Energy Strong programs.[84] This includes upgrades to

---

[78] *Id.* at 33.

[79] *Id.*

[80] *See id*. at 33-35.

[81] *See* Powers Report, Att. 1 at 1-2, 9.

[82] Compliance Statement, *supra* note 16 at 6, 8.

[83] *See id.* at 8.

[84] *See* PSE&G, *Making New Jersey Energy Strong Fact Sheet,* (Aug. 2021), https://nj.pseg.com/-/media/pseg/global/gathercontentdocuments/5-6-3-1makingnewjerseyenergystrong/energystrong_factsheet_2016_print.ashx (detailing the $1.68 billion spent in the second phase of the Energy Strong program); *see also* PSE&G, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program* (Mar. 2021), https://nj.pseg.com/-/media/pseg/global/gathercontentdocuments/5-6-3-1makingnewjerseyenergystrong/energystrong_factsheet_2016_print.ashx (detailing the $1.68 billion spent in the second phase of the Energy Strong program); PSE&G, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program* (Mar. 30, 2018), att. 1 at pp 1-3, https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2106258 (detailing the $400 million in Flood Mitigation expenditures).

infrastructure near PVSC like the Port Street Substation, Waverly Substation, and Bayonne Switching Station.[85] Substation failure, not power generation system failure, was the main cause of grid outage during Sandy.[86] PSE&G says that these stations were "remediated to sustain the higher of one foot above the FEMA flood elevation level or one foot above the highest observed flood levels and constructed in accordance with [DEP] Flood Hazard rules."[87]

Image of PSE&G Raising Electric Infrastructure Above Superstorm Sandy Water Levels

Because nearby infrastructure has been hardened to sustain even higher flooding than that experienced during Sandy, a Sandy-like storm today is much less likely to cause two-days' worth of grid-related power outage at PVSC, if at all. Over 50% of New Jersey customers lost power after Sandy,[88] including over 2 million PSE&G customers.[89] But after the implementation of the Energy Strong program, only 215,000 of PSE&G's customers lost power after Tropical Storm Ida,[90] despite Ida causing more immediate flooding deaths than Sandy.[91] While flooding during Sandy caused service interruptions at 29 PSE&G substations, flooding from Ida did not cause any service interruptions at PSE&G substations.[92] The success of these grid hardening

---

[85] *See* PSE&G, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program*, *supra* note 84 at att. 1 at pp 1-3; *see also* State of New Jersey Board of Public Utilities, Decision and Order, Docket Nos. ER211111209 and GR21111210 (May 4, 2022) at 3, https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2110838.

[86] *See* Powers Report, Att. 1 at 1, 3-5.

[87] PSE&G, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program, supra* note 84 at att. 1, page 2.

[88] U.S. Dep't of Energy, Office of Electricity Delivery & Energy Reliability, *Situation Report* (Oct. 31, 2012) at 1, https://www.oe.netl.doe.gov/docs/2012_SitRep6_Sandy_10312012_1000AM_v_1.pdf.

[89] PSE&G, *A Decade after Superstorm Sandy, New Jersey's Infrastructure is Considerably More Prepared for Hurricane Season*, (Jun. 9, 2022), https://nj.pseg.com/newsroom/newsrelease303; *see also* Powers Report, Att. 1 at 4-5.

[90] PSE&G, *A Decade after Superstorm Sandy, New Jersey's Infrastructure is Considerably More Prepared for Hurricane Season*, (Jun. 9, 2022), https://nj.pseg.com/newsroom/newsrelease303.

[91] Carly Baldwin, *Ida Caused More Immediate Deaths Than Sandy*, PATCH (Sept. 16, 2021), https://patch.com/new-jersey/woodbridge/ida-caused-more-immediate-deaths-sandy-rutgers-prof.

[92] *PSE&G Wins 94th Annual Edison Award*, EDISON ELECTRIC INSTITUTE (Jun. 21, 2022), https://www.eei.org/News/news/All/pseg-wins-94th-annual-edison-award.

efforts won PSE&G the 2022 Edison Award from the Edison Electric Institute, which represents all U.S. investor-owned utilities.[93]

Given PSE&G's extensive grid hardening efforts, a more realistic assumption of storm-related grid outage duration is closer to 12 hours.[94]

2. <u>PVSC's critical power is likely less than 34 MW.</u>

Much like PVSC's assumed need of 14 days of uninterrupted power, PVSC's assumed need of 34 MW is also likely a gross overestimate. The Compliance Statement says that PVSC's "historical average and maximum electrical power demand is 23 megawatts (MW) and 28 MW, respectively," and that PVSC bumped up the design parameter to 34 MW "to accommodate new flood mitigation measures being implemented under the FEMA Resiliency Program."[95] Meanwhile, information that PVSC presented in the RFP for renewable alternatives shows annual electricity usage closer to 22 MW.[96] In fact, a 2012 PVSC-commissioned Plantwide Solar Feasibility Study says that PVSC "most commonly consumes electricity in the 18,000 kWh to 21,000 kWh range," with most time spent between 19 and 20 MWh, and second most often at 18 to 19 MWh.[97] The Compliance Statement does not explain the discrepancy between its representation of 23MW of historical average demand and these lower values in other documents.

In addition, PVSC appears to calculate 6 to 11 MW of the stated 34 MW to be energy purportedly needed "to accommodate new flood mitigation measures being implemented under the FEMA Resiliency Program," presumably the operation of the two new flood water pumps that PVSC will install as part of those resiliency measures.[98] But in a 2018 presentation, PVSC stated that these new pumps would require only 2 MW of energy.[99] This aligns with a 2020 filing with FEMA, where PVSC said it would need temporary generators of only 1 or 1.5 MW to provide power to the pumping stations.[100] So it appears that these new pumps would add only 2 MW of energy demand, and it is unclear why PVSC calculates that it would need up to 11 MW of energy for these measures.

---

[93] *Id*.

[94] *See* Powers Report, Att. 1 at 7.

[95] Compliance Statement, *supra* note 16 at 33.

[96] *See* Powers Report, Att. 1 at 9 (citing RFP, *supra* note 42 at App.D).

[97] Passaic Valley Sewerage Commissioners, *Plant-Wide Solar Feasibility Study* (Jan. 19, 2012) at 2-1 ("2012 Solar Report") (excerpt attached here as Attachment 7).

[98] Six to 11 MW calculated based on PVSC's statement that it needs 34MW "to accommodate new flood mitigation measures being implemented under the FEMA Resiliency Program" despite 23MW historical average demand and 28MW historical maximum demand. *See* Compliance Statement, *supra* note 16 at 33.

[99] Powers Report, Att. 1 at 10 (citing John Rotolo, PVSC, *The PVSC Resiliency & Mitigation Efforts/ Lessons Learned*, at 38 (Jan. 18, 2018), https://www.nj.gov/dep/dwq/pdf/20180118_NJWWRRAP_Workshop_07_JRotolo.pdf).

[100] Passaic Valley Sewerage Commission, *Cost Amendment Request*, Appendix, Exhibit 3, Item 53 (Feb. 20, 2020) (attached here as Attachment 8).

This additional energy for new flood pumps would likely be needed mostly during the brief surge of flood waters, but certainly not continuously for 14 days. In a document to FEMA, PVSC explained that it sized these flood water pumps based on the surge of rainfall that happens around Hour 12 of a 24-hour, 500-year storm.[101] PVSC explains that it sized the pump stations based on this "*short period* of the Design Storm" so that the pumps could handle the "flow during this *brief* peak."[102] Thus, even if PVSC needs 2 MW of power for the pumps during this momentary rainfall surge, it does not appear that PVSC would need full pumping capabilities for the entire 24-hour storm event, let alone the full two-week period.

Moreover, the Compliance Statement's 34 MW need appears to be based on an assumption that PVSC would be operating its "entire . . . electric load" with little to no powering down of non-essential systems.[103] But during Sandy, PVSC "strategically"[104] powered down "to protect treatment equipment" hours before the facility lost grid power.[105] If this was done to protect the equipment from damage from winds or flooding, then PVSC would presumably still want to power this equipment down for the next storm event, whether or not it had superfluous standby power available.

Indeed, PVSC already powers down its systems as part of its participation in the demand response program. The Compliance Statement explains that PVSC participates in a "voluntary program that allows end use customers to reduce their electricity usage when requested by PJM," and that "PVSC responds to the PJM request by shedding load, or temporarily shutting down some processes to reduce electrical demand. The equipment operation curtailment can be for up to 12 consecutive hours. The list of equipment that is shut down or put on standby operation for the demand response request period includes the Zimpro sludge heat treatment system, the sludge filter press units, the decant and storage system, and half of the oxygenation units."[106] Altogether, this equipment accounts for about half of PVSC's average demand, and depowering this equipment would leave only 11 MW of remaining electricity demand.[107] Indeed, PVSC voluntarily reduced its electricity demand down to 11.5 MW during the last planned test event in March 2022.[108] PVSC does not explain why, if it voluntarily powers down half of its electricity use for up to 12 hours during non-emergencies, it cannot power down some or all of this same equipment during emergencies.

---

[101] Passaic Valley Sewerage Commission, *Cost Amendment Request* (Feb. 20, 2020) at 14-16 (attached here as Attachment 9).
[102] *Id.* at 16.
[103] Compliance Statement, *supra* note 16 at 14.
[104] Passaic Valley Sewerage Commission, *The PVSC Resiliency & Mitigation Efforts/Lesson Learned* (Jan. 18, 2018) at 15, https://www.nj.gov/dep/dwq/pdf/20180118_NJWWRRAP_Workshop_07_JRotolo.pdf.
[105] Compliance Statement, *supra* note 16 at 6.
[106] *Id*. at 17.
[107] Powers Report, Att. 1 at 9-10.
[108] *Id*. at 9 (citing March 14-15, 2022 PVSC Plant KW (attached here as Attachment 10)).

In addition, some 40% percent of PVSC's annual electricity demand is used by its oxygen production and oxygenation compressor building, but this electricity demand could be cheaply and effectively reduced by installing additional onsite oxygen storage for emergency use.[109] At a cost of less than $500,000 – much cheaper than the SPGF – PVSC could have enough oxygen storage onsite to shut down all (not just half) of the oxygenation units.[110] This would save PVSC an additional 4.5 MW of demand, reducing plantwide demand down to 7 MW.[111]

Thus, adding in the 2 MW that would be needed to power the new flood pumps during the brief surge halfway through a 24-hour, 500-year storm event, PVSC's electricity need would be only about 13 MW, or could go down to 9 MW if PVSC adds onsite oxygen storage.[112] This is less than a third of the 34 MW that PVSC currently says it would need.[113]

PVSC's electricity use data supports the notion that PVSC can operate at or below 15 MW for at least 12 hours. That data shows that in March 2022, PVSC operated below 15 MW for up to 17 hours straight during a period of equipment maintenance and a PJM demand response test event.[114] So PVSC operates below 15 MW for extended periods of time even under non-emergency conditions.

C. PVSC's Proposed Gas Plant Would Not Meet PVSC's Own Resiliency Needs.

1. Gas supply is likely to be interrupted during storm conditions.

Neither the Compliance Statement nor the Permit Application mention any consideration of the high likelihood that gas supplies will be interrupted during storm conditions or other emergencies. For this reason, FEMA's 2014 guidance on emergency power systems for critical facilities expressly recommends *against* relying on gas for emergency power, stating,

---

[109] Powers Report, Att. 1 at 10.

[110] *Id.*

[111] *Id.*

[112] *Id.*

[113] To the extent that PVSC cites unspecified FEMA guidance that "called for the protection of wastewater treatment plants, as critical infrastructure, to the 500-year or 0.2% annual chance storm event," Compliance Statement, *supra* note 16 at 10, to suggest that it must require 34 MW of standby power' for two weeks, FEMA guidance contains no such requirement. FEMA's Hazard Mitigation Grant Program guidance for power generator projects instead says that generator size "will vary by facility and usage. It is not always necessary for the generator to support facility operations to their full capacity," but instead should be sized to the critical functions of the facility only. Federal Emergency Management Agency, *Eligibility of Generators as a Fundable Project by the Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program*, at 2, https://www.fema.gov/sites/default/files/2020-09/fema_eligibility_generators_fundable_project_under_hmgp_pdm_02-19-15.pdf.

[114] Powers Report, Att. 1 at 9 (citing March 14-15, 2022 PVSC Plant KW, Att. 10).

> Natural gas supplies can be interrupted during high-wind, flood, or earthquake events. Also, natural gas services are often intentionally shut down prior to a storm event to reduce the risk of fires and explosions. Because of this, *natural gas should not be used as a fuel for providing emergency power to critical facilities* unless the facility can confirm that natural gas service will not be interrupted.[115]

That same FEMA guidance notes, "If a generator receives fuel only from a source that may be interrupted, the fuel source is *not considered reliable*."[116] FEMA thus considers gas "not . . . reliable" for emergency power.

Indeed, New Jersey's gas infrastructure saw multiple shutoffs and failures after Sandy. New Jersey Natural Gas ("NJNG") shut off gas flow to 28,000 customers – 5% of its customer base – after Hurricane Sandy caused some 1,300 gas leaks on its system.[117] Many NJNG customers remained without gas over a month after Sandy.[118] The systems of South Jersey Gas and National Grid also sustained damage during Sandy, and service there had to be cut.[119] These supply outages can extend longer-term if supply lines are damaged from water intrusion when gas pressure is cut, requiring the rebuilding of infrastructure.[120] Williams shut down its liquified natural gas facility to deal with Sandy-related water damage.[121] And gas supply can be impacted by blockages to generation even before the gas reaches the distribution lines, like what happened to Texas's natural gas system during the cold snap of 2021, causing widespread blackouts.[122]

PVSC's assumptions about gas plant reliability may have their roots in the 2013 cost-benefit analysis conducted as part of the FEMA grant application, which stated that a gas plant was preferable to diesel electric generators since a gas plant's "supply logistics are solid . . . [because] high pressure natural gas lines have performed well in hurricanes in all parts of the country."[123] But this statement was written *before* FEMA's 2014 guidance that expressly said

---

[115] Federal Emergency Management Agency, *Emergency Power Systems for Critical Facilities: A Best Practices Approach to Improving Reliability*, FEMA P-1019, at 5-8 (Sep. 2014), https://www.wbdg.org/FFC/DHS/femap1019.pdf (emphasis added).

[116] *Id.* at 5-6 (emphasis added).

[117] *Superstorm Sandy Slams Northeast's Coastal LDCs*, NATURAL GAS INTEL. (Nov. 5, 2012), https://www.naturalgasintel.com/superstorm-sandy-slams-northeasts-coastal-ldcs.

[118] *See* U.S. Dep't of Energy, Office of Electricity Delivery & Energy Reliability, *Hurricane Sandy-Nor'easter Situation Report #13* (Dec. 3, 2012) at 2, https://www.oe.netl.doe.gov/docs/SitRep13_Sandy-Nor'easter_120312_300PM.pdf.

[119] *Superstorm Sandy Slams Northeast's Coastal LDCs*, *supra* note 117.

[120] *Id.*

[121] *Id.*

[122] *See* Erin Douglas, *Texas Largely Relies on Natural Gas for Power. It Wasn't Ready for the Extreme Cold*, THE TEXAS TRIBUNE (Feb. 16, 2021), https://www.texastribune.org/2021/02/16/natural-gas-power-storm/.

[123] Passaic Valley Sewerage Commission, *Mitigation Analysis* (Aug. 8, 2013) at 50 (attached here as Attachment 11).

"natural gas should not be used as a fuel for providing emergency power to critical facilities," and appears to ignore the widespread gas system failures that happened after Sandy.[124]

Despite the inherent risks in relying on a gas supply system that may be even more prone to storm damage than the electric grid that PVSC deems unreliable during storms, the Compliance Statement and Permit Application provide no mention of this gas supply, let alone address the inherent unreliability of the system.

2. Gas turbines are unreliable.

Not only is PVSC's proposed fuel source unreliable, but the gas turbines that would burn that fuel are also themselves unreliable, prone to failure and requiring constant maintenance. Indeed, PVSC's need for *monthly* maintenance for turbines it proposes to use otherwise primarily only for emergencies is itself indicative of the comparatively low reliability of this technology.

One recent study finds reliability for gas turbines reaches only approximately 90%, meaning the turbines do not work 10% of the time.[125] And this is a high point of reliability reached only after 17-33 days of operation.[126] Another study similarly finds that the greatest number of turbine failures occur in the first 424 hours (approximately 17 days) of operation.[127] Thus, PVSC is planning to rely on a technology that, at best, is not working 10% of the time, and is likely not working at even higher percentages in PVSC's case, where the turbines will operate no longer than 16 days after startup.

This contrasts with battery storage technology, which, as described below, has much higher reliability and does not need constant maintenance or repair, nor does it require an expensive "n+1" overbuild just to compensate for the inherent unreliability of the technology, as PVSC proposes for its gas turbines.

3. The gas plant's long start-up time risks damage to PVSC equipment.

PVSC's proposed gas plant may risk damage to PVSC's equipment, further hampering the supposed resiliency benefits of the project. The Compliance Statement says the SPGF would have a startup time of up to half an hour, the ensuing connection of SPGF electricity to PVSC's electrical systems could take "several hours," and during this time, "[if] the impending storm produces power fluctuations at PVSC, or if a sudden voltage variation occurs as equipment is

---

[124] *See* Emergency Power Systems for Critical Facilities, *supra* note 115 at 5-8; Superstorm Sandy Slams Northeast's Coastal LDCs, *supra* note 117.

[125] Amal El Berry et al., *Reliability Analysis of Gas Turbine Power Plant Based on Failure Data*, Int'l J. Mech. & Mechatronics Eng'g 13, 22 (2020), http://ijens.org/Vol_20_I_02/200402-9696-IJMME-IJENS.pdf.

[126] *Id.*

[127] *See* Gas Processing & LNG, *Improve gas turbine operation with a reliability analysis*, Figure 2A, http://gasprocessingnews.com/features/202102/improve-gas-turbine-operation-with-a-reliability-analysis.aspx.

being switched over to the SPGF, the power surge can damage equipment or take equipment offline."[128] While PVSC suggests that this risk could be addressed by starting up the turbines a full 48 hours before predicted storm events, PVSC does not address how this risk could be avoided in other types of possible grid outage, which may not provide the "several hours" of notice that PVSC apparently needs to switch to SPGF power.

As explained further below, batteries can be powered instantly and thus do not present this risk of equipment damage.[129]

4. <u>The proposed gas plant contradicts state climate policy.</u>

A gas plant is the wrong solution to PVSC's emergency energy needs for the additional reason that it contradicts New Jersey's climate policy. The Compliance Statement claims that "[t]he SPGF will meet the State's 2030 targets with respect to greenhouse gas (GHG) emissions and meet the objectives of the State's 2050 Energy Master Plan (EMP),"[130] but the SPGF runs directly counter to these objectives.

The Energy Master Plan's goal is 100% clean energy by 2050, and states that New Jersey "must model, assess, and implement ways to minimize reliance on natural gas" in order to reach this goal.[131] This is because GHG emissions from New Jersey's electricity generation sector "is almost entirely attributable to natural gas."[132] Clearly, the construction of a new gas-burning power plant would not meet these goals.

The Energy Master Plan's strategy for reducing reliance on natural gas is to instead shift the state's energy generation towards renewables, stating that "New Jersey should maximize the development of offshore wind and in-state renewable energy generation (including community solar) and the interconnection of zero-emission distributed energy resources (DER)," and that "energy system modeling further supports that New Jersey should optimally build 17,000 MW of solar energy and 2,500 MW of energy storage by 2035."[133] Thus, the options that are truly in line with the state's Energy Master Plan are the renewables and battery storage options that PVSC rejected.

After all, DEP asked PVSC to assess renewable alternatives to the gas plant "to fulfill the objectives of the January 2020, New Jersey Energy Master Plan,"[134] and more recently asked PVSC for "potential reductions in facility-wide emissions and any appropriate commitments to reduce

---

[128] Compliance Statement, *supra* note 16 at 18.
[129] Powers Report, Att. 1 at 11-12.
[130] Compliance Statement, *supra* note 16 at 4; *see also id.* at 32, 43-47.
[131] New Jersey Board of Public Utilities, *New Jersey Energy Master Plan: Pathway to 2050* (2019) at 97, https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf.
[132] *Id.*
[133] *Id.* at 13.
[134] PVSC Permit Application, *supra* note 66 at 1-3.

or phase out facility reliance upon natural gas,"[135] not because the proposal to build a new gas plant was in line with the Energy Master Plan, but because it was in direct opposition to it.

D. PVSC's Proposal to Burn Hydrogen is Expensive and Ill-Conceived.

In an apparent attempt to assuage concerns about the environmental impact of the proposed gas plant, the Compliance Statement adds a proposal – not included in the Permit Application – to burn 65-100% hydrogen in the gas turbines within 10 years, and proposes that PVSC will produce this "green" hydrogen using an on-site electrolizer powered by solar energy.[136] But far from being a green solution, burning hydrogen could increase the environmental impacts and safety risks of the project.

1. Burning hydrogen would contribute to an adverse environmental stressor in the Ironbound.

Burning hydrogen can *increase* some forms of pollution when compared to burning fossil gas. As the New York State Department of Environmental Conservation ("NYSDEC") recently explained in its denials of permit applications to repower gas turbines with promises of burning hydrogen in those turbines in the future:

> When compared to natural gas, hydrogen has a higher explosive potential, a higher leak potential, a lower volumetric heating value, and a higher flame temperature. A lower volumetric heating value means that more fuel needs to be fired to achieve the same output. The additional volume of fuel fired, combined with the higher flame temperature when firing hydrogen, is expected to cause higher emissions of NOx without the installation of additional NOx controls. An existing combustion turbine facility may be required to modify its fuel feed system, fuel firing system, and/or emission control system to facilitate hydrogen firing in the combustion turbine while maintaining compliance with its permitted emission limits.[137]

---

[135] DEP March 2 Letter, *supra* note 13 at 1.

[136] *See* Compliance Statement, *supra* note 16 at 32.

[137] Letter from Daniel Whitehead, Director, Division of Environmental Permits, New York State Department of Environmental Conservation, to Andrew Scano, Astoria Gas Turbine Power, LLC ("NYSDEC Permit Denial – Astoria Gas") (Oct. 27, 2021) at 12, https://www.dec.ny.gov/docs/administration_pdf/nrgastoriadecision10272021.pdf; *see also* Letter from Daniel Whitehead to Brenda D. Colella and Danielle E. Mettler-LaFeir, Barclay Damon ("NYSEC Permit Denial – Barclay Damon") (Oct. 27, 2021) at 10-11, https://www.dec.ny.gov/docs/administration_pdf/danskammer10272021.pdf.

Indeed, because of the factors that NYSDEC highlighted, burning hydrogen can emit up to *six times* more smog-forming NOx than burning fossil gas.[138] This is primarily because hydrogen burns at a higher temperature than methane.[139] A study conducted by General Electric on its combustion turbines found that a 50/50 mixture of hydrogen and fossil gas (by volume) increased concentrations of NOx in gas exhaust by 35 percent.[140] A report by a gas turbine industry association warned that these higher flame temperatures will produce more health-harming NOx emissions "if no additional measures are undertaken."[141] Spiking NOx emissions are especially a problem for local air quality during startup periods when pollution controls have not yet adequately warmed up, and PVSC is proposing that these high-emitting startup periods would happen at least monthly.

This means that PVSC's supposedly environmentally-friendly proposal would in fact lead to *more* smog in Northern New Jersey, which is already in severe nonattainment for ozone. And, importantly, burning hydrogen would contribute to an adverse stressor already identified by DEP for the Overburdened Community where PVSC is located.[142]

In addition, hydrogen is an indirect greenhouse gas with near-term warming effects that could be up to sixty times higher than an equal amount of carbon dioxide.[143] And given hydrogen's high propensity to leak from pipes and equipment, the hydrogen leaks from any hydrogen infrastructure at PVSC could potentially counterbalance any supposed benefits of burning hydrogen instead of fossil gas in the turbines.

The Compliance Statement's emissions analysis, meanwhile, considers emissions from a blend of only 5% hydrogen, instead of the 65-100% hydrogen blend in PVSC's proposal, in an apparent attempt to mask over the large NOx emission increases from burning higher percentages of hydrogen.[144]

---

[138] *See* Cellek Mehmet Salih & Ali Pınarbaşı, *Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen Enriched Natural Gas and Hydrogen as Fuels*, 43 INT'L J. OF HYDROGEN ENERGY 1994, 1205 (Jan. 11, 2018), https://www.sciencedirect.com/science/article/abs/pii/S0360319917319791.

[139] Sasan Saadat & Sara Gersen, *Reclaiming Hydrogen for a Renewable Future: Distinguishing Oil & Gas Industry Spin from Zero-Emission Solutions*, EARTHJUSTICE (Aug. 2021) at 25, https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice.pdf.

[140] Jeffrey Goldmeer et al., *Hydrogen as a Fuel for Gas Turbines*, GENERAL ELECTRIC (2021) at 5, https://www.ge.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/future-ofenergy/hydrogen-fuel-for-gas-turbines-gea34979.pdf).

[141] ETN GLOBAL, HYDROGEN GAS TURBINES: THE PATH TOWARDS A ZERO-CARBON GAS TURBINE (2020) at 9, https://etn.global/wp-content/uploads/2020/01/ETN-Hydrogen-Gas-Turbines-report.pdf.

[142] *See Supra* Section II A.

[143] *See* Shanti Menon, *Everyone's excited about this new climate solution, but it could create a new climate problem. We need to talk about hydrogen.* ENVT'L. DEFENSE FUND (June 21, 2022), https://www.edf.org/article/we-need-talk-about-hydrogen (referencing upcoming study by Steven Hamburg and Ilissa Ocko).

[144] Compliance Statement, *supra* note 16 at 45, 49.

2. Burning hydrogen is dangerous.

The storing and burning of hydrogen present unique safety risks that PVSC does not appear to have taken into consideration. Hydrogen ignites easily, is very reactive, has a large flammable range, and is highly explosive.[145] Hydrogen has a minimum ignition energy that is an order of magnitude lower than that of other hydrocarbons like methane gas, and so sparks much more easily.[146] Explosion models show that hydrogen has a laminar burning velocity six times higher than that of methane, meaning that hydrogen has high reactivity and very high explosion strength.[147] Hydrogen is much more flammable than methane gas and has the potential to have flames spread much faster when ignited.[148]

Many of these safety issues were raised by NYSDEC in the permit denials discussed above, where NYSDEC noted, "When compared to natural gas, hydrogen has a higher explosive potential, a higher leak potential, a lower volumetric heating value, and a higher flame temperature."[149]

And it is because of these risks to health and safety that the American Medical Association recently resolved to inform physicians, healthcare provides, and the public about the "health, safety, and climate risks of current methods of producing fossil fuel-derived hydrogen and the dangers of adding hydrogen to natural gas."[150]

3. Burning hydrogen is infeasible, expensive, and inefficient.

As NYSDEC noted, "there is uncertainty surrounding the feasibility of firing hydrogen in existing combustion turbines."[151] That uncertainty extends to PVSC's proposal to burn hydrogen in turbines that PVSC says are "designed to be fueled with natural gas."[152] Even though the SPGF has not been built yet, PVSC is planning to install turbines designed for fossil gas that then must be converted to burn hydrogen, a process that the Compliance Statement says would take up to

---

[145] ABB Energy Industries Consulting, *Process Safety and Hydrogen – Webinar*, YOUTUBE (Apr. 13, 2022), https://www.youtube.com/watch?v=oQs5doEa2P8 (at 17:00).
[146] *Id.* at 20:00.
[147] *Id.* at 31:00.
[148] Bryndis Woods & Elizabeth A. Stanton, *Applied Econs. Clinic, Comments on Astoria Gas Turbine Power LLC's Proposed Gas-Fired Combustion Turbine* (Sept. 2020) at 10, https://www.ge.com/content/dam/gepower/global/en_US/documents/fuelflexibility/GEA33861%20Power%20to%20Gas%20-%20Hydrogen%20for%20Power%20Generation.pdf.
[149] *See* NYSDEC Permit Denial – Astoria Gas, *supra* note 137 at 12-13; *see also* NYDSEC Permit Denial – Barclay Damon, *supra* note 137 at 10-11.
[150] American Medical Association, *Report of Reference Committee D (A-22)*, Resolution #438 at 16 (attached here as Attachment 12).
[151] *See* NYSDEC Permit Denial – Astoria Gas, *supra* note 137 at 12; *see also* NYSDEC Permit Denial – Barclay Damon, supra note 137 at 10.
[152] Compliance Statement, *supra* note 16 at 14.

10 years.[153] Given that the expected useful life of these turbines are "20 years or more,"[154] PVSC would be refurbishing the turbines less than halfway along their useful life so that they could burn hydrogen. And additional equipment such as fuel piping component materials, pipe sizes, sensors, and safety systems would likely need to be refurbished or replaced to handle hydrogen.[155] If PVSC is indeed planning to burn hydrogen, the cost-effective route would be to install turbines that can safely burn hydrogen from the start – but PVSC's apparent inability to do so casts doubt on the feasibility of its hydrogen-burning proposal.

Indeed, hydrogen's "energy density (one-third of fossil gas), molecular size (the smallest of all molecules), flammability, and flame speed (an order of magnitude faster than fossil gas),"[156] all pose challenges to retrofitting gas plants to run on hydrogen, and those challenges increase with increasing concentrations of hydrogen in the fuel blend. Burning pure hydrogen in a gas turbine also requires different fuel delivery piping and components; different gas turbine controls, ventilation systems, and enclosures; and different selective catalytic reduction systems for NOx removal.[157] Many of these are also needed for high blends of hydrogen mixed with traditional gas.[158]

PVSC's proposal also fails to grapple with the high costs of green hydrogen production. Between 20% to 40% of energy is lost in the production of hydrogen.[159] This inherent inefficiency means that green hydrogen will always be more expensive than just using solar energy directly (or through a battery).[160] In addition, green hydrogen production requires "as much as nine kilograms of high-purity water per kilogram of hydrogen,"[161] but the Compliance Statement does not address where PVSC would source this high-purity water, particularly during storm or emergency periods.

In addition, the Compliance Statement does not grapple with the logistics of storing two weeks' worth of hydrogen onsite, particularly when the AO-25 Statement admits that PVSC *rejected* a hydrogen proposal because it could only store 4 hours' worth of hydrogen onsite.[162] Nor does the AO-25 Statement note that the hydrogen would likely have to be stored as liquified

---

[153] *Id.* at 32.
[154] *Id.*at 19.
[155] *See* Powers Report, Att. 1 at 1-2, 11.
[156] Sasan Saadat & Sara Gersen, *supra* note 139 at 24 (citing Jeffrey Goldmeer et al., *supra* note 140 at 3).
[157] *Id.* at 24–25 (citing Goldmeer et al.).
[158] *Id.*
[159] Energy Transitions Commission, *Making the Hydrogen Economy Possible: Accelerating Clean Hydrogen in an Electrified Economy*, at 22 (Apr. 2021), https://energy-transitions.org/wpcontent/uploads/2021/04/ETC-Global-Hydrogen-Report.pdf.
[160] AGORA VERKEHRSWENDE, AGORA ENERGIEWENDE AND FRONTIER ECONOMICS, THE FUTURE COST OF ELECTRICITY-BASED SYNTHETIC FUELS at 11 (Sept. 19, 2018), https://www.agora-energiewende.de/fileadmin2/Projekte/2017/SynKost_2050/Agora_SynKost_Study_EN_WEB.pdf.
[161] Feroze Abbas et al., Water Resource Considerations for a Hydrogen Economy, JDSupra (Dec. 17, 2020), https://www.jdsupra.com/legalnews/water-resource-considerations-for-the-84603/.
[162] Compliance Statement, *supra* note 16 at 44.

hydrogen, meaning that PVSC would have to construct and operate a hydrogen liquification train in addition to the electrolizer, and meaning that PVSC would be storing large amounts of highly flammable liquified hydrogen, presenting a danger to its workers and Ironbound residents.

III. PVSC'S REJECTION OF LESS-POLLUTING ALTERNATIVES IS ARBITRARY.

Less polluting technologies are viable alternatives to PVSC's proposed gas plant. But neither the Compliance Statement nor PVSC's other documents suggest that PVSC has adequately considered renewable alternatives.

Indeed, on multiple occasions DEP asked PVSC for a more thorough analysis of renewable alternatives. After PVSC submitted its initial air permit application for the SPGF gas plant in January 2020, DEP commented to PVSC in a March 2020 meeting and in follow-up phone conversations that "PVSC should consider alternatives to the construction of a new 34-MW fossil-fuel-fired power plant, as well as options to maximize the energy efficiency of the plant."[163] PVSC's January 2021 amended air permit application therefore included a section on renewable alternatives "at the request of the NJDEP to fulfill the objectives of the January 2020, New Jersey Energy Master Plan."[164] That same alternatives analysis reappears largely unchanged in the pending July 2021 Permit Application and the Compliance Statement. DEP's comments on a draft version of the Compliance Statement again asked PVSC to "provide additional information on PVSC's evaluation of renewable energy sources, i.e., solar, wind, and battery storage, to support the conclusion that these could not feasibly replace the SPGF, entirely or partially."[165]

DEP's repeated requests for an analysis of renewable alternatives is notable when compared to the complete lack of consideration of renewables at the time of the FEMA grant application. The grant application and related Benefit Cost Analysis and Environmental Assessment did not include any renewables among the alternatives considered.[166] This is despite the completion of the PVSC-commissioned solar feasibility study the year prior to the grant application. Thus, the FEMA process that locked PVSC into the gas plant proposal never even considered renewable alternatives.

As explained further below, renewables are a viable and preferable alternative to PVSC's outdated gas plant proposal.

A. Battery Storage Can Satisfy PVSC's Emergency Needs.

In many ways, battery storage is the ideal solution to provide standby power to PVSC. Today's battery technology could easily provide PVSC's emergency energy needs. Assuming a

[163] PVSC Permit Application, *supra* note 66 at 3-1 & n.4.
[164] Passaic Valley Sewerage Commission, *Title V Operating Permit Significant Modification Application for Proposed Standby Power Generation Facility* at 1-3 (Jan. 14, 2021).
[165] DEP March 2 Letter, *supra* note 13 at 2.
[166] Compliance Statement, *supra* note 16 at 12-13.

15 MW need (providing a buffer over the 9-13 MW need calculated above) over 12 hours would result in 180 MWh, or only 1.6% of the 11,424 MWh under PVSC's current design assumptions.[167]

This amount of battery storage could easily fit onto the PVSC site. Only 30 of the 6 MWh Samsung SDI 22S Modules referenced in the Compliance Statement would be needed to provide 180 MWh, and at a 320 square feet each, they would take up less than a quarter of an acre of space if placed end to end, and even less area if stacked vertically.[168] This is just a sixth of the space of the 1.5 acre site that PVSC is planning for the SPGF building.

Batteries are also a much more economical option. At current costs, 180 MWh of batteries would cost approximately $36 million – only 30% of the $118 million cost of the SPGF.[169] It is for these low costs that electric utilities now forecast production costs of solar plus battery storage to be less than production costs of combustion turbines and declare that "batteries are now more economic than gas-fired peakers, even at today's natural gas prices."[170]

Furthermore, batteries could provide additional cost savings if PVSC uses them as a peak shaving resource which – unlike PVSC's prior proposal to use the SPGF for peak shaving – would not add to toxic emissions in an environmental justice community. The Atlantic County Utilities Association wastewater treatment plant in Atlantic City, New Jersey, already uses its 1 MW on-site battery storage for grid frequency regulation and peak shaving to reduce the electric bill at the plant.[171] 180 MWh of batteries at PVSC could provide an even more robust peak-shaving and cost-saving resource that, unlike PVSC's prior proposal, would replace fossil fuel-based energy with true clean energy, instead of more fossil-fuel based energy.

Batteries are also superior to the SPGF proposal because they can provide electricity instantaneously.[172] This avoids the possibility of equipment damage or operational obstacles that the Compliance Statement explains may come about from the up to half-hour necessary to startup the SPGF gas plant.[173] After all, PVSC's stated need for a quick response time is the reason it rejected the idea of using a more energy efficient combined-cycle gas plant.[174]

B. Solar Can Supplement PVSC's Batteries.

Though battery storage by itself can provide PVSC's standby power needs, pairing that storage with solar PV can further supplement PVSC's resiliency and enable further cost-savings.

---

[167] Powers Report, Att. 1 at 1, 12.
[168] *See* Compliance Statement, *supra* note 16 at 33.
[169] Powers Report, Att. 1 at 12.
[170] *Id.* at 11.
[171] Powers Report, Att. 1 at 11; Atlantic County Utilities Authority, *Battery Storage Demonstration Project Fact Sheet*, https://www.acua.com/ACUA/media/Acua/Battery-Storage-Demonstration-am.pdf.
[172] Powers Report, Att. 1 at 8-9.
[173] Compliance Statement, *supra* note 16 at 18.
[174] *Id.* at 35.

The Compliance Statement recognizes that data from a 2012 study shows up to 10.6 MW of feasible solar onsite at PVSC.[175] That same study found 5.9 MW of solar possible on the roof of just one nearby offsite location.[176] Thus, PVSC's own documents show 16.5 MW of solar possible without even considering the large amount of ground and additional roof space near the PVSC facility. This is more than enough to provide the revised electricity demand and could be used to refill the battery storage facility described above.

IV. CONCLUSION

PVSC has presented to the public an unclear, inaccurate, and incomplete AO-25 Compliance Statement that provides no basis for DEP to move forward on PVSC's Permit Application. Nor should DEP approve this application, because PVSC's proposed gas plant would contribute to adverse environmental stressors in an overburdened community that *already* has more gas plants than any other community in the state. PVSC's standby power needs can be more effectively and economically met by foregoing the gas plant proposal and instead constructing a battery storage and solar system that can more than satisfy future emergency power needs.

Thank you,

/s/ Jonathan Smith
Jonathan Smith
Jasmine Crenshaw
Earthjustice
jjsmith@earthjustice.org

On behalf of the Ironbound Community Corporation

[175] *Id.* at 34.
[176] 2012 Solar Report, *supra* note 97 at 2-12.

Attachment 1

Clean Alternative Emergency Power Supply for PVSC

Bill Powers, P.E., July 1, 2022

I. Summary

The backup onsite power system proposed by Passaic Valley Sewerage Commission (PVSC) should be designed for a service duration much shorter than the proposed two weeks and a peak load substantially less than 34 megawatts (MW). The backup power supply should be designed to address the longest credible Public Service Electric and Gas (PSEG) grid outage duration and should supply only the critical PVSC loads during that outage. The longest credible PSEG grid outage, after PSEG has raised all low-lying substations above the 500-year flood level, is no more than 12 hours. The PVSC critical loads are less than 15 MW. This equals a maximum potential PVSC backup power demand of 180 megawatt-hours (MWh). Battery storage alone can meet this 180 MWh backup power demand more cost-effectively and more reliably than the gas turbines proposed for the SPGF.

PVSC proposes to construct a 34 MW onsite Standby Power Generation Facility (SPGF) at a cost of $118 million. The plant will consist of three Siemens natural gas-fired 17 MW combustion turbines (CTs). It will be designed to operate in "island" mode, disconnected from the PSEG grid. The genesis of the SPGF project was the loss of PSEG grid power to PVSC during Hurricane Sandy due to flooding of low-lying PSEG substation(s), and flooding of process units at PVSC. PSEG has upgraded the affected substations. PVSC is in the process of upgrading its facilities to assure future flooding will not affect reliable operation. The maximum duration of non-flood related PSEG power outages has been a few hours.

The proposed SPGF CTs must be operational in advance of PVSG isolating from the PSEG grid in an emergency, as the CTs require some time to go from a cold condition to full output. For this reason, PVSC projects that the CTs could collectively operate as many as 1,284 hours per year, anticipating up to ten storm events per year with CT startup two days in advance of the anticipated arrival of each storm event. PVSC has withdrawn its earlier proposal to operate the SPGF as a peak shaving facility, for up to 700 hours per year, to avoid the associated air emissions.

PVSC has applied for incentives to add up to 19 MW (direct current) of onsite and offsite solar power.[1] PVSC has also proposed to add 5 MW/10 MWh of battery storage for peak load management.[2]

The PVSC proposal to convert the CTs to green hydrogen fuel at some point in the future is conjectural and uncertain. All elements of the SPGF, including the fuel piping component materials, pipe sizes, sensors and safety systems, and gas turbine metals exposed to hydrogen combustion exhaust gases, may require modification or replacement to enable use of 100 percent

[1] Passaic Valley Sewerage Commission, *Request for Proposals for a Renewable Energy Power Generation System*, February 2022, p. 7.
[2] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 49.

hydrogen fuel.[3] PVSC indicates that the SPGF will cost $118 million.[4] There is no indication that PVSC has considered the additional cost of converting the $118 million SPGF to burn 100 percent hydrogen, or considered the potentially high cost of producing the green hydrogen that will be required.

PVSC's average power demand is 22 MW. PVSC participates in the regional PJM demand response program, and can voluntarily reduce its demand by approximately half, to about 11 MW, when called to participate. PVSC has a contractual obligation to maintain this reduced demand for up to 12 hours if requested by PJM to do so.

PVSC assumes, as design conditions of the PVSC, that a 34 MW demand must be met continuously for 14 days. These design conditions are too conservative. PVSC can operate at about 11 MW in demand response mode for up to 12 hours (or more) with only critical facility loads operational. The new PVSC flood water pumps will add another 2 MW of demand if they are needed. These pumps will only operate if required. They are not critical loads that must be supported as the PVSC shifts from grid power to backup power.

The longest PSEG outage PVSC endured before Hurricane Sandy in 2012 was a few hours. The susceptibility of low-lying PSEG substations to flooding has been resolved. Therefore, the design condition for grid power outage duration should be a small number of hours. PVSC is already obligated to reduce load substantially for up to 12 hours as a participant in PJM's demand response program. A PSEG outage duration of no more than 12 hours should be the SPGF design "grid emergency duration" assumption.

The PVSC minimum critical load is 11 MW. The flood water pumps, if needed during the event, would add another 2 MW of power demand. The design PVSC power demand, to conservatively assure critical loads are met during the emergency event with the flood water pumps operating, should be 15 MW.

The SPGF would need to provide 180 MWh of backup power to meet a continuous demand of 15 MW over 12 hours. The current cost of utility-scale battery storage is approximately $200,000 per MWh. At this unit value, a 180 MWh battery storage-only SPGF at PVSC would cost $36 million. This is about 30 percent of the $118 million capital cost projected by PVSC for the proposed CT-based SPGF.

A battery-based SPGF would emit no air emissions. For this reason, the battery-based SPGF could also earn income for PVSC as a peak-shaving resource reducing PVSC power costs and by bidding into the PJM regional market.

---

[3] Siemens, *Hydrogen power with Siemens gas turbines*, 2020, p. 16: file:///C:/Users/Bill/Downloads/Siemens%20Energy%20-%20Hydrogen%20Power%20with%20Siemens%20Gas%20Turbines.pdf.

[4] J. Rotolo, P.E. – PVSC, *The PVSC Resiliency & Mitigation Efforts/ Lessons Learned*, PowerPoint, January 18, 2018, p. 38: https://www.nj.gov/dep/dwq/pdf/20180118_NJWWRRAP_Workshop_07_JRotolo.pdf.

A battery-based SPGF could also seamlessly isolate from the PSEG grid in real-time. There would be no justification or need for up to two days of anticipatory operation before each storm event as is proposed by PVSC for the CT-based SPGF.

II. Background - Description of Problem the SPGF Is Intended to Address

Low-lying PSEG substations along the Passaic River were flooded during Hurricane Sandy, requiring PSEG to shut down power to those substations. PSEG provides grid power to PVSC. As a result of the flooding, PSEG discontinued power to PVSC for approximately 50 hours.[5] Subsequently, PSEG raised the elevation of these substations to one foot above the Hurricane Sandy flood level to assure these substations remain in operation during the 500-year flood event.[6]

Hurricane Sandy exposed three major resiliency weaknesses at PVSC's main facility: 1) the lack of protection from storm surges, 2) the susceptibility of the substantial underground portions of PVSC to flooding, regardless of the cause of the flooding, and (3) the lack of reliable backup electrical power in the event of a transmission grid (PSEG) failure.[7]

The PVSC also is in the process of hardening it operations to assure continued operation during the 500-year flooding event. This resiliency project has five primary elements: 1) installation of flood walls, 2) elevation of switchgear and MMCs, 3) reconfiguration of drainage systems, 4) addition of flood water pumps, and 5) the installation of an on-site SPGF. The SPGF has not yet been constructed. The design of the SPGF is the subject of this letter report.

A. Flooding of PSEG Substations and PVSC Processes During Hurricane Sandy

Adequate control of 500-year floodwaters, either through the elevation of critical equipment above the 500-year flood event water level or through the construction of flood walls of sufficient height to achieve the same objective, is necessary to prevent the future loss of external PSEG power and damage to PVSC wiring and process equipment.

PSEG shut down power to PVSC during Hurricane Sandy due to flooding of its low-lying substations, as detailed in the October 31, 2012 US DOE Situation Report on Hurricane Sandy:[8]

> The storm surge flooded a large number of (PSEG) substations along the Passaic, Raritan, and Hudson rivers, disrupting service to customers in Hudson, Essex, and Middlesex counties. The magnitude of the flooding in contiguous areas caused

[5] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, pp. 6-8. At p. 7: "500-year catastrophic natural disaster".
[6] PSEG, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program* March 30, 2018, Attachment 1, p. 2 (pdf p. 15): https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2106258.
[7] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 2.
[8] U.S. DOE - Office of Electricity Delivery & Energy Reliability, *Hurricane Sandy Situation Report #6*, October 31, 2012, p. 8: https://www.oe.netl.doe.gov//docs/2012_SitRep6_Sandy_10312012_1000AM_v_1.pdf.

PSEG to take these stations out of service, wait for the flood waters to recede to assess the damage, dry out the equipment, replace equipment when necessary, and re-energize the system to restore service.

The PSEG substation outages along the Passaic, Raritan, and Hudson rivers were caused by the flooding of the substations, not by failure of the bulk power system to continue supplying those substations with grid power. The PSEG substation flooding resulted in grid power to PVSC being curtailed for approximately 50 hours, from 9:00 pm on October 29, 2012 to 10:40 pm on October 31, 2012, as detailed in the timeline shown in Table 1.

Table 1. Timeline of PSEG curtailment and restoration of power to PVSC, October 29-31, 2012[9]

Date/time	Event
October 29, 2012, 9:00 pm	PVSC lost both the primary and backup direct electrical utility feeds from PSEG. Once power was lost and PVSC had no way to get sewage flow through the WWTP, strategic combined sewer overflows (CSOs) were automatically activated, which diverted the raw sewage coming from PVSC's Main and Southside Interceptors into the Passaic River.
October 31, 2012, 10:30 am	Sewage flows from Hudson County continued to be pumped into the PVSC plant via a force main, further adding to the flooding until 10:30 am on October 31st. PVSC was able to bypass the plant by diverting the raw sewage coming from Hudson County into Newark Bay in order to prevent further flooding in the plant.
October 31, 2012, 10:40 pm	PSEG restored power to PVSC's Substation 1, which feeds power to the rest of the WWTP.
Nov. 3, 2012, 8:45 am	From 9:00 pm on October 29 to 8:45 am on November 3, it is estimated that approximately 840 million gallons of raw sewage were bypassed into the Passaic River and Newark Bay.

The only major loss of the PSEG bulk power supply in New Jersey in the 21st Century occurred during the historic August 2003 Northeast blackout. Power was restored to most PSEG customers "within hours" after this 2003 event occurred.[10] The 2003 blackout did not result in PVSC proposing the construction of an onsite backup power plant to improve power supply reliability. PVSC can apparently withstand a number of hours of grid power interruption – in the absence of onsite flooding – without unduly compromising process operations.

PVSC identifies the Hurricane Sandy storm surge as "a 500-year catastrophic natural disaster."[11] The 500-year flood conditions experienced by PSEG and PVSC during Hurricane are the design basis for the offsite substation upgrades by PSEG and the PVSC onsite upgrades.

[9] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, pp. 6-8.
[10] nj.com, *A decade after historic blackout, N.J. utilities focus on strengthening the system*, August 11, 2013: https://www.nj.com/business/2013/08/a_decade_after_the_big_blackou.html. "In New Jersey, where most customers had power restored within hours, PSEG relay stations prevented further damage by disconnecting from the system to stop the domino effect of outages . . ."
[11] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 7.

The SPGF was conceived by PVSC as a reliability response to the loss of PSEG power due to the flooding of PSEG substation(s) supplying PVSC caused by Hurricane Sandy. However, PSEG has resolved the flooding risk at its substation(s) serving PVSC by elevating the substation equipment above the 500-year flood water level.

PVSC is addressing the flooding risk to its process operations by: 1) building flood wall(s) around its east and west compounds, 2) elevating electrical switchgear and MMCs, 3) improving drainage, and 4) adding flood water pumps to address rainwater collecting inside the PVSC flood walls. In theory, no SPGF should be needed with critical PSEG infrastructure now protected, and with the PVSC infrastructure upgrades that are intended to prevent 500-year flood waters from impacting facility operations.

B. PSEG Has Effectively Addressed the Substation Flooding Problem That Led to Outages During Hurricane Sandy

The low-lying PSEG substations were tested to a degree in 2021 when Tropical Storm Ida hit PSEG service territory. Newark experienced record-breaking flooding.[12] PSEG invested heavily in hardening its electric and natural gas infrastructure in the wake of Hurricane Sandy. According to PSEG, major storms such as Ida have much less impact on PSEG infrastructure now than when Hurricane Sandy hit in 2012:[13]

> The $4.8 billion investment in infrastructure strengthening and modernization programs, portions of which are still in progress, spans PSE&G programs Energy Strong I and II and Gas System Modernization Program I and II and includes raising, rebuilding, eliminating and equipment upgrades at 26 stations, many of which were damaged by flooding during Sandy. PSE&G also installed smart grid technologies, replaced close to 2,000 miles of aging gas lines and added digital and other technologies to make the network more intelligent and agile.
>
> The benefit to customers was evident last year (2021) when Tropical Storm Ida brought historic flooding to most of the utility's service territory. Tropical Storm Ida and its remnants would cause more than $75 billion in damage nationwide – surpassing the damage caused by Superstorm Sandy in 2012. PSE&G's infrastructure stood strong. A total of 215,000 customers lost power compared to more than 2 million who suffered lengthy outages during Sandy.

It was the failure of PSEG substation(s) due to flooding damage that led to the loss of power at PVSC during Hurricane Sandy. That failure mode has been eliminated by PSEG. The design parameters for the SPGF need to reflect the upgraded reliability of the PSEG substation(s) serving PVSC.

---

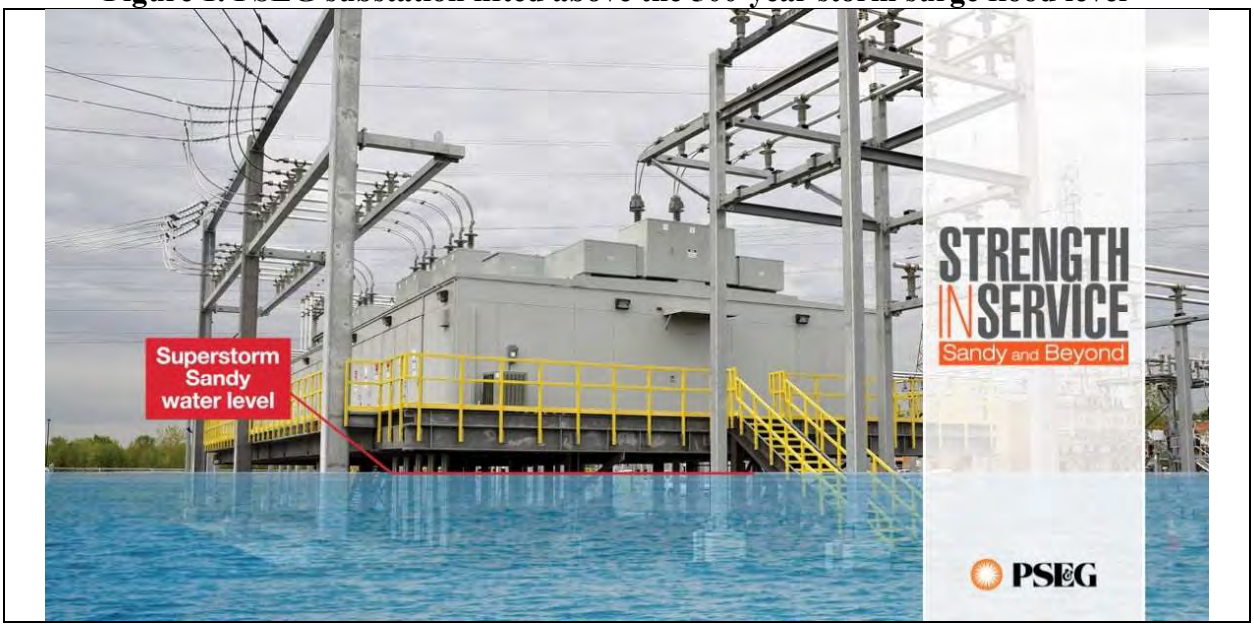
[12] TapintoNewark, *Tropical Storm Ida Pummels Newark With Record-Breaking Rainfall, Prompting Rescue Efforts for Hundreds of Residents*, September 2, 2021: https://www.tapinto.net/towns/newark/sections/police-and-fire/articles/tropical-storm-ida-pummels-newark-with-record-breaking-rainfall-prompting-rescue-efforts-for-hundreds-of-residents.

[13] PSEG press release, *A Decade after Superstorm Sandy, New Jersey's Infrastructure is Considerably More Prepared for Hurricane Season*, June 9, 2022: https://nj.pseg.com/newsroom/newsrelease303.

III. Post-Sandy Actions Taken by PSEG and Proposed by PVSC to Minimize Future Outage Duration During 500-Year Event

PSEG has raised the elevation of twenty-six substations in low-lying areas to one foot above the 500-year storm surge flood level.[14] See Figure 1. The only reason identified by PSEG for the loss of PSEG power during the Hurricane Sandy storm surge was flooding of the PSEG substation(s) providing grid power to the PVSC onsite substation.[15]

Figure 1. PSEG substation lifted above the 500-year storm surge flood level[16]



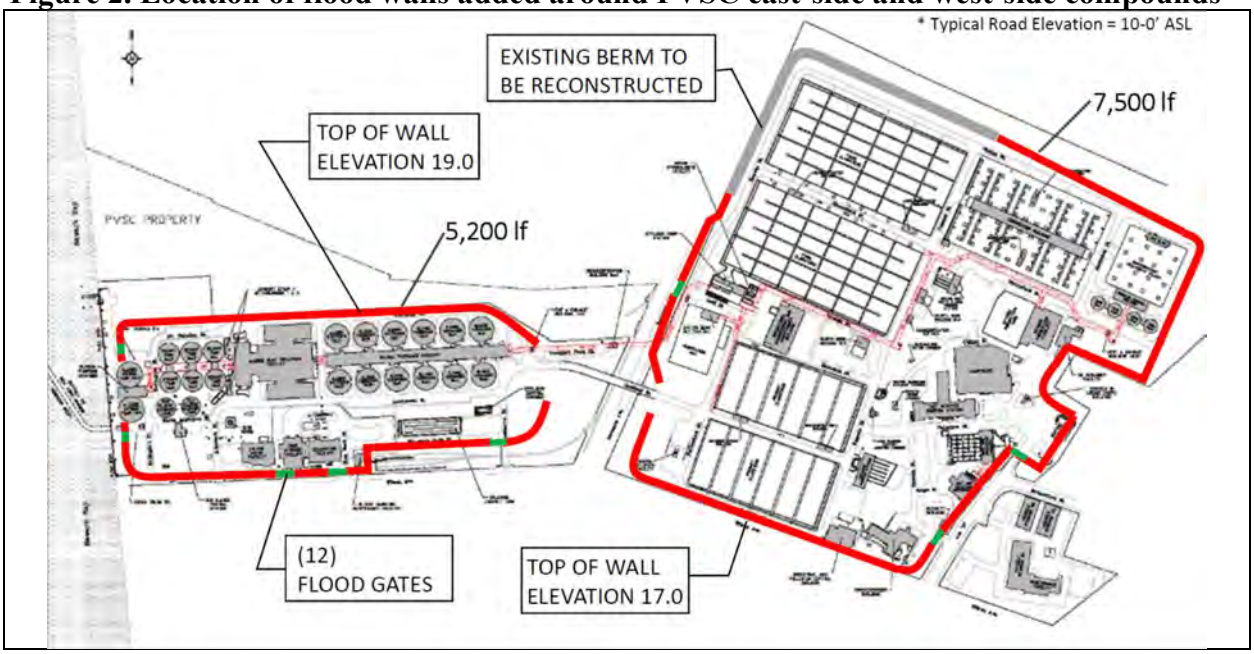
PGEG has spent $415 million elevating these twenty-six substations above the 500-year flood level.[17]

IV. Post-Sandy PVSC Mitigation Measures to Minimize Impact on Process Equipment During 500-Year Event

PVSC is in the process of adding flood walls, elevating switchgear and MMCs, improving drainage, and adding flood water pumps. The locations of the flood walls are shown in Figure 2.

[14] PSEG, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program* March 30, 2018, Attachment 1, p. 2 (pdf p. 15): https://publicaccess.bpu.state.nj.us/CaseSummary.aspx?case_id=2106258.
[15] U.S. DOE - Office of Electricity Delivery & Energy Reliability, *Hurricane Sandy Situation Report #6*, October 31, 2012, p. 8: https://www.oe.netl.doe.gov//docs/2012_SitRep6_Sandy_10312012_1000AM_v_1.pdf.
[16] PSEG press release, *A Decade after Superstorm Sandy, New Jersey's Infrastructure is Considerably More Prepared for Hurricane Season*, June 9, 2022: https://nj.pseg.com/newsroom/newsrelease303.
[17] PSEG, *Petition for Approval of Electric and Gas Base Rate Adjustments Pursuant to the Energy Strong Program* March 30, 2018, Attachment 1, p. 1 (pdf p. 14).

Figure 2. Location of flood walls added around PVSC east-side and west-side compounds[18]



PVSC indicates it must have reliable onsite backup power to assure that water accumulating inside the flood walls can be removed.[19] There is no discussion in the PVSC analysis of the $415 million that PSEG has spent to elevate its low-lying substations to assure PSEG's ability to provide reliable power to customers, including PVSC, under 500-year flood conditions.

Reliable power will be available from PSEG to operate the PVSC flood water pumps. If PSEG does experience an outage unrelated to substation flooding during a storm event, it will be of short duration based on past PSEG outage history. The SPGF design should be based on a short-duration PSEG outage.

V. Proposed Design Basis and Cost of Emergency Power SPGF Supply

A. Proposed SPGF Design Should Be Based on Maximum PSEG Outage Duration of 12 Hours, Not the Maximum PVSC Flood Damage Duration

The proposed function of the SPGF is to provide onsite power when PSEG power is interrupted during storm events.[20] PSEG has flood-hardened the substation(s) supplying PVSC. These substations are no longer subject to outages due to 500-year flood elevation levels. PVSC will

[18] J. Rotolo, P.E. – PVSC, *The PVSC Resiliency & Mitigation Efforts/ Lessons Learned*, PowerPoint, January 18, 2018, p. 20.

[19] J. Rotolo, 2018, p. 11. "Construction of the floodwall would require that drainage systems be redone as well as the installation of pump stations to remove significant water from rainfall. However, the floodwall and associated work could result in a catastrophe should a power failure occur, as building the floodwall without the certainty of having reliable power to pump out the walled-in grounds would not alleviate the flooding hazard . . . Therefore, in addition to the floodwall, the team agreed that the solution required a reliable, centralized, onsite standby power system that is available in all weather conditions."

[20] As noted, PSEG restored power to customers within hours in the wake of the August 2003 blackout which was caused by regionwide tripping of transmission lines and generators. This blackout was not caused by severe weather.

have flood walls around its east-side and west-side compounds to protect the compounds from 500-year flood water levels.

The duration of the PSEG power outage caused by Sandy, and the duration of PVSC downtime resulting from the flood water levels caused by Sandy, are not the relevant design criteria for the SPGF. Post-Sandy PVSC conditions following the PSEG and PVSC upgrades are the correct design criteria for the SPGF.

PVSC considered PSEG grid power reliable, without onsite backup power, prior to Sandy and after the August 2003 blackout. A valid argument can be made that, by increasing height of the low-lying PSEG substations above the 500-year flood level, reliable grid power is assured under all weather conditions and the SPGF is not necessary to assure power reliability at PVSC.

The difference between the August 2003 blackout and Hurricane Sandy was the unprecedented flooding caused by Sandy, and the damage it did to PSEG and PVSC equipment. The PSEG and PVSC infrastructure upgrades (not including the SPGF), neutralize the impact of 500-year flooding and allow normal operations to proceed reliably under severe weather conditions.

B. SPGF Design Proposed by PVSC

The SPGF proposed by PVSC would consist of three 17- MW Siemens CTs, to meet a projected facility demand of 34 MW.[21] Two of the CTs would be operational under normal standby power operation conditions, with the third CT in standby mode. The facility would only isolate from the grid, and operate in "island" mode as a standalone microgrid, if PSEG power is not available. However, PVSC will not be able to immediately switch to the CTs if they are offline when grid power is lost (CT startup can take up to 30 minutes).[22]

PVSC will not be able to immediately switch to the SPGF to address a sudden PSEG power outage. For this reason, PVSC is projecting that the SPGF will be started as much as 48 hours in advance of a forecast storm event.[23] PVSC, for the purpose of calculating annual usage of the SPGF CTs, is projecting up to ten storm events per year. This translates into a potential for up to 480 hours per year of operating time each for the two primary 17 MW CTs. There would also be 100 hours per year of operation and maintenance (O&M) testing of each CT. These hour totals do not include actual operating hours during storm events. PVSC projects that the CTs could collectively operate as many as 1,284 hours per year.[24]

PVSC has withdrawn its earlier proposal to operate the SPGF as a peak shaving facility, for up to 700 hours per year, to avoid the associated air emissions.[25]

---

[21] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, pp. 15-21.
[22] Ibid, p. 18. "Starting up the SPGF itself would take less than a half-hour."
[23] Ibid, p. 18. "Action items would include starting the facility at least 24 hours in advance of the expected event, and up to 48 hours in advance if deemed necessary."
[24] Ibid, p. 21.
[25] Ibid, p. 31.

Effectively all of the operating time projected for the CTs is due to: 1) the inability of the CTs to instantly provide replacement power from a cold start when grid power is lost, and 2) the complexity of the turbine machinery that necessitates regular O&M test runs to assure the CTs will be ready when needed. The complexity of the CT, and the resulting possibility that any one CT may not be available when needed, is the reason a third standby CT is specified for the SPGF.

C. PVSC Can Operate Under Emergency Conditions at Much Less Than 34 MW

The average annual demand of the PVSC is approximately 22 MW.[26] PVSC participates in the PJM demand response program, intended to reduce demand on the grid during periods of peak demand. PVSC is obligated to reduce demand for up to 12 hours.[27] PVSC describes the process units included in the demand response program in the following manner:[28]

> PVSC currently participates in the PJM Demand Response Program. PVSC responds to the PJM request by shedding load, or temporarily shutting down some processes to reduce electrical demand. The equipment operation curtailment can be for up to 12 consecutive hours. The list of equipment that is shut down or put on standby operation for the demand response request period includes the Zimpro sludge heat treatment system, the sludge filter press units, the decant and storage system, and half of the oxygenation units.

The equipment that PVSC curtails during a 12-hour demand response event represents about half of PVSC's average demand.[29] Curtailing this load would reduce PVSC demand to about 11 MW on average. PVSC provided the demand curve for the one demand response test event it carried-out on March 15, 2022. During this event, PVSC reduced its demand to 11.5 MW, and maintained demand at less than 15 MW for sixteen hours.[30] The load curve for this demand response test event is attached to this letter report.

---

[26] Passaic Valley Sewerage Commission, *Request for Proposals for a Renewable Energy Power Generation System*, Appendix D – PVSC Annual Electricity Usage by Facility, pdf p. 89, February 2022. Annual PVSC usage = 194,827,564 kWh. Annual average demand = 194,827,564 kWh ÷8,760 hr/yr = 22,241 kW (22.2 MW).

[27] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 17. "PVSC currently participates in the PJM Demand Response Program. PVSC responds to the PJM request by shedding load, or temporarily shutting down some processes to reduce electrical demand. The equipment operation curtailment can be for up to 12 consecutive hours."

[28] Ibid, p. 17.

[29] Passaic Valley Sewerage Commission, Request for Proposals for a Renewable Energy Power Generation System, Appendix D – PVSC Annual Electricity Usage by Facility, pdf p. 89, February 2022. Annual average demand: 1) sludge heat treatment = 5.8 MW; sludge filter press units = 0.3 MW; decant and storage system = 0.2 MW; O_2 compressor/production = 9.1 MW. Total average load reduction during demand response event = 5.8 MW + 0.3 MW + 0.2 MW + (9.1 MW/2) = 10.9 MW.

[30] E-mail communication from M. Witt, PVSC, to J. Smith, Earthjustice, June 30, 2022 (PVSC demand response event graphic, March 14-15, 2022). The event took place during the planned maintenance of other equipment.

PVSC indicates that only half of the oxygenation units are curtailed during a demand response event. The oxygenation process equipment, producing 500 tons per day of 95 percent pure oxygen,[31] consumes about 40 percent of PVSC's average power demand.[32]

Additional onsite oxygen storage would potentially allow PVSC to shut down the entire oxygenation system during the demand response event (or storm event), reducing the demand from 11 MW to about 7 MW.[33]

Adding oxygen storage to eliminate the power demand of oxygen production during the storm event would likely be substantially less expensive than designing the SPGF to meet that oxygen production power demand. One-half of PVSC's oxygen consumption over 12 hours would be 125 tons. The cost of adding 125 tons of additional cryogenic oxygen storage onsite at PVSC would be less than $500,000 [34]

The new flood water pumps, with a combined demand of just over 2 MW,[35] are not a part of the operational processes at PVSC. However, they may be needed and operational under emergency storm event conditions.

Therefore, during a 12-hour demand response event, under the current scenario described by PVSC the facility-wide power demand would be about 11 MW. With the flood water pumps fully operational, the demand would increase by 2 MW to 13 MW. If sufficient oxygen storage is added onsite to eliminate oxygen production power demand during the emergency event, PVSC critical load power demand would be about 7 MW. This power demand would rise to 9 MW if all flood water pumps were operational during the storm event.

---

[31] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 19.
[32] (34,731.910 kWh/yr + 44,972,047 kWh/yr) ÷194,827,564 kWh/yr = 0.409 (40.9 percent).
[33] 22.2 MW – (5.8 MW + 0.3 MW + 0.2 MW + 9.1 MW) = 6.8 MW.
[34] B. Powers telephonic communication with E. Blanco, sales manager, Universal Industrial Gases, Inc. (http://www.uigi.com/index.html), June 24, 2022. Estimated cost of 250 tons of liquid oxygen storage is approximately $500,000. B. Powers note: Only 125 tons of additional liquid oxygen would be needed to provide half of the PVSC oxygen demand over 12 hours.
[35] J. Rotolo, 2018, p. 38. "Storm Water Pumping Stations ($39.5 million): West: (5) 375hp pumps, 158MGD; Northeast: (4) 150hp pumps, 59.5MGD; Southeast: (3) 100hp pumps, 27.2MGD. Total pumping hp = 2,775 hp (2,069 kW).

D. Solar and Battery Storage Are Proposed for PVSC in Addition to the SPGF

PVSC has applied for incentives to add up to 19 MW (direct current) of onsite and offsite solar power.[36] PVSC has also proposed to add 5 MW/10 MWh of battery storage to support SPGF operations and as a peak shaving resource.[37,38]

Battery storage is already in operation at another wastewater treatment plant impacted by Hurricane Sandy, the Atlantic County Utilities Authority (ACUA) wastewater treatment plant in Atlantic City, NJ. The 1 MW battery at the ACUA wastewater treatment plant provides frequency regulation services in the PJM market and peak shaving to reduce the electric bill at the ACUA wastewater treatment plant.[39]

VI. Eventual Use of Hydrogen as Fuel in SPGF Gas Turbines Is Speculative and Uncertain

The PVSC proposal to convert the CTs to green hydrogen fuel is highly speculative. All elements of the SPGF may require modification or replacement to enable use of 100 percent hydrogen fuel.[40] These elements include: fuel piping component materials, pipe sizes, sensors and safety systems, and gas turbine components exposed to hydrogen combustion exhaust gases.[41] There is no indication that PVSC has considered the additional cost of converting the $118 million SPGF to burn 100 percent hydrogen, or the potentially high cost of producing the green hydrogen that will be required.

VII. Battery Storage Alternative to the Proposed SPGF

Battery storage is a better alternative for backup power at PVSC for the limited number of hours, 12 hours or less, that backup will potentially be necessary. Electric utilities now view battery storage as a superior alternative to CTs for cost reasons alone. NextEra Energy states that "batteries are now more economic than gas-fired peakers (CTs), even at today's natural gas prices."[42] NextEra Energy is the parent company of Florida Power & Light.[43] NextEra Energy

---

[36] Passaic Valley Sewerage Commission, *Request for Proposals for a Renewable Energy Power Generation System*, February 2022, p. 7.
[37] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 31. "PVSC now proposes to supplement the black start generators with five MW (10 MWh) of on-site battery storage. This would be enough to start the CTGs in the event of total loss of utility power, and make use of the BSGs necessary only if the batteries fail."
[38] Passaic Valley Sewerage Commission, *Standby Power Generation Facility Project - Program Interest ID No. 07329 BOP 190004, AO 2021-25 Compliance Statement*, March 30, 2022, p. 49.
[39] Atlantic County Utilities Authority, Battery Storage Project, webpage accessed June 30, 2022: https://www.acua.com/Projects/Renewable-Energy-Battery.aspx.
[40] Siemens, *Hydrogen power with Siemens gas turbines*, 2020, p. 16.
[41] Ibid.
[42] GreenTech Media, *NextEra looks to spend $1B on energy storage in 2021*, April 22, 2020.
[43] Companies owned by NextEra Energy: https://www.nexteraenergy.com/company/subsidiaries.html.

also forecasts the production cost of solar plus battery storage is less than the production cost of an existing CT.[44]

The total battery storage capacity needed for a battery-based SPGF would be: 12 hours x 15 MW = 180 MWh. A 15 MW demand is conservatively assumed for PVSC for design purposes to meet the maximum calculated PVSC critical load demand during storm events of 13 MW.

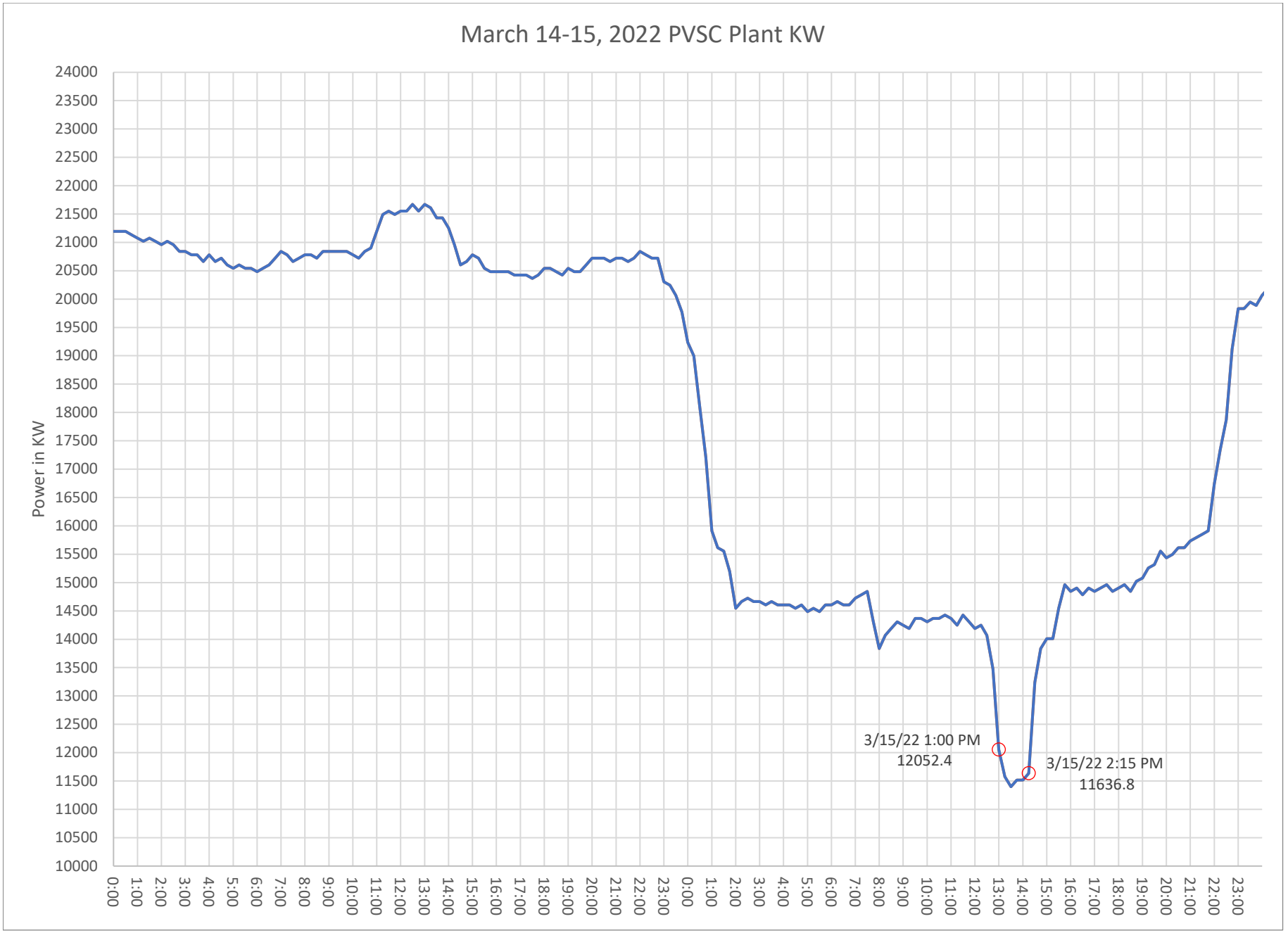
The estimated unit capital cost of 200 MWh of battery storage capacity is $193,000/MWh.[45] The estimated capital cost of 180 MWh of battery storage capacity for a battery-only SPGF is: ~$200,000/MWh x 180 MWh = $36 million. This compares to PVSC's cost estimate for the CT-based SPGF of $118 million.

A properly designed battery-based microgrid is capable of seamlessly switching from grid power to an islanded microgrid, and then back to grid power when grid power is restored.[46] A battery storage microgrid would typically be designed to meet only the critical loads during the brief switchover (in milliseconds) from grid power to islanded microgrid operation.[47] Other loads may be added as needed after the microgrid is functioning in islanded mode, up to the design capacity (in MW) of the battery storage system.

VIII. Conclusion

PVSC should design the SPGF for a maximum 12-hour storm event outage at a reduced power demand of 9 MW (if additional oxygen storage is added so that all oxygen demand met from storage tanks during event) to 13 MW. The SPGF should consist of battery storage only. The design of the battery-based microgrid should allow PVSC to seamlessly isolate from the grid in the case of a grid power outage. To generate income for PVSC, the battery capacity should be bid into the PJM market and also used as a peak shaving resource, similar to the operation of battery storage at the Atlantic County Utility's Authority wastewater treatment plant.

[44] NextEra Energy, Investor Conference 2022, PowerPoint, June 14, 2022, p. 26: https://www.investor.nexteraenergy.com/~/media/Files/N/NEE-IR/news-and-events/events-and-presentations/2022/06-14-2022/June%202022%20Investor%20Presentation_Website_vF.pdf.
[45] Lazard, *Lazard's Levelized Cost of Storage Analysis - Version 7.0*, October 28, 2021, pdf p. 23: https://www.lazard.com/media/451882/lazards-levelized-cost-of-storage-version-70-vf.pdf. Storage capital cost for 100 MW/200 MWh storage only system ($/kWh) = ($147 + $239)/2 = $193/kWh.
[46] Microgrid Knowledge, *Two pitfalls to avoid when selecting batteries for your industrial microgrid*, June 21, 2022: https://microgridknowledge.com/selecting-batteries-industrial-microgrid/.
[47] Ibid.


March 14-15, 2022 PVSC Plant KW
Power in KW
24000
23500
23000
22500
22000
21500
21000
20500
20000
19500
19000
18500
18000
17500
17000
16500
16000
15500
15000
14500
14000
13500
13000
12500
12000
11500
11000
10500
10000
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00
3/15/22 1:00 PM
12052.4
3/15/22 2:15 PM
11636.8

Attachment 2

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF THE COMMISSIONER
Permitting & Project Navigation
401 East State Street
P.O. Box 402, Mail Code 401-07
Trenton, New Jersey 08625-0402
Tel. (609) 292-3600 • Fax (609) 292-1921
www.nj.gov/dep

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LaTOURETTE
Commissioner

Gregory A. Tramontozzi, Esq.
Passaic Valley Sewerage Commission
600 Wilson Avenue
Newark, NJ 07105

March 2, 2022

RE: Passaic Valley Sewerage Commission (PVSC) Standby Power Generation Facility (SPGF) Compliance Statement – Comments
Project Program Interest ID # 07329 BOP 190004

Dear Mr. Tramontozzi,

The New Jersey Department of Environmental Protection (Department) has reviewed PVSC's Draft Standby Power Generation Facility Project Environmental Justice Law and Administrative Order (AO) 2021-25 Compliance Statement dated February 2022. Based on the information provided and representations made therein, the Department offers the following technical comments for your consideration:

1. **General Comments:** Please ensure that PVSC's analysis focuses on the environmental and public health stressors associated with the project that are directly related to or may be experienced by the host community including, but not limited to: (1) whether and how the project relates to environmental, health and safety of the host community; (2) whether and how the project relates to the reliability of PVSC services that directly benefit the host community; (3) whether and how the project is or could be configured to avoid or reduce any potential environmental or public health stressors within the host community, including any alternatives or changes to the project that have been considered; and (4) the stressor avoidance measures to which PVSC would permanently commit, including, if applicable, potential reductions in facility-wide emissions and any appropriate commitments to reduce or phase out facility reliance upon natural gas.

2. **Section II (Demand Response Request)**: Please provide additional information on PVSC's current participation in the PJM Demand Response Program, including details about whether and how its proposed future participation would impact or benefit the host community.

3. **Section II (Storm Preparation Mode):** Please provide further clarification of the proposed operation during Storm Preparation Mode. PVSC notes that, "Fluctuations in PVSC's power supply can have severe impacts on operations, even when the fluctuations last less than one (1) second," and "starting up the SPGF itself would take less than a half-hour. Connecting the SPGF to the facility's electrical systems would take several hours." While this describes situations in which a utility power outage can be predicted, the Department requests additional technical details concerning how the SPGF starts up and is integrated during unexpected utility power outages.

4. **Section II (Table 1)**: The 93.0 hours per year number listed for the Scenario of Steady State does not match the description under the Basis, which states that this operation would occur 12 times per year, 6 hours per run. The Steady State hours per year should be 72.0 based on the information provided, instead of 93.0. Please provide clarification.

5. **Section V (Changes to Project Scope):** Please provide additional information on PVSC's evaluation of renewable energy sources, i.e., solar, wind, and battery storage, to support the conclusion that these could not feasibly replace the SPGF, entirely or partially.

6. **Section V (Changes to Project Scope):** The response for Item 5 (first list, page 27) references the use of diesel generators for emergency electrical power and fire pump engines, along with renewable fuel sources. The current application under review by the Department only indicates the use of natural gas a fuel, not diesel generators and no indication of using renewable fuel sources. Please clarify whether PVSC is proposing to change the way it currently operates its equipment and will modify its current application by submitting a revised application to the Department.

7. **Section V (Changes to Project Scope):** Items 4, 5, 6, and 8 (second list, pages 28-29) reference additional upgrades to equipment at the facility for further emissions reductions; however, these are not part of any current permit application under review. Please clarify whether PVSC is intending to reduce its allowable emissions and will modify its current application by submitting a revised application to the Department. If the proposed upgrades are to be considered as part of PVSC's efforts to address environmental and public health impacts to the host community, PVSC should clarify and provide schedule on when PVSC intends to implement these additional measures for emissions reductions.

8. **Section VII (Environmental Impacts to Host Community):** Please note that the estimates set forth in this section are preliminary estimates by the facility that must be more thoroughly reviewed by the Department for methodology and approach as part of the detailed permit technical review conducted by the air quality permitting program.

9. **Section IX (Overall Impacts to Facility-Wide Emissions):** It is not clear whether the values in the table on page 46 are based on actual emissions or potential to emit (permitted allowable limits). Please clarify if the benefits are based on actual emissions or potential to emit, and ensure consistency in calculation, or do the calculation for both but separately. Additionally, PVSC should clarify when any claims of emissions reduction would be implemented, be it as part of the current application or as future projects.

The Department appreciates the opportunity to provide technical comments on the PVSC's Draft Compliance Statement. Please adjust the compliance statement with above noted comments and resubmit by March 14, 20222. Upon receipt, the Department will authorize PVSC to move forward with the public process required under AO 2021-25.

Should you have any questions, or need additional information, please contact the Office of Permitting and Project Navigation at (609) 292-3600.

Thank you,

David Pepe, P.G.
Supervisor
Office of Permitting & Project Navigation

Attachment 3

Passaic Valley Sewerage Commission

"Protecting Public Health and the Environment"

REQUEST FOR PROPOSALS

FOR A RENEWABLE ENERGY POWER GENERATION SYSTEM

Passaic Valley Sewerage Commission
600 Wilson Avenue
Newark, New Jersey 07105

February 2022

TABLE OF CONTENTS

INDEX OF APPENDICES

Appendix A - PVSC Site Plan
Appendix B – Floodwall Plan
Appendix C - Existing Roof Information
Appendix D - PVSC Annual Electricity Usage By Facility
Appendix E - Form of Power Purchase Agreement between the Successful Respondent and PVSC

DUE TO THE SIZE OF THE FOLLOWING DOCUMENTS, THEY ARE ACCESSIBLE AND CAN BE DOWNLOADED AT THE FOLLOWING WEB ADDRESS:

https://pvsc.sharefile.com/d-s697df79564ec4b9685dc55bbbdbcabff

Appendix F - PVSC TREC Application & Approval
Appendix G - Single Line Diagrams for PV System Connections
Appendix H - Roof Framing Structural Drawings
Appendix I – Soil Boring Logs
Appendix J – PVSC 15 Minute Electricity Data

NOTICE TO RESPONDENTS

REQUEST PROPOSALS
FOR A RENEWABLE ENERGY POWER GENERATION SYSTEM
FOR THE PASSAIC VALLEY SEWERAGE COMMISSION

Notice is hereby given that the Passaic Valley Sewerage Commission ("PVSC"), County of Essex, State of New Jersey, will accept sealed proposals from qualified Respondents for a Renewable Energy Power Generation System REPGS with a targeted behind the meter generation capacity of 34 megawatts (MW) located on PVSC property or at locations owned or controlled by the Respondent that is capable of operating during Superstorm Sandy like conditions. The Respondent may propose any combination of renewable energy technologies that total the desired 34 MW of desired generation capacity in a behind the meter microgrid. A renewable energy technology is defined as a technology that does not rely on energy sources derived from fossil fuels, waste products from fossil fuels, or waste products from inorganic sources. In addition to the renewable energy technologies proposed, the PVSC will consider proposals for a Renewable Energy Power Generation System that also includes an energy storage component, such as batteries. Failure to include an energy storage component will not disqualify a proposal. Furthermore, the proposed system should be capable of operating in island mode whereby the system can provide the desired generation capacity of 34 MW completely isolated from the utility grid on a 24x7 basis for a minimum period of two weeks at which time utility power is anticipated to be restored. If the Respondent is unable to satisfy this requirement, the PVSC will consider a proposal put forth by the Respondent for a REPGS that produces less than the desired 34 MW of generation capacity and/or less than the desired power generation duration of 24x7 for a minimum two-week period. However, the Respondent should clearly identify the inability to meet the requirement, and must identify the power generation capacity (MW) and the operating duration in island mode of the Renewable Energy Power Generation System being proposed.

The Respondent should price the proposed REPGS in the following manner: 1.) as a Power Purchase Agreement (PPA) for a term of fifteen (15) years for the sale of electricity to the PVSC, 2.) as a straight sale of the proposed REPGS to the PVSC, 3.) as a lease of the proposed REPGS to the PVSC, or 4.) any other financial arrangement that the Respondent wishes to propose to the PVSC.

The original, five copies, and one electronic copy of the proposal must be received by PVSC on or before March 31, 2022 at 10:00 o'clock a.m. Proposals shall be enclosed in opaque sealed envelopes, addressed to the Mr. Thomas Fuscaldo, PVSC Purchasing Agent, The Passaic Valley Sewerage Commission, 600 Wilson Avenue, Newark, New Jersey 07105, with the name and address of the Respondent plainly marked upon the outside thereof. If forwarded by mail, the sealed envelope containing the proposal, marked as directed above must be enclosed in another envelope addressed as specified in the Proposal, preferably by registered mail. If forwarded by express carrier or other delivery service, please be advised that access to the PVSC is restricted to the following address: 734 Wilson Avenue, Newark New Jersey 07105. All proposals must be submitted in the form required, as required herein. No late submissions will be accepted. The

PVSC reserves its right to reject all Proposals and determine that it will not award any contracts in response to the RFP, in accordance with applicable law.

Passaic Valley Sewerage Commission
Matthew F. Murray
Clerk

SECTION 1
INTRODUCTION AND PROJECT OVERVIEW

1.1 **Introduction.**

The Passaic Valley Sewerage Commission (PVSC) is seeking proposals from firms that are financially and technically qualified to develop, commission, operate and maintain a Renewable Energy Power Generation System (REPGS) with a targeted behind the meter generation capacity of 34 megawatts (MW) located on PVSC property or at locations owned or controlled by the Respondent that is capable of operating during Superstorm Sandy like conditions. The proposed REPGS should be capable of operating in island mode, whereby the REPGS can provide the desired generation capacity of 34 MW completely isolated from the utility grid on a 24x7 basis for a minimum period of two weeks at which time utility power is anticipated to be restored. If the Respondent is unable to satisfy this requirement, the PVSC will also consider a proposal put forth by the Respondent for a REPGS that produces less than the desired 34 MW of generation capacity and/or less than the desired power generation duration of 24x7 for a two week period. However, the Respondent must clearly identify the inability to meet this requirement and must identify the power generation capacity (MW) and the operating duration in island mode of the Renewable Energy Power Generation System being proposed.

Anticipating that solar generation will likely be the dominant renewable energy source, the PVSC has successfully filed for and has received initial acceptance of a 19,089.825 kW(DC) proposed solar electric energy generation project under the New Jersey Transition Incentive Renewable Energy Certificate (TI or TREC) Program. Refer to Appendix F for copies of the submitted documents and initial acceptance. Based on the approval date, the final acceptance of the initial application is conditioned on completing the solar installation and commencing operation on or before the expiration date of 10/8/2022. In the event that this milestone cannot be extended or met, Respondent will be responsible for submitting the proposed solar electric energy generation project under the New Jersey Successor Solar Incentive (SuSI) Program. The Respondent's may incorporate the identified locations in their Proposal as well as add to the identified locations to obtain the desired generation capacity of 34 MW.

The Respondent may propose any combination of renewable energy technologies that total the desired 34 MW of desired generation capacity. A renewable energy technology is defined as a technology that does not rely on energy sources derived from fossil fuels, waste products from fossil fuels, or waste products from inorganic sources. Renewable energy technologies include those that rely on energy derived directly from the sun, on wind, geothermal, hydroelectric, wave, or tidal energy, or on biomass or biomass-based waste products. In addition to the renewable energy technologies proposed, the PVSC will consider proposals for a Renewable Energy Power Generation System that also includes an energy storage component, such as batteries. Failure to include an energy storage components will not disqualify a proposal.

The Respondent shall complete the Cost Proposal Form #17 and is required to include three distinct pricing options for the proposed Renewable Energy Power Generation System as described in Sections 1.1.1, 1.1.2, and 1.1.3 below:

1.) As a Power Purchase Agreement (PPA) for a term of fifteen (15) years for the sale electricity on a price per kilowatt-hour with an annual escalation to the PVSC. The PPA will require the Successful Respondent to construct, own, operate, and maintain the proposed REPGS on PVSC property or at locations owned or controlled by the Respondent. At the end of the fifteen (15) year term, the PVSC will have the option to purchase at Fair Market Value the REPGS in the aggregate. If the PVSC does not exercise its end of term purchase option, the Successful Respondent will be required to remove the REPGS and restore the Premises to their prior condition, less wear and tear, at no costs to the PVSC.

2.) As a Sale Agreement of the proposed REPGS to the PVSC whereby the Successful Respondent will construct the REPGS on PVSC property and sell it to the PVSC at a fixed upfront cost. The successful Respondent should also price out separately its fee to operate and maintain the proposed REPGS on a yearly basis.

3.) As a Lease Agreement of the proposed REPGS to the PVSC whereby the Successful Respondent will construct, operate, and maintain the proposed REPGS on PVSC property or at locations owned or controlled by the Respondent. The Successful Respondent will provide .electricity service to the PVSC on a fixed monthly basis for a period of 15 years. At the end of the fifteen (15) year term, the PVSC will have the option to purchase at Fair Market Value the REPGS in the aggregate. If the PVSC does not exercise its end of term purchase option, the Successful Respondent will be required to remove the REPGS and restore the Premises to their prior condition, less wear and tear, at no cost to the PVSC

4.) In addition to the above, the Respondent may, but is not required, to identify any other financial arrangement that the Respondent wishes to propose to the PVSC.

1.2 **Award of RFP.**

Proposals will be evaluated and an award made as set forth in Section 5 of this Request For Proposals (RFP). The PVSC reserves its right to reject all Proposals and/or not make an award, in accordance with applicable law.

Respondents that submit a Proposal as a joint venture" will be required to demonstrate that the Respondents jointly satisfy the relevant requirements of the RFP.

SECTION 2
INSTRUCTIONS TO RESPONDENTS

2.1 **Relevant Dates.**

1. Pre-Proposal Conference February 24, 2022

The pre- proposal conference will be at **10:00 AM EST on FEBRUARY 24, 2022.** The pre-proposal meeting will be conducted via the Zoom Conferencing Application at

https://pvsc.zoom.us/j/82270183974?pwd=RUxsZys3VFp3ekFrNlhHdTFGd3QwQT09

Meeting ID: 822 7018 3974
Passcode: 595273

Interested parties can also dial into the pre-proposal meeting by phone at +1 646 876 9923

2. Facility Tour March 7-11, 2022

Prospective Respondents must pre-register to participate by contacting the PVSC contact person identified in Section 3.1.5 via email with their desired tour date. Access to the PVSC site will be limited to one vehicle per Respondent with no more than four occupants. Respondents will receive a confirmation back from PVSC confirming their scheduled tour date.

3. Deadline for Submission of Written Questions March 18, 2022

4. Submission of Proposals March 31, 2022

2.2 **RFP Availability.**

Copies of this RFP may be obtained from the following PVSC representative:

Thomas Fuscaldo, PVSC Purchasing Agent
600 Wilson Avenue
Newark, NJ 07105
Phone: (973) 817-5702
Email: tfuscaldo@pvsc.com

2.3 **Pre-Registration of Prospective Respondents.**

Each prospective Respondent is encouraged to pre-register with the PVSC by (i) expressing its intention to submit a Proposal in response to this RFP, and (ii) providing the PVSC with the name and contact information (name, company, address, phone, cell, fax, and e-mail address) of the person to whom any and all communications with the Respondent shall be sent relating to the RFP. If there are any changes to any information in the RFP, including any future addenda amending or supplementing any terms, notice of such changes will be posted on the PVSC's website. The PVSC will also send the changes by either mail, fax or e-mail, to the contact person

for each prospective Respondent. Pre-registration with the PVSC can be accomplished by e-mailing the required information described in clauses (i) and (ii) above to the following PVSC representative:

Thomas Fuscaldo, PVSC Purchasing Agent
600 Wilson Avenue
Newark, NJ 07105
Phone: (973) 817-5702
Email: tfuscaldo@pvsc.com

2.4 **PVSC Contact Person.**

All questions or inquiries regarding this RFP should be directed, in writing, to the following PVSC representative:

Thomas Fuscaldo, PVSC Purchasing Agent
600 Wilson Avenue
Newark, NJ 07105
Phone: (973) 817-5702
Email: tfuscaldo@pvsc.com

2.5 **Respondents' Questions.**

Respondents may submit written questions at any time during the RFP process and, at all times, the decision to respond to questions is within the PVSC's discretion. The deadline above in Section 2.1 is intended to permit the PVSC sufficient time to analyze the questions and issue a response or an addendum, if appropriate to all potential Respondents. The PVSC may not have sufficient time to respond to questions submitted after the above-referenced deadline.

2.6 **Right To Make Changes.**

The PVSC retains the absolute and unabridged right, in accordance with applicable law, to alter the requirements of the RFP in any respect, at any time prior to the deadline for Submission of Proposals, including by withdrawing the Advertisement for Proposals, changing, adding or deleting its scope.

2.7 **Completion Of Proposal Submissions.**

Each Proposal submission must be provided in a typewritten format and signed by a duly authorized representative of the Respondent and shall contain the name, address and telephone number of the Respondent. All prices and dollar amounts must be typewritten All Respondents must complete the forms included in the RFQ/RFP and must complete the Respondent's checklist. Failure to include any required pricing information will render such Proposal incomplete and nonresponsive. For forms included in the RFP, Respondents shall insert "N/A" in the blanks if "not applicable". Proposals showing any erasures, alterations or interlineations must be initialed by Respondent in ink. Failure to comply may be cause for rejection of Proposal. Each

signatory to the submission must initial all erasures or corrections. The Respondents shall type their name below their signature wherever it appears on the Proposal Forms. The completed Proposal shall have no interlineations or erasures except those necessary to correct errors made by the Respondent.

2.8 **Proposal Submission.**

The original, five copies, and one electronic copy of the proposal must be received by PVSC on or before March 31, 2022 at 10:00 o'clock a.m. Proposals shall be enclosed in opaque sealed envelopes, addressed to Mr. Thomas Fuscaldo, PVSC Purchasing Agent, The Passaic Valley Sewerage Commission, 600 Wilson Avenue, Newark, New Jersey 07105, with the name and address of the Respondent plainly marked upon the outside thereof. If forwarded by mail, the sealed envelope containing the proposal, marked as directed above must be enclosed in another envelope addressed as specified in the Proposal, preferably by registered mail. If forwarded by express carrier or other delivery service, please be advised that access to the PVSC is restricted to the following address: 734 Wilson Avenue, Newark New Jersey 07105. All proposals must be submitted in the form required as required herein. No late submissions will be accepted. The PVSC reserves its right to reject all Proposals and determine that it will not award any contracts in response to the RFP in accordance with applicable law.

2.9 **Submissions Not In Compliance.**

The PVSC may, in accordance with applicable law, waive any informality in any Proposal submissions, or reject any and/or all Submissions. More than one submission from an individual, a firm or partnership, a corporation, or an association of principals under the same or different names are not permitted and shall not be considered.

2.10 **Withdrawing Submissions.**

Submissions forwarded to the PVSC before the time of opening of submissions may be withdrawn upon written application of the Respondent if received by the PVSC at least twenty-four (24) hours prior to the deadline for Submission of Proposals..

2.11 **Rejection Of Proposals.**

All Respondents are hereby notified that failure to comply with any of the requirements listed may be cause for rejection of Proposals. If a prospective Respondent has any questions with reference to the Proposal documents or form of Proposal, he or she should contact the PVSC as specified in the paragraph headed "Addenda and Interpretation".

2.12 **Addenda And Interpretation.**

2.12.1 It shall be understood that any addendum issued from time to time to provide additional information to the Respondents shall become an integral part of this Proposal package. Receipt of Addenda shall be acknowledged by the Respondents in the space provided therefore on the "Proposal Form".

2.12.2 No oral interpretation of the specifications or other contract documents will be given to any Respondent. Should any Respondent find discrepancies or omissions in the specifications or other contract documents, Respondent shall at once notify the PVSC which will, if appropriate, send written interpretations to all potential Respondents. Every request for such interpretation shall be addressed in writing to the PVSC. All such interpretations and supplemental instructions will be in the form of written addenda to the RFP and will become a part of the RFP requirements and incorporated into the PPA, and all such interpretations and supplemental instructions will be mailed by either overnight express services, facsimile or e-mail to all prospective Respondents at their respective addresses furnished for such purposes not later than seven (7) business days prior to the Proposal due date.

2.12.3 Submission of a Proposal shall constitute the Respondent's acknowledgment of its exclusive responsibility to obtain and utilize all Addenda. All Addenda shall be acknowledged on the form provided.

2.13 **Respondents' Responsibility Of Understanding Proposal.**

By submitting a proposal, the Respondent covenants and agrees that he/she has satisfied himself/herself from his/her own investigation of the conditions to be met, that he/she fully understands his/her obligations and that he/she will not make any claim for, or have a right to cancellation or relief because of any misunderstandings or lack of information.

2.14 **Respondent's Duty To Notify Of Errors.**

2.14.1 **Respondent's Duty of Full Investigation.** Respondent shall carefully study, compare, correlate and coordinate its obligations both within the RFP documents and as to extrinsic information that may in any way affect its obligations, including circumstances pertaining to the description of the Project requirements described in the RFP documents, the Premises or the use thereof in the performance of the Project requirements, and any such other factors as may affect the satisfaction of the Project requirements. Except as specifically provided in the RFP and contract documents attached thereto, the Respondent assumes all risks and responsibility for any and all conditions and circumstances that pertain to the Project requirements whether same are known or unknown to the Respondent at the time of submitting their Proposal.

2.14.2 **Notice.** Notice of any alleged error, omission or inconsistency that should have been reasonably identified prior to submitting a Proposal shall be provided to the PVSC in order that the PVSC in its discretion may issue an Addendum. A Respondent's failure to do so prior to submission of a Proposal constitutes an absolute waiver of any claims with respect to any error, omission or inconsistency that may thereafter be asserted with respect thereto, and shall bar any recovery regarding such claims.

2.15 **Duration Of Proposal.**

Submission of a Proposal constitutes an express representation of a Respondent that it will not attempt to modify, withdraw or cancel its Proposal for sixty (60) days after the submission of the Proposal (or such longer time to which the Respondent may agree, provided the Respondent agrees to extend the validity of its Proposal Security correspondingly).

2.16 **Acknowledgment Of Receipt Of Addenda.**

Each Respondent shall acknowledge receipt of all Addenda by completing the Acknowledgement section of the Proposal Form.

2.17 **Proposal Submissions Relative to the Award of a Public Works Contract as defined by NJSA 34:11-56.26(5)**

Respondents shall indicate on Form 17 Cost Proposal (Item A.5) if their proposal falls within the definition of a public works project as defined under Appendix E, Exhibit B Item (tt) of this document. If the proposal submitted constitutes a Public Works Project, all terms and conditions included in this RFP relative to Public Works projects shall apply to the procurement as well as the resulting contract, and additional compliance documentation will be required as follows:

1. Bid bond (Form 18)
2. Form of Surety (Form 19)
3. Federal Debarment (Form 20)
4. Subcontractor Listing (Form 6)

SECTION 3
PROJECT REQUIREMENTS

3.1 General Requirements

3.1.1 **Applicability of the General Requirements.** In addition to the requirements discussed elsewhere in this RFP, the Successful Respondent must agree to the requirements of this section.

3.1.2 **Contract .** As identified in this RFP, a Contract between the Successful Respondent and the PVSC may be based on a Power Purchase, Lease, or Sales Agreement. For either a Power Purchase or Lease Agreement, the Successful Respondent will provide all development, engineering, design, labor, materials, construction, installation, operation, and maintenance services to achieve a fully operational and functional Renewable Energy Power Generation System. The Contract term for a Power Purchase or Lease Agreement will be fifteen (15) years. For a Sales Agreement, the Successful Respondent will provide all development, engineering, design, labor, materials, construction, and installation services. Further, the PVSC may choose to enter into an Agreement with the Successful Respondent for operation, and maintenance services of the PVSC owned REPGS. For reference, the material form of the terms of a Power Purchase Agreement is attached hereto as Appendix E. If awarded, any lease or sales contract agreement will be prepared by PVSC in accordance with the terms and conditions found within this Request for Proposal document and proposal pricing received. The lease or sales agreement will be forwarded to the successful respondent for execution.

3.1.3 **Financial Incentives.** The Successful Respondent will take advantage of all applicable performance based incentives such as rebates, tax incentives, governmental and non-governmental cost offsetting programs, Renewable Energy Credits (REC), and any other environmental attributes available to reduce the installation and operational costs of the REPGS , and the associated cost of providing electricity to be purchased by the PVSC with the exception of the PVSC purchasing and owning the REPGS.

3.1.4 **REPGS Design, Capacity & Interconnection.** A detailed project design and the associated engineering is not provided herein, and shall be the responsibility of the Respondent. Each Respondent's proposal shall include conceptual drawings, layouts, and manufacturer information for each system component for each generation and control system. Each Respondent's proposal shall comply with the Technical Specifications set forth in Section 4 of this RFP. Respondents should include any other information that will help the PVSC to gain an understanding of the proposed REPGS, along with its features and benefits. The scope of this RFP includes all work necessary to install complete systems qualified and accepted by the New Jersey Board of Public Utilities (NJBPU) Office of Clean Energy (OCE) including but not limited to: total project financing, design services, permits, materials, labor, equipment, utility interconnection and commissioning for each area and facility identified.

The REPGS shall be designed and constructed in accordance with all applicable regulations, codes and standards. Each Respondent is expected to have familiarized itself with all applicable regulations, codes and standards, and must include a representation by the Successful Respondent that the REPGS design is in accordance with all applicable regulations, codes and

standards. The Respondent agrees to manage the applications for any necessary approvals from the local electric distribution utility, including the submission of applications for interconnection of the REPGS with the local electric distribution utility.

3.1.5 **Premises Inspections and Respondent Representation.** Respondents will be required to rely solely and completely on information obtained by the Respondent as a basis for Proposals. PVSC will not be responsible for the accuracy of any information provided in this RFP. If the Respondent wishes to field verify any information, site inspections may be arranged by contacting the PVSC Representatives identified below:

Name: John Rotolo
Phone: (973) 817-5962
Email: jrotolo@pvsc.com

The Respondent will be required to provide in advance of a site inspection, a listing of the information the Respondent desires to field verify during the site visit.

3.1.6 **REPGS Construction Schedule.** Each Respondent is required to submit a detailed proposed construction schedule for completion of the Project, beginning on the day that formal authorization to proceed is provided by the PVSC, and ending on the day that the REPGS (i.e., all of the Component Parts) is deemed by the NJBPU to be completed and in operation ("Commercial Operation Date"). Each Respondents' proposed construction schedule shall, at a minimum, include milestones for:
a. Completion of final design schematics;
b. Required approvals and permits;
c. Delivery of materials;
d. Beginning of installation;
e. Completion of installation;
f. Electrical Interconnection;
g. Beginning of start-up and testing;
h. Completion of start-up and testing;
i. REPGS inspections by NJ BPU OCE;
j. Conduct of on-site training;
k. Delivery of required manuals and documentation;
l. Component Part(s) placed into service (i.e. "Commercial Operation Date").

"Commercial Operation" shall mean that the REPGS has passed all State and local inspections, including inspections by the New Jersey Board of Public Utilities, and has received certifications required for the REPGS to generate electricity at its system design capacity and to fully participate in Office of Clean Energy's net-metering and renewable energy credit programs.

3.1.7 **Roof Warranties.** The PVSC will require the Successful Respondent to maintain or extend the existing roof warranties for any roof installation work for roof-mounted Photovoltaic (PV) System installations as set forth more specifically in this RFP. The Successful Respondent shall undertake all reasonably commercial efforts to cause the PV System to be designed, constructed and maintained in such a manner so as to not void any existing roofing warranties. Prior to the installation of each Component Part, the Successful Respondent should review existing roof warranties and attempt to obtain written confirmation from each warrantor that the installation of the PV System will not void applicable warranties. If any of the warrantors of the roofs advise the Successful Respondent that the installation of the PV System will void a roof warranty, the Successful Respondent shall notify the PVSC and the Successful Respondent shall warrant that it will be responsible for all damage to the roof related to the installation or operation of the PV System. Under all circumstances, the Successful Respondent shall cause the system to be installed using best practices to prevent damage to the roof.

3.1.8 **Roof Repair, Replacement and Warranty.** The PV System should be designed to minimize the number of roof penetrations for installation. All roof penetrations shall be conducted by a certified, experienced roofing contractor that is qualified to work on public works projects. The Successful Respondent shall repair all damage to the roof related to the installation or operation of the PV System. For PV System installations installed at PVSC locations for which the existing expected roof life expectancy is less than 15 years, Respondent shall be responsible for replacing roof at Respondent's expense prior to the installation of the PV System. Respondent shall identify as part of his proposal which PVSC roofs the Respondent will replace. The type and installation date of the existing roofs is provided for in Appendix C.

3.1.9 **Removal Of REPGS & Restoration of Property.** If the PVSC enters into either a PPA or Lease Agreement and elects to not purchase the REPGS at the end of the Term of the Agreement, the Successful Respondent shall remove the REPGS from the PVSC Premises and shall restore the property to its prior condition absent reasonable wear and tear at no additional costs to the PVSC. The Successful Respondent will not be required to remove the electrical infrastructure installed in connection with its electrical facilities upgrades.

3.1.10 **Approvals.** The Successful Respondent shall be responsible for obtaining all required permits, developing and providing all submittals, arranging for all inspections, and for all expenses and fees associated with these activities that are required by any applicable regulatory or other agency, including the local municipal construction and code officials, the New Jersey Board of Public Utilities, the local electric distribution utility, and other authorities having applicable jurisdiction.

3.1.11 **Purchase Option.** The PVSC shall be entitled to purchase the REPGS at the end of either a PPA or Lease Agreement. The purchase price shall be set at the Fair Market Value for the REPGS in its entirety. If the PVSC is interested in exercising its option to purchase the REPGS, the PVSC shall send a notice to that effect to the Successful Respondent no later than one hundred and twenty (120) days prior to the expiration date of the Agreement. The Fair Market Value shall be determined by the mutual agreement of the PVSC and Successful Respondent within thirty (30) days of the PVSC's notice of interest in purchasing. If the parties cannot agree upon the Fair Market Value, then the PVSC shall select, subject to the Successful Respondent's

consent, which consent shall not be unreasonably withheld or delayed, a nationally recognized independent appraiser. Such appraiser shall determine the Fair Market Value and shall set forth such determination in a written opinion delivered to the PVSC and Successful Respondent. The valuation made by the appraiser shall be binding on the PVSC and Successful Respondent in the absence of fraud or manifest error. The costs of the appraisal shall be borne by the parties equally. If the PVSC and Successful Respondent cannot agree upon an appraiser, they shall request the American Arbitration Association to select an appraiser. The fees, if any, of the American Arbitration Association, shall be shared equally by the parties. After the Fair Market Value has been determined by the appraiser, the PVSC shall have thirty (30) days to advise the Successful Respondent whether it intends to purchase the REPGS. If the PVSC determines it will not purchase the REPGS and the parties do not agree to an extension of the Agreement at the expiration of the Agreement, the Successful Respondent shall, at the Successful Respondent's sole expense, shall remove the Component Parts as set forth in the removal and restoration requirements in the Agreement. If the PVSC exercises its option to purchase the REPGS, upon the PVSC's payment of the purchase price: (a) title to the REPGS, which shall be fully operational, shall pass to the PVSC from the Successful Respondent, free and clear of any liens and encumbrances; (b) the remaining period on all third party warranties for the REPGS shall be transferred from the Successful Respondent to the PVSC; and (c) the PVSC will acquire all rights and interests in renewable energy credits, or other environmental attribute benefits, that are generated by the REPGS after the date of the transfer of the title. The Successful Respondent shall execute such documents as the PVSC deems reasonably necessary to effectuate the transfer of title to the REPGS.

3.1.12 **Minimum Electricity Output Requirements.** Each Respondent shall designate the estimated electricity output of the REPGS (i.e., all of the Component Parts) for the first operational year in kWhs. For each year thereafter for the remainder of the term, the Respondent's proposal shall identify the annual estimated electricity output expected from the REPGS on the anniversary of the operation date by an annual degradation factor. The Respondent must guarantee that the annual electricity output for the REPGS will be at least 90% of the actual REPGS design capacity ("Guaranteed Electricity Output") for the REPGS, less degradation. The Respondent's estimated and guaranteed electricity outputs should be set forth in the Cost Proposal Form attached as Form 18.

3.1.13 **Project Start & Construction Coordination.** The Successful Respondent shall commence construction activity as soon after the issuance of the Notice to Proceed as required to comply with the specified Project Completion Date. The Successful Respondent shall schedule material deliveries to correspond with starting dates so that materials are on site on the required start date. The Successful Respondent shall schedule and coordinate all construction activities at the sites through the PVSC's representatives to avoid, to the maximum extent possible, interference with the PVSC's operations and to meet specified completion dates. The Successful Respondent shall not interfere with the PVSC's operation of its buildings or facilities. If an interruption or shut-down will be required, the Successful Respondent shall schedule the interruption or shut-down at a time acceptable to the PVSC. In the event of a system shutdown, the PVSC may require the Successful Respondent to provide back-up power. The Successful Respondent shall insure all equipment, materials, fittings, and similar items required are available before interrupting or shutting-down existing systems. The Successful Respondent

shall notify all inspectors and representatives of utility companies, municipal officials, PVSC representatives and similar parties by letter in advance of required changeovers, tie-ins, removals, and similar operations.

3.1.14 **Hazardous Materials.** If the Successful Respondent discovers hazardous materials during the inspection or construction of the REPGS, the Successful Respondent shall notify the PVSC and cease further work until permitted by the PVSC. In the event a delay is caused as a result of the discovery of hazardous materials, the Successful Respondent's schedule and completion date would be adjusted to reflect the delay attributable to the hazardous materials or munitions.

3.1.15 **Recovery of Damages and Expenses.** The PVSC may recover from the Successful Respondent any damages and expenses reasonably incurred as a result of the Successful Respondent's default, including attorneys' fees and the cost to repair the Solar PV Sites to pre-installation condition. The PVSC may elect to offset any damages resulting from the Successful Respondent's default against any monies owing or to be owed to the Successful Respondent under this Agreement. If the PVSC elects not to terminate the Agreement following an event of default by the Successful Respondent, this election shall not constitute a waiver by the PVSC as to any subsequent event of default by the Successful Respondent.

3.1.16 **Force Majeure.** Any party claiming Force Majeure under the Agreement shall advise the other party as soon as possible of the occurrence.

3.1.17 **Disputes.** The Successful Respondent shall perform its responsibilities under the Agreement during any dispute. In the event that disputes arise between the parties which cannot be resolved through conference and negotiation, such disputes shall be controlled by New Jersey law and both Parties agree that such disputes shall be adjudicated by the Superior Court of New Jersey, Essex County, provided however, that it shall be a condition precedent to the filing of any lawsuit that the parties shall first submit the dispute to mediation with a qualified mediator mutually agreed to by the parties. The parties shall be bound to participate in mediation in good faith and in confidence to the extent permitted by law.

3.1.18 **Financing.** The Successful Respondent's proposal shall disclose its estimated aggregate development and construction costs for the REPGS on the Cost Proposal Form attached as Form 18. Each Respondent shall identify on Form 18 the sources(s) of its funds/financing for the construction of the REPGS. Sufficient financial information should be included to allow for the evaluation of the creditworthiness of the Respondent including the proposed project financing method. If the Respondent intends to use internally generated funds to construct the REPGS, the Respondent must submit adequate evidence of the existence and availability of such funds. Financial statements evidencing the availability of the funds and a statement from the Respondent that the funds are available should be submitted. If the Respondent intends to rely upon third-party financing to construct the REPGS, the Respondent must provide evidence that it will be able to secure and obtain receive financing to construct the REPGS in the amount of the Respondent's aggregate development and construction costs related thereto.

3.1.19 **Assignment.** The duties and obligations of the Successful Respondent shall not be assignable in whole or in part without the written consent of the PVSC and upon such reasonable terms and conditions that the PVSC may require. The Successful Respondent acknowledges that the PVSC is relying upon the specific experience and expertise of the Successful Respondent and that if the Successful Respondent proposes to assign the Agreement the Successful Respondent must produce evidence that the proposed assignee has the financial capacity, experience, resources and technical expertise to perform the Successful Respondent's duties and obligations under the Agreement. Notwithstanding the production of evidence of a proposed assignee's ability to perform under the Agreement. The decision whether to approve a proposed assignee shall reside exclusively with the PVSC.

3.1.20 **Payment & Performance Bond.** The Respondent acknowledges that if it is awarded a contract pursuant to this RFP it will be required to obtain payment and performance bonds, each in an amount of 100% of the contract value. The performance and payment bonds shall remain in effect during the total implementation. The performance bond shall be released upon the PVSCs acceptance of the Renewable Energy Power Generation System. The payment bond shall be released upon receipt of satisfactory evidence that all subcontractors, suppliers, etc. have been paid in full. The surety on the required Bonds must be a corporate surety. The surety must be licensed in accordance with the laws of the State of New Jersey to transact business as a surety company in the State of New Jersey.

3.1.21 **Insurance Requirements.** The Respondent shall secure and maintain in force for the term of the Agreement liability insurance as provided herein. The Successful Respondent shall provide the PVSC with current certificates of insurance for all coverages and renewals thereof, naming the PVSC, its officers, and employees, The State of New Jersey and its venues, employees and officers as an Additional Insured and shall contain the provision that the insurance provided in the certificate shall not be canceled for any reason except after sixty (60) days written notice to the PVSC. The certificate of insurance must be accompanied by the actual General Liability Endorsement conferring Additional Insured status. The insurance to be provided by the Seller shall be as follows:

(a) $5,000,000 Each Occurrence Bodily Injury and Property Damage; $5,000,000 Personal Injury and a $5,000,000 General Aggregate General Liability Limit with a requirement that:

(i) the Aggregate per location/Aggregate per Project Endorsement is a part of the policy, and

(ii) Broad Form Property Damage and Blanket Broad Form Contractual Liability Coverage is included.

(b) Workers' Compensation-Statutory-applicable to the laws of New Jersey

(c) $5,000,000 Umbrella Excess Liability - Umbrella Excess Liability Coverage limit excess the:

(i) General Liability

(ii) Automobile Liability

(iii) Workers' Compensation Section B- Employers Liability Limits of

1. $1,000,000 Each Accident
2. $1,000,000 By Disease each employee
3. $1,000,000 By Disease aggregate limit

(d) Insurance coverage to replace the REPGS in the event of a system loss

(e) Coverage should be at least as broad as the primary coverage and should include the same Additional Insured wording as the primary General Liability.

(f) The above required Comprehensive General Liability Insurance policy or its equivalent shall name the PVSC, its officers, and employees, The State of New Jersey and its venues, employees and officers as Additional Insureds. The coverage to be provided under these policies shall be at least as broad as that provided by the standard basic, unamended, and unendorsed Comprehensive General Liability Insurance occurrence coverage forms or its equivalent currently in use in the State of New Jersey, which shall not be circumscribed by any endorsement limiting the breadth of coverage.

(g) Certificate(s) of Insurance shall be filed with the PVSC's Purchasing Office upon award of contract by the PVSC.

3.1.22 **Warranties.** Each Respondent shall warrant that all goods delivered shall: (i) be free from defects in workmanship, material, and manufacture (including without limitation defects which could create a hazard to life or property); (ii) be new, not refurbished or reconditioned, unless otherwise stated in the RFP or PPA; (iii) be of merchantable quality and shall be fit for the purposes intended by the PVSC; (iv) comply with the requirements of this RFP and (v) be in compliance with all applicable laws and regulations. Respondents also expressly warrant that all Project Services performed shall be in conformity with the terms of the RFP. These express warranties shall not be waived by reason of acceptance or payment by the PVSC. The RFP incorporates by reference all terms of the Uniform Commercial Code as adopted in the State of New Jersey (the "UCC") providing any protection to the PVSC including but not limited to all warranty protection (express or implied) and all of the PVSC's remedies under the UCC.

3.1.23 **Indemnification**. To the fullest extent permitted by law, the Successful Respondent shall indemnify and hold harmless the PVSC, its individual members, successors, assigns, employees, agents, engineers, professionals and representatives (the Indemnitees) from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Project Services, including without limitation, those attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Project Services itself), caused by the negligent acts or omissions of the Successful Respondent, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. In claims against any person or entity indemnified under this Section by an employee or agent of the Successful Respondent, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they

may be liable, the indemnification obligation under this Section shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Successful Respondent or a subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts. The Successful Respondent's indemnity obligations include, but are not limited to any fines, penalties, liabilities, expenses or damages including attorney's fees arising out of or in connection with (i) violation of or failure to comply with any law, statute, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Project Services by the Successful Respondent, a subcontractor, or any person or entity for whom either is responsible; (ii) means, methods, procedures, techniques, sequences of execution or performance of the Project Services or safety violations, requirements, accidents; and (iii) failure to secure and pay for permits, fees, approvals, licenses, or any violation of any permit or other approval of a public authority applicable to the Project Services, by the Successful Respondent, a subcontractor, or any person or entity for whom either is responsible. The Successful Respondent shall indemnify and hold harmless all of the Indemnitees from and against any costs and expenses (including reasonable attorney's and consultant fees and costs) incurred by any of the Indemnitees in enforcing any of the Successful Respondent's defense, indemnity and hold harmless obligation under this Contract. Without limitation to any of the Successful Respondent's obligations herein, upon request of the PVSC, its successors, assigns, agents or representatives, the Successful Respondent agrees to defend at the Successful Respondent's expense any suit or proceeding brought against the PVSC, its individual members, successors, assigns, employees, agents and representatives due to or arising out of the Project Services performed by the Successful Respondent.

3.1.24 **New Jersey Business Registration**. All Respondents must comply with the New Jersey Business Registration Requirements set forth in N.J.S.A. 52:32-44. The Respondent must be registered and shall provide proof of business registration prior to the time a contract is awarded. and shall provide notice to its subcontractors of the responsibility to submit proof of business registration to the Respondent.

3.1.25 **Performance Requirements.** The Project Services shall be performed in a first class manner by qualified and efficient workers who shall not cause labor conflicts with any workers employed by the PVSC or others working at the PVSC's facilities. The Project Services shall be performed in strict conformity with the strictest quality standards mandated and/or recommended by all generally recognized organizations establishing quality standards for work of the type to be performed hereunder. The Successful Respondent shall be solely responsible for controlling the means and methods of performance of the Project Services and perform all of its obligations in accordance with all legal requirements. The Successful Respondent, to the exclusion of the PVSC, shall be solely responsible for the safety of its workplace and its employees. The Successful Respondent shall comply fully with all applicable safety codes, regulations and requirements imposed or enforced by all government agencies, including all applicable requirements of the Occupational Safety and Health Administration (OSHA) and all safety codes and procedures mandated or recommended by insurance underwriting organizations and all generally recognized organizations establishing safety standards, for work of the type to be performed hereunder. Notwithstanding the foregoing, any stricter standard contained in the Agreement shall govern. The Successful Respondent shall secure and maintain all applicable

licenses and permits in order to be able to lawfully perform the Project Services and the contract price shall include the cost of these items.

3.1.26 **Material Safety Data Sheets.** If some or all of the goods being provided by Successful Respondent are on OSHA's "Hazardous Substances List," Seller must forward a complete Material Safety Data Sheet (MSDS).

3.1.27 **Taxes.** The PVSC is established under the authority of the State of New Jersey and is **exempt** from the New Jersey Sales and Use Tax. The Successful Respondent will be responsible for all taxes associated with the Agreement and the performance of the Agreement.

3.1.28 **American Goods.** In accordance with N.J.S.A. 40A:11-18, only products and materials produced, mined or manufactured in the United States, wherever available, will be used with this project.

3.2 **Employment Requirements.**

During the performance of this contract, the Successful Respondent and its contractors or subcontractors agrees as follows:

3.2.1 **N.J.S.A. 10:2-1 – Anti-Discrimination**

a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, sex, affectional or sexual orientation, discriminate against any person who is qualified and available to perform the work to which the employment relates;
b. No contractor, subcontractor, nor any person on his behalf shall in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, sex, affectional or sexual orientation;
c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of $50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

.

3.2.2 The Successful Respondent and its contractors or subcontractors, where applicable, will, in all solicitations or advertisements for employees placed by or on behalf of the Successful Respondent and its contractors or subcontractors, where applicable, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

3.3 **Americans With Disabilities Act Of 1990.**

The Successful Respondent agrees that Title 11 of the Americans With Disabilities Act of 1990 ("the Act") (42 U.S.C. §12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this Agreement. In providing any aid, benefit, or service on behalf of the PVSC pursuant to this Agreement, the Successful Respondent agrees that the performance shall be in strict compliance with the Act. In the event the Successful Respondent, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the Successful Respondent shall defend the PVSC in any action or administrative proceeding commenced pursuant to this Act. The Successful Respondent shall indemnify, protect, and save harmless the PVSC, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violations.

3.4 **Contractors/Subcontractors.**

If applicable, every Respondent must disclose, and establish to the satisfaction of the PVSC the reliability and responsibility of any of the persons or entities proposed as contractors/subcontractors for plumbing, heating and ventilating, electrical and structural steel or ornamental iron. Each Respondent is hereby advised that any person, firm or other party to whom it is proposed to award a subcontract under their contract must be acceptable to the PVSC. All subcontractors which the PVSC has required to be named in the Proposal, must be registered with the New Jersey Department of Labor and Workforce Development pursuant to the Public Works Contractor Registration Act at the time of submission of the Proposal.

3.5 **Prevailing Wages; Labor Standards.**

The Successful Respondent and/or its subcontractors shall pay not less than the prevailing wage rate to workers employed in the performance of any contract for the project, in accordance with the rate determined by the Commissioner of the New Jersey Department of Labor and Workforce Development pursuant to N.J.S.A. 34:11-56.25 et seq. The rate schedules are incorporated herein.

3.5.1 The Successful Respondent or its General Contractor/Subcontractor shall comply with the New Jersey Prevailing Wage Act requirements of N.J.S.A. 34:11- 56.25 et seq. for all construction contracts for two thousand dollars ($2,000.00) or greater.

3.5.2 The Successful Respondent is required to comply with the Prevailing Wage Rates as applicable to all workmen performing activities under the terms of this Contract and shall submit Certification of Compliance with said Prevailing Wage Rates on the Respondent's Certification Form incorporated herein.

3.5.3 The Successful Respondent shall post the Prevailing Wage Rates for each job classification listed by the New Jersey Department of Labor & Workforce Development, Division of Wage and Hour Compliance, in a prominent and easily accessible place at the site of the work performed under the terms of the Contract Documents, or at such places as are used to pay said Successful Respondent's workforce.

3.5.4 If the Successful Respondent does not pay the itemized employee benefits to the workmen, as set forth in the Prevailing Wage Rate, it shall pay the value of said benefits directly to the employee on each pay day as part of wages.

3.5.5 The Successful Respondent shall submit a Certified Payroll Record to the PVSC each payroll period within ten (10) days of the payment of wages. Said payroll certification shall be submitted on New Jersey Department of Labor and Workforce Form MW-30 or such other form as the Department shall require. The Successful Respondent may obtain a supply of said forms from the PVSC upon execution of the Agreement.

3.5.6 It is the responsibility of the Successful Respondent before the Proposal opening to request, if necessary, any additional information on prevailing wage rates for those tradespeople who are not covered by the applicable wage rate schedules, but who may be employed for the proposed Project Services under these Contract Documents.

3.6 **Public Law 2005, Chapter 51 & Executive Order 117**

Background Information

On September 22, 2004, then-Governor James E. McGreevey issued Executive Order 134, the purpose of which was to insulate the negotiation and award of State contracts from political contributions that posed a risk of improper influence, purchase of access or the appearance thereof. To this end, Executive Order 134 prohibited State departments, agencies and authorities from entering into contracts exceeding $17,500 with individuals or entities that made certain political contributions. Executive Order 134 was superseded by Public Law 2005, c. 51, signed into law on March 22, 2005 ("Chapter 51").

On September 24, 2008, Governor Jon S. Corzine issued Executive Order No. 117 ("E.O. 117"), which is designed to enhance New Jersey's efforts to protect the integrity of procurement decisions and increase the public's confidence in government. The Executive Order builds upon the provisions of Chapter 51.

Two-Year Certification Process

Upon approval by the State, the Certification and Disclosure of Political Contributions form (CH51.1R1/21/2009) is valid for a two (2) year period. Thus, if a vendor receives approval on Jan 1, 2009, the certification expiration date would be Dec 31, 2011. Any change in the vendor's ownership status and/or political contributions during the two-year period will require the submission of new Chapter 51/EO117 forms to the State Review Unit. **Please note that it is the vendor's responsibility to file new forms with the State should these changes occur.**

Prior to the awarding of a contract, the agency should first send an e-mail to CD134@treas.state.nj.us to verify the certification status of the vendor. If the response is that the vendor is NOT within an approved two-year period, then forms must be obtained from the vendor and forwarded for review. If the response is that the vendor is within an approved two-year period, then the response so stating should be placed with the bid/contract documentation for the subject project.

3.7 **Disclosure of Investment Activities In Iran**

Pursuant to N.J.S.A. 52:32-58, et seq., Respondents shall submit, prior to contract award, the Disclosure of Investment Activities in Iran (Form 17), to certify that neither the bidder, nor one of its parents, subsidiaries, and/or affiliates (as defined in N.J.S.A. 52:32-56(e)(3)), is listed on the Department of the Treasury's List of Persons or Entities Engaging in Prohibited Investment Activities in Iran and that neither is involved in any of the investment activities set forth in N.J.S.A. 52:32-56(f). If the bidder is unable to so certify, the bidder shall provide a detailed and precise description of such activities to PVSC.

SECTION 4
TECHNICAL SPECIFICATIONS

4.1 **General Requirements.**

4.1.1 The Successful Respondent shall be responsible for all engineering, design services, permits, materials, labor, equipment, tools, supervision, services, and commissioning necessary to install a Renewable Energy Power Generation System (REPGS) for the PVSC as specified hereinafter, including, but not limited to, the work included in this specification. Appendix A provides a site map of the PVSC main plant located at 600 Wilson Avenue, Newark, New Jersey.

4.1.2 The REPGS shall be designed and constructed in accordance with all applicable regulations, codes and standards. The Respondent is expected to have familiarized itself with all applicable regulations, codes and standards, and must provide a certification that the REPGS design is in accordance with all applicable regulations, codes and standards.

4.1.3 Successful Respondent is responsible for review of PVSC electrical infrastructure and for determining the optimum point of interconnection for each component of the REPGS into the PVSC infrastructure. The cost of any and all modifications to PVSC electrical infrastructure including but not limited to metering, breakers, transformers, protective relays, grounding, conductors and the like is the Successful Respondent's responsibility. The Respondent should refer to the single line diagrams included in Appendix G for further illustration of potential connection points to the existing electrical grid. Connection to the existing switchgear is to be determined by the Respondent. All possible connection points and methods are to be investigated by Respondents to efficiently and effectively provide as much power as possible.

4.1.4 Design and construction shall be overseen by a Professional Engineer, licensed in the State of New Jersey, who has experience with electrical and energy systems.

4.1.5 Work associated with the REPGS shall be coordinated by the Respondent so as to minimize interference with PVSC's plant operations and other ongoing construction work that may be taking place. Work will be phased consistent with a detailed schedule to be agreed-upon between the Respondent and PVSC representatives.

4.1.6 The Successful Respondent shall coordinate any and all routing of conduits and conductors with PVSC staff and receive approval of routing before construction.

4.1.7 Work will be permitted during business hours. Business hours of PVSC offices are Monday-Friday 7:00 a.m. to 4:00 pm, or as otherwise agreed to by the parties.

4.1.8 All trash shall be removed at the end of each shift and placed in dumpsters to be provided by Respondent. Wherever possible, materials shall be recycled in lieu of placing them in the trash.

4.1.9 The Respondent shall adhere to all procedures, limitations, and cautions for the products in themanufacturer's current printed literature.

4.1.10 All work shall be done in a neat and workmanlike manner and shall comply with all local,state, and federal codes.

4.1.11 The Respondent shall leave finished work and work area in a neat, clean condition with noevidence of spillover, construction dust, and/or trash onto adjacent areas.

4.1.12 The PVSC electrical system provides a 90% Power Factor. The Successful Respondent shall take measures to maintain this power factor to prevent additional electricity costs to the PVSC. If the Successful Respondent is unable to address this requirement, any additional cost increase shall be deducted from the Respondent's proposed cost to sell electricity to the PVSC.

4.2 **RFP Response Submission.**

4.2.1 Respondents should provide a preliminary REPGS design that includes:

1. System project size in kW (DC) and power generation capacity in MW (ac)
2. Calculation to determine annual kWh (AC) production for each year
3. Annual guaranteed kWh (AC) production for each year
4. Continuous Hours of Stand Alone Power Generation
5. Electrical one-line drawings depicting points of interconnection with all meters, protective relays and any and all modifications that may be required to existing PVSC electrical infrastructure
6. Preliminary site-specific system arrangement drawings
7. Schematic design of major conductor routing depicting above and underground raceways and conduit runs, hand holes, interrupter switches, communication cable, remote I/O as required
8. System specific mounting details
9. Specification of major system components
10. Provide pricing as identified in this RFP.
11. Calculate composite power factor of proposed Renewable Energy Power Generation System combined with existing PVSC electrical system.

4.3 **Staging Area.**

The PVSC will designate a staging area for the Successful Respondent's use during construction of the REPGS. If required by the PVSC, the Successful Respondent shall install a temporary fence around that area. If the Successful Respondent requires the use of a construction trailer, the trailer shall be located at a location approved by the PVSC. The Successful Respondent shall be responsible for the costs to connect it to the PVSC's electrical and telephone system and for the costs of electricity and telephone service.

4.4 **Warranty.**

The Respondent must supply the PVSC with all warranty information whether it be expressed or implied for a minimum term of 15 years.

4.5 **Regulatory Compliance.**

The Respondent shall be responsible for obtaining all permits and interconnect applications, developing and providing all submittals, arranging for all inspections, and for all expenses and fees associated with these activities that are required by any applicable regulatory or other agency, including the local municipal construction and code officials, the New Jersey Department of Community Affairs, the New Jersey Board of Public Utilities, the local electric distribution utility, and other authorities having applicable jurisdiction including planning board if required. The Respondent shall describe its record of compliance with applicable regulatory requirements. The Respondent shall list any material violations of any applicable regulatory requirements, including any that resulted in fines over $50,000.00.

4.6 **Engineering Evaluation.**

The Successful Respondent will be required to submit a first set of preliminary design documents for review and comment by PVSC. Upon receipt, resolution and incorporation of PVSC comments, the Successful Respondent shall submit detailed design of the REPGS for the PVSC's final review and approval and "Issue for Construction". For the final "issued for Construction" set of design documents, a certification signed by a licensed engineer in the State of New Jersey will be required to document the acceptability of the electric distribution system necessaryto support the REPGS. The Successful Respondent shall guarantee and warranty any or all material and services under these specifications. Defective or inferior items shall be replaced at the expense of the Respondent.

4.7 **Quality Assurance.**

The Successful Respondent shall store and condition the REPGS equipment and materials in full compliance with the manufacturer's recommendations. The Respondent shall be fully responsible for the security of materials throughout the Project.

4.8 **Safety.**

The Successful Respondent shall provide a Health and Safety Plan prior to commencing construction activities. The plan shall also comply with the requirements of the PVSC Safety Manual which is available for download on PVSC's website (https://www.nj.gov/pvsc/home/forms/pdf/Construction_Safety_&_Health_Manual_for_Contractors.pdf). The Successful Respondent's on site employees and subcontractors shall also complete online PVSC safety training prior to performing any on site work.

The Successful Respondent will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. Responsibility to protect and prevent damage to property during removal, relocation or replacement actions rests solely with the Successful Respondent. The Successful Respondent shall restore to its original condition without extra costs to the PVSC property that shall be damaged due to the acts or omissions of any employees, agents or subcontractors of the Respondent. Such repairs shall meet the requirements of the PVSC. The Successful Respondent must take

proper care to protect all finished work by substantial covering until accepted by the PVSC. To ensure public safety, the Successful Respondent's work must be performed as not to affect adjacent active areas, pedestrian and vehicular traffic, existing surfaces and equipment.

The Successful Respondent will be required to adhere to PVSC's COVID-19 Site Access Protocols defined below.. The Successful Respondent shall provide the following resources for their personnel and adhere to the following PVSC protocols (at a minimum):

- Company COVID-19 Work Plan (on company letterhead) submitted to PVSC;
- Portable restroom facilities to accommodate their work force, for all companies coming on-site to conduct long-term operations [i.e. long-term shall be considered four (4) days or longer] (and/or use of the Contractor's during construction phase of the project);
- Portable wash stations with soap and water to accommodate their work force, for all companies coming on-site to conduct long-term operations [i.e. long-term shall be considered four (4) days or longer] (and/or use of the Contractor's during construction phase of the project);
- Hand sanitizing supplies and station to accommodate their work force (and/or use of the Contractor's during construction phase of the project);
- All Personal Protective Equipment (PPE) to support the job tasks and adherence to Centers for Disease Control & Prevention (CDC) and NJ Department of Health (NJDOH) COVID-19 protection guidance and protocols;
- All current COVID-19 Safety and informational posters accessible on the job site, for all companies coming on-site to conduct long-term operations [i.e. long-term shall be considered four (4) days or longer] (and/or use of the Contractor's during construction phase of the project); and
- All food services shall be the responsibility of the Respondent as PVSC's on-site food service providers shall not be accessible to outside consultants/contractors.

The Successful Respondent shall adhere to PVSC's COVID-19 Site Access Protocols until such time as formally rescinded by PVSC.

4.9 **Post-Award Document Submissions.**

4.9.1 **Engineering Package.** All drawings shall be created in AutoCAD format. The working drawings and design calculations shall be signed and sealed by the Successful Respondent's Professional Engineer. Submit 5 sets of the working drawings with the initial submission. Drawing sheet sizeshall be 24'' x 36". One set will be returned with any indicated corrections.. If revisions are necessary, the Successful Respondent will make the necessary corrections and resubmit 5 revised sets. When the drawings are approved, furnish 5 sets of the approved drawings including electronic AutoCAD format. The package shall include the following:

1. Schematic REPGS Design
2. Mounting System Design – roof, ground, and parking lot
3. Single-Line Diagrams
4. Electrical Interconnection Diagrams
5. Installation Details – including mounting method and location of transformers,inverters, and other equipment.
6. Conduit and cable diagrams
7. Communication architecture
8. Details of Data Acquisition System
9. Equipment Cut sheets
10. Project Schedules
11. Equipment Staging Plan – crane lift plan
12. O&M Plan
13. Structural details including mounting for roof, canopy, ground, or other proposed mounting systems.

4.9.2 **Shop Drawings.** Indicate fabrication details, dimensions, weights, loads, required clearances, method of field assembly, components, ad location and size of each field connection.

1. Design Calculations
2. Wiring Diagrams
3. Location of conduit runs and building penetrations
4. Mounting details for components: combiner boxes, disconnects, transformers, inverters, etc.

4.9.3 **Field Test and Observation Reports.** Field test results and inspection records relative to compliance with performance requirements.

4.9.4 **Certified Summary of Performance Tests**. Provide copies of all testing data and reports.

4.9.5 **Factory Test Reports.** Provide copies of all testing data and reports.

4.9.6 **Procedures Manuals**. Submit procedures manuals for:

1. Health and Safety Plan
2. Start-up Procedures
3. Testing Procedures
4. Commissioning Plan
5. Operation and Maintenance

4.9.7 **As-built Drawings**

4.10 **Photovoltaic Systems.**

4.10.1 **General.**

General Description and Requirements. These specifications cover the installation of equipment, hardware, design, documentation, labor and supervision required for a Photovoltaic (PV) System that a Respondent may choose to incorporate into their proposed Renewable Energy Power Generation System. The permitted installations may include roof, canopy or ground mounted locations. In addition the PVSC is in the process of constructing an approximately 11 foot high flood wall around its campus location that may be utilized once construction is completed. Appendix B includes floodwall location, sectional profile, and construction schedule.

a. **Description.** All systems should be designed for outdoor installation in New Jersey based on annual ambient temperatures ranging from 0° F to 105° F. Supplied equipment must be rated andwarranted to withstand and operate under these conditions, in both the operational and storage modes.

1. The design and specification of the PV modules, power converters, electrical interconnections,PV System electrical design, and PV array mechanical design shall meet local utility requirements and local municipal codes, as well as the National Electrical Code and all State of New Jersey adopted building code and subcodes.

2. The Respondent and its project team members should be aware of all the RFP requirements prior to submitting its bid.

3. The Respondent and its project team members shall have been trained in accordance with industry standards in installing grid-connected photovoltaic systems. All electrical work shall be performed by an electrical contractor licensed in the State of New Jersey.

4. The Respondent will incorporate required manufacturer’s and vendor's drawings into its as-built drawings for records.

5. All drawings shall be prepared in an electronic format that may be imported into AutoCAD drafting software for submission to the PVSC.

6. The Respondent shall be responsible for obtaining any required interconnection agreements,approvals, inspections and startup coordination from the local electric distribution utility company.

7. The PV modules shall meet or exceed the requirements of Underwriter Laboratories (UL)Standard 1703 Standard for Safety for Flat-Plate Photovoltaic Modules and either IEEE Standard 1262-1995 IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules and

Panels or IEC 1215 Crystalline Silicon Terrestrial Photovoltaic (PV) Modules-Design Qualification and Type Approval.

b. **Maintenance**.

1. The Successful Respondent shall be capable of providing routine maintenance services of the PV System. This includes changing blown fuses, diodes, or other minor equipment and includes any labor required to change out these or other components that fail. .

2. The Successful Respondent shall conduct a routine maintenance site visit at least once every six (6) months to make sure the system is operating properly. During this visit, the Respondent shall conduct tests similar to those made during the original system installation test.

3. The Respondent shall provide to the PVSC quarterly operational and maintenance reports identifying all operational and maintenance activities.

4.10.2 **Inverter Specifications.**

a. The power interface for each system may use a single or multiple inverter(s), designed for utility grid interconnection of photovoltaic arrays and be capable of automatic, continuous, unattended operation including start-up, synchronization, and disconnect. The inverter shall be capable of stable operation over the range of voltages, currents, and power levels for the size and type of array used. Inverter output voltage shall match building service voltage.

4.10.3 **PV System Electrical Design.**

a. The electrical design and installation instructions for the PV systems shall conform to the latest edition of the National Electric Code (NFPA 70) (NEC) Article 690 Solar Photovoltaic Systems, and comply with the IEEE Std. 1374-1998 (Guide for Terrestrial Photovoltaic PowerSystem Safety).

4.10.4 **Documentation.**

a. The Successful Respondent will prepare Operating and Maintenance Manual in hard cover binder andelectronic copies and deliver to the PVSC. As a minimum the binder shall include:

1. A complete set of all approved submittals including shop drawings and product literature.

2. As-built plans showing the final placement of all panels, connections and conduit.

3. As-built electrical plans, including single line diagrams.

4. Troubleshooting guidelines.

5. System maintenance schedule and procedures.

6. Contact information for technical assistance and parts ordering.

7. Copy of pertinent permits and inspections.

8. Copies of Startup and Commissioning records and reports

9. As built structural plans including structural mounting details.

10. New or extended roof warranties.

4.10.5 **Testing and Commissioning.** Before start up the PV System shall be tested and Commissioned by the Successful Respondent and witnessed by the PVSC. The results of all inspections, tests, and subsequent corrective action taken or to be taken shall be documented and provided to the PVSC.

4.11 Ground Mounted PV Systems.

4.11.1 PV Array Mechanical Design.

a. The Respondent shall provide the mechanical hardware for mounting the photovoltaic arrays.

b. The Respondent shall provide all other hardware required for assembling the photovoltaic modulesand panels and structurally attaching them to the base support structure.

c. The PV array, including modules, hardware and attachments shall be designed to withstandwind loads of 115 mph or more and comply with all existing local and state codes for SeismicZone 3 installations.

d. Ground Mount Array:

1. The Respondent shall provide all hardware required to attach modules to support structures.
2. All ground mounted arrays shall be located above the FEMA 500 year flood elevation.

4.12 Roof-Mounted PV Systems.

PV System components must be designed to minimize the roof penetrations. Any penetrations of the existing roof shall be performed by a Certified Roofing Contractor, approved by the PVSC as per the roof manufacturer's requirements to maintain the warranty of the existing roofs.

4.12.1 **Surfaces.** The Respondent will be required to represent and warrant that the installation, operation and maintenance of the PV System will not cause damage or excessive wear and tear on the roof surfaces.

4.12.2 **PV Array Mechanical Design.**

a. The Respondent shall provide the mechanical hardware for mounting the photovoltaic arrays.

b. The Respondent shall provide all other hardware required for assembling the photovoltaic modulesand panels and structurally attaching them to the base support structure/roof.

c. The PV array, including modules, hardware and attachments shall be designed to withstand wind loads of 115 mph or more and comply with all existing local and state codes for SeismicZone 3 installations.

d. Tilt-Roof Mount Array:

1. The Respondent shall provide all hardware required to attach modules to support structures.

4.13 **Parking Lot/Ground Mount PV Systems.**

4.13.1 **Site Lighting.**

a. The Successful Respondent shall provide site lighting beneath the solar canopies for the parking lot PV Systems. This lighting shall provide a minimum of 1 foot candles. The site lighting shall be circuited so that the lighting level may be reduced to .5 foot candle during off hours.

b. The electrical design of Parking Lot / Ground Mount PV System shall be compatible with and make provision for future installation of vehicle EV charging stations.

4.13.2 **Construction Site Survey.**

a.The Successful Respondent is responsible for field locating and verifying the location of all utilities prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the PVSC representative of any utility locations that mayrequire foundation relocations or structure design modification.

b.Prior to start of any foundation construction activity, the Successful Respondent and PVSC representative shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.

c. A series of soil borings will be required to be performed by the Successful Respondent in order to determine existing geotechnical conditions at the project sites. The location of the soil borings to be performed at each site along with the proposed geotechnical scope of work shall be submitted to the PVSC for review and approval. For reference, PVSC is providing as part of Appendix I the available soil boring information it has on record.

4.13.3 **Foundation Design Requirements.**

The foundations shall be designed to meet the specified loading conditions. The required geotechnical safety factors/strength factors (for SLD Design) or load and resistance factors (for LRFD Design) shall be in accord with the FHWA manual, unless specified otherwise. Estimatedsoil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, right-of-ways and other applicable design criteria will be provided to the PVSC for the design review. Structural design of any individual foundation structure elements shall be by the service load design method in conformance with appropriate articles of the most current Editionof the AASHTO Standard Specifications for Highway Bridges, including current interim specifications.

4.13.4 **Foundation Design Submittals.**

a. At least twenty-one (21) calendar days before the planned start of foundation structure construction, submit complete design calculations and working drawings to the PVSC for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the foundation structure. Verify the limits of the foundation structure and ground survey data before preparing the detailed working drawings.

b. The drawings and calculations provided to the PVSC shall be signed and sealed by the Successful Respondent's Professional Engineer. The Successful Respondent shall have overall responsibility for both the design and the construction of the foundation.

4.13.5 **Working Drawings.**

The working drawings shall include all information required for the construction and quality control of the footings/concrete piers. Working drawings shall include, but not be limited to, thefollowing items unless provided in the contract plans:

a. A plan view of the concrete foundation structure(s) identifying:

1. A reference baseline and elevation datum.

2. The offset from the construction centerline or baseline to the face of the micro-pile structure atall changes in horizontal alignment.

3. Beginning and end of foundation structure stations.

4. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the foundation structure.

5. Subsurface explorations locations shown on a plan view of the proposed foundation structure alignment with appropriate reference base lines to fix the locations of the explorations relative tothe foundation structure.

b. An elevation view of the foundation structure(s) identifying:

1. Elevation view showing foundation locations and elevations; vertical and horizontal spacing;batter and alignment and the location of drainage elements (if applicable).

2. Existing and finish grade profiles both behind and in front of the foundation structure.

c. Design parameters and applicable codes.

d. General notes for constructing the foundation structure including construction sequencing orother special construction requirements.

e. Horizontal and vertical curve data affecting the foundation structure and foundation structurecontrol points. Match lines or other details to relate foundation structure stationing to centerlinestationing.

f. A listing of the summary of quantities on the elevation drawing of each foundation structureshowing pay item estimated quantities.

g. Foundation typical sections including foundation spacing; and connection details to thesubstructure footing, anchorage, plates, etc.

h. Details, dimensions, and schedules for all foundations and reinforcing steel, includingreinforcing bar bending details.

4.14 **Other – Flood Wall Mounted PV Systems.**

4.14.1 **Construction Site Survey.**

a. The Successful Respondent is responsible for field locating and verifying the location of the floodwall prior to starting the Work. Notify the PVSC of any array locations that may interfere with ongoing PVSC operations and that may require deletion or modifications..

4.14.2 **Anchoring Design Requirements.**

a. The anchoring system shall be designed to meet the specified loading conditions for the

support of the array to the flood wall system.

4.14.3 **Anchoring Design Submittals.**

a. At least twenty-one (21) calendar days before the planned start of array structure construction, submit complete design calculations and working drawings to the PVSC for review and approval. Include all anchor bolt type, details, dimensions, quantities, profiles, and installation details necessary to construct the anchoring structure.

b. The drawings and calculations provided to the PVSC shall be signed and sealed by the Successful Respondent's Professional Engineer. The Successful Respondent shall have overall responsibility for both the design and the construction of the anchoring structure.

4.14.4 **Working Drawings.**

The working drawings shall include all information required for the construction and quality control of the anchor and array assemblies. Working drawings shall include, but not be limited to, thefollowing items unless provided in the contract plans:

a. A plan view of the array and anchoring structure(s) identifying:

1. A reference baseline and elevation datum.

2. The offset from the construction centerline or baseline to the face of the flood wall structure.

3. Beginning and end of arrays.

b. An elevation view of the array and mounting structure(s) identifying:

1. Elevation view showing anchor locations and array elevations; vertical and horizontal spacing.

2. Existing and finish grade profiles both behind and in front of the foundation structure.

c. Design parameters and applicable codes.

d. General notes for constructing the anchoring assemblies including construction sequencing orother special construction requirements.

e. Details, dimensions, and schedules for all anchoring and mounting assemblies

SECTION 5
AWARD PROCESS AND EVALUATION CRITERIA

5.1 **Submissions.**

The original, five copies, and one electronic copy of the Proposal must be received by PVSC on or before March 31, 2022 at 10:00 o'clock a.m. Proposals shall be enclosed in opaque sealed envelopes, addressed to Mr. Thomas Fuscaldo, PVSC Purchasing Agent, The Passaic Valley Sewerage Commission, 600 Wilson Avenue, Newark, New Jersey 07105, with the name and address of the Respondent plainly marked upon the outside thereof. (If forwarded by mail, the sealed envelope containing the Proposal, marked as directed above must be enclosed in another envelope addressed as specified above, preferably by registered mail.) (If forwarded by express carrier or other delivery service, please be advised that access to the PVSC is restricted to the following address: 734 Wilson Avenue, Newark New Jersey 07105)

All Proposals must be submitted in the form required as required herein. No late submissions will be accepted. The PVSC reserves its right to reject all Proposals and determine that it will not make any award in response to the RFP.

5.2 **Basis of Award.**

5.2.1 Proposals are being solicited pursuant to the competitive contracting process set forth in Section 4 of the Local Public Contracts Law, codified at N.J.S.A. 40A:11-4.1 (i) and the regulations promulgated thereunder. The competitive contracting process permits the award of a contract for any good or service that is exempt from bidding pursuant to N.J.S.A. 40A:11-5 (gg), to a responsible Respondent based on price and other factors.

5.2.2 In the event the PVSC determines to make an award, it will be to the Respondent whose Proposal is ranked highest by the PVSC pursuant to the criteria and methodology set forth in this Section 5 of the RFP. The PVSC Evaluation Committee ("Evaluation Committee") shall review all proposals in response to this RFP to determine if they satisfy the RFP requirements and evaluate the proposals based upon the evaluation criteria set forth in the Evaluation Criteria provisions of this Section 5 of the RFP.

5.3 **Evaluation of Respondent and Proposal.**

5.3.1 **Evaluation of Proposal.** The PVSC retains the right, in accordance with applicable law, to reject all Proposals or any particular Proposal, including, without limitation, one that is in any way unbalanced, unreasonable, non-conforming, unqualified, incomplete, non-responsive, otherwise irregular, or contrary to the public interest.

5.3.2 **Evaluation of Respondent.** The PVSC Evaluation Committee will, in accordance with applicable law, conduct such investigation as it deems necessary within its sole discretion to assist in connection with the evaluation of any Proposal, in relation to the Evaluation Criteria. The Respondent shall provide to the PVSC all the information requested for this purpose. The PVSC reserves the right to reject any Proposal if its investigation of the Respondent reveals that,

in accordance with applicable law and in the opinion of the PVSC, the Respondent is not properly qualified to carry out the obligations of the contract and complete it as outlined herein. The PVSC has the right to request information about similar work or services to that specified in the RFP. The Respondent shall complete the qualification forms included in the RFP and provide, upon the PVSC's request, the following: copies of all current licenses required by applicable laws and regulations for the Respondent or its subcontractors to perform the Project Services, and such proof of financial responsibility as the PVSC may deem necessary including without limitation copies of its financial statements for three (3) prior years, prepared by an outside accounting firm.

5.3.3 **Discretionary Waiver Rights.** In connection with its evaluation of the Proposals, the PVSC reserves all rights, in accordance with applicable law, to waive informalities or non-material irregularities in a Proposal or to accept the Proposal which accords with its best interests, in its sole discretion.

5.4 **Evaluation Criteria.**

5.4.1 The PVSC intends to award the RFP to the most responsible Respondent based on price and other factors, pursuant to the Evaluation Criteria set forth below. The PVSC will evaluate all compliant Proposals received based on the evaluation point system below. The PVSC may assign all, a portion, or none of the total points listed for each criteria.

a. PROPOSED SYSTEM DESIGN – 30 POINTS
The Respondent's proposed REPGS design in meeting the requirements of this RFP, including system capacity, equipment efficiency, equipment expected life, and construction schedule.

b. ECONOMIC BENEFIT TO THE PVSC – 35 POINTS
The economic benefit to the PVSC as measured by the proposed system costs to the PVSC and the per kWh energy cost savings that the PVSC realizes as compared to its current kWh costs

c. PROJECT TEAM EXPERIENCE – 30 POINTS
Experience of the Respondent and the project team in financing, developing, leasing, owning and/or operating projects of similar scale and complexity.

d. UNDERSTANDING OF PROJECT SCOPE – 5 POINTS
The Respondent's understanding of the scope of the Project Services work and the Respondent's general approach to satisfying the requirements and procedures set forth within the RFP.

5.5 **Evaluation Process.**

The PVSC Evaluation Committee will review all Proposals. In connection with its review process the PVSC reserves the right, to be exercised at its sole discretion, to interview one or more of the Respondents regarding their submissions.

5.6 **Rejection of Proposals.**

The PVSC reserves its right to reject all Proposals and to not make an award of the RFP if the PVSC determines that the award of the RFP is not in the PVSC's best interest. This RFP does not obligate or otherwise commit the PVSC to award the RFP and the PVSC, in its sole discretion, will determine if the RFP will be awarded. Proposals that are not submitted timely or do not conform with the material requirements of the RFP may be rejected without further review.

5.7 **Non-Materiality Waiver.**

In connection with its evaluation of the Proposals to determine the Proposal that is in the best interest of the PVSC, the PVSC, consistent with applicable law, reserves its rights to waive non-material, non-conforming provisions in a Proposal.

5.8 **Notification of Award.**

If the PVSC determines to award a contract in response to this RFP, the PVSC will notify the Successful Respondent in writing of the award, and any conditions that may be associated with the award, as permitted by applicable laws.

INDEX TO REQUIRED FORMS AND RESPONDENT'S CHECKLIST

CHECKLIST

This checklist is provided to assist the Respondent in insuring that its Proposal is complete and responsive. It shall, however, remain the sole and exclusive responsibility of each Respondent to ensure that its Proposal complies with all requirements. Respondents are required to submit with their Proposal a completed checklist.

____ Form 1: Respondent Company Information

____ Form 2: Statement of Relevant Experience

____ Form 3: Additional Statement of Respondent and Project Team's Qualification

____ Form 4: Proposal Form

____ Form 5: Certification of Authority, Veracity, Non-Collusion and Non-Disbarment

____ Form 6: List of Subcontractors (if applicable)

____ Form 7: Ownership Disclosure Form

____ Form 8: Equal Employment Opportunity Notice Form

____ Form 9: Mandatory Equal Employment Opportunity Language Acknowledgment Form

____ Form 10: Insurance Requirements Acknowledgement Form

____ Form 11: Business Registration Notice Acknowledgment Form

____ Form 12: Americans With Disabilities Act of 1990 Acknowledgment Form

____ Form 13: Bond Acknowledgment Form

____ Form 14: Public Law 2005 Chapter 51 & Executive Order 117 Certification and Disclosure Form

____ Form 15: Public Works Contractor Registration

____ Form 16: Disclosure of Investment Activities in Iran (Required prior to Contract Award)

____ Form 17: Cost Proposal Form

____Form 18: Bid Bond (if applicable)

____Form 19: Consent of Surety (if applicable)

____Form 20: Federal Non-Debarment Certification (if applicable)

FORM 1:
RESPONDENT COMPANY INFORMATION FORM

Company: _____

Signature: _____

Typed Name and Title: _____

Address: _____

City, State, Zip: _____

Phone Number: _____

Fax Number: _____

Email Address: _____

Primary Contact Person: _____

Witness: Witness:

(Signature) (Signature)

(Name – Print or Type) (Name – Print or Type)

The Respondent shall on the line below, if a corporation, supply the name of the state in which incorporated

Contact Person: _____

Who Prepared Proposal: _____

Telephone Number: _____

Federal ID Number: _____

FORM 2:
STATEMENT OF RELEVANT EXPERIENCE

The Respondent hereby submits the following information demonstrating its and its project team's past experience to provide the Services in accordance with the Request for Proposals. (Attach supporting information as appropriate).

1. Services. Respondent and/or its project team members submits the following information to demonstrate that it has successfully designed, permitted, constructed, operated and maintained Renewable Energy Power Generating Systems, for a period of at least three (3) consecutive years. Identify all projects that the Respondent and/or its project team members have participated in and explain the specific responsibilities of the Respondent and project team member for each project.

Name of Facility and Period of Operation	Name, Address and Location Phone No. of Reference	REPGS MW Size

Respondents are encouraged to provide additional relevant information as to Respondent's experience and qualifications. For example, identify other installations that the Respondent and its project team have worked on. Attach documents and additional information discussing the Renewable Energy Power Generation System installations and projects.

2. References. Provide a list of references (name, telephone number and project description) regarding the Respondent's experience for PV projects, including the Respondent's experience financing such projects.

Name	Address	Telephone. No.	Project Description

3. Power Purchase Agreements. Respondent shall submit the following information demonstrating that it or its project team members have experience in connection with the provision of the sale of electricity pursuant to power purchase agreement(s). The Respondent shall identify PPAs that it has entered into relating to Renewable Energy Power Generation Systems comparable to the REPGS included in the Project.

FORM 3:
ADDITIONAL STATEMENT OF RESPONDENT AND PROJECT TEAM'S QUALIFICATIONS

(This form must be completed and submitted with Proposal, one form for each entity if a joint venture.

1. If firm is a Corporation, list state of incorporation:

_____

2. If firm is a Partnership, list names of partners:

_____

_____

Attach separate sheets wherever necessary to properly answer question.

1. Firm name.

2. Principal address.

3. Year firm was organized.

4. Where and when incorporated.

5. Years of firm's experience in similar contracts.

6. List of comparable work completed by firm within the past 3 years and any jobs currently in progress. (note cost of construction for each project and beginning and completion dates.)

7. List any previous contracts the proposer has defaulted on within the past 10 years.

8. List present comparable contracts presently underway.

9. List of major equipment available for this contract.

10. Provide evidence of the capacity of the Respondent to obtain the required financing for the Project. (Respondent shall attach copies of financial documents (including audited accounting statements) demonstrating that the Respondent has sufficient financial resources or has taken commercially reasonable steps to secure funding sufficient to complete the Project.)

FORM 4:
PROPOSAL FORM

PROPOSAL OF _____ hereinafter called "Respondent" a corporation/partnership/joint venture/individual (strikeout inapplicable terms) organized and existing under the State of _____ and doing business as_____.

Non-New Jersey entity sign here to indicate the evidence of authority to transact business in New Jersey is attached hereto: _____

TO: PVSC

PROPOSAL FOR A RENEWABLE ENERGY POWER GENERATION SYSTEM

1. The Respondent hereby certifies that it has examined the Request for Proposal ("RFP"), attachments to the RFP, Instructions to Respondents, and all attached forms, documents and attachments., Proposal.

2. Respondent acknowledges receipt of the following Addenda:

Addendum No._____ Dated _____
Addendum No._____ Dated _____
Addendum No._____ Dated _____

3. The Respondent must attach hereto a completed version of the Cost Proposal Form attached to the RFP as Form 18. The pricing submitted by the Respondent must remain firm for a period of sixty days (60) days from the date the selected Proposer is notified by the PVSC that they are the party with whom the PVSC desires to enter into an agreement with.

4. Respondent understands that the PVSC reserves the right to reject any and all Proposals to the maximum extent of its lawful discretion and to waive any informality in the Proposal, as allowed by law and as may be in its interest.

5. The Respondent hereby certifies that all of the figures, computations and additions used in the Proposal submission herein have been carefully checked and are accurate in all respects and no claim shall be made as a basis for withdrawal of this Proposal after opening on these grounds.

7. By signing this Proposal the signatory represents that he/she is fully authorized by the Respondent to submit this Proposal, is doing so with the knowledge and consent of the Respondent, and that the Respondent consents to be bound by this Proposal.

This Proposal is respectfully submitted on this _____ day of _____2022

By: _____
Signature of Respondent
(Print Name and Title of Signatory)

Notary Public:

Sworn and Subscribed before me on this ____ day of _____, 2022

_____
Notary's Signature

_____
Print or Type Notary's Name

Commission expires:_____

Notary's Seal:_____

ADDRESS OF RESPONDENT:

RESPONDENT'S CONTACT:

CONTACT TELEPHONE AND FAX NUMBERS:

Telephone:

Fax:

FORM 5:
CERTIFICATION OF AUTHORITY, VERACITY,
NON-COLLUSION AND NON-DISBARMENT

The undersigned, having knowledge of and authority to bind the Respondent to the information herein, hereby swears, upon his oath, according to law, I am the undersigned, who, on behalf of the Respondent and with full authority to do so, has executed this Certification in connection with its Proposal; and

1. The Respondent has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the within Proposal;

2. I further warrant that, no person or selling agency has been employed, or retained, to solicit, or secure, such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employee or bona fide established commercial or selling agencies identified as follows:

3. The Respondent is not, as of this date, and has not been at any time within three (3) years immediately preceding the date on which Proposals were received, included on the New Jersey State Treasurer's List of Debarred, Suspended or Disqualified Respondents; the Respondent hereby acknowledges that it may be debarred, suspended or disqualified from contracting with the PVSC if it commits any of the acts listed in N.J.A.C. 17:19-4.1 and further acknowledges its obligation to notify the PVSC immediately if it appears that said Respondent may be added to any such list.

4. All statements and representations contained in the Respondent's Proposal are true, complete and correct, and made with full knowledge that the PVSC shall rely upon same in awarding a public contract for the Work as defined in the Contract Documents.

Respondent's Authorized Representative
(MUST BE PRINCIPAL OWNER OR OFFICER OF RESPONDENT):

_____ _____
Signature Print or Type Name and Title

Notary Public:

Sworn and Subscribed before me on this _____ day of _____, 2022:

_____ _____

Notary's Signature Print or Type Notary's Name

Commission expires:_____ Notary's Seal:_____

FORM 6:
LIST OF SUBCONTRACTORS

The Respondent will set forth below the names, addresses and, if applicable, license numbers of the subcontractors to whom the Respondent will subcontract work in the categories listed in connection with the erection, alteration or repair of any public building and the related site work.

WORK	**SUBCONTRACTOR**
1. Plumbing and gas fitting and all kindred work.	Name; _____ Address: _____ License No. _____ Expires: _____
2. Steam and hot water heating and ventilating apparatus, steam power plants and kindred work.	Name; _____ Address: _____ License No. _____ Expires: _____
3. Electrical work.	Name; _____ Address: _____ License No. _____ Expires: _____
4. Structural steel and ornamental iron work.	Name; _____ Address: _____ License No. _____ Expires: _____

If the Respondent will not subcontract the work described in any category above but will complete it as prime contractor, it is not necessary to name a subcontractor. In such case, the Respondent should insert "prime contractor" in the subcontractor name space. If more than one subcontractor will be utilized in any category, attach a certification signed by the Respondent listing each subcontractor named in the Proposal for that category. The certification shall set forth the scope of work for which the subcontractor has submitted a price quote and which the Respondent has agreed to award to each subcontractor should the Respondent be awarded the contract. The certification shall be submitted simultaneously with the list of the subcontractors. The certification may take the form of a single form listing all subcontractors or, alternatively, a separate certification may be submitted for each subcontractor.

Provide evidence, if applicable, that:
1. The contractor or subcontractor is registered with the New Jersey Department of Labor as a public works contractor pursuant to the Public Works Contractor Registration Act, N.J.S.A. 34:11- 56.48 et seq. (Copy of Registration Certificate Shall be Provided Prior to Award)

2. That if required to maintain same in order to do business in the State of New Jersey, the

contractor or subcontractor possesses a current, valid certificate of authority to perform work in New Jersey, issued by the New Jersey Department of the Treasury (Copy of Business Registration Certificate Shall be Provided Prior to Award)

3. That the contractor or subcontractor possesses and maintains any and all contractor or trade license(s) required under applicable New Jersey law and are appropriately classified for any trade or specialty area in which the Respondent seeks to perform work (ATTACH COPY OR COPIES OF LICENSE(S)); and

Authorized Representative of Respondent:

(MUST BE PRINCIPAL OWNER OR OFFICER):

_____
Signature

_____
Print or Type Name and Title

Notary Public:

Sworn and Subscribed before me on this ____ day of _____, 2022

_____
Notary's Signature

_____
Print or Type Notary's Name

Commission expires:_____

Notary's Seal:

FORM 7:
OWNERSHIP DISCLOSURE FORM

Name of Business: _____

Address of Business: _____

Name of person completing this form: _____

N.J.S.A. 52:25-24.2:

"No corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, unless prior to the receipt of the bid or proposal, or accompanying the bid or proposal of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be.

If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest."

This Ownership Disclosure Certification form shall be completed, signed and notarized.

Failure of the bidder/proposer to submit the required information is cause for automatic rejection of the bid or proposal

Part I

Check the box that represents the type of business organization:

☐ Sole Proprietorship

☐ Non-Profit Corporation (skip Parts II and III, sign and notarize at the end)

☐ Partnership ☐ Limited Partnership ☐ Limited Liability Partnership

☐ Limited Liability Company

☐ For-profit Corporation (including Subchapters C and S or Professional Corporation)

☐ Other (be specific): _____

Part II

☐ I certify that the list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

OR

☐ I certify that no one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or that no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be.

Sign and notarize the form below, and, if necessary, complete the list below. (Please attach additional sheets if more space is needed):

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Name: _____ Name: _____

Address: _____ Address: _____

_____ _____

Part III - Any Direct or Indirect Parent Entity Which is Publicly Traded:

"To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest."

☐ Pages attached with name and address of each publicly traded entity as well as the name and address of each person that holds a 10 percent or greater beneficial interest.

OR

☐ Submit here the links to the Websites (URLs) containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent.

_____

_____

AND

☐ Submit here the relevant page numbers of the filings containing the information on each person holding a 10 percent or greater beneficial interest.

_____

_____

Subscribed and sworn before me this ___ day of

_____, 20___.

(Notary Public)

My Commission expires:

_____
(Affiant)

_____
(Print name of affiant and title if applicable)

(Corporate Seal if a Corporation)

FORM 8:
EQUAL EMPLOYMENT OPPORTUNITY NOTICE
(N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq.)

This form is a summary of the Respondent's requirement to comply with the requirements of N.J.S.A. 10:5- 31 et seq. and N.J.A.C. 17:27 et seq. The successful Respondent shall submit to the PVSC after notification of award but prior to execution of this contract, one of the following three documents as forms of evidence:

(a) A photocopy of a valid letter that the vendor is operating under an existing Federally approved, or sanctioned affirmative action program (good for one year from the date of the letter);

OR

(b) A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-1.1 et seq.;

OR

(c) A photocopy of an Employee Information Report (Form AA302) provided by the Division of Contract Compliance and distributed to the PVSC to be completed by the vendor in accordance with N.J.A.C. 17:27-1.1 et seq.

The undersigned Respondent certifies that he/she is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq. and agrees to furnish the required forms of evidence.

COMPANY: _____

SIGNATURE: _____ PRINT NAME:_____

TITLE: _____ DATE: _____

FORM 9:
EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
(N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq.)

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor, where applicable, will send to each labor union or representative or workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to employ minority and women workers consistent with the applicable county employment goals established in accordance with N.J.A.C. l7:27-5.2, or a binding determination of the applicable county employment goals determined by the Division, pursuant to N.J.A.C. 17:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, labor unions, that it does not discriminate on the basis of age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression,

disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the applicable employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval

Certificate of Employee Information Report

Employee Information Report Form AA302

The contractor and its subcontractors shall furnish such reports or other documents to the Division of Purchase & Property, CCAU, EEO Monitoring Program as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Purchase & Property, CCAU, EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

Acknowledgement of Mandatory Equal Employment Opportunity Language:

_____ _____

(Signature) (Date)

_____

(Print Name and Title)

FORM 10:
INSURANCE REQUIREMENTS ACKNOWLEDGEMENT FORM

The Respondent shall secure and maintain in force for the term of the Agreement liability insurance as provided herein. The Successful Respondent shall provide the PVSC with current certificates of insurance for all coverages and renewals thereof, naming the PVSC, its officers, and employees, The State of New Jersey and its venues, employees and officers as an Additional Insured and shall contain the provision that the insurance provided in the certificate shall not be canceled for any reason except after sixty (60) days written notice to the PVSC. The certificate of insurance must be accompanied by the actual General Liability Endorsement conferring Additional Insured status. The insurance to be provided by the Respondent shall be as follows:

(a) $5,000,000 Each Occurrence Bodily Injury and Property Damage; $5,000,000 Personal Injury and a $5,000,000 General Aggregate General Liability Limit with a requirement that:

(i) the Aggregate per location/Aggregate per Project Endorsement is a part of the policy, and

(ii) Broad Form Property Damage and Blanket Broad Form Contractual Liability Coverage is included.

(b) Workers' Compensation-Statutory-applicable to the laws of New Jersey

(c) $5,000,000 Umbrella Excess Liability - Umbrella Excess Liability Coverage limit excess the:

(i) General Liability

(ii) Automobile Liability

(iii) Workers' Compensation Section B- Employers Liability Limits of

4. $2,000,000 Each Accident
5. $2,000,000 By Disease each employee
6. $2,000,000 By Disease aggregate limit

(d) Insurance coverage to replace the REPGS in the event of a system loss

(e) Coverage should be at least as broad as the primary coverage and should include the same Additional Insured wording as the primary General Liability.

(f) The above required Comprehensive General Liability Insurance policy or its equivalent shall name the PVSC, its officers, and employees, The State of New Jersey and its venues, employees and officers as Additional Insureds. The coverage to be provided under these policies shall be at least as broad as that provided by the standard basic, unamended, and unendorsed Comprehensive General Liability Insurance occurrence coverage forms or its equivalent currently in use in the State of New Jersey, which shall not be circumscribed by any endorsement limiting the breadth of coverage.

(g) Certificate(s) of Insurance shall be filed with the PVSC's Purchasing Office upon award of contract by the PVSC.

Acknowledgement of Insurance Requirement:

_____ _____

(Signature) (Date)

_____

(Print Name and Title)

FORM 11:
BUSINESS REGISTRATION NOTICE FORM

N.J.S.A. 52:32-44 requires that each Respondent submit proof of New Jersey Business Registration prior to the time a contract is awarded.

All business organizations that do business with a public contracting agency are required to be registered with the State of New Jersey, Department of Treasury, Division of Revenue, and provide proof of that registration to the contracting agency prior to the time a contract is awarded. "Business Organization" means an individual, partnership, association, joint stock company, trust, corporation or other legal business entity or successor thereof.

Proof of registration shall be a copy of the Respondent's New Jersey Business Registration Certificate (BRC). A BRC is obtained from the New Jersey Division of Revenue. Further information may be obtained by visiting the following web site at the State of New Jersey: www.nj.gov/treasury/revenue/busregcert.htm.

N.J.S.A. 52:32-44 imposes the following requirements on contractors and all subcontractors that **knowingly** provide goods or perform services for a contractor fulfilling this contract:

1) the contractor shall maintain and submit to the contracting agency a list of subcontractors and their addresses that may be updated from time to time.
2) Prior to receipt of final payment from a contracting agency, a contractor must submit to the contracting agency an accurate list of all subcontractors or attest that none was used;
3) During the term of this contract, the contractor and its affiliates that they must collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered into this State.

A contractor, subcontractor or supplier who fails to provide proof of business registration or provides false business registration information shall be liable to a penalty of $25.00 for each day of violation, not to exceed $50,000.00 for each business registration not properly provided or maintained under a contract with a contracting agency. Information on the law and its requirements is available by calling (609) 292-9292.

Acknowledgement of Business Registration Notice:

_____ _____

(Signature) (Date)

_____

(Print Name and Title)

FORM 12:
AMERICANS WITH DISABILITIES ACT OF 1990
EQUAL OPPORTUNITY FOR INDIVIDUALS WITH DISABILITY

The Respondent and the PVSC do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 ("The Act") (42 U.S.C. § 12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the PVSC pursuant to this contract, the Respondent agrees that the performance shall be in strict compliance with the Act. In the event the Respondent, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the RESPONDENT shall defend the PVSC in any action or administrative proceeding commenced pursuant to this Act. The Respondent shall indemnify, protect, and save harmless the PVSC, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violations. The Respondent shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the PVSC's grievance procedure, the Respondent agrees to abide by any decision of the PVSC, which is rendered pursuant to, said grievance procedure. If any action or administrative proceeding results in an award of damages against the PVSC or if the PVSC incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the Respondent shall satisfy and discharge the same at its own expense. The PVSC shall, as soon as practicable after a claim has been made against it, give written notice thereof to the Respondent along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the PVSC or any of its agents, servants, and employees, the PVSC shall expeditiously forward or have forwarded to the Respondent every demand, complaint, notice, summons, pleading, or other process received by the PVSC or its representatives. It is expressly agreed and understood that any approval by the PVSC of the services provided by the Respondent pursuant to this contract will not relieve the Respondent of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the PVSC or its representatives. It is further agreed and understood that the PVSC assumes no obligation to indemnify or save harmless the Respondent, it agents, servants, employees and sub-contractors for any claim which may arise out of their performance of this Agreement. Furthermore, the Respondent expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the Respondent's obligations assumed in this Agreement, nor shall they be construed to relieve the Respondent from any liability, nor preclude the PVSC from taking any other actions available to it under any other provisions of this Agreement or otherwise at law.

Acknowledgement of Americans with Disabilities Act of 1990:

_____ _____

(Signature) (Date)

_____

(Print Name and Title)

FORM 13:
BOND ACKNOWLEDGMENT FORM

The Respondent acknowledges that if it is awarded a contract pursuant to this RFP it will be required to obtain payment and performance bonds in an amount of 100% of the total contract value. The performance and payment bonds shall remain in effect during the total implementation. The performance bond shall be released upon the PVSCs acceptance of the Renewable Energy Power Generation System. The payment bond shall be released upon receipt of satisfactory evidence that all subcontractors, suppliers, etc. have been paid in full in accordance with all applicable laws.

By the Respondent's signature below, the Respondent acknowledges that it will satisfy the bond requirements set forth in the RFP if the Respondent is awarded the contract pursuant to the RFP.

Acknowledgement of Restoration Bond Requirement:

_____ _____

(Signature) (Date)

_____

(Print Name and Title)

FORM 14:
CHAPTER 51 & EXECUTIVE ORDER 117 CERTIFICATION AND DISCLOSURE

PASSAIC VALLEY SEWERAGE COMMISSION

Two-Year Chapter 51/Executive Order 117 Vendor Certification and
Disclosure of Political Contributions

FOR STATE AGENCY USE ONLY

Solicitation, RFP, or Contract No._____ Award Amount

Description of Services _____

State Agency Name Passaic Valley Sewerage Commission Contact Person Thomas A. Fuscaldo

Phone Number 973-817-5702 Contact Email tfuscaldo@pvsc.com

☐ Check if the Contract / Agreement is Being Funded Using FHWA Funds

Part 1: Business Entity Information **Please check if requesting recertification ☐**

Full Legal Business Name _____
(Including trade name if applicable)

Address_____

City _____ State____ Zip _____ Phone_____

Vendor Email_____ Vendor FEIN (SS# if sole proprietor/natural person)_____

Check off the business type and list below the required information for the type of business selected.
MUST BE COMPLETED IN FULL

□ Corporation: LIST ALL OFFICERS and any 10% and greater shareholder
□ Professional Corporation: LIST ALL OFFICERS and ALL SHAREHOLDERS
□ Partnership: LIST ALL PARTNERS with any equity interest
□ Limited Liability Company: LIST ALL MEMBERS with any equity interest
□ Sole Proprietor

Note: "Officers" means President, Vice President with senior management responsibility, Secretary, Treasurer, Chief Executive Officer or Chief Financial Officer of a corporation, or any person routinely performing such functions for a corporation.

All Officers of a Corporation or PC	**10% and greater shareholders of a corporation or all shareholders of a PC**
All Equity partners of a Partnership	**All Equity members of an LLC**

If you need additional space for listing of Officers, Shareholders, Partners or Members, please attach separate page.

IMPORTANT NOTE: You must review the definition of "contribution" and "business entity" on the Information and Instructions form prior to completing Part 2 and Part 3. The Information and Instructions form is available at: http://www.state.nj.us/treasury/purchase/forms.shtml#eo134

Part 2: Disclosure of Contributions by the business entity or any person or entity whose contributions are attributable to the business entity.

1. **Report below all contributions solicited or made during the 4 years immediately preceding the commencement of negotiations or submission of a proposal to any:**

   Political organization organized under Section 527 of the Internal Revenue Code and which also meets the definition of a continuing political committee as defined in N.J.S.A. (See Information and Instructions form.)

2. **Report below all contributions solicited or made during the 5 ½ years immediately preceding the commencement of negotiations or submission of a proposal to any:**

   Candidate Committee for or Election Fund of any Gubernatorial or Lieutenant Gubernatorial candidate State Political Party Committee
   County Political Party Committee

3. **Report below all contributions solicited or made during the 18 months immediately preceding the commencement of negotiations or submission of a proposal to any:**

   Municipal Political Party Committee
   Legislative Leadership Committee

Full Legal Name of Recipient _____

Address of Recipient _____

Date of Contribution _____ Amount of Contribution _____

Type of Contribution (i.e. currency, check, loan, in-kind) _____

Contributor Name _____

Relationship of Contributor to the Vendor

If this form is not being completed electronically, please attach additional contributions on separate page. Click the "Add a Contribution" tab to enter additional contributions.

Remove Contribution

Add a Contribution

☐ Check this box only if no political contributions have been solicited or made by the business entity or any person or entity whose contributions are attributable to the business entity.

Part 3: Certification

(A) ☐ I am certifying on behalf of the business entity and all individuals and/or entities whose contributions are attributable to the business entity as listed on Page 1 under **Part 1: Vendor Information**.

(B) ☐ I am certifying on behalf of the business entity and all individuals and/or entities whose contributions are attributable to the business entity as listed on Page 1 under **Part 1: Vendor Information**, except for the individuals and/or entities who are submitting separate Certification and Disclosure forms which are included with this submittal.

(C) ☐ I am certifying on behalf of the business entity only; any remaining persons or entities whose contributions are attributable to the business entity (as listed on Page 1) have completed separate Certification and Disclosure forms which are included with this submittal.

(D) □ I am certifying as an individual or entity whose contributions are attributable to the business entity.

I hereby certify as follows:

1. **I have read the Information and Instructions accompanying this form prior to completing the certification on behalf of the business entity.**
2. **All reportable contributions made by or attributable to the business entity have been listed above.**

3. **The business entity has not knowingly solicited or made any contribution of money, pledge of contribution, including in-kind contributions, that would bar the award of a contract to the business entity unless otherwise disclosed above:**

   a) Within the 18 months immediately preceding the commencement of negotiations or submission of a proposal for the contract or agreement to:
      (i) A candidate committee or election fund of any candidate for the public office of Governor or Lieutenant Governor or to a campaign committee or election fund of holder of public office of Governor or Lieutenant Governor; OR
      (ii) Any State, County or Municipal political party committee; OR
      (iii) Any Legisative Leadership committee.

   b) During the term of office of the current Governor or Lieutenant Governor to:
      (i) A candidate committee or election fund of a holder of the public office of Governor or Lieutenant Governor; OR
      (ii) Any State or County political party committee of the political party that nominated the sitting Governor or Lieutenant Governor in the last gubernatorial election.

   c) Within the 18 months immediately preceding the last day of the sitting Governor or Lieutenant Governor's first term of office to:
      (i) A candidate committee or election fund of the incumbent Governor or Lieutenant Governor; OR
      (ii) Any State or County political party committee of the political party that nominated the sitting Governor or Lieutenant Governor in the last gubernatorial election.

4. **During the term of the contract / agreement the business entity has a continuing responsibility to report, by submitting a new Certification and Disclosure form, any contribution it solicits or makes to:**
   (a) Any candidate committee or election fund of any candidate or holder of the public office of Governor or Lieutenant Governor; OR
   (b) Any State, County or Municipal political party committee; OR
   (c) Any Legislative Leadership committee.

   The business entity further acknowledges that contributions solicited or made during the term of the contract/agreement may be determined to be a material breach of the contract/agreement.

5. **During the two-year certification period the business entity will report any changes in its ownership structure (including the appointment of an officer within a corporation) by submitting a new Certification and Disclosure form indicating the new owner(s) and reporting said owner(s) contributions.**

I certify that the foregoing statements in Parts 1, 2 and 3 are true. I am aware that if any of the statements are willfully false, I may be subject to punishment.

Signed Name _____ Print Name _____

Title/Position _____ Date _____

Procedure for Submitting Form(s)

The contracting State Agency should submit this form to the Chapter 51 Review Unit when it has been required as part of a contracting process. The contracting State Agency should submit a copy of the completed and signed form(s), to the Chapter 51 Unit and retain the original for their records.

The business entity should return this form to the contracting State Agency. The business entity can submit this form directly to the Chapter 51 Review Unit only when it -

- Is approaching its two-year certification expiration date and wishes to renew certification;
- Had a change in its ownership structure; OR
- Made any contributions during the period in which its last two-year certification was in effect, or during the term of a contract with a State Agency.

Forms should be submitted either electronically to:cd134@treas.nj.gov or regular mail at: Chapter 51 Review Unit, P.O. Box 230, 33 West State Street, Trenton, NJ 08625.

Chapter 51 - Rev. 4/17/15

FORM 15:
PUBLIC WORKS CONTRACTOR REGISTRATION

1. In accordance with "The Public Works Contractor Registration Act, N.J.S.A. 34:11 – 56.48 et seq

   "No contractor shall Bid on any contract for public work as defined in section 2 of P.L. 1963, c150 (C34:11 – 56.26) unless the contractor is registered pursuant in this act. No contractor shall list a subcontractor in a Bid proposal for the contract unless the subcontractor is registered pursuant to P.L. 1999, c238 (C34:11 – 56.48 et seq.) at the time the Proposal is made. No contractor or subcontractor, including a subcontractor not listed in the Bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor is registered pursuant to that act." (N.J.S.A. 34:11 – 56.51 et seq.)

   "Contractor means a person, partnership, association, joint stock company, trust, corporation, or other legal business entity or successor thereof who enters into a contract which is subject to the provisions of the "New Jersey Prevailing Wage Act," P.L., 1963, c.150, (C.34:11 – 56.25 et seq.) and includes any subcontractor or lower tier subcontractor of a contractor defined herein" N.J.S.A. 34:11 – 56.55 et seq.

2. Proof of registration is required before an award can be made:

   "Each contractor shall, after the Proposal is made and prior the awarding of the contract, submit to the public entity the certificates of registration for all subcontractors listed in the Bid proposal. Applications for registration shall not be accepted as a substitute for a certificate of registration for the purposes of this section." N.J.S.A. 34:11-56.55

3. Contractors and their listed subcontractors bidding on covered work shall provide proof of the required registration prior to the contract award. [As practical matter, PVSC requests proof of registration be submitted with the Proposal]

4. By signing this form, the Contractor certifies that they shall provide proof of the required registration prior to the contract award.

_____ _____
(Signature) (Date)

_____
(Name and Title of Signer - Please Type)

FORM 16:
DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Bidder/Offeror: _____

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract with the Passaic Valley Sewerage Commission must complete the certification below to attest, under penalty of perjury, that the person or entity's parents, subsidiaries, or affiliates is not identified on a list created and maintained by the N.J. Department of the Treasury as a person or entity engaging in investment activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List") The Chapter 25 list is found on the Division's website at http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf

Bidders must review this list prior to completing the below certification. **Prior to contract award or authorization, the contractor shall provide the Contracting Agency with a completed copy of the certification below.**

If PVSC finds a person or entity to be in violation of the principles which are the subject of this law, it shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the person or entity.

PLEASE CHECK THE APPROPRIATE BOX:

☐ I certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

☐ I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates ***is*** listed on the New Jersey Department of Treasury Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as nonresponsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

Name: _____ **Relationship to Bidder/Offeror:** _____

Description of Activities:

_____

_____
_____

Duration of Engagement: _____**Anticipated Cessation Date:** _____

Proposer Contact Name: _____ **Contact Phone Number:**_____

Certification: I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the State of New Jersey is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State to notify the State in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the State of New Jersey and that the State at its option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print)_____
Signature_____

Title_____ **Date:**

FORM 17:
COST PROPOSAL FORM

NAME OF RESPONDENT: _____

TO: PASSAIC VALLEY SEWERAGE COMMISSION

RE: REQUEST FOR PROPOSALS FOR A RENEWABLE ENERGY POWER GENERATION SYSTEM

1. Instructions for completing Form 17: Respondent shall complete and submit **Form 17** in accordance with the following:

Section A. Preliminary Information. Respondent must completely fill out Section A, subsections 1 through 4. These subsections are self-explanatory. Note that in subsection 1, for a joint venture, Respondent must list all entities in the joint venture and identify the managing or lead entity.

Section B. Proposal.

Subsection 2. In subsection 2.1.a, Respondent must set forth its proposed PPA Price, from the Commencement Date. In subsection 2.1.b, Respondent may propose an escalation factor expressed as a percentage of the increase in the PPA Price over the prior year PPA Price for each of years two (2) through (15) of the PPA, which years shall immediately follow each other, and begin on the anniversary date of the Commencement Date. If Respondent proposes no escalation, it must insert "none" on the appropriate line.

Subsection 3. Subsection 3(a) requires that Respondent set forth the amount of electricity to be generated by the Renewable Energy Power Generation System being proposed measured in kW (dc), and post inversion, annual kWh (ac) for each year of a fifteen (15) year period. Subsection 3(b) requires that Respondent set forth the guaranteed amount of electricity to be generated by the Renewable Energy Power Generation System being proposed, measured in kW (dc), and post inversion, annual kWh (ac) for each year of a fifteen (15) year period. The Guaranteed Production Level must be at least ninety (90%) per cent of the expected electricity output. A true-up payment is required by the Successful Respondent under a PPA or Lease agreement if the guaranteed output is not met in any guarantee anniversary year, in which event the difference between the PPA or Lease Price, and the amount paid by PVSC to the existing local electric utility distribution provider for the amount of electricity guaranteed, but not provided, by the Successful Respondent, is the true-up amount owed by the Successful Respondent under a PPA or Lease agreement.

Subsection 4. Subsection 4(b) requires that Respondent provide a detailed description of any revision(s) it proposes to the Power Purchase Agreement (**Appendix E**) together with a justification for such revisions. The PVSC reserves the right, in its sole discretion, to determine

whether such proposed revisions are material or non-material, consistent with law. If deemed non-material, PVSC reserves the right, in their sole discretion, to determine whether such non-material revisions are acceptable to it. Revisions deemed material may result in Respondent's Proposal being rejected as non-responsive. Accordingly, Respondents should pose all questions to PVSC regarding proposed revisions, in accordance with the process established in RFP Section 2.5. This will permit PVSC to consider such proposed revisions prior to the Proposal Submission Date and, if PVSC deems such revisions acceptable, it will issue an addendum to the RFP.

Subsection 5. Subsection 5 allows Respondent, at its option, to provide early termination and end of term fair market value purchase option price for each of the Renewable Energy Power Generation System being proposed. The PVSC reserves the sole right as to whether it will include any such prices in the final Contract Agreement.

FORM 17
COST PROPOSAL FORM
(continued)

A. Preliminary Information:

1. *Respondent*:_____

_____
[List all entities if a joint venture, and identify lead entity—attach any additional sheets as necessary]

2. *Date*:_____, 2022

3. *Does Respondent intend to form a special purpose entity?*

[Answer yes or no] _____ *If yes, please provide additional information by attaching additional sheets.*

4. *Respondent Contact Person*:

Name: _____ Title: _____

Phone: _____ Fax: _____

E-mail Address: _____ Cell: _____

Signature: _____

Date:_____

5. *Proposal is submitted as a Public Works Contract as defined in Appendix E, Exhibit B Item (tt) of this document:*

YES _____ *NO* _____

B. Proposal:

1. *General*. By executing this Proposal form, the Respondent Contact Person is authorized to bind the Respondent to all of the representations and terms of this Proposal form, and Respondent is so bound.

2. *Proposal Pricing*

2.1 *PPA Price and related information.* Respondent hereby proposes the following PPA Price, and related information, to perform the Services, which PPA Price for each year of the PPA

FORM 17

COST PROPOSAL FORM
(continued)

(including any escalation factor below) shall be established in a PPA Price table to be included in the PPA. **Note: pursuant to LFN 2009-10, PVSC shall reject the Proposals of all Respondents whose PPA Price Quotation related to the generation of solar power exceeds the avoided cost of electrical power from the local distribution company(s) currently serving the Local Unit Facilities.**

(a) PPA Price. Respondent proposes the following PPA Price to be charged to PVSC for the Facilities included in this RFP, expressed in dollars per kWh, from the Commencement Date to, but excluding the first anniversary of such Commencement Date (exclusive of any escalation factor):

Total Cost of Proposed System that PPA pricing is based on	$	_____
PPA Price with TRECs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/kWh
PPA Price with SREC-IIs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/kWh
PPA Price with PVSC retaining RECs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/kWh

(b) Escalation Factor. The PPA Price proposed in subsection (a) above, shall be increased for each remaining year of the PPA (other than the initial year from the Commencement Date), by the following constant, escalation factor, expressed as an annual percentage increase from the prior year's PPA Price. If no escalation factor is being proposed, write none in the space below:

PPA Price fixed escalation factor for all subsequent years of PPA (expressed as an annual percentage increase from the prior year's PPA Price)	_____%

2.2 *Lease Price and related information.* Respondent hereby proposes the following Lease Price, and related information, to perform the Services.

(a) Lease Price. Respondent proposes the following Lease Price to be charged to PVSC for the Facilities included in this RFP, expressed in dollars per year, from the Commencement Date to, but excluding the first anniversary of such Commencement Date (exclusive of any escalation factor)

FORM 17

COST PROPOSAL FORM
(continued)

Total Cost of Proposed System that Lease pricing is based on	$	_____
Lease Price with TRECs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/year
Lease Price with SREC-IIs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/year
Lease Price with PVSC retaining RECs ($ per kWh, from Commencement Date for one year), exclusive of escalation factor, if any	$	_____/year

(b) Escalation Factor. The Lease Price proposed in subsection (a) above, shall be increased for each remaining year of the Lease (other than the initial year from the Commencement Date), by the following constant, escalation factor, expressed as an annual percentage increase from the prior year's Lease Price. If no escalation factor is being proposed, write none in the space below:

Lease Price fixed escalation factor for all subsequent years of Lease (expressed as an annual percentage increase from the prior year's Lease Price)	_____%

2.3 *Sale Price and related information.* Respondent hereby proposes the following Sale Price, and related information, to perform the Services.

(a) Sale Price. Respondent proposes the following Sale Price to be charged to PVSC for the Facilities included in this RFP, expressed in dollars,

Sale Price	**$**	_____
Annual Fee for Successful Respondent to Operate & Maintain Proposed System (Rate Shall be Fixed for First Two Years)	**$**	_____

FORM 17

COST PROPOSAL FORM
(continued)

3. Production of Electricity.

(a) Expected System Output. Respondent must provide the expected fifteen (15) year output for each identified location of the Renewable Energy Power Generation System being proposed. The Respondent shall provide the basis or software used for this calculation.

Location	**System Size (kWdc)**	**Expected System Output (kWh)**

(b) Guaranteed Output. Respondent must provide the guaranteed fifteen (15) year output for each of identified location of the Renewable Energy Power Generation System being proposed. The Successful Respondent must guarantee annual electricity output for the Renewable Energy Power generation System being proposed.(Guaranteed Production Level). The Guaranteed Production Level must be at least ninety (90%) per cent of the expected electricity output.

FORM 17

COST PROPOSAL FORM
(continued)

Location	**System Size (kWdc)**	**Percent of Expected Production Guaranteed (%)**

4. *Non-Material Changes.* Respondents are advised that any material revisions to the Power Purchase Agreement (**Appendix E**) shall render the proposal non-responsive, and PVSC shall reject the proposal. If Respondent proposes to make any non-material revision(s) to these documents, Respondent shall provide a detailed description of the proposed revision(s) together with a justification for such revisions, below. The PVSC reserves the right, in their sole discretion, to determine whether such proposed revisions are material or non-material, consistent with law. If deemed non-material, PVSC reserves the right, in their sole discretion, to determine whether such non-material revisions are acceptable.

(a) _____ None.

(b) Respondent proposes the following changes to the following identified documents:

_____

_____

_____

_____

_____

FORM 17

COST PROPOSAL FORM
(continued)

_____

_____

_____
[attach additional sheets as necessary]

5. *End of Term Fair Market Value Purchase Option; Early Termination Purchase Price.*

(a) General. The Respondent is requested (but not required) to provide Early Termination Purchase Price at the end of the 10 year period and Purchase Option Price of the Renewable Energy Power Generation System upon expiration of the 15 year term of the PPA or Lease. If such Prices are accepted by PVSC, which acceptance shall be at PVSC's sole discretion, such Prices will form the basis of PVSC's Early Termination Purchase Price and/or Purchase Option Price for the Renewable Energy Power Generation System under the PPA or Lease.. Importantly, PVSC reserves the right to reject any proposed Early Termination Purchase Price and/or Purchase Option Price.

(b) Respondent shall identify either a dollar amount or the word "Formula" in (i) for the Renewable Energy Projects Purchase, or check the box in (ii) below. In the event that a formula is proposed, please provide a complete description and explanation in (c) below.

(i) Provide a Chart listing a dollar amount or "Formula" for the Renewable Energy Projects Purchase. The amount can be stated as a fixed dollar amount, or represented by a formula.

(ii) No estimate provided Check here _____

(c) Explanation:

_____
_____
_____
_____

FORM 17

COST PROPOSAL FORM
(continued)

[RESPONDENT]

_____ _____
Signature of Authorized Agent Type or Print Name

Title:_____ Date:_____

FORM 18
BID BOND

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, _____ as Principal; and _____ Surety, are hereby held and firmly bound unto the Passaic Valley Sewerage Commission in the penal sum of **$1,000.00** for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 20___.

The condition of the above obligation is such that whereas the Principal has submitted to the Passaic Valley Sewerage Commission a certain Bid, attached hereto, and hereby made a part hereof, to enter into a contract in writing, for:

CONSTRUCTION OF A RENEWABLE ENERGY POWER GENERATION FACILITY

NOW THEREFORE,

A. If said Bid shall be rejected, or, in the alternate,

B. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and shall in all other respects perform the agreement created by the acceptance of said Bid.

   Then, this obligation shall be void, otherwise the same shall remain in force, and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of time within which the Principal may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have set their hands and seals, and such of them as are corporations having caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal:	_____	Surety:	_____
	Print Name		Print Name
By:	_____	By:	_____
	Authorized Signature		Authorized Signature
	_____		_____
	Print Name		Print Name
Title:	_____	Title:	_____
Seal:	_____	Seal:	_____

FORM 19

SURETY COMPANY CERTIFICATE

(To Accompany Proposal)

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the sum of $1.00, lawful money of the United States, the receipt whereof is hereby acknowledged, paid the undersigned corporation, and for other valuable consideration, the _____
_____(Name of Surety Company)
corporation organized and existing under the laws of the State of _____ and licensed to do business in the State of New Jersey, certifies and agrees, that if Contract for a Renewable Energy Power Generation System is awarded to _____
(Name of Respondent)
undersigned corporation will execute the Bond or Bonds as required by the Contract Documents and will become surety in the full amount of the Contract price for the faithful performance of the contract and for payment of all persons supplying labor or furnishing materials in connection thencewith.

_____
(Surety)

(To be accompanied by the usual proof of authority of officers of surety company to execute the same.)

FORM 20
FEDERAL NON-DEBARMENT CERTIFICATION

As used herein, "Affiliate" means any entity that (1) directly, indirectly, or constructively controls another entity, (2) is directly, indirectly, or constructively controlled by another entity, or (3) is subject to the control of a common entity. An entity controls another entity if it owns, directly or individually, more than 50% of the ownership interest in that entity.

This certification shall be completed, certified to, and submitted to the <Owner> prior to contract award.

PART I: BIDDER INFORMATION	
Individual or Organization Name ("Bidder")	
Address of Bidder	
DUNS Code (if applicable)	
CAGE Code (if applicable)	

PART II – Identification of Affiliates: Individual or Entity Owning Greater than 50 Percent of Bidder ("Parent Organization")	
Section A (Check the Box that applies)	
☐	Below is the name and address of the interestholder(s) owning, directly, indirectly or constructively, as the case may be, a greater than 50 percent interest in the Bidder.
Name of Individual or Organization	
Address	
OR	
☐	No interestholder(s) owns, directly, indirectly or constructively, a greater than 50 percent interest in the Bidder.

Part III – Identification of Affiliates: Bidder-Controlled Entities ("Child Entities")		
Section A		
☐	Below is the name and address of the entities in which the **Bidder listed in Part I** owns, directly, indirectly or constructively, as the case may be, a greater than 50 percent interest.	
Name		**Address**
Add additional sheets if necessary		
OR		
☐	The **Bidder listed above in Part I** does not own, directly, indirectly or constructively, a greater than 50 percent interest in any other entity.	

[CONTINUED NEXT PAGE]

Part IV – Identification of Affiliates: **Entities under Common Control with Bidder ("Sister Entities")**		
Section A		
☐	Below is the name and address of all entities, **other than the Bidder listed in Part I and the Bidder-Controlled Entities listed in Part III,** of which the **Parent Organization listed in Part II** owns, directly, indirectly or constructively, as the case may be, a greater than 50 percent interest.	
Name		**Address**
Add additional sheets if necessary		
OR		
☐	The **Parent Organization listed in Part II** does not own, directly, indirectly or constructively, greater than 50 percent interest in any entity other than the **Bidder listed in Part I and the Bidder-Controlled Entities listed in Part III**.	

PART V – CERTIFICATION OF NON-DEBARMENT			
I hereby certify that the **individual or organization listed above in Part I** (i.e. the "Bidder") is not debarred by the federal government from contracting with a federal agency, **nor are any of its "Affiliates", as defined above and identified herein in Parts II, III, and IV, so debarred**. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the **<*Owner*>** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by **<*Owner*>** to notify the **<*Owner*>** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the **<*Owner*>**, permitting the **<*Owner*>** to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

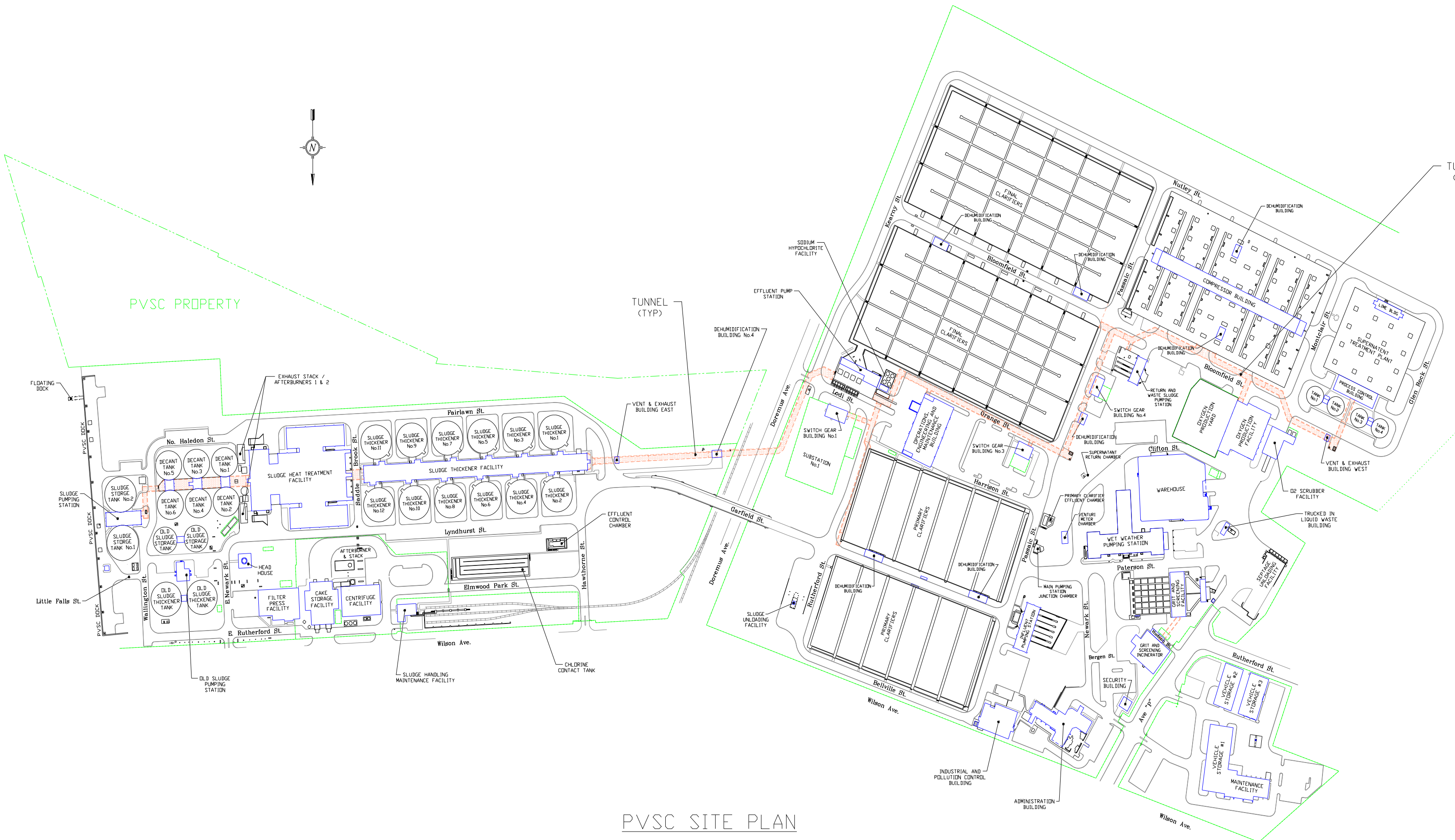
4832-4187-2854, v. 1

INDEX OF APPENDICES

DUE TO THE SIZE OF THE FOLLOWING DOCUMENTS, THEY ARE ACCESSIBLE AND CAN BE DOWNLOADED AT THE FOLLOWING WEB ADDRESS:

https://pvsc.sharefile.com/d-s697df79564ec4b9685dc55bbbdbcabff

Appendix A - PVSC Site Plan



PVSC SITE PLAN

200 0 200

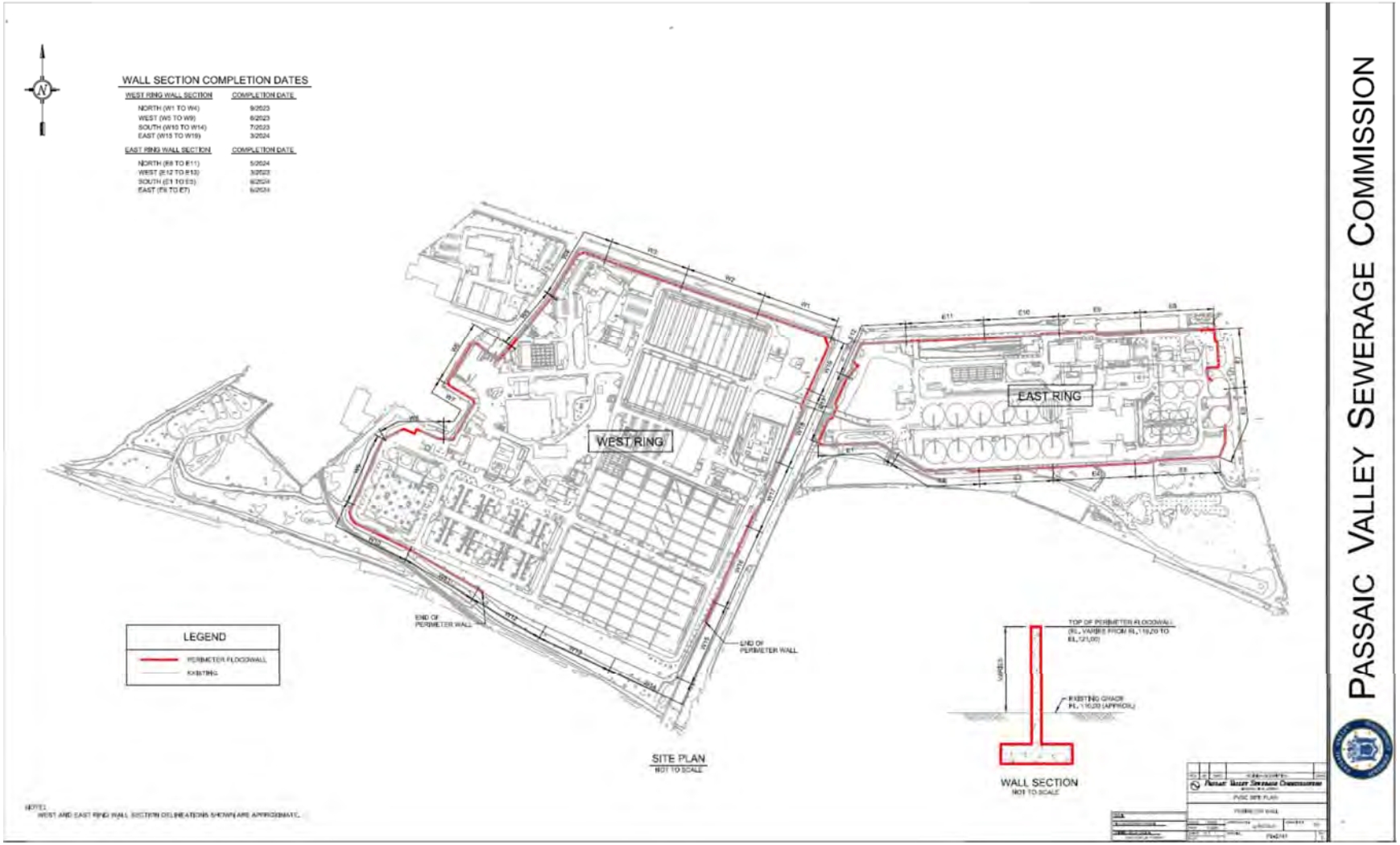
SCALE 1"= 200'

PASSAIC VALLEY SEWERAGE COMMISSION (PVSC)
Plant Boundary & Surrounding
Newark, New Jersey

PLANT BOUNDARY (MINUS WITCO)

0 200 400 800 1,200 US Feet
1" = 400'

Appendix B – Floodwall Information



Appendix C - Existing Roof Information

Facility Name	Approx. Sq. Ft.	Type	2021 Roof Age	Warranty Expires
Administration Building	12,545	Modified Bitumen/Metal Standing Seam	12	2039
Switchgear Building 1	2,553	Four ply modified bitumen	23	Expired
Vehicle Maintenance Building #1	20,340	4 Ply Built-up Roof	20	2021
Vehicle Storage Building #2	8,450	Pre Fab Metal	30	n/a
Vehicle Storage Building #3	8,450	Pre Fab Metal	22	n/a
Operations, Engineering, Mtc Building	19,670	Four ply modified bitumen	22	Expired
Warehouse	42,300	Modified Bitumen	19	Expired
Wet Weather Pumping Station	22,550	Four ply modified bitumen	24	Expired
Influent Pump Station	6,300	Four ply modified bitumen	23	Expired
Return Waste Sludge Pump Station	3,400	Four Ply Built-up	19	Expired
Oxygen Compressor Building	23,100	Four Ply Modified Bitumen	19	Expired
Oxygen Production	18,055	Four Ply Built-up	19	Expired
Oxygen Production Scrubber Building	5,320	Prefab Metal	27	n/a
Sludge Thickeners	15,744	Ballasted Single Ply EPDM-Penthouses, Modified Bitumen Addition	16	Expired
Centrifuge Dewatering	12,000	Standing Seam Metal Roof	30	n/a
Sludge Cake Storage	10,706	Ballasted Single Ply EPDM	30	Expired
Sludge Heat Treatment	21,000	Concrete Deck& Mod. Bitumen West Section	32	n/a
Filter Press	12,480	Fully Adhered Single Ply EPDM	25	Expired
Industrial & Pollution Control Building	10,400	Four Ply Modified Bitumen	24	Expired

Appendix D - PVSC Annual Electricity Usage By Facility

Description	Estimated Kw-Hr Usage
Administration Building	1,445,621
Security Building	140,276
Warehouse	99,362
Vehichle Mtc Buildings	492,914
Operation, Engineering, Mtc Building	1,494,327
Solids Handling Maintenance Bldg	19,483
Final Clarifiers	1,092,983
Effluent Pumping Station	16,367,464
Sodium Hypochloride Facility	1,205,983
Wet Weather Pump Station	1,872,293
Grit & Screenings Facility	1,891,776
Influent Pumping Station	14,162,016
Primary Tanks	2,417,810
Return Waste Sludge	5,197,999
Oxygenation Compressor Building	34,731,910
Supernatant Treatment	896,207
Oxygen Production	44,972,047
Sludge Thickeners	4,391,413
Sludge Storage & Pumping	755,931
Sludge Decant Tanks Facility	566,948
Centrifuge Dewatering Facility	1,073,500
Sludge Cake Storage	2,523,017
Regenerative Afterburner	3,236,086
Sludge Heat Treatment	50,386,305
Filter Press	2,365,207
Employee Services Building	140,276
Industrial & Polution Control Buidling	693,586
Total	**194,827,564**

Appendix E - Form of Power Purchase Agreement between the Successful Respondent and PVSC

FORM OF

POWER PURCHASE AGREEMENT

BETWEEN

[THE SUCCESSFUL RESPONDENT]

AND

PASSAIC VALLEY SEWERAGE COMMISSION

DATED AS OF _____, 2022

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

TABLE OF CONTENTS

INDEX OF EXHIBITS

POWER PURCHASE AGREEMENT

THIS POWER PURCHASE AGREEMENT ("***PPA***" or "***Agreement***") is made and entered into as of the last date referenced on the signature page below (the "***Effective Date***"), by and between [the Successful Respondent], a _____ Corporation, with offices at _____ ("***Seller***"), and the Passaic Valley Sewerage Commission (***"the PVSC"*** or "***Buyer***"). Seller and Buyer are sometimes hereinafter referred to individually as a Party and collectively as the Parties.

RECITALS

WHEREAS, the PVSC has determined to implement an energy savings program that will reduce the PVSC's electricity costs as well as its carbon footprint through the purchasing of electricity to be supplied by a Renewable Energy Power Generation System (collectively the "***REPGS***") to be constructed at the various sites owned by the PVSC or at locations owned or controlled by the Seller but approximate to the PVSC property (the "***Premises***");

WHEREAS, on _____, 2022, the PVSC issued a Request for Proposals for a Renewable Energy Power Generation System;

WHEREAS, the RFP required the Successful Respondent to finance, install, own, operate, and maintain a Renewable Energy Power Generation System as identified in **Exhibit A**.

WHEREAS, the RFP required the Seller to deliver and sell to the PVSC all of the electricity generated by the REPGS;

WHEREAS, on _____, 2022, Seller responded to the RFP under which Seller agreed to finance, install, own, operate, and maintain the REPGS based on the terms and conditions required by the RFP ("***Seller's Response to the RFP***");

WHEREAS, after reviewing the Proposals submitted by all vendors, on _____, 2022, the PVSC approved the Seller's Response to the RFP as is set forth in PVSC Resolution No. _____ dated _____2022 determining that [the Successful Respondent] was the most responsive, responsible Respondent and authorizing the award of this PPA to Seller.

AGREEMENT

In consideration of the foregoing recitals, the mutual agreements, representations, warranties and covenants set forth in this PPA and the Schedules and Exhibits hereto, the representations in Seller's Response to the RFP, and for other good and valuable consideration, the receipt of which is hereby acknowledged, Seller and Buyer agree as follows:

ARTICLE 1.
DEFINED TERMS; RULES OF INTERPRETATION

1.1 **Defined Terms**. Capitalized terms used in this PPA shall have the meanings ascribed to them in the Schedule of Definitions and Rules of Interpretation attached hereto as **Exhibit B** and made a part of this PPA by this reference, or elsewhere in this PPA.

1.2 **Rules of Interpretation**. The rules of interpretation in the Schedule of Definitions and Rules of Interpretation shall apply to this PPA unless expressly provided otherwise.

1.3 **REPGS and Component Parts**. Buyer and Seller recognize that the REPGS will be comprised of Component Parts. Buyer and Seller may agree to substitute or omit Component Parts only by mutual agreement in a signed writing.

1.4 **Survival of RFP and Contract Documents**. This PPA is intended to memorialize the award of the RFP, effectuate the intent of the RFP and clarify the RFP through the elaboration of specific requirements in the RFP. It is understood that the terms of this PPA as set forth herein are intended to be consistent with the terms of the RFP and the requirements of the RFP are incorporated into this PPA by reference. The terms of the RFP shall survive the execution and delivery of this PPA; *provided*, *however*, that more specific provisions set forth in the PPA shall govern less specific provisions of the RFP. At the time of the execution of the PPA, Seller agrees that it will execute and deliver to the Buyer the Restoration Bond, Surety Disclosure Statements and Certifications, and any other documents required by the RFP.

ARTICLE 2.
TERM

2.1 **Term**.

(a) The Initial Term of this PPA (the "***Initial Term***") shall commence on the Effective Date and shall be in end at 00:00 hours Eastern Prevailing Time on the Fifteenth (15^{th}) anniversary of the Commercial Operation Date of the last Component Part that is installed pursuant to this PPA.

(b) At the conclusion of the Initial Term, Buyer shall be offered an option to purchase the REPGS, in accordance with the provisions of ARTICLE 16 of this PPA or to enter into, subject to any requirements of the public contracting laws, an agreement extending its rights and obligations pursuant to this PPA for an additional

term (an "***Extension Term***") with notification of its intent at least six (6) months prior to the end of the Initial Term.

(c) Except as otherwise provided herein, Seller shall, within ninety (90) Business Days following the end of the Initial Term for each Component Part, at Seller's sole cost and expense, remove the Component Part(s) from the Premises and restore the Premises to their original condition, normal wear and tear excluded. Seller and its agents, consultants, and representatives shall have access at all reasonable times to the Premises and the Component Parts for purposes of such removal.

2.2 **Test Energy**. If one or more Component Parts generates Energy prior to Seller's notice of the Commercial Operation Date for that Component Part, Seller shall make that Energy available to the respective Buyer and that Buyer shall have the option to buy the Energy that is available and delivered at a rate equal less than or equal to the Energy Payment Rate under the RFP award per kilowatt hour. Buyer's purchase of Energy prior to the Commercial Operation Date for a Component Part shall not otherwise affect the Energy Payment Rate to which Buyer is entitled.

2.3 **Conditions Precedent**. The respective rights and obligations of the Parties under this PPA (other than those contained in ARTICLE 11 (Events of Default; Remedies), ARTICLE 14 (Representations and Warranties: Buyer Acknowledgement), ARTICLE 15 (Indemnity; Limitations), ARTICLE 17 (Confidentiality), ARTICLE 18 (Notices), ARTICLE 19 (Assignment; Binding Effect), and ARTICLE 21 (Miscellaneous), which are binding upon the Parties as of the Effective Date) are conditioned, subject to Section 2.4, upon the satisfaction in full (or waiver) of the following:

(a) Unless excused under this Agreement, within ninety (90) days of the Effective Date of the PPA, Seller shall have obtained any and all Approvals required for the commencement of construction of the Component Parts. Subject to the notice and cure provisions of this PPA, Seller's failure to make reasonable and diligent attempts to obtain all required Approvals shall constitute a default under this PPA.

2.4 **Failure to Satisfy Component Specific Conditions Precedent**. A failure of a condition precedent with respect to one Component Part of the REPGS shall not affect or diminish Buyer's or Seller's rights and obligations as to other Component Parts of the REPGS. For example, failure to obtain all Approvals for a Component Part(s) will not relieve the Parties of their obligations as to other Component Parts.

2.5 **Notice of Commercial Operation**. Subject to the remaining provisions of this PPA, Seller shall notify and represent to the Buyer when each Component Part has achieved Commercial Operation (the "***Notice of Commercial Operation***"), and shall in such notice certify to Buyer the Commercial Operation Date.

2.6 **Survival**. Effective as of any termination of this PPA, the Parties will no longer be bound by the terms and conditions of this PPA, except (i) to the extent necessary to enforce any rights and obligations of the Parties, including payment obligations, arising under this PPA prior to termination of this PPA, (ii) as provided in ARTICLE 15, and (iii) that the obligations of the

Parties under this PPA with respect to indemnification (but only with respect to claims for indemnification based upon events or circumstances (a) occurring or arising on or before the termination of this PPA, or (b) relating to the removal of the REPGS from the Premises by Seller after the termination of the PPA) will survive the termination of this PPA and will continue for a period of two (2) years following any termination of this PPA.

ARTICLE 3.
PURCHASE AND SALE; DELIVERY

3.1 **Purchase and Sale of Energy Output**. Commencing on the Commercial Operation Date with respect to each Component Part that has achieved Commercial Operation, and continuing throughout the remainder of the Term, Seller shall make available to Buyer, and Buyer shall take delivery of, at the Receiving Point, all of the Energy produced by the REPGS.

3.2 **Price for Energy Output**. Buyer shall pay Seller for the Energy, as metered at the Seller Installed Metering Device at the applicable Energy Payment Rate.

3.3 **Energy Payment Rate**.

(a) Initial Term. For the first Contract Year in which a Component Part delivers power to a Buyer, the Buyer shall pay for Energy delivered to the Receiving Point from that Component Part at a rate (the "***Energy Payment Rate***") equal to _____ cents ($00.__) per kilowatt hour. On the _____ anniversary of the commencement of a Component Part's Contract Year, and each _____ anniversary thereafter during the Initial Term, the Energy Payment Rate for a Buyer in effect for the prior Contract Year shall be increased by the Energy Payment Rate Increase Factor of _____ percent (__%).

(b) Adjustments to Energy Payment Rate. In all cases, any adjustments in the Energy Payment Rate shall be made to the nearest thousandth of a cent.

3.4 **Title and Risk of Loss of Energy Output**. Title to and risk of loss of the Energy will pass from Seller to Buyer at the Receiving Point. As between the Parties, Seller shall be deemed to be in exclusive control of all Energy prior to the Receiving Point, and Buyer shall be deemed to be in exclusive control of all Energy at and from the Receiving Point. Seller warrants that it will deliver the Energy to Buyer at the Receiving Point free and clear of all liens, security interests, claims, and other encumbrances.

3.5 **Guaranteed Minimum Energy Output Requirement.**

(a) **Exhibit C** sets forth the Guaranteed Minimum Energy Output Requirement for the REPGS. The Guaranteed Minimum Energy Output will equal at least 90% of the Expected Performance Output. The Seller shall provide annually to Buyer Energy in an amount at least equal to the Minimum Energy Output Requirement. If the Seller fails to provide to Buyer the Minimum Energy Output Requirement, the Seller shall issue a credit to the Buyer in the amount equal to the PVSC's "Reduced Savings" measured as the difference between the amount paid by the Buyer to the local electric distribution utility for delivered electricity (i.e., the "Utility Rate") and

the amount the Buyer would have paid to Seller, based on the Energy Payment Rate, had Seller satisfied the Minimum Energy Output Requirement. In the event of a System Loss as referred to in Article 10, Seller shall be relieved of its obligation to satisfy the Minimum Energy Output Requirement, provided the Seller complies with its REPGS Loss obligations set forth in Article 10.

(b) Satisfaction of the applicable Minimum Energy Output Requirements shall be judged on the basis of the total output of the REPGS at the end of each Contract Year period throughout the term of the PPA as set forth below. The Minimum Energy Output Requirements shall be measured based on the total actual Energy output for the REPGS for each Contract Year period. If the actual Energy output equals or exceeds the total Minimum Energy Output Requirements for the REPGS, the Minimum Energy Output Requirements shall be deemed satisfied. No later than sixty (60) days after the end of each Contract Year Period in which the Seller's Energy output performance is measured, the Seller shall submit to the Buyer a statement stating whether the total Minimum Energy Output Requirements for the period was satisfied based upon the measurement method set forth in this section of the PPA and, if not satisfied, stating any deficiency.

(c) If Seller fails to meet the Minimum Energy Output Requirements, Seller will pay the Buyer an amount equal to the PVSC's Reduced Savings (as described above and in the RFP) within sixty (60) days of the date the deficiency is established. If the Seller does not submit payment as required by this Section 3.5(c), Buyer may offset the amount owed for Reduced Savings against any amounts owed by Buyer to Seller.

3.6 **Component Part Relocation.** If the Buyer determines that it no longer requires electricity consumption at one of the sites in which a Component Part has been installed, in order to avoid a default under the PPA, the Buyer may require the Seller to relocate the Component Part to another Buyer designated property. The Buyer, however, shall be required to pay the Seller all reasonable costs incurred by the Seller to remove the Component Part, restore the property to its prior condition, and to reinstall the Component Part at another location. The Buyer's obligation to purchase power during the time period in which relocation occurs is not affected by this relocation provision.

3.7 **Temporary Removal of REPGS.** The Seller shall be required, at its own cost, to temporarily move or remove the REPGS's components when required for roof repair, equipment repair or parking lot repair during the term of the Agreement. The Buyer will make a good faith effort to minimize temporary removals and shall complete all repairs requiring a temporary removal as promptly as reasonably possible. A temporary removal of the REPGS's components shall not exceed fifteen (15) calendar days. The Buyer will provide the Seller with at least three weeks' notice in the case of scheduled work and as much notice as possible in the event of an emergency. The Seller will not be required to remove the same sections of the Component Parts more than once. If temporary removal is required for a portion of the Component Parts that was removed previously by the Seller, the Buyer shall pay the costs of temporary removal. The percentage of the REPGS subject to temporary removal shall not exceed 5% of the REPGS size at any one time. Moreover, no more than the total of 20% of the REPGS shall be subject to temporary removal during the term of the PPA. During the period of temporary removal, the

Buyer shall be required to pay kWh charges for at least 90% of the REPGS design capacity output provided the REPGS would produce 90% of its REPGS capacity design had the temporary removal not occurred. During the period of temporary removal, the Seller's minimum output requirement will be reduced by the lost output attributable to the temporary removal.

ARTICLE 4.
SITE SUITABILITY CONFIRMATION

4.1 **Familiarity with the Premises.** The Seller acknowledges that the Seller's agents and representatives have visited, inspected and are familiar with the Premises and their condition relevant to the obligations of the Seller pursuant to this Agreement, that the Seller is familiar with all reasonably known local and other conditions which may be material to the Seller's performance of its obligations under this Agreement, and has received and reviewed all information regarding the Premises made available by the PVSC during the RFP process, and based on the foregoing, the Premises constitute acceptable and suitable host sites for the installation and operation of the REPGS in accordance herewith, and the based upon the information provided by the PVSC and Seller's visual inspection of the Premises, the REPGS can be constructed, started up and successfully tested on the Premises by the Commercial Operation Date in accordance with the requirements of this Agreement. Familiarity with premises extends to proposals for off site design in that interconnection to the PVSC on-site electrical system is required.

ARTICLE 6.
CONSTRUCTION, MAINTENANCE AND MONITORING

6.1 **Construction, Maintenance, and Monitoring of REPGS by Seller**.

(a) Seller shall, at its sole cost and expense, (i) construct the REPGS in Component Parts as described in **Exhibit A**, in accordance with the specifications identified in Section 4 of the RFP and the Construction Schedule set forth in Seller's Response to the RFP (the "***Construction Schedule***"), and in a manner reasonably required in order to assure that the REPGS will perform as specified, (ii) maintain the REPGS in good condition and repair so as to produce Energy in amounts sufficient to fulfill its obligations under this PPA, and satisfy applicable requirements of the insurance policies maintained by Seller with respect to the REPGS, and the terms of this PPA and the RFP, and (iii) monitor the REPGS performance so that any REPGS malfunction causing a loss of Energy will be discovered and rectified. Buyer hereby consents to the construction, in accordance with the requirements and specifications of the RFP, of each Component Part, including, without limitation, solar panels, mounting substrates or supports, wiring and connections, power inverters, service equipment, metering equipment and utility interconnections, on the Premises and on the property of Buyer adjacent and contiguous to the Premises.

(b) In the event that the Commercial Operation Date for any Component Part is delayed beyond the Commercial Operation Date set forth in the Construction Schedule for that Component Part, Seller shall take any actions necessary, at the cost and expense of Seller, to remedy that delay. If

a Component Part does not achieve Commercial Operation within thirty (30) days of the Commercial Operation Date set forth in the Construction Schedule, and a Force Majeure event has not occurred, Seller shall pay to the Buyer **"Daily Construction Delay Lost Savings"** for each day after thirty (30) days after Commercial Operation Date set forth in the Construction Schedule until the Commercial Operation Date. Daily Construction Delay Lost Savings shall be calculated based on the difference between the Energy Payment Rate and the Utility Rate multiplied by 90% of the daily system design capacity output for each Component Part that has not achieved Commercial Operation within thirty (30) days of the Commercial Operation Date set forth in the Construction Schedule.

(c) If, as of the date which is one-hundred and twenty (120) days beyond the scheduled Commercial Operation Date for any Component Part, as such date may be extended due to a Force Majeure, the Commercial Operation Date has not occurred, an Event of Default by the Seller will be deemed to have occurred under Section 11.1 hereof with respect to that Component Part, and the Buyer shall have the right to terminate this Agreement with respect to that Component Part upon written notice to Seller.

(d) Seller shall, at its sole cost and expense, maintain the REPGS in good working order and repair and in a clean and orderly condition, shall conduct the required periodic maintenance of the REPGS consistent with the REPGS Operations and Maintenance Manual described in ARTICLE 8 hereof, shall maintain a spare parts inventory and shall maintain the REPGS in accordance with good industry standards, reasonable wear and tear excepted and in keeping with the surrounding operations of the Buyer. Seller shall provide or make provisions for all labor, materials and equipment which are necessary for the normal operation and maintenance of the REPGS for commercial purposes. Seller shall at its sole cost and expense be responsible for providing major maintenance and major repairs and replacements for machinery, equipment, and improvements constituting part of the REPGS during the Term of this Agreement. Buyer shall not be financially responsible for any such major maintenance, repair or replacement. The PVSC and any designated representative shall have the right to conduct inspections of the REPGS at its sole expense and risk at any time during normal business hours in order to assure that the REPGS is being properly installed, operated and maintained in accordance with this Agreement. Operation and maintenance of the REPGS is the responsibility of the Seller. Seller shall maintain a suitable inventory of spare parts to maintain the REPGS. Equipment requiring replacement and/or repair will be corrected at the cost of the Seller for the term of the Agreement.

(e) Seller shall be responsible for all repairs, replacement and alterations in and to the Premises and the REPGS, the need for which arises out of (i) Seller's use or occupancy of the Premises, (ii) the installation, removal, use or operation of the REPGS, (iii) the moving of equipment into or out of the Premises, or (iv) the act, omission, misuse or negligence of the Seller, its agents, contractors, employees or invitees.

(f) If Seller fails to comply with its maintenance and repair obligations pursuant to this Agreement, the Buyer shall give Seller notice in writing to do such maintenance and repair activities as are reasonably required under this Agreement. If within thirty (30) days thereafter, Seller fails to commence and diligently attempt to complete the requested activities, then, in addition to its other remedies under this Agreement, the Buyer shall have the right to have such

work performed and expend such funds at the expense of Seller as are reasonably required to perform such work. Any amount so expended by the Buyer shall be paid promptly by the Seller upon the Buyer's submittal of the work invoices to Seller. If the Buyer has not received such reimbursement within thirty (30) days of the date of sending such invoices to Seller, then the Buyer may deduct the cost thereof against any future payment due Seller.

(g) Seller and its sub-contractors, agents, consultants, and representatives shall have reasonable access at reasonable times (including under emergency conditions) to the necessary portion of the Premises for the purpose of planning, construction, operation, inspection, maintenance, repair and removal of the REPGS, and to any documents, materials and records of Buyer relating to the Premises that Seller reasonably requests in conjunction with these activities. Seller's access for construction shall include access to repair or replace roofing material. To the extent space is reasonably available at the Premises, Buyer shall make such space available for the temporary storage and staging of tools, materials and equipment and for the parking of construction crew vehicles and temporary construction trailers and facilities reasonably necessary during the installation work, removal work and access for rigging and material handling. To the extent space is reasonably available at the Premises, Buyer shall provide Seller a reasonable area for construction laydown. Prior to the commencement of any construction activity, Seller shall meet with Buyer to develop a logistical plan and schedule setting forth the times and locations that Seller may conduct construction activities.

(h) Seller shall provide Buyer reasonable notice of all activities to be conducted by or on behalf of Seller on the Premises. During any such activities, Seller, and its sub-contractors, agents, consultants, and representatives shall comply with Buyer's reasonable safety procedures, security procedures and policies regarding visitors/vendors access to the Premises, and Seller and its sub-contractors, agents, consultants and representatives shall conduct such activities in such a manner and at such a time and day as to cause minimum interference with Buyer's activities. Buyer shall comply with Seller's safety and security practices, policies and requirements applicable to the Premises. Seller shall obtain permission to access the Premises from an administrator at the Premises in accordance with the rules applicable to visitors/contractors on the Premises. The rights of access conferred pursuant to this PPA shall not be construed to confer a leasehold on the Seller.

(i) The capacity of the Component Parts as listed on **Exhibit A** is based on a design prepared by the Seller in response to the information provided in the RFP. Prior to the installation of a Component Part, Seller shall submit to the Buyer a final design drawing of the layout of the Component Part and the final capacity of the Component Part. Buyer will review and approve or reject the final design drawings submitted to it within fifteen (15) Business Days of submission to Buyer. If the Buyer rejects the final design drawings the Buyer shall set forth in detail the reasons for its rejection. The Seller shall then submit revised drawings that address the Buyer's reasonable bases for rejection. If the final design of a Component Part(s) results in less capacity than in **Exhibit A** due to structural limitations, site specific design or layout requirements that could not have been reasonably known at the time of the submission of Seller's Response to the RFP, factors that could adversely affect the integrity of the Premises, or factors that could adversely affect the Buyer's use of the Premises, the Minimum Energy Output Requirement for Component Part(s) set forth in **Exhibit C** shall be deemed modified to reflect the approved final

design of the Component Part(s). Thus, the Minimum Energy Output Requirement for each Component Part shall be based on the capacity of the Component Part as set forth in the final design as modified by Seller based upon the review and comments of Buyer as provided in this Section 6.1(i).

6.2 **Non-interference**. Except as set forth in Section 6.1(f) Buyer shall have no right to perform any non-emergency related maintenance or repair on the REPGS without Seller's prior written consent.

6.3 **Roof Repair, Replacement and Warranty.** The REPGS should be designed to minimize the number of roof penetrations for installation. All roof penetrations shall be conducted by a certified, experienced roofing contractor that is qualified to work on public works projects. For Component Parts to be installed on the Premises for which there is an existing roof warranty, the Seller shall, prior to the installation of this Component Part, make a good faith effort to obtain written confirmation from the roof warrantor that the installation of the Component Part will not void or impair the warranty. If the roof warrantor advises the Seller that the installation of the Component Part will void or impair the roof warranty, the Seller shall notify the Buyer. The Seller shall be responsible to repair all roof damages caused or related to the installation or operation of the REPGS. For Component Parts to be installed on the Premises for which the expected roof life expectancy is less than 15 years, Seller shall be responsible for replacing all roofs at Seller's expense.

6.4 **Buyer's Maintenance**. Subject to Section 6.1, Buyer shall maintain the Premises in and around the REPGS in a reasonable manner consistent with Buyer's current and past practices and Buyer shall be obligated to maintain the Premises so that the condition of the Premises does not unreasonably interfere with the efficient operation of the REPGS. Seller agrees to take reasonable measures to minimize interference with Buyer's use of the Premises.

6.5 **Telemetry**. Upon Buyer's request, Seller shall provide an internet address that will permit the Buyer to access real-time data or telemetry with respect to performance of each Component Part's performance through means that may reasonably be incorporated into an educational curricula. In accordance with the requirements of the RFP, Seller shall provide equipment that displays the amount of electricity generated by the Component Part(s).

6.6 **Engagement of PVSC Project Manager.** Seller shall fully cooperate with any PVSC Project Manager (i.e., the PVSC designated engineer(s) or representative(s)) in connection with the administration of this Agreement. In the performance of such services, Seller agrees that the PVSC Project Manager(s) (and/or an engineering consultant designated by the PVSC) may, without limiting other possible services to the PVSC: review and monitor construction progress; review drawings, plans and specifications; review and advise the PVSC with respect to material changes to the REPGS during the Term of this Agreement; and provide certifications and perform such other duties as may be specifically conferred upon the PVSC Project Manager hereunder.

6.7 **Personnel Performance.** Seller shall employ or engage all necessary personnel to perform all services required under this Agreement. Seller shall enforce discipline and good order at all

times among Seller's employees and all Subcontractors. All persons engaged by Seller in connection with this Agreement shall have requisite skills for the tasks assigned. Seller shall employ or engage and compensate engineers and other consultants to perform all engineering and other services required under this Agreement. All firms and personnel performing services under this Agreement, including Subcontractor firms and personnel, shall meet the licensing and certification requirements imposed by applicable law, including laws applicable to public works contracts.

6.8 **Monthly On-Site Meetings and Progress Reports.** During the construction period the Seller shall conduct management meetings on a monthly basis with designated PVSC representatives. At such meetings, discussions will be held concerning relevant aspects of the design and construction work including the construction schedule. A monthly progress report (the **"Monthly Progress Report"**), containing all relevant information as agreed to by the parties, shall be prepared by Seller and provided to the PVSC and the PVSC Project Manager at least five (5) days prior to each monthly meeting.

ARTICLE 7.
METERING

7.1 **Metering Equipment**. The Parties acknowledge and agree that Seller shall provide, install, own, operate and maintain the Seller Installed Metering Device for each Component Part.

7.2 **Measurements**. Readings of the Seller Installed Metering Device shall be conclusive as to the amount of energy output; *provided*, *however*, that if the Seller Installed Metering Device is out of service, is discovered to be inaccurate pursuant to Section 7.3, or registers inaccurately, measurement of Energy to the Receiving Point shall be determined in the following sequence: (a) by estimating by reference to quantities measured during periods of similar conditions when Seller Installed Metering Device was registering accurately; or (b) if no reliable information exists as to the period of time during which such Seller Installed Metering Device was registering inaccurately, it shall be assumed for correction purposes hereunder that the period of such inaccuracy for the purposes of the correction under Section 7.3 was equal to (i) if the period of inaccuracy can be determined, the actual period during which inaccurate measurements were made; or (ii) if the period of inaccuracy cannot be determined, one-half of the period from the date of the last previous test of such Seller Installed Metering Device through the date of the adjustments; *provided*, *however*, that, in the case of clause (ii), the period covered by the correction under Section 7.3 shall not exceed six (6) months.

7.3 **Testing and Correction**.

(a) Each Party and its consultants and representatives shall have the right to witness each test conducted to verify the accuracy of the measurements and recordings of the Seller Installed Metering Device. Seller shall provide at least twenty (20) Business Days prior written notice to Buyer of the date upon which any such test is to occur. Seller shall prepare a written report setting forth the results of each such test, and shall provide Buyer with copies of such written report not later than thirty (30) Business Days after completion of such test. Seller shall conduct

annual testing of the Seller Installed Metering Devices and the Seller shall bear the cost of the annual testing and the preparation of the Seller Installed Metering Device test reports.

(b) The following steps shall be taken to resolve any disputes regarding the accuracy of the Seller Installed Metering Device:

(i) If either Party disputes the accuracy or condition of the Seller Installed Metering Device, such Party shall so advise the other Party in writing.

(ii) Seller shall, within fifteen (15) Business Days after receiving such notice from Buyer or Buyer shall, within such time after having received such notice from Seller, advise the other Party in writing as to its position concerning the accuracy of such Seller Installed Metering Device and state reasons for taking such position.

(iii)If the Parties are unable to resolve the dispute through reasonable negotiations, then either Party may request the Meter to be tested under the supervision of a third party.
(iv)If the Seller Installed Metering Device is found to be inaccurate by not more than 2%, any previous recordings of the Seller Installed Metering Device shall be adjusted in accordance with Section 7.2(b)(i) and, if Buyer requested the test, Buyer shall bear the cost of inspection and testing of the Seller Installed Metering Device.

(v) If the Seller Installed Metering Device is found to be inaccurate by more than 2% or if such Seller Installed Metering Device is for any reason out of service or fails to register, then (A) Seller shall promptly cause any Seller Installed Metering Device found to be inaccurate to be adjusted to correct, to the extent practicable, such inaccuracy, (B) the Parties shall estimate the correct amounts of Energy delivered during the periods affected by such inaccuracy, service outage or failure to register as provided in Section 7.2, and (C) Seller shall bear the cost of inspection and testing of the Seller Installed Metering Device. If as a result of such adjustment the quantity of energy output for any period is decreased, Seller shall reimburse Buyer for the amount paid by Buyer in consideration for the decrease, and shall bear the cost of inspection and testing of the Seller Installed Metering Device. If as a result of such adjustment the quantity of Energy output for any period is increased, Buyer shall pay for the increase at the Energy Payment Rate applicable during the applicable Contract Year.

7.4 **Invoicing Pending Metering Disputes**. The pendency of a metering dispute shall not relieve the Buyer of paying invoices when due while the metering dispute is being addressed. To the extent Buyer may prevail in a metering dispute, Buyer's relief shall be a credit or offset against billing upon final disposition of the dispute, unless any such credit or offset cannot be realized because of the termination of the PPA.

ARTICLE 8.
OPERATIONS AND MAINTENANCE MANUAL AND TRAINING

8.1 **Operations and Maintenance Manual and Training.**

(a) **REPGS Operations and Maintenance Manual.** For each Component Part Seller shall provide to the Buyer three copies of an REPGS Operations and Maintenance Manual in hard cover binders and three electronic copies on Flash Drives at least 30 days prior to the Commercial Operation Date of the first Component Part to achieve commercial operation. Seller shall review and discuss in good faith with the PVSC any aspect of the final REPGS Operations and Maintenance Manual. The content of the REPGS Operations and Maintenance Manual shall be consistent with the terms and provisions of this Agreement, shall be sufficiently detailed to permit the REPGS to be operated and maintained by a third party reasonably experienced in REPGS operations and shall include at a minimum: (i) a complete set of all approved submittals including shop drawings and product literature; (ii) as built roof plans showing the final placement of all panels, combiner boxes, connections and conduit placement; (iii) as built electrical plans, including three line diagrams, and elevation drawings showing the final placement of the electrical equipment; (iv) cleaning instructions for the PV panels; (v) copies of all start-up procedure measurements; (vi) copies of all testing data and reports; (vii) troubleshooting guidelines; (viii) system maintenance schedule and procedures; and (ix) contact information for technical assistance and parts ordering. The PVSC may not require any change to the REPGS Operations and Maintenance Manual but may provide Seller with comments and suggestions with respect thereto. Notwithstanding any such review and approval by and discussion with the PVSC, the preparation and timely updating of the REPGS Operations and Maintenance Manual shall remain the responsibility of Seller. Neither the review of or comment upon, nor the failure of the PVSC or the PVSC Project Manager to comment upon the REPGS Operations and Maintenance Manual shall relieve Seller of any of its responsibilities under this Agreement or be deemed to constitute a representation by the PVSC or the PVSC Project Manager that operating the REPGS pursuant to the REPGS Operations and Maintenance Manual will cause the REPGS to be in compliance with this Agreement or pertinent provisions of Applicable Law, or impose any liability upon the PVSC or the PVSC Project Manager. Seller shall bear all costs and expenses of performing the duties and responsibilities set forth in the REPGS Operations and Maintenance Manual. Seller shall keep the REPGS Operations and Maintenance Manual current and supply the PVSC with one unbound copy of any updates, supplements or revisions thereto.

(b) **Training Manual.** Seller shall provide the Buyer with three (3) copies of a training manual for operation and maintenance of the each Component Part that will include procedures to follow in the event of emergency.

(c) **Training Classes**. In addition, Seller shall conduct six (6) onsite training classes, each class to be two (2) hours in length and to accommodate up to (20) attendees. The PVSC will provide appropriate classroom space.

ARTICLE 9.
SAFETY AND EMERGENCY PLANNING

9.1 **Safety.** Seller shall prepare a safety plan which shall be maintained in accordance with this Section (the "***Safety Plan***"). The Safety Plan shall be delivered to the PVSC at least 30 days prior to the Commercial Operation Date of the first Component Part to achieve commercial operation. Seller shall maintain the safety of the REPGS at a level consistent with Applicable

Law, the Insurance Requirements, and industry standards. Without limiting the foregoing, Seller shall at its sole cost and expense:

(a) take all reasonable precautions for the safety of, and provide all reasonable protection to prevent damage, injury or loss by reason of or related to the operation of the REPGS to (1) all employees working and persons working at the locations where the Component Parts are installed, (2) all visitors to the REPGS, (3) all machinery, materials, equipment and structures, and (4) other property located at the Component Part locations including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities;

(b) establish and enforce all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards and promulgating safety regulations;

(c) comply with all Applicable Laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction relating to the safety of persons or property or their protection from damage, injury or loss;

(d) designate a qualified and responsible employee whose duty shall be the supervision of plant safety, the prevention of fires and accidents and the coordination of such activities as shall be necessary with federal, State, county and local officials;

(e) operate all equipment in a manner consistent with the manufacturer's safety recommendations; and

(f) make suitable plans to respond to emergencies which may occur within the parameters of the REPGS, including fires or explosions.

9.2 **Emergencies.**

(a) **Emergency Response Plan.** Seller shall prepare an emergency response plan. The plan shall be maintained in accordance with this Section, and shall: (1) provide for appropriate notifications to the Buyer and all other Governmental Bodies having jurisdiction and for measures which facilitate coordinated emergency response actions by the Buyer and all such other appropriate Governmental Bodies; (2) specifically include response measures; and (3) assure the timely availability of all personnel required to respond to any emergency (no later than three hours during nights, weekends or holidays). The Emergency Response Plan shall be provided to the PVSC at least 30 days prior to the Commercial Operation Date of the first Component Part to achieve commercial operation. The emergency response plan shall be reviewed by the parties annually as part of the review of the annual operations and maintenance report, and updated when necessary.

(b) **Emergency Action.** Notwithstanding any requirement of this Agreement requiring the Buyer's approval or consent to reports or submittals, if at any time Seller determines in good faith that an emergency situation exists such that action must be taken to protect the safety of the public or its employees, to protect the safety or integrity of the REPGS or the Component Parts, or to mitigate the immediate consequences of an emergency event, then Seller shall immediately

(within three hours from receiving notification of the emergency event) take all such action it deems in good faith to be reasonable and appropriate under the circumstances. As promptly thereafter as is reasonable, Seller shall notify Buyer of the event at an emergency phone number from a list supplied by Buyer, and Seller's response thereto. The cost of Seller's response measures shall be borne by Seller.

ARTICLE 10.
LOSS, DAMAGE OR DESTRUCTION OF REPGS; INSURANCE; FORCE MAJEURE

10.1 **REPGS Loss**.

(a) Seller shall bear the risk of any REPGS Loss, excluding, however, any REPGS Loss caused in total or partially by the negligence or intentional misconduct of Buyer or Buyer's agents or representatives (collectively, "***Buyer's Misconduct***").

(b) In the event of any REPGS Loss that, in the reasonable judgment of Seller, results in less than total damage, destruction or loss of the REPGS or Component Parts thereof, this PPA will remain in full force and effect and Seller will, at Seller's sole cost and expense, subject to Section 10.1(c) below, repair or replace the REPGS as quickly as practicable.

(c) To the extent that any REPGS Loss that, in the reasonable judgment of Seller, results in less than total damage, destruction or loss of the REPGS or Component Parts thereof and is caused by Buyer's Misconduct, Buyer shall promptly upon demand therefore from Seller pay any and all costs and expenses of such repair or replacement less any insurance proceeds received by Seller intended to recompense Seller for the damage, destruction or loss caused by Buyer's Misconduct. Seller agrees to file insurance claims in the event of damage, destruction or loss to the REPGS.

(d) In the event of any REPGS Loss that, in the reasonable judgment of Seller, results in total damage, destruction or loss of the REPGS or Component Parts thereof, Seller shall, within twenty (20) Business Days following the occurrence of such REPGS Loss, notify Buyer whether Seller is willing, notwithstanding such REPGS Loss, to repair or replace the REPGS or Component Parts thereof.

(i) In the event that Seller notifies Buyer that Seller is not willing to repair or replace the REPGS or any Component Part thereof, this PPA will terminate automatically with respect to the Component Part(s) so damaged or destroyed and Seller shall promptly remove the applicable Component Part(s) from the Premises in accordance with Sections 2.1(c) and 16.7 hereof. If the REPGS Loss is caused by the negligence or misconduct of Seller or Seller's agents or representatives, Seller shall be deemed to be in default of the PPA and the Buyer may, subject to the limitations set forth in Section 15.2, pursue all remedies available at law, including the recovery of damages and the recovery of attorney's fees. If the REPGS Loss is caused by Buyer's Misconduct, as to the affected Component Part(s), Buyer shall be deemed to be in default of the PPA and the Seller may pursue all remedies available at law, including the recovery of damages and the recovery of attorney's fees.

(ii) In the event that Seller notifies Buyer that Seller is willing to repair or replace the REPGS or Component Part(s) thereof so damaged or destroyed, the following shall occur: (A) this PPA will remain in full force and effect, and (B) Seller will repair or replace the REPGS or Component Part(s) thereof as quickly as practicable and, in addition, if such REPGS Loss has been caused, in total or partially, by Buyer's Misconduct, then Buyer shall promptly upon demand therefore from Seller pay any and all costs and expenses of such repair or replacement.

10.2 **Insurance Requirements.** The Seller shall secure and maintain in force for the term of the Agreement liability insurance as provided herein. The Successful Respondent shall provide the PVSC with current certificates of insurance for all coverages and renewals thereof, naming the PVSC, its officers, and employees, The State of New Jersey and its venues, employees and officers as an Additional Insured and shall contain the provision that the insurance provided in the certificate shall not be canceled for any reason except after sixty (60) days written notice to the PVSC. The certificate of insurance must be accompanied by the actual General Liability Endorsement conferring Additional Insured status.
The insurance to be provided by the Seller shall be as follows:

(a) $5,000,000 Each Occurrence Bodily Injury and Property Damage; $5,000,000 Personal Injury and a $5,000,000 General Aggregate General Liability Limit with a requirement that:

(i) the Aggregate per location/Aggregate per Project Endorsement is a part of the policy,

(ii) Broad Form Property Damage and Blanket Broad Form Contractual Liability Coverage is included.

(b) Workers Compensation-Statutory-applicable to the laws of New Jersey

(c) $5,000,000 Umbrella Excess Liability - Umbrella Excess Liability Coverage limit excess the:

(i) General Liability

(ii) Automobile Liability

(iii)Workers Compensation Section B- Employers Liability Limits of

7. $2,000,000 Each Accident
8. $2,000,000 By Disease each employee
9. $2,000,000 By Disease aggregate limit

(d) Insurance coverage to replace the REPGS in the event of a system loss

(e) Coverage should be at least as broad as the primary coverage and should include the same Additional Insured wording as the primary General Liability.

(f) The above required Comprehensive General Liability Insurance policy or its equivalent shall name each the PVSC, its officers, and employees, The State of New Jersey and its venues,

employees and officers as Additional Insureds. The coverage to be provided under these policies shall be at least as broad as that provided by the standard basic, unamended, and unendorsed Comprehensive General Liability Insurance occurrence coverage forms or its equivalent currently in use in the State of New Jersey, which shall not be circumscribed by any endorsement limiting the breadth of coverage.

(g) Certificate(s) of Insurance shall be filed with the PVSC Agent's Purchasing Office upon award of contract by the PVSC.

10.3 **Performance Excused by Force Majeure**. To the extent either Party is prevented by Force Majeure from carrying out, in whole or part, its obligations under this PPA and such Party (the "***Claiming Party***") gives notice and details of the Force Majeure event to the other Party as soon as practicable, this PPA will remain in effect, but the Claiming Party will be excused from the performance of its obligations under this PPA for the affected Component Part(s) for a period equal to the disabling Force Majeure circumstances, together with a period of time reasonably required to remedy any damage caused by such circumstances. The Party affected by Force Majeure will use reasonable efforts to eliminate or avoid the Force Majeure and resume performing its obligations; *provided*, *however*, that neither Party is required to settle any strikes, lockouts or similar disputes except on terms acceptable to such Party, in its sole discretion. The non-Claiming Party will not be required to perform or resume performance of its obligations to the Claiming Party corresponding to the obligations of the Claiming Party excused by Force Majeure.

10.4 **Termination Due to Force Majeure**. If a Claiming Party justifiably claims Force Majeure for a consecutive period of twelve (12) calendar months or longer, the Parties may terminate this PPA for the affected Component Part(s), in whole or in part, without any liability to the Claiming Party as a result of such termination.

ARTICLE 11.
EVENTS OF DEFAULT; REMEDIES

11.1 **Events of Default**. An Event of Default means, with respect to a Party (a "***Defaulting Party***"), the occurrence of any of the following:

(a) the failure to make, when due, any payment required under this PPA if such failure is not remedied within twenty (20) Business Days after receipt of written notice from the party claiming the failure and stating that the failure constitutes a default (a "***Non-Defaulting Party***");

(b) any representation or warranty made by such Party in this PPA is false or misleading in any material respect when made or when deemed made or repeated;

(c) the failure to perform any material covenant or obligation set forth in this PPA (except to the extent constituting a separate Event of Default), if such failure is not remedied, if capable of being remedied, within thirty (30) Business Days after receipt of written notice from the Non-Defaulting Party; *provided*, *however*, that, if (i) such failure is reasonably susceptible of being

remedied within ninety (90) days after the receipt of such notice, and (ii) the Defaulting Party presents to the Non-Defaulting Party a plan the Non-Defaulting Party reasonably believes will cure such failure within one hundred eighty (180) days, and the Defaulting Party is diligently proceeding to cure such failure in accordance with such plan, then the period for cure shall be extended for such period, not to exceed one hundred eighty (180) days, as may be necessary to cure such failure;

(d) such Party becomes Bankrupt;

(e) (i) such Party fails to provide or maintain in full force and effect any required insurance, if such failure is not remedied within twenty (20) Business Days after receipt of written notice from the Non-Defaulting Party to the Defaulting Party, or (ii) the occurrence of a default by the insurer of such Party under any insurance policy provided hereunder, if such failure is not remedied within twenty (20) Business Days after the insurer's default; or

(f) such Party consolidates or amalgamates with, or merges with or into, or transfers all or substantially all of its assets to, another entity, and the resulting, surviving or transferee entity fails to assume, effective immediately upon the effectiveness of such consolidation, amalgamation, merger or transfer, each and all of the obligations of such Party under this PPA.

11.2 **Remedies for Default.** The parties agree that, except as otherwise provided herein, and subject to the limitations set forth in Section 15.2, in an Event of Default the Non-Defaulting Party shall have the right to take any action, including termination, and seek any remedy at law or in equity to enforce the payment of any damages or the performance of such other obligation hereunder. Seller acknowledges that the PVSC may enforce this PPA by an action for specific performance of Seller's obligations hereunder to design, permit, construct, test, operate and maintain the REPGS on the terms and conditions provided herein. Neither party shall have the right to terminate this Agreement for cause except after an Event of Default determined in accordance with the provisions of this ARTICLE 11 shall have occurred and be continuing.

11.3 **Closeout Setoffs**. The Non-Defaulting Party will be entitled, at its option and in its discretion, to set off, against any amounts due and owing from the other Party under this PPA, any amounts due and owing from the Defaulting Party under this PPA.

11.4 **Unpaid Obligations**. The Non-Defaulting Party shall be under no obligation to prioritize the order with respect to which it exercises any one or more rights and remedies available under this PPA or at law. Notwithstanding anything to the contrary herein, the Defaulting Party shall in all events remain liable to the Non-Defaulting Party for any amount payable by the Defaulting Party in respect of any of its obligations remaining outstanding after any such exercise of rights or remedies.

11.5 **Remedies Cumulative**. The rights and remedies contained in this Article 11 are cumulative with the other rights and remedies available under this PPA or at law or in equity.

11.6 **No Waiver in Event of Default**. Pursuit of any remedy for an Event of Default by any Party shall not constitute a forfeiture or waiver of any amount due by the defaulting Party or of

any damages occurring by reason of the violation of any terms, provisions or conditions of this PPA. No waiver of any Event of Default or breach of this PPA shall be deemed or construed to constitute a waiver of any other violation or breach of any of the terms, provisions, or conditions of this PPA. Forbearance to enforce one or more of the remedies available upon the occurrence of an Event of Default shall not constitute a waiver of that or any subsequent Event of Default or breach.

ARTICLE 12.
INVOICING AND PAYMENT

12.1 **Invoicing**. Seller is responsible for invoicing the Energy produced by each Component Part to the Buyer. At the time the Buyer receives notice from Seller of the Commercial Operation Date for a Component Part, Buyer shall identify the appropriate person and office to which such invoices should be directed for that Component Part. Notice of any change in such person or office shall be provided to Seller, notification being solely the responsibility of the Buyer, in accordance with the Notice provisions of ARTICLE 18 herein. All payments made and amounts referenced hereunder are and will be in U.S. dollars.

12.2 **Payment.** Payment for invoices under this PPA will be due and payable not later than sixty (60) days after receipt of the applicable invoice.

12.3 **Disputed Amounts**. A Party may in good faith dispute the correctness of any invoice (or any adjustment to any invoice) under this PPA at any time within three (3) months following the date the invoice (or invoice adjustment) was rendered. In the event that either Party disputes any invoice or invoice adjustment, such Party will nonetheless be required to pay the full amount of the applicable invoice or invoice adjustment (except any portions thereof that are manifestly inaccurate or are not reasonably supported by documentation, payment of which amounts may be withheld subject to adjustment as hereinafter set forth) on the applicable payment due date, except as expressly provided otherwise elsewhere in this PPA, and to give notice of the objection to the other Party. Any required payment or credit will be made within five (5) Business Days after resolution of the applicable dispute.

12.4 **Netting and Setoff**. The Parties may net any and all mutual debts and payment obligations that are due and owing under this PPA. Accordingly and subject to Section 12.3, all amounts owed by each Party to the other Party under this PPA, including any related damages and any applicable interest, payments or credits, may be netted such that only the excess amount remaining due will be paid by the Party that owes it. Each Party shall have the right to set off any undisputed amount due and owing to such Party from the other Party under this PPA against any undisputed amount due and owing from such Party to the other Party under this PPA.

12.5 **Records and Audits**. Each Party will keep, for a period not less than three (3) years after the expiration or termination of any Transaction, records sufficient to permit verification of the accuracy of billing statements, invoices, charges, computations and payments for such Transaction. During such period each Party may, at its sole cost and expense, and upon reasonable notice to the other Party, examine the other Party's records pertaining to Transactions during such other Party's normal business hours.

ARTICLE 13.
RESTORATION BOND

13.1 **Restoration Bond:** On or prior to the date of the execution of this PPA, Seller shall provide the PVSC with a restoration bond in a form acceptable to the PVSC from a surety authorized to do business in the State of New Jersey in the amount of $1,500,000.00 to secure Seller's obligations to restore the Premises to its prior condition if the Seller defaults prior to the completion of construction of the REPGS. In the event the Seller defaults prior to the completion of the construction of the REPGS and the Commercial Operation date, the Seller may call the bond in order to remove the REPGS and restore the Premises to its condition prior to the commencement of construction. The bond shall remain in place until Seller achieves the Commercial Operation Date of the last Component Part.

ARTICLE 14.
REPRESENTATIONS AND WARRANTIES; USER ACKNOWLEDGEMENT

14.1 **Representations and Warranties of Seller and Buyer**. Seller and Buyer represent and warrant to the other Party that: (a) the execution, delivery and performance of this PPA are within its powers, have been duly authorized by all necessary action and do not violate any of the terms and conditions in its governing documents or any contracts to which it is a party; (b) this PPA and each other document executed and delivered in accordance with this PPA constitutes its legally valid and binding obligation enforceable against it in accordance with its terms, subject to any bankruptcy, insolvency, reorganization and other Laws affecting creditors' rights generally, and with regard to equitable remedies, the discretion of the applicable court; (c) it is acting for its own account, and has made its own independent decision to enter into this PPA, and is not relying upon the advice or recommendations of the other Party in so doing; (d) it is capable of assessing the merits of and understanding, and understands and accepts, the terms, conditions and risks of this PPA; and (e) it understands that the other Party is not acting as a fiduciary for or an advisor to it or its Affiliates.

14.2 **Additional Warranties of Seller.**

(a) **Generally.** Seller warrants that the structures, improvements, fixtures, machinery, equipment and materials incorporated in the REPGS will be new, of good quality, and in conformity in all material respects with the requirements of the RFP. Seller shall obtain from all subcontractors, vendors. suppliers and other persons from which the Seller procures structures, improvements, fixtures, machinery, equipment and materials such warranties and guarantees as are consistent with industry standard engineering and construction practice in general and with respect to solar energy projects.

(b) **Special Warranty.** In accordance with the requirements of the RFP, Seller shall provide a written warranty, executed by a qualified manufacturer agreeing to repair or replace PV equipment and system components that fail in materials or workmanship within a specified

warranty period. Each PV module included in the REPGS shall be covered by a power warranty that guarantees module power will be within ten percent (10%) of original power for the first ten (10) years of operation and will be within twenty percent (20%) of original power for the following fifteen (15) years of operation. Regardless of manufacturers' warranties, Seller is responsible for the maintenance and operation of the REPGS during the term of the Agreement and, as such, shall be responsible for equipment repair and replacement as needed to maintain the operation of the REPGS so as to meet its obligations under the Agreement.

14.3 **Practicability of Performance.** The technology and the construction practices to be employed in the design and construction of the REPGS is furnished exclusively by Seller and its subcontractors pursuant to the terms of this Agreement, and Seller assumes and shall have exclusive responsibility for their efficacy. Seller assumes the risk of the practicability and possibility of performance of the REPGS Work on the scale, within the time for completion, and in the manner required hereunder, even though such performance may involve technological or market breakthroughs or overcoming facts, events or circumstances (other than Force Majeure) that may be different from those assumed by Seller in entering into this Agreement. No impracticability or impossibility of any of the foregoing, in and of itself, shall be deemed to constitute a Force Majeure.

14.4 **Patents and Licenses.** Seller owns, or is expressly authorized to use under patent rights, licenses, franchises, trademarks or copyrights, the technology necessary for the REPGS Work without any known material conflict with the rights of others.

14.5 **Buyer's Acknowledgement Regarding Inapplicability of Bankruptcy Code Section 366**. Buyer acknowledges and agrees that, for purposes of this PPA, Seller is not a "utility" as such term is used in Section 366 of the United States Bankruptcy Code (the Bankruptcy Code) and Buyer agrees to waive and not to assert the applicability of the provisions of Section 366 in any bankruptcy proceeding wherein Buyer is debtor.

ARTICLE 15.
INDEMNITY; LIMITATIONS

15.1 **Indemnity**. To the fullest extent permitted by law, each Party (the "***Indemnitor***") hereby indemnifies and agrees to defend and hold harmless the other Party and its representatives, agents, professionals and engineers (the "***Indemnified Parties***") from and against any and all Indemnity Claims, whether or not involving a third-party claim, caused by, resulting from, relating to or arising out of any breach of this PPA by the Indemnitor or any of its Representatives, or any negligence or intentional misconduct on the part of the Indemnitor or any of its Representatives; *provided*, *however*, that the Indemnitor will not have any obligation to indemnify the Indemnified Parties from or against any Indemnity Claims to the extent caused by, resulting from, relating to or arising out of the negligence or intentional misconduct of the Indemnified Parties.

15.2 **Limitation of Remedies, Liability and Damages**. If no remedy or measure of damages is expressly provided herein, the obligor's liability will be limited to direct actual damages only

and/or specific performance, and such direct actual damages and/or specific performance will be the sole and exclusive remedy. Without prejudice to the calculation of the Daily Construction Delay Lost Savings, neither Party will be liable for consequential, incidental, punitive, special exemplary or indirect damages, lost profits or other business interruption damages, by statute, in tort or under contract under any indemnity provision or otherwise; *provided*, *however*, that notwithstanding the foregoing, in no event will the foregoing limitations of liability be applied to limit the extent of the liability of either Party to the other for intentional misconduct or with respect to any third party Indemnity Claims.

ARTICLE 16.
REPGS PURCHASE OPTION

16.1 **Grant of Purchase Option**. For and in consideration of the payments made by Buyer under this PPA, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged by the Parties, Seller hereby grants Buyer the right and option to purchase all of Seller's right, title and interest in and to all of the REPGS Assets, on the terms set forth in this PPA (the "***Purchase Option***"). The Purchase Option shall be irrevocable by Seller and may be exercised by Buyer during the Exercise Period following a final determination related to a valuation performed pursuant to the procedure set forth herein.

16.2 **Purchase Price.** The purchase price shall be set at the Fair Market Value of the REPGS in the aggregate.

16.3 **Fair Market Value.** The Fair Market Value of the REPGS shall be determined by the mutual agreement of the Buyer and Seller within thirty (30) days of the Buyer's notice of interest in purchasing the REPGS or any of the Component Parts thereof at Fair Market Value. If the parties cannot agree upon the Fair Market Value, then the Buyer shall select, subject to Seller's consent, which consent shall not be unreasonably withheld or delayed, a nationally recognized Independent Appraiser with experience and expertise in the solar photovoltaic industry to value the REPGS. Such appraiser shall determine the Fair Market Value and shall set forth such determination in a written opinion delivered to the Buyer and Seller. The valuation made by the appraiser shall be binding on the Buyer and Seller in the absence of fraud or manifest error. The costs of the appraisal shall be borne by the Parties equally. If the Parties cannot agree upon an appraiser, they shall request the American Arbitration Association to select an appraiser. The fees, if any, of the American Arbitration Association, shall be shared equally by the Parties. After the Fair Market Value has been determined by the appraiser, the Buyer shall have thirty (30) days to advise the Seller whether it intends to purchase the REPGS. If Buyer determines it will not purchase the REPGS and the parties do not agree to an extension of the PPA, at the expiration of the PPA, the Seller shall remove the REPGS and shall restore the property to its prior condition, subject to reasonable wear and tear.

16.4 **Exercise Period**. Buyer may exercise the Purchase Option for all of the REPGS Assets by giving Seller notice thereof not less than one hundred twenty (120) days prior to the expiration of the Term (the ***"Exercise Period")*** for the applicable Component Part.

16.5 **Exercise of Purchase Option.** Buyer may exercise its option to purchase the REPGS, from Seller following the notice required by Section 16.4 by tendering payment of the Purchase Price. Promptly following receipt of Buyer's notice pursuant to Section 16.4, Seller shall make the REPGS Assets, including records relating to the operations, maintenance, and warranty repairs, available to Buyer for its inspection during normal business hours.

16.6 **Terms of REPGS Purchase**. Upon exercise of the Purchase Option, on the Transfer Date: (a) Seller shall surrender and transfer to Buyer all of Seller's right, title, and interest in and to all REPGS Assets, which shall be fully operational, and shall retain all liabilities arising from or related to the REPGS Assets, prior to the Transfer Date; (b) title to the system shall pass to the Buyer free and clear of any liens and encumbrances; (c) the remaining period on all third party warranties for the REPGS or Component Parts shall be transferred to the Buyer; (d) the Buyer shall acquire all rights and interests in renewable energy credits, or other environmental attribute benefits that are generated by the system after the Transfer Date; (e) Buyer shall pay the Purchase Price to Seller by bank draft or wire transfer and shall assume all liabilities arising from or related to the REPGS Assets, from and after the Transfer Date; and (f) both Parties shall (i) execute and deliver a bill of sale and assignment of contract rights containing such representations, warranties, covenants and other terms and conditions as are usual and customary for a sale of assets similar to the REPGS, together with such other conveyance and transaction documents as are reasonably required to fully transfer and vest title to the REPGS Assets, in Buyer, and (ii) deliver ancillary documents, including releases, rights to leasehold, resolutions, certificates, third person consents and approvals and such similar documents as may be reasonably necessary to complete the sale of the REPGS Assets, to Buyer.

16.7 **Disposition of REPGS at Expiration of Term.**

(a) **Removal and Restoration.** The Parties hereby agree that the REPGS shall remain the personal property of Seller notwithstanding the method or mode of installation or attachment to real property. Seller shall have an obligation within three (3) months after the expiration or termination of this Agreement to remove the equipment and personal property constituting the REPGS (unless purchased by the PVSC pursuant to Section 16.6 hereof) and is hereby granted such rights of use and access as may be necessary to complete such removal.

(b) **Surface Restoration.** Upon expiration or termination of this Agreement, Seller shall restore the Premises to their condition at the execution of the Agreement, or if improved during the Term, to the condition when such improvement was made, normal wear and tear excepted at no additional costs to the PVSC.

16.8 **No Adjustment of Amounts or Obligations on Account of Change in Federal or State Income Tax Law Affecting Ownership.** Except as set forth otherwise in this Agreement, there shall be no adjustment of any obligation of Seller hereunder on account of (a) any change in any provision of federal or State income tax law pertaining to the ownership of the REPGS made or to take effect after the Effective Date which affects Seller (including, without limitation, provisions thereof allowing tax credits or deductions and establishing income tax rates), notwithstanding any assumptions made by Seller in entering into this Agreement as to the provisions of federal or State income tax law which would be applicable to this transaction or

their effect on Seller or its Affiliates; (b) any administrative or judicial determination that is adverse to Seller as to ownership of the REPGS for federal or State income tax purposes for any reason, including without limitation any term or provision of this Agreement; or (c) any inability of Seller or any of its Affiliates, or any other person, to fully utilize any benefits of ownership of the REPGS or tax credits under the Internal Revenue Code which may be available under federal or State income tax law.

16.9 **Copyright and Patent Obligations.** Seller shall pay all royalties and license fees that may be required for the methodology, techniques, and other intellectual property, in connection with operating the REPGS.

ARTICLE 17.
CONFIDENTIALITY

17.1 **Confidentiality.** Neither party will use any Confidential Information for any purpose except such Party's performance under this PPA. Furthermore, neither Party will disclose any Confidential Information to any third party (other than (and then only for purposes permitted by this PPA) the Party's or the Party's Affiliates' officers, employees, lenders, counsel, accountants or advisors (collectively, Representatives) who have a need to know such information for the purposes permitted by this section and who have agreed to keep such terms confidential or are otherwise bound by confidentiality obligations at least as restrictive as those contained herein) except in order to comply with the requirements of any applicable Law, including the requirements of the New Jersey Open Public Records Act, or any exchange, control area or independent system operator rule, tariff or agreement or in connection with any judicial or regulatory proceeding or request by a Governmental Entity; provided, however, that each party will use reasonable efforts to prevent or limit any such disclosure. "***Confidential Information***" means any nonpublic confidential or proprietary information of a Party or its Affiliates or any of its or their Representatives relating to this PPA and the REPGS and revealed to the other Party or its Affiliates or any of its or their Representatives during the Term. The obligations of the Parties under this Article will survive for a period of two (2) years from and after the termination of the Transaction to which any Confidential Information relates.

ARTICLE 18.
NOTICES

18.1 **Notices**. All notices, requests, statements or payments will be made to the addresses and persons specified below. All notices, requests, statements or payments will be made in writing except where this PPA expressly provides that notice may be made orally. Notices required to be in writing will be delivered by hand delivery, overnight delivery, facsimile, or e-mail (so long as a copy of such e-mail notice is provided immediately thereafter in accordance with the requirements of this section by hand delivery, overnight delivery, or facsimile unless confirmation of successful transmission is received). Notice of facsimile will (where confirmation of successful transmission is received) be deemed to have been received on the day on which it was transmitted (unless transmitted after 5:00 pm at the place of receipt or on a day that is not a Business Day, in which case it will be deemed received on the next business day). Notice by hand delivery or overnight delivery will be deemed to have been received when

delivered. Notice by e-mail will be deemed to have been received when such e-mail is transmitted, so long as a copy of such e-mail notice is delivered immediately thereafter by hand delivery, overnight delivery or facsimile unless confirmation of successful transmission is received. When notice is permitted to be provided orally notice by telephone will be permitted and will be deemed to have been received at the time the call is received. A party may change its address by providing notice of the same in accordance with the provisions of this section.

Buyer:

Seller:

ARTICLE 19.
ASSIGNMENT; BINDING EFFECT

19.1 **Assignment; Binding Effect.**

(a) Buyer shall not, without the prior written consent of Seller, which consent will not be unreasonably withheld or delayed, assign, pledge or transfer all or any part of, or any right or obligation under, this PPA, whether voluntarily or by operation of law, and any such assignment or transfer without such consent will be null and void.

(b) Seller shall not, without the prior written consent of Buyer, which consent will not be unreasonably withheld or delayed, assign, pledge or transfer all or any part of, or any right or obligation under, this PPA. However, Seller may, on reasonable written notice to Buyer but without the prior written consent of Buyer, assign, pledge or transfer all or any part of, or any right or obligation under this PPA (i) to any Affiliate of Seller (but such assignment shall not release Seller from its liability hereunder unless consented to by Buyer), (ii) to any party that acquires some or all or substantially all of Seller's assets, or (iii) for security purposes in connection with any financing or other financial arrangements regarding the REPGS (each, a "***Permitted Transfer***"); *provided*, *however*, that assignee shall not be deemed to have assumed any of Seller's obligations under this PPA until such time as it notifies Buyer that it has exercised its rights to take control of the REPGS from Seller. Buyer agrees to execute such reasonable consents to assignment and other documents, and to provide such information, as is requested by Seller in connection with any Permitted Transfer.

(c) Subject to the foregoing restrictions on assignment, this PPA will inure to the benefit of and be binding upon the Parties and their respective successors and permitted assigns.

19.2 **Cooperation with Financing**. Buyer acknowledges that Seller may be financing the construction of the REPGS and Buyer agrees that it shall reasonably cooperate with Seller and its financing parties in connection with such financing for the REPGS, including the furnishing of such information and providing such opinions of counsel and other matters as Seller and its financing parties may reasonably request; *provided*, *however*, that the foregoing undertaking shall not obligate Buyer to materially change any rights or benefits, or materially increase any burdens, liabilities or obligations of Buyer, under this PPA (except for providing notices and additional cure periods to the financing parties with respect to Events of Default with respect to Seller as a financing party may reasonably request, accepting cure of a default by the financing party as though it were by Seller, executing estoppel certificates in a form reasonably satisfactory to Buyer, and agreeing to enter into an agreement with the financing party substantially similar to this PPA in the event the Seller is determined to be Bankrupt).

ARTICLE 20.
LEGAL REQUIREMENTS

20.1 **Prevailing Wages; Labor Standards.** The Seller and/or its subcontractors shall pay not less than the prevailing wage rate to workers employed in the performance of any contract for the project, in accordance with the rate determined by the Commissioner of the New Jersey Department of Labor and Workforce Development pursuant to N.J.S.A. 34:11-56.25 et seq. The rate schedules are incorporated herein.

(a) The Seller or its General Contractor/Subcontractor shall comply with the New Jersey Prevailing Wage Act requirements of N.J.S.A. 34:11-56.25 et seq. for all construction contracts for two thousand dollars ($2,000.00) or greater as set forth below.

(b) The Seller is required to comply with the Prevailing Wage Rates as applicable to all workmen performing activities under the terms of this Contract and shall submit Certification of Compliance with said Prevailing Wage Rates on the Respondent's Certification Form incorporated herein.

(c) The Seller shall post the Prevailing Wage Rates for each job classification listed by the New Jersey Department of Labor & Workforce Development, Division of Wage and Hour Compliance, in a prominent and easily accessible place at the site of the work performed, or at such places as are used to pay said Seller's workforce.

(d) If the Seller does not pay the itemized employee benefits to the workmen, as set forth in the Prevailing Wage Rate, it shall pay the value of said benefits directly to the employee on each pay day as part of wages.

(e) The Seller shall submit a Certified Payroll Record to the PVSC each payroll period within ten (10) days of the payment of wages. Said payroll certification shall be submitted on New Jersey Department of Labor and Workforce Form MW-30 or such other form as the Department shall require. The Seller may obtain a supply of said forms from the PVSC upon execution of the Agreement.

20.2 **Employment Requirements.** The following requirements shall apply to the PPA:

(a) The Seller and/or its general contractor/subcontractors, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, or sex. The Seller will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, sexual orientation, or sex. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other terms of compensation, and selection for training, including apprenticeship. The Seller agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this non-discrimination clause.

(b) The Seller and/or its general contractor/subcontractor(s), where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the Seller, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation or sex.

(c) The Seller or its general contractor/subcontractor(s), where applicable, agrees to comply with any regulations promulgated by the Treasury pursuant to N.J.S.A. 10:531, et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

(d) The Seller and/or its general contractor/subcontractor(s) agree to attempt in good faith to employ minority and female workers consistent with the applicable PVSC employment goals established in accordance with N.J.A.C. 17:27-5.2 or a binding determination of the applicable PVSC employment goals determined by the Division, pursuant to N.J.A.C. 17:27-5.2.

(e) The Seller and its subcontractor(s) shall furnish such reports or other documents to the Division of Contract Compliance & EEO as may be requested by the Division from time to time in order to carry out the purposes of these regulations, and shall furnish such information as may be requested by the Division of Contract Compliance & EEO for conducting a compliance investigation pursuant to Subchapter 10 of the Administrative Code at N.J.A.C. 17-27.

20.3 **Affirmative Action Requirements.**

(a) In addition to all Respondents complying with the requirements of P.L. 1975, c.127 (Affirmative Action Requirements) (N.J.A.C. 17:27), the Seller must submit to the PVSC within 20 days after execution of the Agreement by the PVSC any one of the following items:

(i) An existing federally approved or sanctioned affirmative action program, or

(ii) A certificate of Affirmative Action Employee Information Report approval, or

(iii)Affirmative Action Employee Information Report (AA302) secured from the Purchasing Agent, or

20.4 **Americans With Disabilities Act Of 1990.** The Seller agrees that Title 11 of the Americans With Disabilities Act of 1990 ("the Act") (42 U.S.C. §12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this Agreement. In providing any aid, benefit, or service on behalf of the PVSC pursuant to this Agreement, the Seller agrees that the performance shall be in strict compliance with the Act. In the event the Seller, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the Seller shall defend the PVSC in any action or administrative proceeding commenced pursuant to this Act. The Seller shall indemnify, protect, and save harmless the PVSC, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violations.

ARTICLE 21.
MISCELLANEOUS

21.1 **Governing Law**. This PPA will be governed by the Laws of the State of New Jersey, without giving effect to principles of conflicts of laws.

21.2 **Entire Agreement; Amendments**. This PPA (including the exhibits, any written schedules, supplements or amendments), the RFP and the Seller's Response to the RFP, constitute the entire agreement between the Parties, and shall supersede any prior oral or written agreements between the Parties, relating to the subject matter hereof. Except as otherwise expressly provided in this PPA, any amendment, modification or change to this PPA will be void unless in writing and executed by both Parties.

21.3 **Non-Waiver**. No failure or delay by either Party in exercising any right, power, privilege, or remedy hereunder will operate as a waiver thereof. No waiver by either party of a breach of any term or provision contained herein shall be effective unless in writing and signed by the waiving party. No consent by either party to or waiver of a breach by either Party, whether express or implied, shall be construed to operate as or constitute a consent to waiver of, or excuse of any other or subsequent or succeeding breach by either Party.

21.4 **Severability**. If any part, term, or provision of this PPA is determined by an arbitrator or court of competent jurisdiction to be invalid, illegal, or unenforceable, such determination shall not affect or impair the validity, legality or enforceability of any other part, term, or provision of this PPA, and shall not render this PPA unenforceable or invalid as a whole. Rather, the part of this PPA that is found invalid or unenforceable will be amended, changed, or interpreted to achieve as nearly as possible the same objectives and economic effect as the original provision, or replaced to the extent possible, with a legally enforceable, and valid provision that is as

similarly in tenor to the stricken provision, within the limits of Applicable Law, and the remainder of this PPA will remain in full force.

21.5 **No Third Party Beneficiaries**. Nothing in this PPA will provide any benefit to any third party or entitle any third party to any claim, cause of action, remedy or right of any kind.

21.6 **Relationships of Parties**. The Parties are independent entities, and will not be deemed to be partners, joint venturers or agents of each other for any purpose unless expressly stated otherwise herein.

21.7 **Counterparts**. This PPA may be executed in several counterparts, each of which is an original and all of which together constitute one and the same instrument. A signature on a copy of this PPA received by either Party by facsimile transmissions is binding upon the other Party as an original.

21.8 **Further Assurances**. The Parties shall at their own cost and expense do such further acts, perform such further actions, execute and deliver such further or additional documents and instruments as may be reasonably required or appropriate to consummate, evidence, or confirm the agreements and understandings contained herein and to carry out the intent and purposes of this PPA as permitted by law.

21.9 **General Interpretation**. The terms of this PPA have been agreed to by the Parties and the language used in this PPA shall be deemed to be the language chosen by the Parties to express their mutual intent. This PPA shall be construed without regard to any presumption or rule requiring construction against the Party causing such instrument of any portion thereof to be drafted, or in favor of the party receiving a particular benefit under the PPA. No rule of strict construction will be applied against any person.

ARTICLE 22.
DISPUTE RESOLUTION

22.1 **Process**. The parties agree that in the event any claim or dispute shall arise between them regarding this Contract, then the same shall be handled in accordance with the following procedures:

(a) **Stay of Litigation**. Neither Party shall commence litigation against the other without exhaustion of the procedures set forth in subparagraphs (b), and (c) hereof.

(b) **Negotiations**. The Parties shall first negotiate in good faith at the project manager level and at the executive officer level in an effort to resolve any claim or dispute.

(c) **Mediation.** In the event the project manager and executive officer negotiations fail to resolve any claim or dispute, then the Parties shall seek the assistance of an independent mediator. If the Parties are unable to agree on a mediator, they each shall choose a mediator and those two mediators shall select an independent mediator who shall assist the parties in resolving the matter(s) in dispute . Unless the Parties agree to the contrary, the mediator shall be a lawyer or

retired judge with experience in the mediation of construction contract disputes. The cost of the mediator's services shall be borne equally between the Parties. If mediation is unsuccessful, either Party may proceed to litigation.

(d) **Litigation.** Upon exhaustion of the foregoing procedures, all claims, disputes and other matters in question between parties in this Contract arising from or relating to this Agreement and/or the Contract Documents or the breach thereof shall be governed by and construed in accordance with the substantive laws of the State of New Jersey, without reference to New Jersey choice of law provisions. The parties to this Contract expressly consent to the jurisdiction of the Superior Court of the State New Jersey or, in the event of a matter pertaining solely to a federal cause of action, the United States District Court for the District of New Jersey. The parties to this Contract further agree that the exclusive venue for the resolution of any dispute relating to the subject matter of this agreement shall be the Superior Court of the State of New Jersey, Essex Vicinage, or, in the event of a matter pertaining solely to a federal cause of action, the United Stated District Court for the District of New Jersey, Newark, New Jersey..

ARTICLE 23.
BUSINESS REGISTRATION CERTIFICATE

23.1 **New Jersey Business Registration.** Seller shall comply with the requirements of the Business Registration Law, N.J.S.A. 52:32-44. Seller shall provide a copy of its business registration to PVSC upon execution of this Agreement.

The Seller shall provide written notice to its subcontractors and suppliers of the responsibility to submit proof of business registration to the Seller
A business organization that fails to provide a copy of a proof of business registration as required pursuant to the Business Registration Law, N.J.S.A. 52:32-44, or that provides false business registration information, shall be liable to a penalty of $25.00 for each day of violation, not to exceed $50,000.00 for each business registration not properly provided or maintained under a contract with a contracting agency.

ARTICLE 24.
PUBLIC LAW 2005, CHAPTER 51 & EXECUTIVE ORDER 117

24.1 **Requirements.** In order to safeguard the integrity of New Jersey State government procurement by imposing restrictions to insulate the award of State contracts from political contributions that pose the risk of improper influence, purchase of access, or the appearance thereof, Public Law 2005, c. 51, signed into law March 22, 2005 (hereinafter, "Chapter 51"), the Certification and Disclosure Form and the Statement of Ownership Form have been completed and executed and are attached hereto. The terms and conditions set forth in this Section are material terms. On September 24, 2008, Governor Jon S. Corzine issued Executive Order No. 117 ("E.O. 117"), which is designed to enhance New Jersey's efforts to protect the integrity of procurement decisions and increase the public's confidence in
government. The Executive Order builds upon the provisions of Chapter 51.

24.2 **Definitions.** For the purpose of this Agreement, the following shall be defined as follows:

(a) Contribution – Means a contribution reportable as a recipient under "The New Jersey Campaign Contributions and Expenditures Reporting Act." P.L. 1973, c. 83 (N.J.S.A. 19:44A-1, et seq.), and implementing regulations set forth at N.J.A.C. 19:25-7 and N.J.A.C. 19:25-10.1, et seq. Contributions in excess of $300 during a reporting period are deemed "reportable" under these laws as of January 1, 2005, for all contracts awarded in excess of $17,500.00 after October 15, 2006.

(b) Business Entity – Means any natural or legal person, business corporation, professional services corporation, limited liability company, partnership, limited partnership, business trust, association or any other legal commercial entity organized under the laws of New Jersey or any other state or foreign jurisdiction. It also includes (i) all principals who own or control more than 10 percent of the profits or assets of a business entity or 10 percent of the stock in the case of a business entity that is a corporation for profit, as appropriate; (ii) any subsidiaries directly or indirectly controlled by the business entity; (iii) any political organization organized under 26 U.S.C.A. 527 that is directly or indirectly controlled by the business entity, other than a candidate committee, election fund, or political party committee; and (iv) if a business entity is a natural person, that person's spouse or child, residing in the same household.

24.3 **Breach of Terms of Chapter 51 Deemed Breach of Contract**. It shall be a breach of the terms of this Agreement for the Business Entity to (i) make or solicit a contribution in violation of Chapter 51, (ii) knowingly conceal or misrepresent a contribution given or received; (iii) make or solicit contributions through intermediaries for the purpose of concealing or misrepresenting the source of the contribution; (iv) make or solicit any contribution on the condition or with the agreement that it will be contributed to a campaign committee or any candidate or holder of the public office of Governor, or to any State or county party committee; (v) engage or employ a lobbyist or consultant with the intent or understanding that such lobbyist or consultant would make or solicit any contribution, which if made or selected by the business entity itself, would subject that entity to the restrictions of Chapter 51; (vi) fund contributions made by third parties, including consultants, attorneys, family members, and employees; (vii) engage in any exchange of contributions to circumvent the intent of Chapter 51; or (viii) directly or indirectly through or by any other person or means, do any act which would subject that entity to the restrictions of Chapter 51.

24.4 **Continuing Disclosure.** The business entity is required, on a continuing basis, to report any contributions it makes during the term of this contract, and any extension(s) thereof, at the time any such contribution is made. A separate disclosure is required for each person or organization defined above as a business entity. Such disclosure shall be submitted to PVSC using the standard certification and disclosure form on the Department of Treasury, Division of Purchase and Property website: http://www.state.nj.us/treasury/purchase

24.5 **Seller's Obligations**. This Agreement is not intended to recite verbatim Seller's obligations under Chapter 51 (N.J.S.A. 19:44A-20.13 to -20.25). Questions regarding the interpretation or application of Public Law 2005, Chapter 51 may be directed to the New Jersey Department of Treasury, Division of Purchase and Property website: http://www.state.nj.us/treasury/purchase

IN WITNESS WHEREOF, PVSC and Seller, acting herein by their duly authorized representatives, have hereunto set their hands this day and year first above written.

Attest: PASSAIC VALLEY SEWERAGE COMMISSION

_____ By: _____
Matthew Murray Thomas Tucci, Jr
Clerk Chairman

Attest: SELLER

_____ By: _____

Title: _____

EXHIBIT A

RENEWABLE ENERGY POWER GENERATION SYSTEM COMPONENTS

(To Be Provided by Seller)

EXHIBIT B

SCHEDULE OF DEFINITIONS AND RULES OF INTERPRETATION

1. **Definitions**. The definitions provided below and elsewhere in this PPA will apply to the defined terms used in this PPA:

(a) "***Affiliate***" means with respect to any entity, such entity's general partner or manager, or any other entity that, directly or indirectly, through one or more intermediaries, controls or is controlled by, or is under common control with, such entity.

(b) ***"Agreement" or "PPA"*** means this Power Purchase Agreement dated as of _____, 2022 between the PVSC and the Seller, as the same may be amended or modified from time to time in accordance therewith.

(c) ***"Applicable Law"*** means any law, rule, regulation, requirement, guideline, action, determination or order of, or Governmental Approvals issued by, any Governmental Body having jurisdiction, applicable from time to time to the siting, permitting, design, acquisition, construction, equipping, financing, ownership, possession, shakedown, testing, operation or maintenance of the REPGS, the sale or purchase of REPGS Generated Electricity or the attribution therefrom or any other transaction or matter contemplated by this Agreement.

(d) "***Bankrupt***" means that a Party or other entity (as applicable): (i) is dissolved (other than pursuant to a consolidation, amalgamation or merger); (ii) becomes insolvent or is unable to pay its debts or fails (or admits in writing its inability) generally to pay its debts as they become due; (iii) makes a general assignment, arrangement or composition with or for the benefit of its creditors; (iv) has instituted against it a proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency Law or other similar Law affecting creditor's rights, or a petition is presented for its winding-up, reorganization or liquidation, which proceeding or petition is not dismissed, stayed or vacated within ninety (90) Business Days thereafter; (v) commences a voluntary proceeding seeking a judgment of insolvency or bankruptcy or any other relief under any bankruptcy or insolvency Law or other similar Law affecting creditors' rights; (vi) seeks or consents to the appointment of an administrator, provisional liquidator, conservator, receiver, trustee, custodian or other similar official for it or for all or substantially all of its assets; (vii) has a secured party take possession of all or substantially all of its assets, or has a distress, execution, attachment, acquestration or other legal process levied, enforced or sued on or against all or substantially all of its assets; (viii) causes or is subject to any event with respect to it which, under the applicable Laws of any jurisdiction, has an analogous effect to any of the events specified in clauses (i) to (vii) inclusive; or (ix) takes any action in furtherance of, or indicating its consent to, approval of, or acquiescence in, any of the foregoing acts.

(e) ***"Buyer"*** shall have the meaning ascribed to it in the Preamble to this PPA.

(f) "***Buyers Misconduct***" shall have the meaning ascribed to it in Section 10.1.

(g) "***Business Day***" means any day except a Saturday, Sunday, or a Federal Reserve Bank holiday.

(h) "***CAMD***" means the Clear Air Markets Division of the United States Environmental Protection Agency or any successor or other agency that is given jurisdiction over a program involving transferability of specific Environmental Attributes.

(i) "***Claiming Party***" shall have the meaning ascribed to it in Section 10.3.

(j) "***Commercial Operation***" means that the REPGS, or a Component Part, is ready for regular, daily operation, has been connected to the Premises electrical system, has undergone testing as provided herein, has been accepted by Buyer, is in compliance with applicable Laws in all respects and is capable of producing Energy Output.

(k) "***Commercial Operation Date***" means, with respect to a Component Part, the first day on which the Component Part is ready for Commercial Operation as certified in writing by Seller to Buyer in the Notice of Commercial Operation.

(l) "***Component Parts***" means those separate solar energy facilities that together comprise the REPGS. The Component Parts are designated on **Exhibit A**.

(m) ***"Confidential Information"*** shall have the meaning ascribed to it in Section 17.1.

(n) ***"Construction Schedule"*** shall have the meaning ascribed to it in Section 6.1(a).

(o) "***Contract Year***" means, as applicable to each Component Part, the consecutive 12 months period commencing on the Commercial Operation Date of that Component Part.

(p) ***"Daily Construction Delay Lost Savings"*** shall have the meaning ascribed to it in Section 6.1(b).

(q) "***Defaulting Party***" shall have the meaning ascribed to it in Section 11.1.

(r) "***Eastern Prevailing Time***" shall mean the local prevailing time in Newark, New Jersey.

(s) "***Effective Date***" shall have the meaning ascribed to it in the Preamble to this PPA.

(t) "***Energy***" means electric energy (alternating current, expressed in kilowatt-hours). Energy does not include any attendant Environmental Attributes.

(u) "***Energy Payment Rate***" shall have the meaning ascribed to it in Section 3.3.

(v) "***Energy Payment Rate Increase Factor***" means the factor expressed in percent by which the Energy Payment Rate shall increase from one Contract Year to another.

(w) "***Environmental Attributes***" means each of the following that is in effect as of the Effective Date or may come into effect in the future: (i) credits, benefits, reductions, offsets and other beneficial allowances, including, to the extent applicable and without limitation, performance based incentives or renewable portfolio standard in New Jersey or in other jurisdictions (collectively, "***allowances***") attributable to the ownership or operation of the REPGS or
the production or sale of Energy from the REPGS, (ii) other allowances howsoever named or referred to, with respect to any and all fuel, emissions, air quality, or other environmental characteristics, resulting from the use of solar generation or the avoidance of the emission of any gas, chemical or other substance into the air, soil or water attributable to the sale of Energy generated by the REPGS during the Term and in which Seller has good and valid title, including any
credits to be evidence by Solar Renewable Energy Certificates or similar laws or regulations applicable in any jurisdiction, (iii) any such allowances related to (A) oxides of nitrogen, sulfur, or carbon, (B) particulate matter, soot, or mercury, or (C) the United Nations Framework Convention on Climate Change (the "***UNFCCC***") or the Kyoto Protocol to the UNFCCC or crediting "early action" with a view thereto, or involving or administered by the CAMD, and (iv) all reporting rights with respect to such allowances under Section 1605(b) of the Energy Policy Act of 1992, as amended from time to time or any successor statute, or any other current or future international, federal, state or local law, regulation or bill, or otherwise. Environmental Attributes shall also include Tax Benefits.

(x) "***Event of Default***" shall have the meaning ascribed to it in Section 11.1.

(y) ***"Exercise Period"*** shall have the meaning ascribed to it in Section 16.4.

(z) "***Extension Term***" shall have the meaning ascribed to it in Section 2.1(b).

(aa) "***Fair Market Value***" with respect to the interest of Seller in the REPGS shall mean the amount that would be received in an arms-length transaction between an informed and willing buyer and an informed and willing seller, under no compulsion, respectively, to buy or sell such interest(s).

(bb) "***Force Majeure***" means any event or circumstance that prevents a Party from performing its obligations under this PPA, which event or circumstance (i) is not within the reasonable control, or is not the result of the negligence, of the Claiming Party, and (ii) by the exercise of reasonable due diligence, the Claiming Party is unable to overcome or avoid or cause to be avoided and shall be deemed to include, but not be limited to, acts of God, acts of civil or military authorities, acts of war or public enemy, acts of any court, regulatory agency or administrative body having jurisdiction, insurrections, riots, strikes or other labor disturbances, , fires, explosions, floods, drought, interruption of
transportation, embargoes or other causes of a similar nature. Force Majeure will not be based

on (i) Buyers' inability economically to use Energy purchased hereunder or by for such Energy, (ii) Seller's ability to sell Energy at a price greater than the price of Energy under this PPA, or (iii) lack of funds, delays in or inability of a Party to obtain financing or other economic hardship of any kind.

(cc) "***Approvals***" means all applications, permits, licenses, franchises, certificates, concessions, consents, authorizations, approvals, registrations, orders, filings, entitlements and similar requirements of whatever kind and however described which are required to be obtained or maintained by any Person with respect to the development, siting, design, acquisition, construction, equipping, financing, ownership, possession, shakedown, startup, testing, operation or maintenance of the REPGS, the production and delivery of Energy, and Environmental Attributes, or any other transactions or matter contemplated by this PPA (including those pertaining to electrical, building, zoning, environmental and occupational safety and health requirements).

(dd) "***Governmental Body***" means any federal, state, regional or local legislative, executive, judicial or other governmental board, agency, authority, commission, administration, court or other body, or any official thereof having jurisdiction or authority.

(ee) "***Governmental Entity***" means any government or any agency, bureau, board, commission, court, department, official, political subdivision, tribunal, program administrator or other instrumentality of any government, whether federal, state or local, domestic or foreign, or any Person, owned, operated, managed or otherwise controlled thereby.

(ff) "***Indemnified Parties***" shall have the meaning ascribed to it in Section 15.1.

(gg) "***Indemnitor***" shall have the meaning ascribed to it in Section 15.1.

(hh) "***Indemnity Claims***" means all losses, liabilities, damages, costs, expenses and attorneys' fees, whether incurred by settlement or otherwise.

(ii) "***Independent Appraiser***" means an individual who is a member of a national accounting, engineering or energy consulting firm qualified by education, certification, experience and training to determine the value of solar generating facilities of the size and age with the operational characteristics of the REPGS. Except as may be otherwise agreed by the Parties, the Independent Appraiser shall not be (or within three years before his appointment have been) a director, officer or an employee of, or directly or indirectly retained as consultant or adviser to, Seller or any Affiliate of Seller or Buyers.

(jj) "***Initial Term***" shall have the meaning ascribed to it in Section 2.1(a).

(kk) ***"Insurance Requirement"*** means any rule, regulation, code or requirement issued by any fire insurance rating bureau or any body having similar functions or by any insurance company which has issued a policy of Required Insurance under this Agreement, as in effect during the Term of this Agreement, compliance with which is a condition to the effectiveness of such policy.

(ll) "***Law***" means any national, regional, state or local law, statute, rule, regulation, code, ordinance, administrative ruling, judgment, decree, order or directive of any jurisdiction applicable to this PPA or the transaction contemplated hereby.

(mm) "***Minimum Energy Output Requirements***" means the annual minimum Energy output required for each Component Part as set forth in **Exhibit C** (based on the Typical Meteorological Year version 3 Data Set produced by the National Renewable Energy Laboratory) and as modified pursuant to Section 3.5.

(nn) ***"Monthly Progress Report"*** shall have the meaning ascribed to it in Section 6.10.

(oo) "***Non-Defaulting Party***" shall have the meaning ascribed to it in Section 11.1(a).

(pp) "***Notice of Commercial Operation***" shall have the meaning ascribed to it in Section 2.5.

(qq) "***Permitted Transfer***" shall have the meaning ascribed to it in Section 19.1(b).

(rr) "***Person***" means an individual, general or limited partnership, corporation, municipal corporation, business trust, joint stock company, trust, unincorporated association, joint venture, Governmental Entity, limited liability company, or any other entity of whatever nature.

(ss) "***Premises***" shall have the meaning ascribed to it in the Recitals.

(tt) "***Public Works Contract***" shall have the meaning ascribed to it in NJSA 34:11-56.26(5): means construction, reconstruction, demolition, alteration, custom fabrication, or repair work, or maintenance work, including painting and decorating, done under contract and paid for in whole or in part out of the funds of a public body, except work performed under a rehabilitation program. "Public work" shall also mean construction, reconstruction, demolition, alteration, custom fabrication, or repair work, done on any property or premises, whether or not the work is paid for from public funds, if, at the time of the entering into of the contract the property or premises is owned by the public body or:

(a)Not less than 55% of the property or premises is leased by a public body, or is subject to an agreement to be subsequently leased by the public body; and

(b)The portion of the property or premises that is leased or subject to an agreement to be subsequently leased by the public body measures more than 20,000 square feet.

(uu) "***Purchase Option***" used in ARTICLE 16 means the terms and conditions under which the Buyer may purchase the REPGS at the end of Term.

(vv) "***Purchase Price***" means the Fair Market Value as that term is defined in the RFP.

(ww) "***Replacement Energy***" means Energy delivered by Seller to Buyers pursuant to Section 3.5 to fulfill its applicable minimum output requirements.

(xx) ***Receiving Point***" means the agreed location or locations where Energy produced by the REPGS is to be transferred and received under this PPA.

(yy) "***Representatives***" means, in respect to a Person, the officers, directors, employees, agents, advisors or representatives of such Person.

(zz) "***RFP***" shall have the meaning ascribed to it in the Recitals.

(aaa) ***"Safety Plan"*** shall have the meaning ascribed to it in Section 9.1.

(bbb) "***REPGS***" means the renewable energy power generating facility that produces the Energy sold and purchased under this PPA as more particularly defined in **Exhibit A** hereto.

(ccc) "***REPGS Assets***" means each and all of the assets of which the REPGS at the time of the notice is given pursuant to Section 16.1 is comprised, including Seller's solar energy panels, mounting systems, carports, tracking devices, inverters, integrators and other related equipment and Components installed on the Premises, electric lines and conduits required to connect such equipment to the Delivery Point, protective and associated equipment, improvements, and other tangible and intangible assets, permits, property rights and contract rights reasonably necessary for the construction, operation, and maintenance of the REPGS.

(ddd) "***REPGS Loss***" means loss, theft, damage or destruction of the REPGS, REPGS Assets or any Component Part(s) thereof, or any other occurrence or event that prevents or limits the REPGS, or any Component Part(s) thereof, from operating in whole or in part, resulting from or arising out of any cause (including casualty, condemnation or other Force Majeure).

(eee) ***"Seller"*** shall have the meaning ascribed to it in the Preamble to this PPA.

(fff) "***Seller Installed Metering Device***" means any and all meters at or before the Delivery Point needed for the registration, recording, and transmission of information regarding the Energy generated by the REPGS and delivered to the Delivery Point.

(ggg) ***"Seller's Response to the RFP"*** shall have the meaning ascribed to it in the Recitals.

(hhh) "***Solar Renewable Energy Certificates***" or "***SRECs***" means the transferable (through the PJM EIS Generation Attributes Tracking System or otherwise) certificates representing the environmental attributes associated with Energy generated by a solar energy facility, as developed under the oversight and regulations of the New Jersey Board of Public Utilities' Clean Energy Program, including any modifications or revisions thereof adopted by the Board or any successor state agency or federal agency administering renewable energy certificate programs.

(iii) "***Tax Benefits***" means ITCs attributable to the REPGS or Energy, accelerated depreciation attributable to the REPGS or any REPGS Asset, and any other tax credit or tax write-offs

allowed under applicable law attributable to the REPGS or Energy, irrespective of whether such Tax Benefits accrue for the benefit of Seller, any Affiliate, or any investor of Seller or any Affiliate of such investor.

(jjj) "***Term***" means the Initial Term and any Extension Term that becomes effective pursuant to Section 2.1(a).

(kkk)""***Transaction***" means any transaction between the Parties under the terms of the PPA or any other agreements, instruments, or undertakings between the Parties.

(lll) "***Transfer Date***" means that date that is the later of (i) the last date of the Term, or (ii) the date that is fifteen (15) Business Days following the date the Purchase Price is finally determined.

(mmm) "***Utility Rate***" means the applicable all-inclusive electric service rate charged to Buyer by the local electric distribution utility serving Buyer in the service territory in which Buyer is located and any other energy service provider serving Buyer, as applicable, at any given time. This all-inclusive rate shall include all electric charges, transmission, distribution or other delivery charges, ancillary service charges, transition or competitive service charges, taxes, and other fees and charges in place.

2. **Rules of Interpretation**. In this PPA, unless expressly provided otherwise:

(a) the words "herein," "hereunder" and "hereof" refer to the provisions of this PPA and a reference to a recital, Article, Section, subsection or paragraph of this PPA or any other agreement is a reference to a recital, Article, Section, subsection or paragraph of this PPA or other agreement in which it is used unless otherwise stated;

(b) references to this PPA, or any other agreement or instrument, includes any schedule, exhibit, annex or other attachment hereto or thereto, and references to this PPA include the Basic PPA Provisions;

(c) reference to any Article, Section, or Exhibits means such Article of this PPA, Section of this PPA, or such Exhibit to this PPA, as the case may be, and references in any Article or Section or definition to any clause means such clause of such Article or Section or definition;

(d) a reference to this PPA, any other agreement or an instrument or any provision of any of them includes any amendment, variation, restatement or replacement of this PPA or such other agreement, instrument or provision, as the case may be;

(e) a reference to a statute or other Law or a provision of any of them includes all regulations, rules, subordinate legislation and other instruments issued or promulgated thereunder as in effect from time to time and all consolidations, amendments, re-enactments, extensions or replacements of such statute, Law or provision;

(f) the singular includes the plural and vice versa;

(g) a reference to a Person includes a reference to the Person's executors and administrators (in the case of a natural person) and successors, substitutes (including Persons taking by novation) and permitted assigns;

(h) words of any gender shall include the corresponding words of the other gender;

(i) "including" means "including, but not limited to," and other forms of the verb "to include" are to be interpreted similarly;

(j) references to "or" shall be deemed to be disjunctive but not necessarily exclusive, (i.e., unless the context dictates otherwise, "or" shall be interpreted to mean "and/or" rather than "either/or");

(k) where a period of time is specified to run from or after a given day or the day of an act or event, it is to be calculated exclusive of such day; and where a period of time is specified as commencing on a given day or the day of an act or event, it is to be calculated inclusive of such day;

(l) a reference to a Business Day is a reference to a period of time commencing at 9:00 a.m. local time on a Business Day and ending at 5:00 p.m. local time on the same Business Day.

(m) if the time for performing an obligation under this PPA expires on a day that is not a Business Day, the time shall be extended until that time on the next Business Day;

(n) a reference to (i) a day is a reference to a calendar day, (ii) a month is a reference to a calendar month, and (iii) a year is a reference to a calendar year;

(o) where a word or phrase is specifically defined, other grammatical forms of such word or phrase have corresponding meanings;

(p) a reference to time is a reference to Eastern Prevailing Time on the relevant date;

(q) references to any date in this PPA shall be deemed to mean such date as adjusted from time to time as permitted hereunder due to Force Majeure unless expressly stated otherwise;

(r) if a payment prescribed under this PPA to be made by a party on or by a given Business Day is made after 2:00 p.m. on such Business Day, it is taken to be made on the next Business Day; and

If any index used in this PPA at any time becomes unavailable, whether as a result of such index no longer being published or the material alteration of the basis for calculating such index, then Seller and Buyers shall agree upon a substitute index that most closely approximates the unavailable index as in effect prior to such unavailability. If the base date of any such index is at any time reset, then the change to the index resulting therefrom shall be adjusted accordingly for purposes of this PPA

EXHIBIT C

Year	Expected Performance Output	Guaranteed Minimum Output
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

MINIMUM ENERGY OUTPUT REQUIREMENT FOR THE REPGS

For the First Operational Year the Expected Performance Output is:

Electricity: _____ Total kWh

Annual Degradation Factor: ____% per Operational Year

The First Operational Year is defined as the 12 month anniversary of the Commercial Operation Date of the last Component Part that is installed pursuant to this PPA.

For subsequent years the Expected Performance Output shall be revised every year at the end of each Contract Year Period by the annual degradation factor specified above.
The Guaranteed Minimum Output Performance shall be calculated as at least 90% of the Expected Performance per Article 3.5 of this PPA.

If the Seller fails to meet the Guaranteed Minimum Output Requirement during any of the Contract Year periods set forth in Article 3.5, the Seller will pay the Buyer an amount equal to the Buyer's "Reduced Savings" for such two year period as calculated below.

RS = (GMO – AS) x PD

where:

RS = Reduced Savings

GMO = Guaranteed Minimum Output Requirement as measured in total annual kWh for as tabulated above.

AS = Actual supplied electricity as measured in total annual kWh at the Seller Installed Metering Device.

PD = (ATP - CP)

PD = Price difference between the average Utility Rate and the PPA contract Price

ATP = Annual average otherwise applicable tariff price in $/kWh. This price is determined by dividing the total cost for delivered electricity paid to the Energy Service Provider(s) during the previous 12 month period by the total annual power delivered by the Energy Service Provider(s)

CP is the contract price for the previous 12 month period in $/kWh

EXHIBIT D

CONSTRUCTION SCHEDULE

(To Be Provided by Seller)

Attachment 4

Overburdened Community Stressor Summary

Block Group: 340130074001 **Municipality: Newark City** **County: Essex** **OBC Criteria: Minority**

Combined Stressor Total	
Block Group Value: Combined Stressor Total	**22**
County	15
State	13
Geographic Point of Comparison	**13**
Adverse Cumulative Stressors	**Higher than 50th Percentile**

Concentrated Areas of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Ground-Level Ozone (3-year average days above standard)	**1.3**	1.0	1.3	**1.0**	**Yes**
Fine Particulate Matter ($PM_{2.5}$) (3-year average days above standard)	**0**	0	0	**0**	**Yes**
Cancer Risk from Diesel Particulate Matter (estimated cancer risk/million)	**312**	174	95	**95**	**Yes**
Cancer Risk from Air Toxics Excluding Diesel Particulate Matter (estimated cancer risk/million)	**66**	51	40	**40**	**Yes**
Non-Cancer Risk from Air Toxics (Combined Hazard Quotient)	**5.95**	3.67	2.05	**2.05**	**Yes**

Mobile Sources of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Traffic – Cars, Light- and Medium-Duty Trucks (Annual Average Daily Traffic (AADT)-mile/square mile)	**228638**	38409	23623	**23623**	**Yes**
Traffic – Heavy-Duty Trucks (AADT-mile/square mile)	**22000**	293	398	**293**	**Yes**
Railways (rail mile/square mile)	**1.52**	0.0	0	**0**	**Yes**

Contaminated Sites					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Known Contaminated Sites (weighted sites/square mile)	**28.68**	3.81	1.49	**1.49**	**Yes**
Soil Contamination Deed Restrictions (percent area)	**19.27**	0.0	0	**0**	**Yes**
Ground Water Classification Exception Area/Currently Known Extent Restrictions (percent area)	**27.8**	0.0	0	**0**	**Yes**

Transfer Stations, or Other Solid Waste Facilities, Recycling Facilities, Scrap Metal Facilities					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Solid Waste Facilities (sites/square mile)	**1.16**	0	0	**0**	**Yes**
Scrap Metal Facilities (sites/square mile)	**4.36**	0	0	**0**	**Yes**

Point-Sources of Water Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Surface Water (percent of uses impaired)	**74.34**	100.0	87.99	**87.99**	**No**
Combined Sewer Overflows (count)		NA	NA	**NA**	**No**

May Cause Potential Public Health Impacts					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Drinking Water (count of public drinking water violations or exceedances, or percent of private well testing exceedances)	**13**	NA	NA	**NA**	**1**
Potential Lead Exposure (percent houses older than 1950)	**0.0**	50.73	15.38	**15.38**	**No**
Lack of Recreational Open Space (population/acre of open space within 0.25 mile)	**7652.0**	29.38	19.14	**19.14**	**Yes**
Lack of Tree Canopy (percent lack of tree canopy)	**94**	61	63	**61**	**Yes**
Impervious Surface (percent impervious surface)	**90**	40	34	**34**	**Yes**
Flooding (Urban Land Cover) (percent urban land use area flooded)	**86**	0	2	**0**	**Yes**

Density/Proximity Stressors					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Emergency Planning Sites (sites/square mile)	**3.47**	0.17	0.05	**0.05**	**Yes**
Permitted Air Sites (sites/square mile)	**3.96**	1.5	0.8	**0.8**	**Yes**
NJPDES Sites (sites/square mile)	**0.13**	0.02	0.0	**0.0**	**Yes**

Social Determinants of Health					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Unemployment (percent unemployed)	**0.0**	3.3	3.7	**3.3**	**No**
Education (percent without high school diploma)	**38.08**	1.49	3.59	**1.49**	**Yes**

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Data Source: Environmental Justice (EJ) Law Combined Stressor Summary for New Jersey, published 06/02/2022

Attachment 5

Overburdened Community Stressor Summary

Block Group: 340139802001 **Municipality: Newark City** **County: Essex** **OBC Criteria: Adjacent**

Combined Stressor Total	
Block Group Value: Combined Stressor Total	**21**
County	15
State	13
Geographic Point of Comparison	**13**
Adverse Cumulative Stressors	**Higher than 50th Percentile**

Concentrated Areas of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Ground-Level Ozone (3-year average days above standard)	**3.0**	1.0	1.3	**1.0**	**Yes**
Fine Particulate Matter ($PM_{2.5}$) (3-year average days above standard)	**0**	0	0	**0**	**No**
Cancer Risk from Diesel Particulate Matter (estimated cancer risk/million)	**249**	174	95	**95**	**Yes**
Cancer Risk from Air Toxics Excluding Diesel Particulate Matter (estimated cancer risk/million)	**60**	51	40	**40**	**Yes**
Non-Cancer Risk from Air Toxics (Combined Hazard Quotient)	**4.88**	3.67	2.05	**2.05**	**Yes**

Mobile Sources of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Traffic – Cars, Light- and Medium-Duty Trucks (Annual Average Daily Traffic (AADT)-mile/square mile)	**224730**	38409	23623	**23623**	**Yes**
Traffic – Heavy-Duty Trucks (AADT-mile/square mile)	**17028**	293	398	**293**	**Yes**
Railways (rail mile/square mile)	**1.13**	0.0	0	**0**	**Yes**

Contaminated Sites					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Known Contaminated Sites (weighted sites/square mile)	**8.12**	3.81	1.49	**1.49**	**Yes**
Soil Contamination Deed Restrictions (percent area)	**3.11**	0.0	0	**0**	**Yes**
Ground Water Classification Exception Area/Currently Known Extent Restrictions (percent area)	**33.14**	0.0	0	**0**	**Yes**

Transfer Stations, or Other Solid Waste Facilities, Recycling Facilities, Scrap Metal Facilities					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Solid Waste Facilities (sites/square mile)	**0.21**	0	0	**0**	**Yes**
Scrap Metal Facilities (sites/square mile)	**0.97**	0	0	**0**	**Yes**

Point-Sources of Water Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Surface Water (percent of uses impaired)	**82.02**	100.0	87.99	**87.99**	**No**
Combined Sewer Overflows (count)	**3**	NA	NA	**NA**	**Yes**

May Cause Potential Public Health Impacts					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Drinking Water (count of public drinking water violations or exceedances, or percent of private well testing exceedances)	**13**	NA	NA	**NA**	**1**
Potential Lead Exposure (percent houses older than 1950)	**0.0**	50.73	15.38	**15.38**	**No**
Lack of Recreational Open Space (population/acre of open space within 0.25 mile)	**7652.0**	29.38	19.14	**19.14**	**Yes**
Lack of Tree Canopy (percent lack of tree canopy)	**94**	61	63	**61**	**Yes**
Impervious Surface (percent impervious surface)	**83**	40	34	**34**	**Yes**
Flooding (Urban Land Cover) (percent urban land use area flooded)	**91**	0	2	**0**	**Yes**

Density/Proximity Stressors					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Emergency Planning Sites (sites/square mile)	**1.49**	0.17	0.05	**0.05**	**Yes**
Permitted Air Sites (sites/square mile)	**2.68**	1.5	0.8	**0.8**	**Yes**
NJPDES Sites (sites/square mile)	**0.05**	0.02	0.0	**0.0**	**Yes**

Social Determinants of Health					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Unemployment (percent unemployed)	**0.0**	3.3	3.7	**3.3**	**No**
Education (percent without high school diploma)	**0.0**	1.49	3.59	**1.49**	**No**

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Data Source: Environmental Justice (EJ) Law Combined Stressor Summary for New Jersey, published 06/02/2022

Attachment 6

2 Penn Center, 1500 JFK Boulevard, Suite 1208
Philadelphia, Pennsylvania 19102
tel: 215 636-0600

July 2, 2021

Messrs. Vladimir Korolev and Yogesh Doshi
New Jersey Department of Environmental Protection
Division of Air Quality
Bureau of Air Permits
401 East State Street, 2nd Floor
P.O. Box 420, Mail Code 401-02
Trenton, NJ 08625-0420

VIA NJDEP Online

Subject: Passaic Valley Sewerage Commission (PVSC)
Facility ID: 07349
Title V Operating Permit Number: BOP 200003
Title V Operating Permit Significant Modification Application
for Proposed Standby Power Generation Facility

Dear Messrs. Smith and Doshi:

On behalf of the Passaic Valley Sewerage Commission (PVSC), CDM Smith Inc. (CDM Smith) is hereby submitting this Title V operating permit modification application to add a new Standby Power Generation Facility (SPGF) Facility at the PVSC Newark Bay Wastewater Treatment Plant (WWTP).

In October of 2012, PVSC was severely impacted by Superstorm Sandy. The 12-foot storm surge from adjacent Newark Bay inundated the facilities, flooding buildings, tunnels and process areas, destroying vehicles, equipment, and inventory stored on-site. The PVSC facility was rendered inoperable for several weeks. The New Jersey Department of Environmental Protection (NJDEP) identified the PVSC facility as a critical component of New Jersey's infrastructure and recommended that the facility be protected from similar events. Guidance issued by the NJDEP called for the protection of wastewater treatment plants as critical infrastructure to the 500-year or 0.2% annual chance storm event consistent with Presidential executive orders.

The proposed SPGF will provide power to operate the PVSC facility during disruption of the electrical power grid. In addition, a new floodwall will be constructed around the perimeter of the facility to protect critical facility infrastructure (currently part of a different project). These two mitigation measures together will protect the PVSC plant from storm surge from Newark Bay and the loss of the main and back-up utility power feeds to the main electrical distribution substation.

PVSC, through the New Jersey Office of Emergency Management, requested public assistance funding from the Department of Homeland Security, FEMA for these projects.

The SPGF is designed to support the entire WWTP electric load, allowing the plant to function upon loss of the utility electrical supply for up to two weeks. The facility's design net power generation capacity is 34 megawatts (MW). The SPGF is designed to operate in island mode, in that the SPGF will not export power to the utility electrical grid and the power generated on site will be consumed by the WWTP. To minimize disruption to the WWTP process, when utility electrical service is restored, the SPGF will parallel with the electrical utility service to seamlessly transfer the power source from the SPGF to the utility. Predicated on the Reliability and Resiliency requirement for critical equipment, the Facility is designed with an "N+1" configuration, meaning that the SPGF would run with two combustion turbine generators, and have a third on standby.

PVSC would install three (3) combustion turbine generators (CTGs) each with a maximum gross output of 28 MW. The CTGs would be fueled with natural gas as the only fuel and would exhaust into the air emissions control equipment ductwork and casing. The facility is designed as an indoor plant with the combustion turbine and emissions controls (consisting of a vertical casing with oxidation catalyst and selective catalytic reduction (SCR) catalyst in the hot gas path) located indoors. The SCR is designed to achieve a final NOx emission rate of 2.5 parts per million by volume, dry (ppmvd). The oxidation catalyst is designed to achieve a final CO emission rate of 3 ppmvd and VOC emission rate of 4 ppmvd.

The SPGF is designed to be capable of starting without support from the utility electric supply. To support black start of the turbine generator, PVSC would install two (2) 2,000-kW standby natural gas-fired generators (stationary combustion engines). The two black start generators (BSG) would be provided to meet the identified Reliability and Resiliency requirement of "N+1" configuration for critical equipment; only one would be needed to start the CTGs. In addition, PVSC is also proposing to install two 164-kW diesel fire pump engines.

On January 13, 2021, PVSC submitted a Title V Air Operating Permit significant modification application to add the proposed Standby Power Generation Facility. The January application included a requested non-emergency operating scenario, “PJM Peak Load Management” that would have allowed the SPGF to operate as a peaking or “peak shaving” power plant. On June 10, 2021, after discussions with community representatives and with the NJDEP, PVSC withdrew the January permit application in order to remove PJM Peak Load Management operating scenario. With this resubmitted application, PVSC is requesting that the SPGF operate only in emergencies (grid power failure), preparation for emergencies, and when requested to operate by the utility to prevent an impending grid failure (e.g. a brownout). This change results in an approximately 40 percent reduction in requested maximum potential annual operating hours for the SPGF - to 1,284 hours (total for all three CTGs) from the 2,100 hours proposed in the January 13, 2021 application.

The enclosed air permit application package includes:

1. Permit application text with the following sections:
    a. Section 1 - Introduction
    b. Section 2 - Community Engagement
    c. Section 3 - Greenhouse Gas Emissions and Alternative Technology Evaluation
    d. Section 4 – Regulatory Applicability
    e. Section 5 – Maximum Potential Emission Rates
    f. Section 6 – Health Risk Assessment
    g. Section 7: Permit Application Forms. A PDF of the air permit application submitted via NJDEP online completed using the NJDEP RADIUS application.
2. Appendices containing supporting documentation:
    a. Appendix A – Plot Plan
    b. Appendix B – Emission Rate Calculations
    c. Appendix C - Netting Analysis. As the netting analysis shows, the net increases in emissions do not trigger the emission offsets requirement (Subchapter 18 applicability) or PSD applicability.
    d. Appendix D - Vendor Provided Information
    e. Appendix E – Photovoltaic System Analysis
    f. Appendix F – National Renewable Energy Laboratory (NREL) Wind Maps
    g. Appendix G - Level 1 Health Risk Analysis Calculations
    h. Appendix H - Draft Air Quality Modeling Protocol
    i. Appendix I – Ironbound Community Corporation Public Information Session Meeting Notes

Due to the size of files, CDM Smith will arrange to send the modeling input and output files to NJDEP via Secured File Transfer (SFT) once the application is submitted on the NJDEP online.

Pursuant to N.J.A.C. 7:27-22.31(k), we understand that a permit application fee should not be submitted at this time. Rather, the NJDEP will forward an invoice to PVSC following the receipt of the application.

We believe that the enclosed information constitutes a complete permit application. If any questions arise or additional information is required during your review, please call Amit Sen at (215) 239-6542.

Sincerely,

Amit K. Sen
Project Engineer
CDM Smith Inc.

Enclosures
cc: Tom Laustsen, Chief Operating Officer (PVSC)
John Rotolo, Chief Engineer (PVSC)
Joe Frissora, Program Manager (AECOM+HDR JV)
Domenick Loschiavo, Project Manager (B&V)
Matthew Young, CDM Smith
Cynthia Hibbard, CDM Smith
Disha Shah, CDM Smith

TITLE V AIR PERMIT APPLICATION

Passaic Valley Sewerage Commission (PVSC)

Title V Operating Permit No. BOP200003

Title V Operating Permit
Significant Modification Application
Proposed Standby Power Generation Facility

July 2021

Table of Contents

List of Figures

List of Tables

Appendices

This Page Left Intentionally Blank

Section 1
Introduction

1.1 Purpose

The Passaic Valley Sewerage Commission (PVSC) has prepared this air permit application to seek approval from the New Jersey Department of Environmental Projection (NDEP) for construction of a new Standby Power Generation Facility (SPGF) at the PVSC Facility, 600 Wilson Avenue, Newark, NJ.

PVSC provides wastewater treatment and biosolids management services for approximately 1.5 million residents, more than 5,000 commercial entities and 200 significant industrial users within its service area. PVSC's service area encompasses approximately 155 square miles and includes 48 municipalities in parts of Bergen, Essex, Hudson, Passaic and Union Counties. In addition, PVSC provides biosolids (sludge) management and Liquid Waste Acceptance services to municipal and industrial entities that transport sludge and wastes to the facility by truck or barge. PVSC's trucked-in wastes also include potable water sludge from New Jersey and New York. In total, the facility treats nearly 25% of the State of New Jersey's wastewater and biosolids and approximately 15% of the biosolids generated in New York City, a service population of over 3.4 million residents.

In October, 2012, PVSC was severely impacted by Superstorm Sandy. The 12-foot storm surge from adjacent Newark Bay inundated the facilities, flooding buildings, tunnels and process areas, destroying vehicles, equipment, and inventory stored on-site. Failure of the direct power connections to the Public Service Electric and Gas (PSE&G) grid caused the PVSC to lose control of their processes and dewatering capabilities. Damage to the facility was such that PVSC could not accept influent for several days. It is estimated that during the first four days following the Superstorm Sandy, approximately 840 million gallons of raw sewage was bypassed directly to the Passaic River and Newark Bay. When effluent pumps were brought back on-line on November 3, untreated sewage (with only a best effort at Primary disinfection) continued to be pumped to the outfall in New York Harbor for another 20 days. On November 23, 2012, enough of the PVSC's treatment systems had been re-activated for daily effluent quality to return to secondary treatment standards. Partial loss of secondary treatment function continued until July 2013.

The Federal Emergency Management Administration, Department of Homeland Security and the NJDEP identified the PVSC facility as a critical component of New Jersey's infrastructure and recommended that the facility be protected from similar events. Guidance issued by the NJDEP called for the protection of wastewater treatment plants as critical infrastructure to the 500-year or 0.2% annual chance storm event.

With assistance of New Jersey Office of Emergency Management (NJOEM), PVSC has procured federal funds to construct standby power generation at the site that would be able to satisfy the full electric load of the PVSC facility and enable continued, full operation in the event of another

prolonged, widespread power outage, thus avoiding future water quality events when the next major storm and/or power outage occurs.

The SPGF project would significantly improve the power resiliency of PVSC and provide greater emergency environmental protection and reliability for the 3.4 million citizens it supports.

1.2 Executive Summary

The Passaic Valley Sewerage Commission (PVSC) has prepared this air permit application to seek approval from the New Jersey Department of Environmental Projection (NDEP) for construction of a new Standby Power Generation Facility (SPGF) at the PVSC Facility, 600 Wilson Avenue, Newark, NJ. The SPGF would operate only during emergencies, for exercising/maintenance of the CTGs, storm preparation, and when the reliability of the grid is threatened. The SPGF would include the following equipment:

- Three natural-gas-fired 28-MW-each[1] combustion turbine generators (CTGs). Only two would operate at a time. The exhaust of each CTG would be treated with a state-of-the-art (SOTA) air pollution equipment train consisting of an oxidation catalyst and selective catalytic reduction (SCR).
- Two 2-MW natural-gas-fired black start engine generators (BSGs). Only one would operate at a time to start the CTGs without utility electricity supply.
- Two 164-kW diesel fire pump engines. One would operate at a time to pump water for fire suppression if hydrant pressure is not available.
- One 10,000-gallon aqueous ammonia (19% ammonia solution) storage tank for the SCR air pollution control equipment.

This application is a modification to PVSC's Title V Air Operating Permit (NJDEP No. BOP 200003). The application is a consolidated preconstruction and operating permit application providing the following information required by both N.J.A.C. 7:27-22.24 and N.J.A.C. 7:27-8:

- NJDEP Application Forms. A hard copy of NJDEP's online RADIUS software completed application forms is provided in Section 7.
- Facility Plot Plan. Appendix A shows a facility layout and the location of the SPGF emission points.
- Maximum potential air emission rate calculations, and state-of-the-art air pollution control equipment analysis. See Section 5, and Appendices B, C and D.
- State and federal air rules applicability analysis. All proposed equipment would have emissions that would meet or be lower than applicable requirements. See Section 4.

[1] 34 MW is needed to run PVSC's wastewater treatment processes. The CTGs have been sized at 28 MW each so that two could meet the 34-MW demand, and so that they could do so under all conditions. A turbine's capacity to produce power drops sharply with higher temperatures. The CTGs have been selected to be able to produce at least 17 MW each at ambient temperatures of 99+ degrees F.

- Emissions netting analysis. This shows that the SPGF's net increases in in air emission rates would not trigger the emission offsets requirement (Subchapter 18 applicability). See Section 4.2 and Appendix C.

- Level 1 Risk Screening. The NJDEP Risk Screening Worksheet showed that further evaluation was required for CTG formaldehyde emissions. For the BSGs, further evaluation was required for formaldehyde and acrolein emissions. See Section 6.1 and Appendix H.

- Level 2 Refined Incremental Inhalation Health Risk Analysis. PVSC conducted refined dispersion modeling with actual hourly meteorological data (from Newark International Airport; provided by NJDEP) of formaldehyde and acrolein emissions from the CTGs and BSGs operating together. Modeled maximum ground-level concentrations (over five years of meteorological data) were found to be below all NJDEP incremental inhalation risk criteria. This was true at the point of highest concentrations (facility fence line) and at all nearby sensitive receptors (including the nearest Ironbound Community residences). The modeling must still be reviewed by the NJDEP, but these preliminary results indicate that the proposed SPGF would cause negligible incremental health risk to the community. See Section 6.2 and Appendix I.

PVSC has conducted additional evaluations at the request of the NJDEP to fulfill the objectives of the January 2020, New Jersey Energy Master Plan. Section 3 of this application contains a Greenhouse Gas (GHG) Emissions and Alternative Technology Evaluation. The analysis shows that the SPGF's maximum potential carbon-dioxide-equivalent (CO_2e) greenhouse gas emission rates would be lower than those from the Public Service Electric and Gas Company (PSE&G) regional utility grid for peak standby power production. This means that PVSC's removing its equipment from the electrical grid and providing its own power would provide a regional GHG and air quality benefit during peak demand periods when the reliability of the grid is threatened (e.g. a hot summer day). Section 3 also contains a renewable energy alternatives evaluation.

NJDEP has provided guidance for this air permit application, based on Executive Order No. 23, which was issued on April 20, 2018, for conducting community outreach about the proposed SPGF project. NJDEP suggested that (NJDEP pre-permitting meeting, March 5, 2020; NJDEP, email dated August 20, 2020; and NJDEP email dated December 2, 2020):

- PVSC submit this application to Ironbound Community Corporation (ICC) representatives for early consultation review before submitting it to the NJDEP Bureau of Stationary Sources.

- PVSC conduct a public information session with the Ironbound Community to present the proposed SPGF Project. This early consultation meeting would be in addition to the public hearing required for the draft Title V permit. A record of this meeting should be submitted with the air permit application.

- PVSC perform refined air dispersion modeling of SPGF toxic air pollutants requiring further evaluation after the Level 1 Risk Screening analysis. The NJDEP Bureau of Stationary Sources normally performs this Level 2 modeling after the air permit application is submitted (NJDEP Technical Manual 1003). However, in this case, NJDEP agreed that PVSC

should prepare a draft protocol and conduct preliminary modeling (to be reviewed by NJDEP after the application is submitted) in order to provide information on possible public health stressors to the Ironbound Community.

A draft application was provided to ICC for review on December 14, 2020. Section 2 of this application discusses Community Engagement meetings and includes a record of the January 7, 2021, ICC public information session held for the draft air permit application. Four additional public outreach meetings have been planned. Section 6 of this application presents the preliminary Level 2 refined dispersion modeling and incremental inhalation health risk assessment.

1.3 Project Description

The proposed SPGF would provide power to operate the PVSC facility during disruption of the electrical power grid. PVSC would not sell power to the grid. A new floodwall would be constructed around the perimeter of the facility to protect critical facility infrastructure. These two mitigation measures together will protect the PVSC plant from storm surge from Newark Bay and the loss of the main and back-up utility power feeds to the main electrical distribution substation. PVSC, through the New Jersey Office of Emergency Management, requested public assistance funding from the Department of Homeland Security, Federal Emergency Management Agency (FEMA) for these projects.

The SPGF is designed to support the entire WWTP electric load, allowing the plant to function upon loss of the utility electrical supply. The facility's design net power generation capacity is 34 MW. This would meet PVSC's full load power demand after the new flood mitigation measures being implemented under the FEMA Resiliency Program are operational. The SPGF is designed to operate in island mode, meaning that the SPGF would not export power to the utility electrical grid and the power generated on site will be consumed by the WWTP. To minimize disruption to the WWTP process, when utility electrical service is restored, the SPGF would parallel with the electrical utility service to seamlessly transfer the power source from the SPGF to the utility. PVSC's Reliability and Resiliency requirement for critical equipment specifies that the SPGF be designed with an "N+1" configuration. This means that two CTGs would operate in an emergency to supply the WWTP full power demand, while the third unit (the "+1" or backup unit) would be available in case one of the other two units is down for repairs or has been damaged during the emergency.

The CTGs have been sized so that two could meet the 34-MW demand under any conditions. A turbine's capacity to produce power drops sharply at higher temperatures. The CTGs have been selected to be able to produce at least 17 MW (net) each at ambient temperatures of 99+ degrees Fahrenheit. The resulting design is for three CTGs, each with a maximum gross output of 28 MW. For this application, the maximum gross CTG output of 28 MW each has been used in all emission rate calculations and modeling. The CTGs would be fueled with natural gas as the only fuel and would exhaust into the air emissions control equipment ductwork and casing. The facility is designed as an indoor plant with the combustion turbine and emissions controls (consisting of a vertical casing with oxidation catalyst and selective catalytic reduction (SCR) catalyst in the hot gas path) located indoors.

The SPGF is designed to be capable of starting without support from the utility electric supply. To support black-start of the turbine generator, PVSC would install two 2-MW standby natural gas-fired generators (stationary combustion engines). These two black-start generators (BSGs) would be provided to meet the Reliability and Resiliency requirement of "N+1" configuration for critical equipment (one unit to start the turbine generators, and a backup unit in case the first is not operational). Two 164-kW diesel fire pump engines would also be provided, with one operating to pump water for fire suppression. The SPGF project would significantly improve the resiliency of PVSC.

1.4 Emergency Operation

According to N.J.A.C. 7:27-22.1., "Emergency" means "any situation that arises from sudden and reasonably unforeseeable events beyond the control of an owner or operator of a facility, such as an unforeseen system capacity shortage caused by an act of God, that requires immediate corrective action to prevent system collapse or to restore normal operations at the facility."

An "emergency generator" may operate in the emergency mode in the situations listed below (N.J.A.C. 7:27-19.1), and only to provide mechanical or thermal energy, or electrical power when the primary source of energy is unavailable. The three CTGs, two BSGs, and two emergency fire pump engines would all be considered "emergency generators." The air permit would contain no restrictions on the number of hours this equipment could operate during an emergency.

- When there is a power outage or the facility's primary source of mechanical or thermal energy fails because of an emergency;
- When the power disruption results from construction, repair, or maintenance activity at the facility - limited to 30 days in any calendar year; or
- When there is a voltage reduction issued by the Pennsylvania Jersey Maryland (PJM) Interconnection[2] and posted on the PJM internet website (www.pjm.com) under the "Emergency Procedures" menu. This would be in anticipation of an imminent grid failure, and happens rarely.

1.5 Non-Emergency Operating Scenarios

Non-emergency operation of the SPGF would occur for manufacturer-recommended routine readiness testing and maintenance, not to exceed 100 hours per year for each CTG, BSG and fire pump engine.

In addition, PVSC is seeking approval to enter into an agreement with PJM to operate the CTGs in a Demand Response program. For Demand Response PVSC would receive an electricity price reduction in exchange for disconnecting from the grid when called to do so by PJM or PSE&G. PVSC also requests permission to start the SPGF in advance of major storms. This Storm Preparation Mode would support a seamless transition in the event of storm-caused utility power failure. These operating scenarios are described in more detail, below.

[2] PJM Interconnection is the regional electricity transmission organization that coordinates the movement of wholesale electricity in New Jersey and 12 other nearby states.

For this application, it is assumed that each CTG would not exceed 592 hours/year (facility operating hours). In addition, all three CTGs together would be limited to 1,284 hours/year (machine operating hours) for all proposed non-emergency operating scenarios combined. In this operating structure, any one of the three turbines could operate up to 592 hours/year; however, the combined operating hours for all three turbines would not exceed 1,284 hours/year.

Each CTG would be permitted to operate for 100 hours/year for maintenance and testing (included within the permitted 1,284 total operating hours). The non-emergency operation of the CTGs would be in one of the operating scenarios described below. These operating scenarios and the maximum hours of operation per year are also provided in the RADIUS permit application (Section 7).

Black-start generators allow the CTGs to be started up when the grid is down, which is an emergency operation. The non-emergency operation of the black-start generators would be limited to 100 hours per year per generator for readiness testing and maintenance. Therefore, the maximum potential non-emergency operation would not exceed 100 hours per year per unit, or 200 hours per year total for the two BSGs.

Table 1-1 shows the breakdown of operating hours for the CTGs. In addition, the non-emergency operating hours for the CTGs are described in the sections below.

Table 1-1 CTG Operating Scenarios and Proposed Non-Emergency Annual Hours of Operation

	Maximum Potential Non-Emergency Operating Hours for One CTG	
Scenario	Revised (Hours/Year)	Basis
Readiness Testing and Maintenance		
Startup	5.0	12 startups/year at 25 minutes each.
Shutdown	2.0	12 shutdowns/year at 10 minutes each.
Steady State	93.0	Testing/maintenance would be conducted once/month, 12 times/year. Each run would take about 6 hours. Value revised to be calculated as difference between 100 hours/year and 7 hours/year for startup/shutdown.
Subtotal	**100**	
PJM Demand Response		
PJM Called Event	10	Estimated at one called event per year and 10 hours/event.
PJM Performance Tests	2	Up to two 1-hour performance tests per year could be required by PJM.
Startup	1.25	3 startups/year at 25 minutes each.
Shutdown	0.5	3 shutdowns/year at 10 minutes each.
Steady State	10.25	Difference between 12 hours/year and time needed for startup and shutdown.
Subtotal	**12**	
Storm Preparation Mode		
Startup	4.17	10 startups/year at 25 minutes each.
Shutdown	1.67	10 shutdowns/year at 10 minutes each.
Steady State	474.2	Difference between 480 hours/year and time needed for startup and shutdown.
Subtotal	**480**	SPGF would be started 48 hours in advance of up to 10 storms per year.
Grand Total	**592**	
Operating Hours		
Facility Total	**One CTG**	**Three CTGs**
Steady State	577.42	1247.83
Startup	10.42	25.83
Shutdown	4.17	10.33
Total	**592.00**	**1284.00**

1.5.1 Readiness (Normal) Testing and Maintenance

The maximum operating hours for readiness (normal) testing and maintenance would be limited to 100 hours per year per CTG. Normal testing and maintenance cannot take place on days when

the Department forecasts air quality anywhere in New Jersey to be "unhealthy for sensitive groups," "unhealthy," or "very unhealthy" as defined in the EPA's Air Quality Index. (N.J.A.C. 7:27.19.2(d))

1.5.2 PJM Demand Response

Demand Response is a PJM program in which requests are made by PJM to end-use customers to reduce the customer's electricity load when the reliability of the grid is threatened. The customers receive payments from PJM members called Curtailment Service Providers. PVSC currently participates in the demand response program. Continued participation in the program will increase reliability of the grid and increase resiliency of PVSC's operation. The most recent PJM called "event" was over five years ago. For the purposes of estimating worst-case emission rates, it is assumed that up to one "event" would be called per year, and last for up to 10 hours. PJM currently requires only one (1) one-hour performance test per year if no actual "events" are called. However, up to two (2) one-hour tests per year may be required by PJM in the future to cover each of the summer and winter demand response enrollment periods.

PVSC would disconnect from the grid, and produce only enough power to support its own operations. No power would be exported or sold to the grid. This would provide benefit to the grid, reduce aggregate regional air emissions, reduce PVSC's electricity costs and pass the electricity cost savings to PVSC rate payers.

1.5.3 Storm Preparation

When there is a potential severe weather event that could impact PVSC operations, PVSC's Director of Security & Safety sends out an email alert and instructions for staff and operators to prepare for the event. The goal is to send the email out at least a day before the potential storm. Appendix B shows that these alerts have been sent from the same day to nine days ahead of storm events with about two and a half days ahead on average. If the SPGF were constructed and operational, the action items would include starting the facility at least 24 hours in advance of the weather event, and up to 48 hours in advance if possible. Because of uncertainty in storm tracks and severity, and the necessity of achieving steady state operation and completing tests on possible points of failure in "island mode," PVSC requests permission to start up to 48 hours in advance of a predicted severe storm.

The Federal Emergency Management Administration, Department of Homeland Security and the NJDEP have identified the PVSC facility as a critical component of New Jersey's infrastructure and recommended that the facility be protected from future storm events that could cause the release of untreated or partially treated sewage to the Passaic River and Newark Bay. In order to ensure seamless operation of PVSC's processes during a power failure, PVSC would start up the SPGF ahead of an expected power failure and seamlessly transfer the electrical load from the Utility to the SPGF where the SPGF would operate in "islanding mode."

Starting up the SPGF itself would take less than a half-hour. Connecting the SPGF to the facility's electrical systems would take few hours. If, however, the impending storm produces power fluctuations at the Utility, or if a sudden voltage variation occurs as equipment is being switched over to the SPGF, the power surge can damage equipment or take equipment offline. The most

vulnerable operations are the Zimpro Sludge Stabilization Units and the Oxygen Production Facility.

The Zimpro Sludge Stabilization Units use high-pressure air and steam injection in reactors to oxidize and thicken the sludge. The time needed to start the sludge processing facilities is due to "cold start" of the reactors. To do a cold start, each reactor needs to be filled and then heated up via the boilers to get it up to the minimum temperature of 390°F before sludge processing can begin. PVSC typically needs eight reactors to process sludge and not all eight can be brought online at the same time.

The Oxygen Production Facility produces 500 tons per day of 95 percent pure oxygen to support the aerobic bacteria secondary treatment process and is considered the "lungs" of the Newark Bay WWTP. Creation of high-purity oxygen is driven by an 8000-horsepower electric compressor. If the compressor were to unexpectedly shut down due to a voltage spike, it could take a minimum of two days to restart the oxygen generation system.

PVSC needs enough time before the storm arrives to make sure the electrical switchover occurs smoothly for this critical equipment and to allow enough time to recover if not. For this reason, PVSC requests up to 48 hours in advance of a storm to start up the SPGF, make the switchover connections deliberately, and achieve reliable steady-state operation of the entire facility in "island mode" with enough time to address a possible failure of the supporting treatment systems before the storm arrives.

PVSC's Director of Security & Safety monitors the weather news, National Weather Service information, and calls the New Jersey State Police Regional Operations & Intelligence Center (NJ ROIC) to check on what they are recommending for emergency preparedness before making the decision to send the email alert. (https://www.njsp.org/division/investigations/njroic.shtml) PVSC has nine years of records of when the Director of Security & Safety sent out this notification. These are listed in Appendix B. The year 2020 was the worst year, with six storm alerts. Appendix B shows a generally increasing trend in the frequency of storm alerts.

Appendix B shows that if storm frequency continues to increase at the same rate as in the last nine years, then one would expect approximately 10 storm alerts per year at PVSC by the year 2030. (The life of SPGF equipment is expected to be 20 years or more.) On this basis, PVSC requests that each of two CTGs be permitted to operate for up to 480 hours/year (48 hours in advance of up to 10 storms/year) for Storm Anticipation Mode.

1.5.4 Startup and Shutdown

During CTG startup and shutdown, emission rates would be higher than during steady-state operation. NJDEP issued guidance (https://www.state.nj.us/dep/aqpp/permitguide/SSM.pdf) on August 9, 2018, requiring that startup and shutdown emissions be included as a separate operating scenario in permit applications. The guidance states that emission rates must be in compliance with Reasonably Available Control Technology (RACT) rules, and that startup and shutdown emissions must be included in calculations of annual emission rates in tons per year. Additionally, NJDEP requested[3] for this application that CTG startup and shutdown emissions

[3] NJDEP, telephone conversation, April 9, 2020.

should be considered both for RACT compliance (Section 4.1.1.1., below) and for the Health Risk Assessment (Section 6, below).

1.5.3.1 Startup

Non-emergency startups would occur for readiness testing and maintenance – once per month or 12 times per year for each of the three CTGs. Non-emergency startups would also occur for Demand Response, described above – up to 3 startups per year for each of two CTGs. In addition, up to 10 startups per year for each of two CTGs would occur for Storm Preparation Mode. Each CTG startup is designed to be 10 minutes or less due to the project's emergency response purpose. However, in the worst case, it could take up to 25 minutes from a cold condition to achieve steady state operation. Therefore, 25 minutes per startup was used for emission rate calculations. The emission rates are shown in Appendix B.

1.5.3.2 Shutdown

This operating scenario accounts for the increased emissions that occur as each CTG is transitioned from steady state operation to shutdown. The maximum number of non-emergency shutdowns per year would be the same as for the Startup Scenario – 12 times per year for each of three CTGs for testing/maintenance, 3 times per year for each of two CTGs for Demand Response, and 10 times per year for each of two CTGs for Storm Preparation Mode. It is assumed that each CTG shutdown could take up to 10 minutes. The emission rates are shown in Appendix B.

This Page Left Intentionally Blank

Section 2

Community Engagement

PVSC submitted a draft of this Title V Operating Permit Modification Application to Ironbound Community Corporation (ICC) representatives for review on December 14, 2020. PVSC conducted a public information session with ICC on January 7, 2021. A record of the meeting is in Appendix I of this Application. Appendix I summarizes all of the ICC comments and input received on this Application, and provides responses. Some changes were made to this Application in response to ICC comments. These are indicated in Appendix I. Four additional public outreach meetings have been planned.

Previously, PVSC held the meetings listed below with the ICC to discuss the proposed resiliency projects, including the Standby Power Generation Facility (SPGF), after the October 29, 2012, Superstorm Sandy event. Other attendees included, but were not limited to, community members and the New Jersey River and Bay Keepers Association.

- November 19, 2012 (at PVSC)
- December 19, 2013 (at PVSC)
- September 29, 2015 (at PVSC)
- December 15, 2015 (at PVSC)
- March 31, 2016 (at the Ironbound Community School)

Two additional meetings were scheduled at PVSC – on June 27, 2017, and June 28, 2018 – but were not attended by the invited community members or organizations.

The following questions and concerns were raised by community members about the resiliency projects, including the SPGF:

1. Construction truck traffic and its effects on the local streets and community.

   Construction vehicles delivering materials and concrete would primarily travel to the PVSC facility directly from the New Jersey Turnpike via Port Street and/or Doremus Avenue. The City of Newark reviews and permits truck travel along designated city streets. PVSC would work with the City of Newark to identify construction traffic routes that would minimize impact to the community.

2. Air quality concerns when the SPGF is tested and exercised.

   PVSC has agreed to provide ICC: (1) advance notice of when PVSC performs required tests of the power generating facility, and (2) After Action Reports containing the results of all such testing.

In addition, FEMA prepared the Passaic Valley Sewerage Commission Floodwall and On-Site Power System Environmental Assessment (EA) in May 2014. Public comments were accepted on the EA in June and July of 2014. The ICC submitted comments expressing concern about air quality impacts from operation of the SPGF. The comments included the following requests:

- that the project include best available control technology (especially for NOx emissions) for the SPGF;
- that the use of sustainable energy sources as backup power supplies be evaluated;
- that existing facility emissions (especially emissions of PM_{10} and $PM_{2.5}$) be reported;
- that SPGF emissions be mitigated to the maximum extent;
- that the standby power generation not come from diesel engines;
- a community air quality impact evaluation;
- that the NJDEP conduct a comprehensive facility-wide risk assessment that includes all equipment emitting hazardous air pollutants (HAPs) at the PVSC facility.

Maximum mitigation of air emissions, best available control technology and NJDEP State-of-the-Art (SOTA) control technology for the CTGs are discussed in Section 5.2, below. An evaluation of sustainable energy sources for the SPGF is presented in Section 3. Note that none of the proposed standby power generation would come from diesel engines – the CTGs and BSGs would be natural-gas-fired. The project would include two small (164 kW) diesel emergency fire pump engines that would not produce electrical power. PVSC total facility emission rates are shown in Section 4, Table 4-1, before and after the proposed SPGF project. Air dispersion modeling of toxic air pollutants, including assessment of inhalation health risk to the community, has been conducted; see Section 6.

Section 3

Greenhouse Gas Emissions and Alternative Technology Evaluation

3.0 Introduction

In January 2020, Governor Murphy released the state's Energy Master Plan, which lays out the state's approach to reach the Administration's goal of 100 percent clean energy by 2050. The state Energy Master Plan identifies seven key strategies with an implementation plan for each. Of these seven, the following four strategies are relevant for the proposed Standby Power Generation Project:

- **Strategy 2: Accelerating Deployment of Renewable Energy and Distributed Energy Resources** by developing offshore wind, community solar, a successor solar incentive program, solar thermal, and energy storage.
- **Strategy 3: Maximizing Energy Efficiency and Conservation, and Reducing Peak Demand**, including enacting 0.75 percent and 2 percent utility energy efficiency standards for natural gas and electricity, respectively, and improving energy efficiency programs in New Jersey.
- **Strategy 5: Decarbonizing and Modernizing New Jersey's Energy System** through planning and establishment of Integrated Distribution Plans, investing in grid technology to enable increased communication, sophisticated rate design, and reducing our reliance on natural gas.
- **Strategy 6: Supporting Community Energy Planning and Action in Underserved Communities** through incentivizing local, clean power generation, prioritizing clean transportation options in these communities, and supporting municipalities in establishing community energy plans.

This Greenhouse Gas Analysis section has been prepared to evaluate the proposed Standby Power Generation Project with respect to these Energy Master Plan strategies, because the proposed CTGs would be fired with natural gas. The NJDEP has commented[4] that PVSC should consider alternatives to the construction of a new 34-MW fossil-fuel-fired power plant, as well as options to maximize the energy efficiency of the plant.

The analysis has been organized into the following sections:

- Section 3.1 Greenhouse Gas (GHG) Emissions. This section presents the Project's maximum potential carbon-dioxide-equivalent emission rates and compares them with the PSE&G

[4] NJDEP Division of Air Quality Stationary Sources, Meeting to Review Approach for Title V Modification Application for the Standby Power Generation Facility, March 5, 2020, and follow-up phone conversations.

regional utility grid greenhouse gas emission rates for peak standby power production. (Strategy 3 – Reducing Peak Demand).

- Section 3.2 Renewable Energy Alternatives Evaluation (Strategies 2, 5 and 6 – Renewable Energy, Reducing Reliance on Natural Gas, Incentivizing Local Clean Power Generation)
- Section 3.3 Energy Efficiency (Strategy 3 – Energy Efficiency Programs)

3.1 Greenhouse Gas (GHG) Emissions

PVSC is proposing to install three Siemens Model SGT-600 combustion turbine generators (CTGs) that would fire natural gas. Although natural gas has less carbon per million British Thermal Unit (MMBtu) of fuel heat content than does oil or coal, it is a fossil fuel, and the proposed SPGF would emit greenhouse gases.

Table 3-1, below, shows calculated projected worst-case GHG emission rates for the three Non-Emergency Operating Scenarios described in Section 1.3. The maximum potential emission rate is based on the assumption that in no case would the SPGF as a whole operate for non-emergency purposes for more than 592 hours/year. Within these 592 facility hours, it is assumed that no more than two CTGs would operate at a time, and the third backup CTG would be operated for up to 100 hours for readiness testing and maintenance. Therefore, the total maximum potential CTG machine operating hours would be up to 1,284 per year.

Table 3-1 Maximum Potential Greenhouse Gas Emission Rates for the SPGF Facility

Case	Emission Factor [2] (lb CO2e/MWh)	GHG Emission Rates (tons CO2e/year) Max Potential
Standby Power Generation Facility (SPGF)	1,317	23,700
Pennsylvania Jersey Maryland (PJM) Interconnection Power Pool [1]	1,647	29,600

Notes:

[1] PJM is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.

[2] SPGF emission factor is based on the EPA Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98) for natural gas combustion; see calculations in Appendix B of this application. PJM grid emission factor is from U.S. EPA, Emissions & Generation Resource Integrated Database, eGRID2019, released February 23, 2021. Available at https://www.epa.gov/egrid . Non-baseload output emission rates (for peaking power plants on the grid) were selected. Emission rates for five eGRID subregions were used to represent the PJM RTO service area, as shown in Appendix B.

Table 3-1 shows that although the proposed SPGF would be a new source of GHG emissions, it would provide a net benefit in displacing higher-emitting peak power generation on the PJM grid. The SPGF is proposed to operate only during emergencies, for exercising/maintenance of the CTGs, for storm preparation and during peak periods when the reliability of the grid is threatened, when the most polluting power plants tend to be brought on-line. For example, the PJM utility grid peaking power plants emit 1,647 pounds of carbon-dioxide-equivalent (CO_2e) GHG per megawatt (MW) for each hour they operate. The proposed SPGF would emit 1,317

pounds of CO_2e GHG per MW for each hour it operates. Therefore, disconnecting the PVSC facility from the grid and reducing utility power demand during peak periods of impending grid instability could also reduce regional GHG emissions by a net 330 lb CO_2e/MWh. Although the SPGF would not be consistent with Strategy 5 of the Energy Master Plan, it would be consistent with Strategy 3.

3.2 Renewable Energy Alternatives Evaluation

3.2.1 Energy Storage – Batteries

The PVSC Wastewater Treatment Plant historical average and maximum electrical power demand is 23 megawatts (MW) and 28 MW, respectively. The current planned power consumption is 34 MW to accommodate new flood mitigation measures being implemented under the FEMA Resiliency Program. The proposed SPGF and its auxiliary components are being designed for an electrical utility outage lasting 14 continuous days. Therefore, the SPGF must provide 34 MW times 336 hours, or 11,424 megawatt-hours (MWh) of electricity.

The highest capacity platform-style battery storage system available is the Samsung SDI 22S Module. This Module, which fits in an ISO Standard Container (40ft (L) x 8ft (W) x 8.5ft (H)), has a storage capacity of 6 MWh. A total of 1,904 units of the 22S Module would be required to meet the project's power requirements. Each 6-MWh unit has a footprint of 320 square feet (40 feet long by 8 feet wide). About 14 acres of land would be required to arrange these units side by side and end to end. The area allotted for the SPGF is 1.5 acres. The only other available free space on the PVSC property totals 7 acres. If the units were stacked vertically on the 1.5-acre SPGF site (and allowing for access between the towers and space for structural support), the overall height of this arrangement would be more than 200 feet above grade. This arrangement is not physically possible, as well as likely not permissible at this location, which is only 1.5 miles from Newark International Airport. Therefore, battery storage is considered a technically infeasible option for the SPGF.

3.2.2 Solar Power

PVSC conducted a plant-wide solar feasibility study March 2012 completed by DLB Associates. The purpose of the study was to determine feasibility of developing an emission-free energy source by installing photovoltaic (PV) solar systems, reducing the demand on local utility, and providing financial benefit by offsetting electricity costs. The analysis included investigating ownership options of PVSC-owned and -operated PV systems, and various power purchase agreement (PPA) provider owned and operated PV systems. Since 2012, the potential to generate more electricity from the same size units has increased. As a result, the figures from the 2012 report have been updated in Appendix F to reflect changes in estimated system size, and output. These results are summarized and compared to annual PVSC energy consumption in Table 3-2. The Table shows that the PV system's total maximum gross power output would be 10,629 kW, or 10.6 MW. This is what the panels could produce on a sunny day. This is only 31 percent of the 34 MW needed to run PVSC's equipment in an emergency. Furthermore, a PV system cannot be solely relied upon as a standby power source during cloudy and rainy days. As a result, the PV systems are only recommended to be used with full battery backup of a facility as discussed in Section 3.2.1. However, battery storage is considered a technically infeasible option for the SPGF.

Therefore, solar power is technically infeasible because it is not possible to provide 34 MW and it is not possible to provide the necessary battery storage.

Table 3-2 Solar Power Installation Location and Percent of Annual PVSC Consumption

Surveyed		Feasible Locations For Solar PV Installation			
Mounting Type[1]	Total Quantity of PV Panels	Quantity of Panels	Gross Power [kW]	Potential Annual Generation [MWh]	Percent of Annual PVSC Consumption [%]
Roof	38	21	859	1,117	0.6
Ground	31	23	8,565	11,323	6.5
Canopy (Parking Lots)	19	15	1,205	1,593	0.9
Total	88	59	10,629	14,033	8.1

Note: 1) PVSC has previously studied installing solar panel covers on the primary and the final settling tanks and determined it would not be practical due to the need to access the tanks for maintenance.

3.2.2 Wind Power

The wind power energy generation potential of the PVSC site was evaluated. The NREL Wind Maps attached in Appendix G show that the site of PVSC has an annual average wind speed of 5.5m/s at 80m (~260'). The National Renewable Energy Laboratory (NREL) notes that, "areas with annual average wind speeds around 6.5m/s and greater are generally considered to have a resource suitable for wind development." Additional challenges include: height restrictions based on proximity to Newark International Airport (EWR), footprint required for 34MW of wind turbines, and reliability of wind flow. The FAA requires wind turbines over 60 meters (200 feet) in height to be analyzed by the FAA for impact on surrounding airspace. Furthermore, the NREL map attached in Appendix G shows that the location of PVSC is excluded from installation of wind turbines at 110 meters (360 feet). This would exclude most utility scale (>1MW) wind turbines as a potential solution and using thousands of smaller wind turbines is not feasible due to the size of the system required to be built. Therefore, wind is only recommended to be used with full battery backup of a facility as discussed in Section 3.2.1. However, battery storage is considered a technically infeasible option for the SPGF. Therefore, wind power is technically infeasible, because it is not possible to provide 34 MW and it is not possible to provide the necessary battery storage.

3.3 Energy Efficiency

The purpose of the SPGF project is to provide reliable standby power generation to support the WWTP's range of electrical power demand as quickly as possible from the time utility electrical power is lost. The planned 34-MW power consumption is designed to be fully available from the CTGs within 10 minutes upon loss of electrical utility power. The worst-case startup time would be 25 minutes for a cold start condition.

The SPGF is arranged in an N+1 simple cycle configuration and is based on the selected Siemens "SGT-600" CTG. At International Standards Organization (ISO) conditions, the SGT-600 machine can produce 25.3 MW power at a gross efficiency of 34.6%. The SGT-600 gross efficiency is typical for the industrial gas turbine market, which spans the power output range of 5 to 100 MW. Alternatively, GE's proposed machine for the SPGF, the "LM2500DLE" CTG, has a gross efficiency

of 35.9% but only produces 22.7 MW at the same ISO conditions compared to the 25.3 MW of the project's selected combustion turbine.

Combined cycle power generating facilities have approximately 50% gross efficiencies depending on the CTG and matched heat recovery steam generator (HRSG) and steam turbine generator (STG). Even though they can achieve higher efficiencies compared to simple cycle plants, combined cycle power plants have longer startup durations and are not well suited to meet the response time to restore power for the WWTP. Combined cycle facilities are restricted by the HRSG and STG in that the large thermal imbalance between the CTG exhaust and cold state of the HRSG and STG requires the CTG to be loaded slowly and gradually. This procedure is required to prevent damage to the STG and auxiliary equipment from thermal shock. The typical startup duration to reach full load is three hours and is significantly longer than the project's requirement for a timely restoration of power.

Combined Heat and Power (CHP) plants, which lack the STG component of combined cycle plants, have lower efficiencies than simple cycle plants due to additional CTG backpressure created by the heat recovery steam generator. Therefore, CHP was not considered a viable solution for the SPGF.

Therefore, neither combined cycle nor CHP are considered technically feasible options for the SPGF.

3.4 Conclusion

The state Energy Master Plan contains strategies to achieve 100 percent clean energy by 2050. Although the proposed SPGF would be a new source of GHG emissions, it would provide a net benefit in displacing higher-emitting peak power generation on the PJM grid. The SPGF would operate only during emergencies, for exercising/maintenance of the CTGs, storm preparation, and peak periods when the reliability of the grid is threatened, when the most polluting power plants tend to be brought on-line. Therefore, although the SPGF would not be consistent with Strategies 2, 5 and 6 of the Energy Master Plan to support clean energy and reduce reliance on natural gas, it would be consistent with Strategy 3 to reduce peak power demand and reduce GHG emissions from the grid. The SPGF would also be consistent with NJDEP's NJ Protecting Against Climate Threats ("PACT") policy.[5] The SPGF, as part of the FEMA resiliency program, fulfills a goal of NJ PACT to ". . . adapt to unavoidable impacts, such as sea-level rise, extreme weather, and chronic flooding." The SPGF would meet NJ PACT's other goal to reduce greenhouse gas emissions by displacing higher emitting sources on the grid.

The analysis shows that use of battery storage, solar or wind power instead of natural-gas-fired turbine generators are all currently technically infeasible. None of them could meet the primary purpose of the FEMA resiliency program to produce 34 MW for an electrical utility outage lasting 14 continuous days, necessary to protect the community from raw sewage flows during another Superstorm-Sandy-like event.

[5] NJ PACT policy is available at: https://www.nj.gov/dep/njpact/

This Page Left Intentionally Blank

Section 4
Regulatory Applicability

4.1 Title V Air Operating Permit Significant Modification

The SPGF is subject to the air quality regulations of the U.S. Environmental Protection Agency (U.S. EPA) and the NJDEP. The Facility currently operates under a Title V Air Operating Permit (Permit No. BOP 200003). The construction of the proposed SPGF would require a modification to facility's current Title V Air Operating Permit. The permit modification is a "significant modification" under N.J.A.C 7:27-22.24, because the CTGs, BSGs, and fire pump engines are subject to Federal New Source Performance Standards (NSPS) in 40 CFR 60.

4.1.1 Air Emission Sources

PVSC is proposing to install three (3) combustion turbine generators (CTGs) each with a maximum gross output of 28 MW. Only two of these would operate at a time. The CTGs would be fueled with natural gas as the only fuel and would include emissions controls consisting of oxidation catalyst and selective catalytic reduction (SCR). To support black-start of the turbine generator, PVSC is proposing to install two (2) 2,000 kW standby natural gas-fired generators (stationary combustion engines). Only one of these would operate at a time. The project would also include two (2) 164-kW diesel fire pump engines[6]. Only one would operate at a time. A facility plot plan is provided in Appendix A, which shows the location of these units and their exhaust stacks.

Table 4-1 presents the Major Stationary Source applicability thresholds and the Facility's potential to emit after the addition of the SPGF. The facility is currently a major source for carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOC), and will remain so after the addition of the SPGF. Details of the potential to emit calculations are available in Section 5 and Appendix B.

Table 4-1 Summary of Estimated Potential Emissions in Tons per Year

Pollutant	Existing Facility Potential to Emit (tons/year)	Proposed SPGF Potential to Emit (tons/year)	Facility Potential to Emit after the SPGF's Maximum Potential to Emit Addition (tons/year)	Title V/Major Stationary Source Applicability Threshold (tons/year)
Carbon Monoxide (CO)	103.5	4.37	107.9	100
Nitrogen Oxides (NOx)	72.0	2.27	74.3	25
Particulate Matter (PM_{10})	14.8	2.86	17.7	100
Sulfur Dioxide (SO_2)	24.9	0.69	25.6	100

[6] The final selection of the fire pump engines has not yet been made. The largest candidate engine is a Clarke Model JU6H-UFADP8 164-kW engine. Two others are under consideration, both Clarke engines, rated at 147 kW and 117 kW. The candidate engine that produced the highest emission rates was used in Table 4-1.

Pollutant	Existing Facility Potential to Emit (tons/year)	Proposed SPGF Potential to Emit (tons/year)	Facility Potential to Emit after the SPGF's Maximum Potential to Emit Addition (tons/year)	Title V/Major Stationary Source Applicability Threshold (tons/year)
Total Suspended Particulate Matter (TSP)	13.8	2.87	16.7	100
Volatile Organic Compounds (VOC)	81.2	1.39	82.5	25
Ammonia (NH3)	---	1.35	1.35	100
Acrolein	---	0.011	0.011	10
Ethylene dibromide	---	0.000091	0.000091	10
Formaldehyde	0.25	0.26	0.51	10
HAPs (Total)	15.6	0.27	15.9	25

4.1.1.1 Regulatory Requirements for Combustion Turbine Generators

Federal Requirements

The three CTGs would be subject to, and would comply with, the Standards of Performance for Stationary Combustion Turbines, 40 CFR 60 Subpart KKKK[7]. 40 CFR 60.4310(a) in Subpart KKKK would exempt the CTGs from the rule's nitrogen oxide (NOx) emission limit if they are used for emergency purposes only (40 CFR 60.4420(i)). However, with the SPGF's proposed Demand Response and Storm Preparation operating modes, the following NOx emission limit would apply: 74 ppm corrected to 15 percent O_2 or 460 ng/J of useful output (3.6 lb/MWh). The CTGs would comfortably meet this limit at 2.5 ppm corrected to 15 percent O_2.

Subpart KKKK also has a fuel-based sulfur dioxide (SO_2) emission limit that would apply to the CTGs in the Emergency, Demand Response and Storm Preparation operating modes: 0.06 pounds per million British Thermal Units (lb/MMBtu) of heat input (40 CFR 60.4330(a)(2)). The CTGs would comfortably meet this limit at 0.0029 lb/MMBtu.

State Requirements

The three CTGs would be subject to, and would comply with, the Reasonably Available Control Technology (RACT) regulations in N.J.A.C. 7:27-19.5 for NOx emissions from stationary combustion turbines. The CTGs would comply with the N.J.A.C. 7:27-19.5(d)2 limit of 2.2 pounds of NOx per MWh for all operating scenarios, including startup and shutdown, for an averaging period of one hour. Details of the RACT compliance calculations are provided in Appendix B.

The three CTGs would be subject to, and would comply with, the Reasonably Available Control Technology (RACT) regulations N.J.A.C. 7:27-16.9 for VOC emissions from stationary combustion turbines. The CTGs would comply with the N.J.A.C. 7:27-16.9(c) VOC limit of 50 parts per million by volume, dry basis (ppmvd) corrected to 15 percent oxygen for all operating scenarios, including startup and shutdown, for an averaging period of one hour. In addition, the CTGs would comply with the N.J.A.C. 7:27-16.9(b) CO limit of 250 ppmvd corrected to 15 percent oxygen for

[7] 40 CFR 60.4300 and 4305 state that Subpart KKKK applies to stationary combustion turbines constructed after February 18, 2005, and with a peak load heat input rate of 10 MMBtu/hr or greater. The 28-MW-each Siemens SGT-600 Turbines each has a heat input rate of 315 MMBtu/hr.

all operating scenarios for an averaging period of one hour. Details of the RACT compliance calculations are provided in Appendix B.

N.J.A.C. 7:27-3.5 regulates opacity (smoke) from stationary turbines and engines. The CTGs would comply with the requirement to emit less than 20 percent opacity, exclusive of visible condensed water vapor, except for periods not exceeding 10 consecutive seconds.

N.J.A.C. 7:27-4.2 sets limits for emission of particulate matter (PM) from combustion of fuel. The maximum allowable PM emission rate for each CTG (with a design heat input or fuel combustion rate of 315 MMBtu/hr) is 31.5 pounds of PM per hour (lb/hr). The vendor-provided PM emission rate for each CTG is 0.014 lb/MMBtu, or 4.41 lb/hr, well below the limit.

4.1.1.2 Regulatory Requirements for Black-Start Generators

Federal Requirements

The two BSGs would be subject to, and would comply with, the Standards of Performance for Standards of Performance for Stationary Spark Ignition Internal Combustion Engines, 40 CFR 60 Subpart JJJJ. As emergency engines, they would be required to meet the limits of: 2.0 grams per brakehorsepower hour (g/bhp-hr) for NOx, 4.0 g/bhp-hr for CO, and 1.0 g/bhp-hr for VOC. PVSC plans to voluntarily install natural-gas-fired engines meeting the more stringent requirements for non-emergency engines: 1.0 g/bhp-hr for NOx; 2.0 g/bhp-hr for CO, and 0.7 g/bhp-hr for VOC.

State Requirements

The BSGs would be subject to the N.J.A.C. 7:27-3.5 opacity standard. They would comply with the requirement to emit less than 20 percent opacity, exclusive of visible condensed water vapor, except for periods not exceeding 10 consecutive seconds.

The N.J.A.C. 7:27-4.2 PM limit would apply to the BSGs. The maximum allowable PM emission rate for each BSG (with a design heat input rate of 18.7 MMBtu/hr) is 7.7 pounds of PM per hour (lb/hr). The vendor-provided PM emission rate for each BSG is 0.0087 lb/MMBtu, or 0.16 lb/hr, well below the limit.

4.1.1.3 Regulatory Requirements for Fire Pump Engines

Federal Requirements

The two diesel fire pump engines would be subject to, and would comply with, the Standards of Performance for Standards of Performance for Stationary Compression Ignition Internal Combustion Engines, 40 CFR 60 Subpart IIII. As emergency fire pump engines, they would be required to meet the limits of: 3.0 g/bhp-hr for NOx + non-methane hydrocarbons, 2.6 g/bhp-hr for CO, and 0.15 g/bhp-hr for PM. PVSC plans to purchase U.S. EPA Tier 3 certified engines, which would ensure compliance with these emission limits.

State Requirements

The fire pump engines would be subject to the N.J.A.C. 7:27-3.5 opacity standard. They would comply with the requirement to emit less than 20 percent opacity, exclusive of visible condensed water vapor, except for periods not exceeding 10 consecutive seconds.

The N.J.A.C. 7:27-4.2 PM limit would apply to the fire pump engines. The largest engine being considered has a design heat input rate of 1.54 MMBtu/hr. The maximum allowable PM emission

rate for each fire pump engine would be 0.9 pounds of PM per hour (lb/hr). A Tier-3 certified engine would have a maximum PM emission rate of 0.08 lb/hr, well below the limit. See Appendix B for this calculation.

N.J.A.C. 7:27-9.2 restricts the sulfur content of No. 2 fuel oil, which would be combusted in the fire pump engines, to 15 parts per million (ppm) or less. The fire pump engines would comply with this requirement.

4.1.1.4 Aqueous (Aqua) Ammonia Storage Tank

PVSC is proposing to install a 10,000-gallon 19% aqueous ammonia storage tank. Aqueous ammonia is the reagent for the SCR air pollution control equipment. The tank is exempt from inclusion in the air permit application, because the capacity is not in excess of 10,000 gallons per N.J.A.C. 7:27-8.2. In addition, the proposed ammonia storage would be exempt from Chemical Accident Prevention Provisions (also known as Risk Management Plan Rule) of federal regulation 40 CFR 68. The threshold storage quantity only applies to aqueous ammonia with a concentration of 20% or greater, which is not applicable in this case.

Leak detection of the 19% aqueous ammonia storage system would be covered by two systems: liquid measurement within the containment area and ambient air monitoring.

A single liquid level transmitter would be installed within the tank containment area and would alarm the control room if it detects the presence of any liquid. Two ammonia vapor leak detectors would be installed in the vicinity of the 19% aqueous ammonia storage tank and forwarding pumps, and within the containment area. The detectors would measure an ambient ammonia concentration over a range of 0 to 500 parts per million (ppm). Each detector would activate a high-level alarm and high-high level shutdown. Upon alarm and/or shutdown, an alarm horn and beacon would be activated at the ammonia storage area and within the SPGF.

In the event of alarm, PVSC's Emergency Call Center would notify the City of Newark Fire Department of a release. PVSC will coordinate with local fire and emergency service providers on safety and site familiarization. Additionally, the tank will be included in PVSC's Discharge Prevention and Countermeasures Control (DPCC) Plan and subject to regular inspections.

4.2 Air Permit Regulatory Framework

4.2.1 Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emission Offset Rule)

The New Jersey's air quality regulation N.J.A.C. 7:27-18, Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emission Offset Rule), applies to a significant modification to an existing source's Title V Operating Permit.

Table 4-2 presents the significant net increase (major modification) stationary source thresholds. PVSC Facility's potential to emit after the SPGF addition does not exceed the major modification stationary source thresholds, and therefore PVSC is not a Prevention of Significant Deterioration (PSD) major stationary source.

Table 4-2 Major Modification Applicability

Pollutant	Proposed SPGF Potential to Emit (tons/year)	Emission Offset Threshold (ton/yr)
Carbon Monoxide (CO)	4.37	100
Nitrogen Oxides (NOx)	2.27	25
Particulate Matter (PM_{10})	2.86	15
Sulfur Dioxide (SO_2)	0.69	40
Total Suspended Particulate Matter (TSP)	2.87	25
Fine Particulate Matter ($PM_{2.5}$)	2.86	10
Volatile Organic Compounds (VOC)	1.39	25

As shown in Table 4-2 the SPGF does not exceed the significant net emission increase threshold in N.J.A.C. 7:27-18.7. Therefore, the project is not subject to N.J.A.C. 7:27-18, Control and Prohibition of Air Pollution from New or Altered Sources Affecting Ambient Air Quality (Emission Offset Rule).

This Page Left Intentionally Blank

Section 5
Maximum Potential Emission Rates

5.1 Source Emission Rates

The proposed SPGF's maximum potential emission rate calculations are provided in Appendix B. The following section provides a brief discussion for the proposed emission units and the basis of their maximum potential emission rates.

5.1.1 Combustion Turbine Generators

PVSC is proposing to install three natural-gas-fired CTGs. The selected equipment is a Siemens "SGT-600" turbine. The control of emissions of air pollutants from the CTGs will be accomplished with Selective Catalytic Reduction (SCR) and Oxidation Catalyst (OC) systems. The OC system controls emissions of carbon monoxide (CO) and volatile organic compounds (VOC), including organic hazardous air pollutants such as formaldehyde and acrolein. The SCR system controls emissions of nitrogen oxides (NOx).

The maximum potential emission rates for the proposed CTG units are presented in Table 5-1.

Table 5-1 Maximum Potential Emission Rates for CTGs

Pollutant	Proposed Emission Limits				
	One CTG Steady-state (pounds/ hour)	One CTG Start Up (pounds/ hour)	One CTG Shut Down (pounds/ hour)	One CTG (tons/year)	Three CTGs (tons/year)
Carbon Monoxide (CO)	2.14	63.20	20.00	1.66	3.92
Nitrogen Oxides (NOx)	2.93	2.90	1.40	0.90	1.96
Particulate Matter (PM_{10})	4.41	1.84	0.74	1.31	2.83
Sulfur Dioxide (SO_2)	1.07	0.45	0.18	0.32	0.69
Total Suspended Particulate Matter (TSP)	4.41	1.84	0.74	1.31	2.83
Volatile Organic Compounds (VOC)	1.64	4.40	3.50	0.57	1.27
Ammonia	2.10	0.88	0.35	0.62	1.35
Hazardous Air Pollutants	0.15	0.88	0.81	0.065	0.147

The emission factors for CO, NO_x, PM_{10}, VOC, and ammonia were provided by the vendor. The SO_2 emission factor is based on U.S. EPA's *Compilation of Air Pollutant Emission Factors*, Report No. AP-42 ("AP-42"), Section 3.1, Stationary Gas Turbines. The SCR is designed to achieve a final NOx emission rate of 2.5 ppmvd. The oxidation catalyst is designed to achieve a final CO emission rate of 3 ppmvd and VOC emission rate of 4 ppmvd, for steady-state operation. For startup and shutdown scenarios, CO, NOx and VOC emissions are calculated based on vendor estimates. The emission factors for hazardous air pollutants (HAPs) for the CTGs are based on the AP-42 emission factors (plus 10% safety factor), except for formaldehyde for which emissions are

calculated based on vendor-provided information. Calculations are provided in Appendix B. Vendor-provided information is shown in Appendix D.

5.1.2 Black-Start Generators

To support black-start of the turbine generator (BSG), PVSC is proposing to install two (2) 2-MW standby natural gas-fired generators (stationary combustion engines). The maximum potential emission rates for the proposed new BSGs are presented in Table 5-2.

Table 5-2 Maximum Potential Emission Rates for BSGs

Pollutant	Proposed Emission Limits		
	One BSG (pounds/hour)	One BSG (tons/year)	Two BSGs (tons/year)
Carbon Monoxide (CO)	3.25	0.16	0.33
Nitrogen Oxides (NOx)	1.63	0.081	0.16
Particulate Matter (PM_{10})	0.16	0.0081	0.016
Sulfur Dioxide (SO_2)	0.012	0.0006	0.0012
Total Suspended Particulate Matter (TSP)	0.34	0.017	0.034
Volatile Organic Compounds (VOC)	1.14	0.057	0.11
Hazardous Air Pollutants	0.40	0.020	0.040

The emission factors for CO, NO_x, PM_{10}, and VOC are based on vendor-provided information. The SO_2 emission factor is based on the AP-42, Section 3.2, Natural-Gas-Fired Reciprocating Engines emission factor (plus 10% safety factor). The emission factors for hazardous air pollutants (HAPs) for the BSGs are based on the AP-42 emission factors (plus 10% safety factor), except for formaldehyde for which emissions are calculated based on vendor provided information. Calculations are provided in Appendix B.

5.1.3 Fire Pump Engines

PVSC proposes to install two (2) 164-kW diesel fire pump engines[8]. The maximum potential emission rates for the proposed new fire pump engines are presented in Table 5-3.

Table 5-3 Maximum Potential Emission Rates for Fire Pump Engines

Pollutant	Proposed Emission Limits		
	One Engine (pounds/hour)	One Engine (tons/year)	Two Engines (tons/year)
Carbon Monoxide (CO)	1.29	0.064	0.13
Nitrogen Oxides (NOx)	1.45	0.072	0.14
Particulate Matter (PM_{10})	0.08	0.0039	0.0077
Sulfur Dioxide (SO_2)	0.001	3.87×10^{-5}	7.7×10^{-5}

[8] The final selection of the fire pump engines has not yet been made. The largest candidate engine is a Clarke Model JU6H-UFADP8 164-kW engine. Two others are under consideration, both Clarke engines, rated at 147 kW and 117 kW. The candidate engine that produced the highest emission rates was used in Table 5-3.

Pollutant	Proposed Emission Limits		
	One Engine (pounds/hour)	One Engine (tons/year)	Two Engines (tons/year)
Total Suspended Particulate Matter (TSP)	0.08	0.0039	0.0077
Volatile Organic Compounds (VOC)	0.07	0.0036	0.0072
Hazardous Air Pollutants	6.70×10^{-3}	3.35×10^{-4}	6.70×10^{-4}

The emission factors for CO, NO_x, PM_{10}, and VOC are based on vendor-provided information and the engine's being certified to meet U.S. EPA Tier 3 emissions standards. The SO_2 emission factor is based on AP-42, Section 3.3, Gasoline and Diesel Industrial Engines, and a fuel oil sulfur content of 15 ppm. The emission factors for hazardous air pollutants (HAPs) for the FPEs are based on AP-42 emission factors (plus 10% safety factor). Calculations are provided in Appendix B.

5.2 State-of-the-Art (SOTA)

The CTGs would each have an oxidation catalyst and SCR emissions control system. The natural-gas-fired BSGs and diesel fire pump engines would not have add-on air pollution control equipment. During steady-state operation of each CTG, the SCR would achieve a NOx emission rate of 2.5 parts per million by volume, dry (ppmvd), corrected to 15% oxygen. The oxidation catalyst would achieve a CO emission rate of 3 ppmvd and a VOC emission rate of 4 ppmvd, both corrected to 15% oxygen.

For an air permit application that proposes construction or installation of equipment and control apparatus which is a significant source identified in N.J.A.C. 7:27-8, the applicant is required to evaluate state-of-the-art (SOTA) for the source with potential to emit any hazardous air pollutant (HAP) at a rate equal to or greater than the SOTA threshold in Appendix 1, Table B; or with a potential to emit any criteria air pollutant at greater than or equal to 5.0 tons/year (Appendix 1, Table A of N.J.A.C. 7:27-8).

Appendix B shows that the maximum potential emission rates of the CTGs, BSGs and fire pump engines are all below the SOTA thresholds, and that SOTA is not required.

For the CTGs, the NOx and CO maximum potential emission rates are below the SOTA thresholds because PVSC is proposing the inclusion of SCR and an oxidation catalyst on each CTG as a federally enforceable permit condition. If the CTGs had no air pollution control equipment, their NOx and CO emission rates would exceed the SOTA thresholds. In this case, NJDEP's SOTA Manual for Stationary Gas Turbines[9] would require that each of these simple-cycle natural-gas-fired CTGs have Dry Low-NOx Combustors (DLN) for NOx control and an oxidation catalyst for CO control. DLN is a combustion technique (e.g., adjustment of fuel/air ratios), and does not remove as much NOx as does SCR. NJDEP's SOTA Manual requires SCR for NOx removal for combined cycle turbines, but not for simple cycle turbines. The Manual states that simple cycle turbines are less efficient than combined cycle turbines, but have the advantage of starting up quickly. NJDEP assumes that simple cycle turbines would be used in emergency and/or standby applications in

[9] State of the Art (SOTA) Manual for Stationary Gas Turbines, Revision Date: December 21, 2004, available at https://www.state.nj.us/dep/aqpp/downloads/sota/sota14.pdf .

which their annual capacity factor would be no more than 10%. Therefore, NJDEP only requires DLN for simple cycle turbines. NJDEP notes that if the annual capacity factor exceeds 10%, the combined cycle turbine requirement of SCR should apply. The SPGF's annual capacity factor would be less than five percent.[10] Therefore, by proposing SCR for NOx control, PVSC is proposing more than would otherwise be required for the CTGs, and is proposing to meet the lowest available emission rates.

[10] The SPGF's operation would be restricted to no more than 1,284 hours per year for 3 CTGs. Unrestricted operation would be 3 CTGs x 8760 hours/year = 26,280 hours/year. 1,284/26,280 = 5%..

Section 6

Health Risk Assessment

The objective of this health risk analysis is to assess potential health impacts from the toxic air pollutant (TAP) emissions resulting from the proposed SPGF Project. Impacts to human health associated with TAP emissions may include increased cancer risks, increased chronic (long-term) non-cancer health hazards, and increased acute (short-term) non-cancer health hazards from inhalation of TAPs.

6.2 Risk Analysis Approach

6.2.1 Level 1 Risk Analysis

Health risk assessments are required for new or modified equipment with the potential to emit toxic air pollutants above the "reporting thresholds" listed in N.J.A.C. 7:27-17. A health risk assessment is required for the CTGs, because each CTG has maximum potential emission rates of formaldehyde and acrolein that exceed these thresholds. A health risk assessment is also required for the BSGs due to maximum potential emission rates of acrolein, formaldehyde and ethylene dibromide exceeding the reporting thresholds. For the fire pump engines, all of the maximum potential air emission rates would be below reporting thresholds. This means that the air emission rates are insignificant, and not required to be reported in the application or considered in a health risk assessment. Appendix B shows the calculations and comparisons with reporting thresholds.

Appendix G includes a Level 1 Risk analysis using the NJDEP Risk Screening Worksheet for a single CTG. As shown in the Appendix G, negligible risk was determined for acrolein. However, further evaluation (Level 2 Risk Analysis) is required for formaldehyde.

In addition, Appendix G includes a Level 1 Risk Analysis for a single BSG. As shown in Appendix G, negligible risk was determined for ethylene dibromide. However, further evaluation (Level 2 Risk Analysis) is required for acrolein and formaldehyde.

6.2.2 Level 2 Risk Analysis

NJDEP policy states that if the Level 1 risk analysis indicates a need for further review, a refined risk assessment must be conducted. Only those toxic air pollutants with an further evaluation is required (FER) result are required to undergo a refined risk assessment. (NJDEP, 2010, "Procedures to Conduct Risk Assessments to Determine the Incremental Health Risks from New or Modified Equipment"; NJDEP, 2018, "Technical Manual 1003: Guidance on Preparing a Risk Assessment Protocol for Air Contaminant Emissions"; both available at https://www.state.nj.us/dep/aqpp/risk.html) Appendix G shows an "FER" result for formaldehyde emissions from a CTG, and for formaldehyde and acrolein emissions from a BSG.

A Level 2 analysis for formaldehyde and acrolein emissions from the CTGs and BSGs would be conducted using a refined atmospheric dispersion model that predicts ambient air concentrations

more accurately than the Level 1 Worksheet by using stack- and source-specific data as well as representative local meteorological data.

Typically, the NJDEP conducts the refined dispersion modeling after the air permit application is submitted, unless the applicant specifies that they will conduct the analysis (Technical Manual 1003). PVSC has chosen to conduct this analysis early, as part of the permit application, to make inhalation health risk information available to the community for the review of this application. The NJDEP concurs with this approach (NJDEP, email dated August 20, 2020). The NJDEP required that PVSC conduct the modeling in accordance with Technical Manual 1002 and submit a draft modeling protocol and preliminary modeling results along with the permit application and risk screening spreadsheet.

Appendix H contains the Draft Air Quality Modeling Protocol based on the requirements of Technical Manual 1002. Section 6.3 presents the preliminary results from the refined dispersion modeling.

6.3 Refined Dispersion Modeling and Risk Impacts

The objective of this modeling is to predict the maximum ground level concentrations for the toxic air pollutant (TAP) (formaldehyde and acrolein) emitted by the proposed SPGF equipment. These maximum ground level concentrations have been used to predict impacts to human health associated with these TAPs, which may include increased cancer risk, increased chronic (long-term) non-cancer health hazards, and increased acute (short-term) non-cancer health hazards from inhalation of TAPs. Formaldehyde is a probable human carcinogen, and a product of fuel combustion. The NJDEP has found[11] that a lifetime exposure to an ambient concentration of 0.077 micrograms per cubic meter ($\mu g/m^3$) or greater could lead to a one-in-a-million lifetime incremental risk of getting cancer. Higher concentrations of formaldehyde (0.1 to 0.5 parts per million) are associated with nasal and eye irritation, neurological effects, increased risk of asthma and/or allergy. Acrolein is not a carcinogen, but is associated with eye watering, and burning of the nose and throat at concentrations exceeding 2.5 $\mu g/m^3$.[12]

An overview of the health risk analysis calculation procedure is included here, in addition to the supporting information provided in Appendix H.

6.3.1 Overview of Health Risk Analysis

6.3.1.1 Incremental Cancer Risk

Cancer risks were determined by multiplying exposure estimates for carcinogenic chemicals by corresponding Unit Risk Factor (URF). The unit risk factor (URF) is the estimated excess probability of contracting cancer as the result of continuous exposure over a 70-year lifetime to an ambient concentration of one microgram of a chemical per cubic meter of air (ug/m3). The methodology is conservative, as it assumes individuals would be exposed to the TAP for almost every hour of each day.

---

[11] NJDEP, June 2020, "Toxicity Values for Inhalation Exposure," available at: https://www.state.nj.us/dep/aqpp/downloads/risk/ToxAll2020.pdf

[12] For more information, see Centers for Disease Control and Prevention (CDC) Agency for Toxic Substances & Disease Registry (ASTDR) information at: https://www.atsdr.cdc.gov/substances/indexAZ.asp#F

NJDEP Technical Manual 1002, Section 10.1, states that chronic health risks should be calculated based on a five-year average (43,800 hours) concentration. Therefore, incremental cancer risk (IR) for a TAP is determined by multiplying the five-year average modeled air concentration (averaged over five years of met data) predicted by AERMOD with the air toxic-specific inhalation Unit Risk Factor (URF) value.

Cancer Risk = C x URF

where:

C = 5-year average air concentration from AERMOD (µg/m^3), of the unique toxic air pollutant

URF = Inhalation unit risk factor (µg/m^3)$^{-1}$, of the unique toxic air pollutant

6.3.1.2 Long-Term (Chronic) Non-Cancer Risk (Hazard Quotient)

Chronic non-cancer health hazard estimates were calculated by dividing exposure estimates by specific Reference Concentrations (RfC). In the context of non-cancer health hazards, RfCs are estimates of the highest exposure levels that would not cause adverse chronic health effects even if exposures continue over a lifetime. The ratio of exposure concentration to reference concentration is termed as "Hazard Quotient" (HQ). A HQ greater than 1 indicates the potential for adverse health effects, and a HQ less than 1 indicates that adverse health effects are unlikely.

The hazard quotient for long-term non-cancer risk was calculated by dividing the maximum annual average modeled air concentration (from five years of met data) predicted by AERMOD by the long-term air toxic-specific reference concentration (RfC).

Hazard Quotient = C/RfC

where:

C = Maximum annual average ambient air concentration from AERMOD (µg/m^3), of the unique toxic air pollutant

RfC = Reference concentration (µg/m^3), of the unique toxic air pollutant.

6.3.1.3 Short-Term (Acute) Non-Cancer Risk (Hazard Quotient)

Short-term concentrations of the TAPs of concern were estimated by modeling the 1-hour maximum concentration. Acute non-cancer health hazards were then estimated at each receptor location by dividing the predicted maximum 1-hour TAP concentrations by the acute RfCs to determine the HQ.

Short-term RfCs are estimates of the highest exposure levels that would not cause adverse acute health effects even if exposures continue over an hour. The ratio of exposure concentration to reference concentration is termed as "Hazard Quotient short-term" (HQst). A HQst greater than 1 indicates the potential for adverse health effects, and a HQst less than 1 indicates that adverse health effects are unlikely.

NJDEP Technical Manual 1002, Section 10.1, states that the maximum air-toxic-specific short-term (one-hour average) concentration modeled should be used for calculating acute health risks. Therefore, the following equation was used to assess short-term non-cancer risk.

$$\textbf{Hazard Quotient}_{\textbf{short-term}} = C_{st}/RfC_{st}$$

where:

C_{st} = Short-term average ambient air concentration from AERMOD ($\mu g/m^3$), of the unique toxic air pollutant

RfC_{st} = Short-term reference concentration ($\mu g/m^3$), of the unique toxic air pollutant

The averaging periods, URF, RfC and risk thresholds for each TAP of concern are summarized in **Table 6-1**. If all evaluated health risks fall into the "negligible" category, no further risk assessment is needed.

Table 6-1 NJDEP Toxicity Values for Inhalation Exposure

Pollutant	Averaging Period	URF	RfC	Significant Risk Level
Formaldehyde	Long-term (5-yr or Annual)	1.3×10^{-5}	9	IR > 1E-6 and HQ_{lt} > 1
Formaldehyde	Short-term (1-hour)	-	55	HQ_{st} > 1
Acrolein	Short-term (1-hour)	-	2.5	HQ_{st} > 1

IR=Incremental Cancer Risk; HQ_{lt}=Hazard Quotient Long-term; HQ_{st} = Hazard Quotient Short-term; URF = Unit Risk Factor

Note: 1) Reference concentrations and Unit Risk Factor obtained from NJDEP's toxicity values for inhalation exposure, updated June 2020[13].

6.3.2 Refined Dispersion Modeling

6.3.2.1 Approach

PVSC has conducted refined air dispersion modeling to predict maximum ground-level ambient concentrations of formaldehyde and acrolein emissions at:

1) the receptor with the highest predicted air concentration in the five-year AERMOD simulation,

2) the nearest sensitive receptors (residences, correctional facilities, daycare centers, hospitals, nursing homes, playgrounds), and

3) the nearest Ironbound Community residences.

The refined dispersion modeling was conducted for the proposed Project, using the Lakes Environmental Software user interface for U.S.EPA's AERMOD, Version 19191. The CTG and BSG

[13] Accessed here: https://www.state.nj.us/dep/aqpp/downloads/risk/ToxAll2020.pdf , on October 30. 2020

exhaust stacks were designated as point sources in AERMOD; the individual unit Model IDs are shown in **Table 6-2**.

Table 6-2 Proposed SPGF Emission Sources

Model ID	Emission Unit and Emission Point NJID (per RADIUS forms)	Model Source Description	Emission Unit Description in RADIUS forms
CTG-1	E3001/PT301	Combustion Turbine Generator # 1	NG Turbine 1 – 28 MWe Natural Gas Turbine 1
CTG-2	E3002 /PT302	Combustion Turbine Generator # 2	NG Turbine 2 – 28 MWe Natural Gas Turbine 2
CTG-3	E3003/PT303	Combustion Turbine Generator # 3	NG Turbine 3 – 28 MWe Natural Gas Turbine 3
BSG-1	E3004/PT304	Black Start Generator # 1	NG Engine 1 – 2000 kW Natural Gas Black Start Engine 1
BSG-2	E3005/PT302	Black Start Generator # 2	NG Engine 2 – 2000 kW Natural Gas Black Start Engine 2

The Draft Air Quality Dispersion Modeling Protocol in Appendix H, Figures 1 through 6, show the proposed stack locations, building layout, receptor grid and sensitive receptor locations. The modeled value selection for each averaging period is presented in Table 6-3 below.

Table 6-3 Modeled Value Selection

Pollutant	Risk Assessment Category	Averaging Period	Modeled Value Selection
Formaldehyde	Carcinogenic Incremental Cancer Risk (IR)	5-years	5-yr average concentration (from 5-year met dataset)
Formaldehyde	Hazard Quotient (HQ) (Long-term) Non-cancer risk	Annual	Maximum Annual concentration (from 5- year met dataset)
Formaldehyde	HQ (Short-term) Non-cancer risk	1-hour	Maximum 1-hour concentration
Acrolein	HQ (Short-term) Non-cancer risk	1-hour	Maximum 1-hour concentration

A load screening analyses were conducted for each CTG and BSG to determine which discharge conditions produced the highest (worst) ground-level concentrations. These analyses included modeling of exhaust stack exit temperature, exit velocity, and pollutant emission rate for operating loads of 100%, 75% and 50% for each CTG and BSG for both short-term and long-term averaging periods. Table 6-4 provides the worst-case operating load scenario determined for each averaging period, for each unit. The detailed approach to load screening analysis and results are provided in Appendix H.

A load screening analysis was not conducted for CTGs in startup and shutdown modes. Instead, all possible startup hour and shutdown hour combinations were modeled. This is discussed further in Section 6.2.2.3.

Table 6-4 Load Screening Analysis Results Summary

Equipment	Averaging Period	Partial Operating Load Scenarios modeled	Worst-Case Partial Operating Load Scenario Determination
CTGs (Steady State)	Short-term (1-hour)	100%, 75% and 50%	100%
CTGs (Steady State)	Long-term (Annual)	100%, 75% and 50%	75%
BSGs	Short-term (1-hour)	100%, 75% and 50%	100%
BSGs	Long-term (Annual)	100%, 75% and 50%	100%

Section 6.3.2.2 describes the individual equipment modeled risk impacts. Peak value results from each piece of equipment, for each pollutant, are tabulated in Section 6.3.2.2. These peak values are compared with the NJDEP benchmark concentration. The benchmark concentration is defined as the air pollutant concentration equivalent to a one-in-a-million cancer risk level.

Section 6.3.2.3 describes the Project (combined equipment) risk impacts. Peak value results from the worst-case combination grouping of Project equipment, for each pollutant, are tabulated in Section 6.3.2.3. These peak values are then used to predict impacts to human health associated with these TAPs, particularly, incremental cancer risk, increased chronic (long-term) non-cancer health hazard, and increased acute (short-term) non-cancer health hazard.

6.3.2.2 Individual Equipment Risk Impacts

Individual CTG Formaldehyde Long-Term Average Concentrations

The stack parameters and emission rates used to model individual CTGs in the steady state operating scenario for formaldehyde, long term (annual) averaging period are summarized in Table 6-5 below. The emission rate shown in Table 6-5 for each CTG includes startup and shutdown emissions.

Table 6-5 AERMOD Model Input Parameters for CTG Long-Term Modeling

Parameter	Unit	Long-term Averaging Period
		75%
Stack Base Elevation	feet (above mean sea level)	8.36 - 9.68
Stack Flow Rate	actual cubic feet/minute	144,724
Stack Gas Temperature	degrees Fahrenheit	830
Stack Gas Velocity	feet per second	76.13
Stack Inside Diameter	meters	3.048
Stack Height	feet	106
Formaldehyde Emission Rate[1]	tons/year	0.0644
Formaldehyde Emission Rate	lb/hr	0.0147
Formaldehyde Emission Rate	g/s	0.0019

Note: AERMOD File Name: PVSC_CTG_Annual_rev_v4_Nano.isc

1. Formaldehyde emission rates shown in tons per year (tpy) represent annual combined CTG emissions that include emissions from steady state, startup and shutdown operation, as shown in the Appendix B calculations. The annual emission rates (tons/year) have been converted to lb/hr using 8760 hours to determine an annualized lb/hr value.

Table 6-6 shows the AERMOD-predicted formaldehyde maximum ground-level concentrations at the peak impacted receptor from each CTG. All the concentrations are below the NJDEP inhalation risk threshold of 0.077 µg/m^3 (this concentration produces an individual cancer risk of 1 potential cancer case per million people exposed). Table 6-6 shows that CTG Stack 2 and CTG Stack 3 are predicted to produce the highest ground-level concentrations of the three CTGs.

Table 6-6 AERMOD Maximum Predicted Annual Average Formaldehyde Concentrations (µg/m3) for CTGs

Parameter	Value	CTG Stack 1	CTG Stack 2	CTG Stack 3	NJDEP Risk Threshold	Units
Formaldehyde Result	Max 5-year average	0.0019	**0.0023**	**0.0021**	0.077	µg/m^3
Formaldehyde Result	Max annual concentration	0.0020	**0.0024**	**0.0024**	0.077	µg/m^3

Notes:
1. The 75 percent partial load operating scenario was modeled with annualized emission rates as shown in Table 6-3 for the annual averaging period.
2. The modeled output value selected for carcinogenic incremental cancer risk is the five-year average concentration over five years of meteorological data.
3. The modeled output value selected for long-term non-cancer risk (Hazard Quotient) is the maximum annual concentration produced from five years of meteorological data.

Individual CTG Formaldehyde Short-Term Average Concentrations

The stack parameters and emission rates used to model individual CTGs in the different operating scenarios (steady-state, startup and shutdown) are summarized in **Table 6-7**. AERMOD predicted the formaldehyde concentration from each piece of equipment at each ground-level receptor. The concentrations for the peak impacted receptor for each CTG scenario are summarized in **Table 6-8** below. All the concentrations are below the NJDEP short-term Reference Concentration (RfC) of 55 µg/m3.

Table 6-8 shows that the Source Group CT1SU50 produces the worst-case one-hour-average concentration when CTG1 is starting up for first 25 minutes at the 50% partial operating load scenario (without control), with the remainder of the hour (35 minutes) having CTG1 operating in the 50% partial operating load scenario (steady state, with emissions control). Similarly, CT3SU50 produces the second worst-case one-hour-average concentration when CTG3 is starting up for first 25 minutes in the 50% partial operating load scenario (without control), and operating for the remaining 35 minutes in the 50% partial operating load scenario (steady state, with emissions control).

This Page Left Intentionally Blank

Table 6-7 AERMOD Model Input Parameters for CTG Short-Term Modeling

Parameter	Unit	CTG Stacks 1, 2, 3								
		Steady state			Start Up			Shutdown		
		100%	75%	50%	50%SU/100%SS	50%SU/75%SS	50%SU/50%SS	50%SD/100%SS	50%SD/75%SS	50%SD/50%SS
Stack Base Elevation	feet (above mean sea level)	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68	8.36-9.68
Stack Flow Rate	actual cubic feet/minute	189,214	144,724	122,125	383,048	316,595	283,233	436,821	341,888	294,227
Stack Gas Temperature	degrees Fahrenheit	840	830	825	866	860.17	857.25	851	842.67	838.50
Stack Gas Velocity	feet per second	100.30	76.13	63.99	81.29	67.18	60.10	92.70	72.55	62.44
Stack Inside Diameter	meters	3.048	3.048	3.048	3.048	3.048	3.048	3.048	3.048	3.048
Stack Height	feet	106	106	106	106	106	106	106	106	106
Formaldehyde Emission Rate	lb/hr	0.15	0.12	0.09	0.968	0.95	0.933	0.93	0.905	0.88
Formaldehyde Emission Rate	g/s	0.0189	0.0151	0.0113	0.1219	0.1197	0.1175	0.1172	0.1140	0.1109

Note: AERMOD File Name: PVSC_CTG_Shortterm_rev_v8.isc

1. The stack parameters were obtained from the vendor for startup and shutdown operation. It is assumed that the 50% load condition represents the transient conditions occurring during startup and shutdown.
2. Each CTG startup event is assumed to take up to 25 minutes from a cold condition to achieve steady state operation, with no controls operating. During the remainder of 35 minutes in a startup hour, the turbine will be operating at steady state with emission controls. Each CTG shutdown event is assumed to take up to 10 minutes from steady state operation, with full emission controls operating, to shutdown with no controls. The smallest averaging time option available in AERMOD is one hour, therefore the following sections describe an approach that will be used to develop a health risk model for a full hour or 60 minutes averaging period that includes a startup or a shutdown event. These are defined as “Startup hour” and “Shutdown hour. A startup hour and shutdown hour are assumed to occur during the 50% transient load condition, but the remainder of hour which operates under steady state could occur at various partial loads such as 100%, 75% and 50%.
3. A weighted average method was used to obtain stack parameters for the startup hour and shutdown hour, as shown in Appendix H, Table H-7 and H-8 respectively. Appendix H, Table H-9 presents the weighted average formaldehyde emission rates for startup hour and shutdown hour.
4. Formaldehyde emission rates shown here represent the 100% operating load steady state scenario. The model also included partial operating loads such as 75% and 50%. The maximum predicted concentrations from the 75% and 50% operating load scenarios were lower than the 100% load steady state scenario. For more details, refer to Appendix H.

This Page Left Intentionally Blank

Table 6-8 AERMOD Maximum Predicted Hourly Formaldehyde Concentrations (µg/m3) for CTGs in Steady State

Source Group Name	Operating Scenario	Load (%)	Maximum 1-hour Formaldehyde Concentration
		Equipment	µg/m^3
CT1SS100	Steady State	100	0.310
CT2SS100	Steady State	100	0.256
CT3SS100	Steady State	100	0.311
CT1SS75	Steady State	75	0.304
CT2SS75	Steady State	75	0.254
CT3SS75	Steady State	75	0.299
CT1SS50	Steady State	50	0.259
CT2SS50	Steady State	50	0.214
CT3SS50	Steady State	50	0.249
CT1SU100	Startup Hour	50% SU/100% SS	2.336
CT2SU100	Startup Hour	50% SU/100% SS	1.974
CT3SU100	Startup Hour	50% SU/100% SS	2.329
CT1SU75	Startup Hour	50% SU/75% SS	2.664
CT2SU75	Startup Hour	50% SU/75% SS	2.210
CT3SU75	Startup Hour	50% SU/75% SS	2.575
CT1SU50	**Startup Hour**	**50% SU/50% SS**	**2.797**
CT2SU50	Startup Hour	50% SU/50% SS	2.296
CT3SU50	**Startup Hour**	**50% SU/50% SS**	**2.670**
CT1SD100	Shutdown Hour	50% SD/100% SS	2.034
CT2SD100	Shutdown Hour	50% SD/100% SS	1.715
CT3SD100	Shutdown Hour	50% SD/100% SS	2.039
CT1SD75	Shutdown Hour	50% SD/75% SS	2.395
CT2SD75	Shutdown Hour	50% SD/75% SS	1.970
CT3SD75	Shutdown Hour	50% SD/75% SS	2.333
CT1SD50	Shutdown Hour	50% SD/50% SS	2.565
CT2SD50	Shutdown Hour	50% SD/50% SS	2.128
CT3SD50	Shutdown Hour	50% SD/50% SS	2.470

SS=Steady state; SU =Startup; SD=Shutdown; CT1=CTG Stack 1, CT2=CTG Stack 2; CT3=CTG Stack 3.
Notes:

1. The modeled value output selected for non-cancer risk (short-term Hazard Quotient) is maximum 1-hour concentration.

Individual BSG Formaldehyde Long-term Average Concentrations

Table 6-9 shows the BSG stack parameters and formaldehyde emission rates used in the annual averaging period dispersion model run.

Table 6-9 AERMOD BSG Model Input Parameters and Long-Term Formaldehyde Emission Rates

Parameter	Unit	Long-term Averaging Period
		100% Load, BSG1, BSG2
Stack Base Elevation	feet (above mean sea level)	12.14 - 12.56
Stack Flow Rate	actual cubic feet/minute	16,371
Stack Gas Temperature	degrees Fahrenheit	881
Stack Gas Velocity	feet per second	124.57
Stack Inside Diameter	Meters	0.509
Stack Height	Feet	78.07
Formaldehyde Emission Rate[1]	tons/year	0.0586
Formaldehyde Emission Rate	lb/hr	0.0134
Formaldehyde Emission Rate	g/s	0.0017

Note: AERMOD File Name: PVSC_Blackstart_V6_Annual_nano.isc

1. Formaldehyde emission rates shown in tons per year have been converted to lb/hr using 8760 hours to determine an annualized lb/hr value.

AERMOD predicted the formaldehyde concentration of each piece of equipment at each ground-level receptor. The concentrations for the peak impacted receptor for each BSG are summarized in Table 6-10 below. All the concentrations are below the NJDEP inhalation risk threshold of 0.077 µg/m^3. Table 6-10 shows that BSG Stack 2 produced the worst-case concentrations for the annual averaging period for formaldehyde.

Table 6-10 AERMOD Maximum Predicted Annual Average Formaldehyde Concentrations (µg/m3) for BSGs

Parameter	Value	BSG Stack 1	BSG Stack 2	NJDEP Risk Threshold	Units
Formaldehyde Result	Max 5-year average	0.0294	**0.0330**	0.077	µg/m^3
Formaldehyde Result	Max annual concentration	0.0321	**0.0362**	0.077	µg/m^3

Notes:

1. The 100 percent load operating scenario was modeled with annualized emission rates as shown in Table 6-3 for the annual averaging period.
2. The modeled output value selected for carcinogenic incremental cancer risk is the average of the five-year maximum concentration.
3. The modeled output value selected for long-term non-cancer risk (Hazard Quotient) is the maximum annual concentration produced from five years of meteorological data.

6.3.2.2.4 Individual BSG Formaldehyde Short-Term Average Concentrations

Table 6-11 lists the stack parameters and formaldehyde emission rates used to model individual BSGs for the one-hour averaging period.

Table 6-11 AERMOD BSG Model Input Parameters and Short-Term Formaldehyde Emission Rates

Parameter	Unit	Short-term Averaging Period
		100% Load, BSG1, BSG2
Stack Base Elevation	feet (above mean sea level)	12.14 - 12.56
Stack Flow Rate	actual cubic feet/minute	16,371
Stack Gas Temperature	degrees Fahrenheit	881
Stack Gas Velocity	feet per second	124.57
Stack Inside Diameter	meters	0.509
Stack Height	feet	78.07
Formaldehyde Emission Rate[1]	tpy	-
Formaldehyde Emission Rate	lb/hr	1.1719
Formaldehyde Emission Rate	g/s	0.1477

Note: AERMOD File Name: PVSC_Blackstart_V9_shorterm.isc

AERMOD predicted the formaldehyde concentration of each piece of equipment at each ground-level receptor. The concentrations for the peak impacted receptor for each BSG are summarized in **Table 6-12** below. All the concentrations are below the NJDEP short-term Reference Concentration (RfC) of 55 µg/m3. Table 6-12 shows BSG Stack 1 produced the worst-case concentration for short-term averaging period for formaldehyde.

Table 6-12 AERMOD Maximum Predicted Short-Term Formaldehyde Concentrations (µg/m3) for BSGs

Parameter	Averaging Time	BSG Stack 1	BSG Stack 2	NJDEP RfC	Units
Formaldehyde Concentration	1-hour	**13.760**	13.044	55	µg/m^3

Notes:

1. The 100 percent load operating scenario was modeled with hourly emission rates as shown in Table 6-9 for the 1-hour averaging period.
2. The modeled output value selected for the short-term non-cancer risk (Hazard Quotient) is the maximum 1-hour concentration.

Individual BSG Acrolein Short-Term Average Concentrations

Table 6-13 lists the stack parameters and acrolein emission rates used to model individual BSGs for the one-hour averaging period.

Table 6-13 AERMOD BSG Model Input Parameters and Short-Term Acrolein Emission Rates

Parameter	Unit	Short-term Averaging Period
		100% Load, BSG1, BSG2
Stack Base Elevation	feet (above mean sea level)	12.14 - 12.56
Stack Flow Rate	actual cubic feet/minute	16,371
Stack Gas Temperature	degrees Fahrenheit	881
Stack Gas Velocity	feet per second	124.57
Stack Inside Diameter	meters	0.509
Stack Height	feet	78.07
Acrolein Emission Rate	lb/hr	0.0961
Acrolein Emission Rate	g/s	0.0121

Note: AERMOD File Name: PVSC_Blackstart_V9_shorterm.isc

AERMOD predicted the formaldehyde concentration of each piece of equipment at each ground-level receptor. The concentrations for the peak impacted receptor for each BSG are summarized in **Table 6-14** below. All the concentrations are below the NJDEP short-term Reference Concentration (RfC) of 2.5 µg/m3. Table 6-14 shows that BSG Stack 1 produced the worst-case concentration for the short-term averaging period for acrolein.

Table 6-14 AERMOD Maximum Predicted Short-Term Acrolein Concentrations (µg/m3) for BSGs

Parameter	Value	BSG Stack 1	BSG Stack 2	NJDEP RfC	Units
Acrolein Result	1-hour	**1.127**	1.069	2.5	µg/m^3

Notes:

1. The 100 percent load operating scenario was modeled with hourly emission rates as shown in Table 6-7 for the 1-hour averaging period.
2. The modeled output value selected for short-term non-cancer risk (Hazard Quotient) is the maximum 1-hour concentration.

6.3.2.3 Combined Equipment Health Risk Impacts

Refined dispersion modeling was conducted for formaldehyde and acrolein emissions to evaluate combined overall risk impacts from simultaneous operation of the CTGs and BSGs together. A worst-case operating scenario was selected to calculate the combined overall risk impact from the Project.

The following was considered when calculating the combined risk from the Project.

- Total combined operation of all three CTGs together would be limited to 1,284 hours/year (machine operating hours) for all proposed non-emergency operating scenarios. Any one of the three CTGs could operate up to 592 hours/year; however, the combined operating hours for all three turbines would not exceed 1,284 hours/year.
- The non-emergency operation of the BSGs would be limited to 100 hours per year per generator for readiness testing and maintenance. Therefore, the maximum potential non-emergency operation for each BSG would not exceed 100 hours per year (200 hours per year total for the BSGs).
- PVSC is proposing to request a permit condition that would allow only one BSG to be exercised (in non-emergency operation) while two CTGs are operating.

Three separate combined risk model runs were prepared: 1) 5-year average and maximum annual average formaldehyde concentrations; 2) one-hour average formaldehyde concentrations, and 3) one-hour average acrolein concentrations. Although the CTGs passed the Level 1 Risk Screening for acrolein (and were, therefore, not required to be considered in Level 2), the BSGs were required further evaluation for short-term HQ for acrolein. Therefore, the CTG acrolein emission rates were included in the one-hour average combined equipment dispersion model run for short-term HQ.

The resulting maximum predicted concentrations shown in **Table 6-15** were used to calculate human health risk, as shown in **Table 6-16** below. Modeled maximum ground-level concentrations (over five years of meteorological data) were found to be below all NJDEP health risk criteria.

Figures 6-1 through 6-3 are concentration isopleth maps showing the maximum 5-year annual average formaldehyde, peak annual formaldehyde, and peak 1-hour formaldehyde concentrations from the combined SPGF sources. Figure 6-7 shows concentration isopleth maps for the maximum combined peak 1-hour acrolein concentrations. These figures show that the maximum ground-level concentrations would occur at the Facility fence line, adjacent to the proposed SPGF building.

6.3.4 Risk Impacts Near Sensitive Receptors

Table 6-17 lists the sensitive receptor locations that were selected for the analysis. The sensitive receptors include a residential apartment complex in the Ironbound District, the nearest residential area across the Newark Bay, prisons in vicinity of the Facility, and the N.J. Transit building next to PVSC Facility. The predicted concentrations near the sensitive receptor locations are shown in **Table 6-18**. These predicted concentrations were used to calculate human health

risk impacts at the sensitive receptor locations. Modeled ground-level concentrations at the sensitive receptor locations were found to be below all NJDEP health risk criteria. Figures 6-4 through 6-7 show that the formaldehyde and acrolein concentrations from the proposed SPGF decrease significantly with distance from the PVSC facility.

Remainder of Page Left Intentionally Blank

Table 6-15 AERMOD Maximum Predicted Concentrations

Pollutant	Avg. Period	Description	Equipment Model ID	Source Group Name	Peak Location (X = UTM Easting; Y = UTM Northing)		Max 5-year Average	Peak Annual	Peak 1-hour
					X (m)	Y (m)	µg/m³	µg/m³	µg/m³
Formaldehyde	5-year & Annual	All 5 units operating over the 5-year period. BSG1 and BSG2 operating 100 hours at 100% load, CTG2 and CTG3 operating at 75% loading at 592 hours each, and CTG1 operating at 75% load at 100 hours.	BSG1_100, BSG2_100, CTG2SS75, CTG3SS75, CT1SS10[1]	Combined	573438.48	4507250.03	0.06624	0.0721	-
Formaldehyde	1-hour	BSG1 when CT1 and CT2 are starting up	BSG1, CT1SU50, CT2SU50	SRCGP34/35	573407.70	4507183.25	-	-	5.0803
Acrolein	1-hour	BSG1/BSG2 when CT1 and CT3 are starting up	BSG1, CT1SU50, CT3SU50	SRCGP26	573448.74	4507272.29	-	-	1.1273

AERMOD File Names: PVSC_Combined_Forma_Shortterm_V0_Terr.isc; PVSC_Formaldehyde_Annual_ALL_v2.isc; PVSC_Combined_Acr_Shortterm_v0.isc

1. CT1SS10 represents combustion turbine generator stack 1 operating 100 hours. The emission rate input for CT1SS10 in the combined model is 0.0109 tons per year (=0.0644*100/592), also equivalent to 0.000313 g/s). Formaldehyde emission rate of 0.0644 in tons per year (tpy) represent annual combined CTG emissions that include emissions from steady state, startup and shutdown operation, as shown in the Appendix B calculations.

Table 6-16 Combined Health Risk Assessment at Maximum Predicted Concentration Locations

Pollutant	Avg. Period	Incremental Cancer Risk	Long-term Non-cancer risk	Short-term Non-cancer risk	Peak Location (X = UTM Easting; Y = UTM Northing)		Peak Location (X = UTM Easting; Y = UTM Northing)	Peak Annual Conc.	Peak 1-hour Conc.
					X (m)	X (m)	µg/m³	µg/m³	µg/m³
Threshold →		**1E-06**	**1**	**1**					
Formaldehyde	5-Year & Annual	8.61E-7	0.0080	-	573438.48	4507250.03	0.06618	0.0721	-
Formaldehyde	1-hour	-		0.092	573407.70	4507183.25	-	-	5.0803
Acrolein	1-hour	-		0.451	573448.74	4507272.29	-	-	1.1273

AERMOD File Names: PVSC_Combined_Forma_Shortterm_V0_Terr.isc; PVSC_Formaldehyde_Annual_ALL_v2.isc; PVSC_Combined_Acr_Shortterm_v0.isc

This Page Left Intentionally Blank

Table 6-17 Sensitive Receptor Locations

Receptor	Location		Type of Location
	Easting X (m)	Northing Y (m)	
Sensitive Receptor 1	572069.7	4508360.8	Ironbound District (Apartment Complex Building) 63 Rome St.
Sensitive Receptor 2	575421.1	4507060.7	Droyer's Point (Apartment Complex Building)
Sensitive Receptor 3	573414.0	4507360.7	N.J. Transit Bldg
Sensitive Receptor 4	573594.5	4507837.1	Delaney Hall Juvenile Detention Facility
Sensitive Receptor 5	573696.0	4508135.8	Essex County Correctional Facility
Sensitive Receptor 6	569890.6	4507237.1	North State Prison

Remainder of Page Left Intentionally Blank

This Page Left Intentionally Blank

Table 6-18 Combined Health Risk Assessment and Maximum Predicted Concentration Near Sensitive Receptor Locations

Pollutant	Location		Description	Predicted Concentrations Near Sensitive Receptor Location				Risk Assessment			
				Formaldehyde			Acrolein	Formaldehyde			Acrolein
				Peak Annual	Average Annual	Peak 1-hour	Peak 1-hour	Incremental Cancer Risk	Long-term Non-cancer risk	Short-term Non-cancer risk	Short-term Non-cancer risk
	X	Y		ng/m³	ng/m³	µg/m³	µg/m³	Threshold → 1E-06	Threshold → 1	Threshold → 1	Threshold → 1
Sensitive Receptor Area	-	-	Ironbound Community	0.09-0.33	0.09-0.33	0.35-0.62	0.02-0.04	4.29E-9	3.67E-5	0.011	0.016
Sensitive Receptor 1	572069.7	4508360.8	Ironbound Community (Apartment Complex Building) 63 Rome St.	0.26	0.26	0.64	0.04	3.38E-9	2.89E-5	0.012	0.016
Sensitive Receptor 2	575421.1	4507060.7	Droyer's Point (Apartment Complex Building)	0.45	0.40	0.57	0.03	5.20E-9	5E-5	0.010	0.012
Sensitive Receptor 3	573414.0	4507360.7	N.J. Transit Bldg	11.50	11.00	2.38	0.52	1.43E-7	1.28E-3	0.043	0.208
Sensitive Receptor 4	573594.5	4507837.1	Delaney Hall Juvenile Detention Facility	1.31	1.30	1.16	0.16	1.69E-8	1.44E-4	0.021	0.064
Sensitive Receptor 5	573696.0	4508135.8	Essex County Correctional Facility	0.67	0.66	0.66	0.07	8.58E-9	7.44E-5	0.012	0.028

Pollutant	Location		Description	Predicted Concentrations Near Sensitive Receptor Location				Risk Assessment			
				Formaldehyde			Acrolein	Formaldehyde			Acrolein
				Peak Annual	Average Annual	Peak 1-hour	Peak 1-hour	Incremental Cancer Risk	Long-term Non-cancer risk	Short-term Non-cancer risk	Short-term Non-cancer risk
	X	Y		ng/m^3	ng/m^3	µg/m^3	µg/m^3	Threshold → 1E-06	Threshold → 1	Threshold → 1	Threshold → 1
Sensitive Receptor 6	569890.6	4507237.1	North State Prison	0.11	0.11	0.43	0.03	1.43E-9	1.22E-5	0.008	0.012

AERMOD File Names: PVSC_Combined_Forma_Shortterm_V0_Terr.isc; PVSC_Formaldehyde_Annual_ALL_v2.isc; PVSC_Combined_Acr_Shortterm_v0.isc

Notes:

1. Reference concentrations and Unit Risk Factor obtained from NJDEP's toxicity values for inhalation exposure, updated June 2020. Incremental Cancer Risk is based on a formaldehyde Unit Risk Factor (URF) of 1.3E-05 [(µg/m^3)$^{-1}$] from NJDEP's Toxicity Values for Inhalation exposure and a long-term reference concentration (RfC) for formaldehyde is 9 µg/m3. Accessed here: https://www.state.nj.us/dep/aqpp/downloads/risk/ToxAll2020.pdf , on October 30. 2020.
2. Reference concentrations were obtained from NJDEP's toxicity values for inhalation exposure, updated June 2020[5]. The short-term Reference Concentration for formaldehyde is 55 µg/m^3
3. Reference concentrations were obtained from NJDEP's toxicity values for inhalation exposure, updated June 2020[5]. The short-term Reference Concentration for Acrolein is 2.5 µg/m^3.
4. The modeled value output selected for carcinogenic incremental cancer risk is the 5-year average concentration over 5-years of met data.
5. The modeled value output selected for long-term non-cancer risk (Hazard Quotient) is maximum 5 -year concentration.
6. The modeled value output selected for non-cancer risk (short-term Hazard Quotient) is maximum 1-hour concentration.

6.4 Conclusion

NJDEP Technical Manual 1003[14] provides risk assessment guidelines for air permit applications to assist NJDEP in evaluating whether a proposed project could cause incremental inhalation health risks that are unacceptable. NJDEP's procedures, described in the sections above, evaluate the incremental inhalation risk from exposure to the proposed project's air toxic emissions. The Manual states that these procedures: "do not consider the existing risk of cancer and other maladies associated with smoking, occupational or domestic exposures, dietary habits, inherited traits, or other factors that impact health and wellbeing; nor do they consider health risks from other nearby air toxics sources or existing levels of toxics in the ambient air."

The NJDEP's risk management guidelines for proposed new or modified source operations in air permit applications are summarized in Tables 6-19 and 6-20, below:

Table 6-19 NJDEP Inhalation Incremental Cancer Risk Guidelines for New or Modified Sources

Risk Level	Outcome
Risk <= 1 in a million (1×10^{-6})	Negligible risk
1 in a million < Risk < 100 in a million	Case-by-case review by NJDEP Risk Management Committee
Risk >= 100 in a million (1×10^{-4})	Unacceptable risk

Source: NJDEP, 2018, Technical Manual 1003: Guidance on Preparing a Risk Assessment for Air Contaminant Emissions, Table 2-1

Table 6-20 NJDEP Long- and Short-Term Non-Cancer Inhalation Risk Guidelines for New or Modified Sources

Risk Level	Outcome
Hazard Quotient <= 1	Negligible risk
Hazard Quotient > 1	Case-by-case review by NJDEP Risk Management Committee

Source: NJDEP, 2018, Technical Manual 1003: Guidance on Preparing a Risk Assessment for Air Contaminant Emissions, Table 2-2

If all evaluated health risks fall into the "negligible" category, no further risk assessment or change to the air permit is needed. If any of the evaluated health risks do not fall into the "negligible" category, the NJDEP Risk Management Committee Review would evaluate the impact and make appropriate recommendations for mitigation.

6.4.1 Formaldehyde

Long-term formaldehyde emissions from the proposed SPGF would not cause an incremental cancer risk greater than 1 in a million near the project location or at any of the sensitive receptor locations. The maximum modeled incremental cancer risk of 8.61×10^{-7} would occur at the fence line on Doremus Avenue. Of all the sensitive receptors modeled, the maximum incremental cancer risk of 1.43×10^{-7} would occur for an employee at the N.J. Transit building. These impacts are all below the 1-in-a-million threshold. The incremental cancer risk for Ironbound Community

[14] NJDEP, 2018, Technical Manual 1003: Guidance on Preparing a Risk Assessment for Air Contaminant Emissions. Available at: https://www.nj.gov/dep/aqpp/downloads/techman/1003.pdf

is in the range of 4.29×10^{-9}, which is well below the 1-in-a-million threshold. The incremental long-term cancer health risk, therefore, would be considered negligible.

Formaldehyde emissions from the proposed SPGF would also not increase the long-term (chronic) HQ greater than 1 near the project location or at any of the sensitive receptor locations. The maximum chronic HQ of 0.008 occurs at the fence line on Doremus Avenue. Of all the sensitive receptors evaluated, the maximum chronic HQ risk impact of 0.00128 would occur for an employee at the N.J. Transit building. These impacts are all below the threshold of 1. The chronic HQ for Ironbound Community is in the range of 3.67×10^{-5} combined, which is well below the threshold of 1. The long-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

Short-term peak formaldehyde emissions from the proposed SPGF would not increase the short-term (acute) HQ greater than 1 near the project location or at any of the sensitive receptor locations. The maximum acute HQ of 0.09 occurs at the fence line on Doremus Avenue. Of all the sensitive receptors evaluated, the maximum acute HQ risk impact of 0.043 is predicted to occur for an employee at the N.J. Transit building. The short-term HQ for Ironbound Community is in the range of 0.016, which is well below the threshold of 1. The short-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

6.4.2 Acrolein

Short-term peak acrolein emissions from the proposed SPGF would not increase the short-term (acute) HQ greater than 1 near the project location or at any of the sensitive receptor locations. The maximum acute HQ of 0.451 is modeled to occur at the fence line on Doremus Avenue. Of all the sensitive receptors selected, the maximum acute HQ risk impact of 0.208 would occur for an employee at the N.J. Transit building. These impacts are all below the threshold of 1. The short-term HQ for Ironbound Community is in the range of 0.012 , which is well below the threshold of 1. The short-term incremental non-cancer inhalation health risk would, therefore, be considered negligible.

Attachment 7

PASSAIC VALLEY SEWERAGE COMMISSIONERS

PLANT-WIDE SOLAR FEASIBILITY STUDY

January 19, 2012

Prepared by:
DLB Associates
(dlb # 11605-01)

dlb associates

265 Industrial Way West, Eatontown, NJ 07724

(732) 774-2000

SECTION 2

TECHNICAL EVALUATION

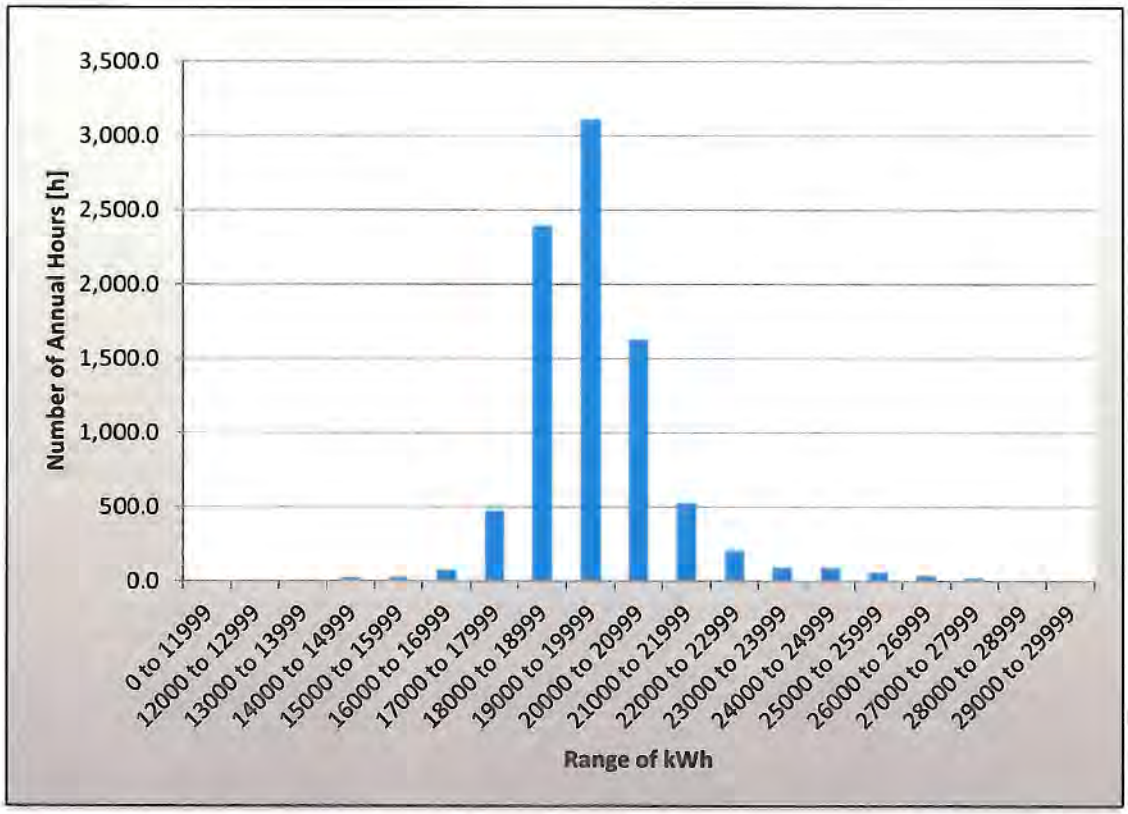
SECTION 2 – TECHNICAL EVALUATION

2.1 PVSC Load Profile: Electrical Energy Consumption

The hourly profile of the PVSC Newark site annual electrical consumption is shown in Figure 2-1. Utility data provided by the PVSC indicated 15-minute interval electric consumption rates for the combined meters at the Newark site. This data was averaged over each hour and statistically analyzed to produce the histogram.

The chart shows that the Newark site most commonly consumes electricity in the 18,000 to 21,000 kWh range. This information can be useful to reduce operational costs depending on the utility rate structure. It is recommended that the electric utility's rate structure and site electric consumption rates be optimized, although this analysis was not described as part of the scope for this project.

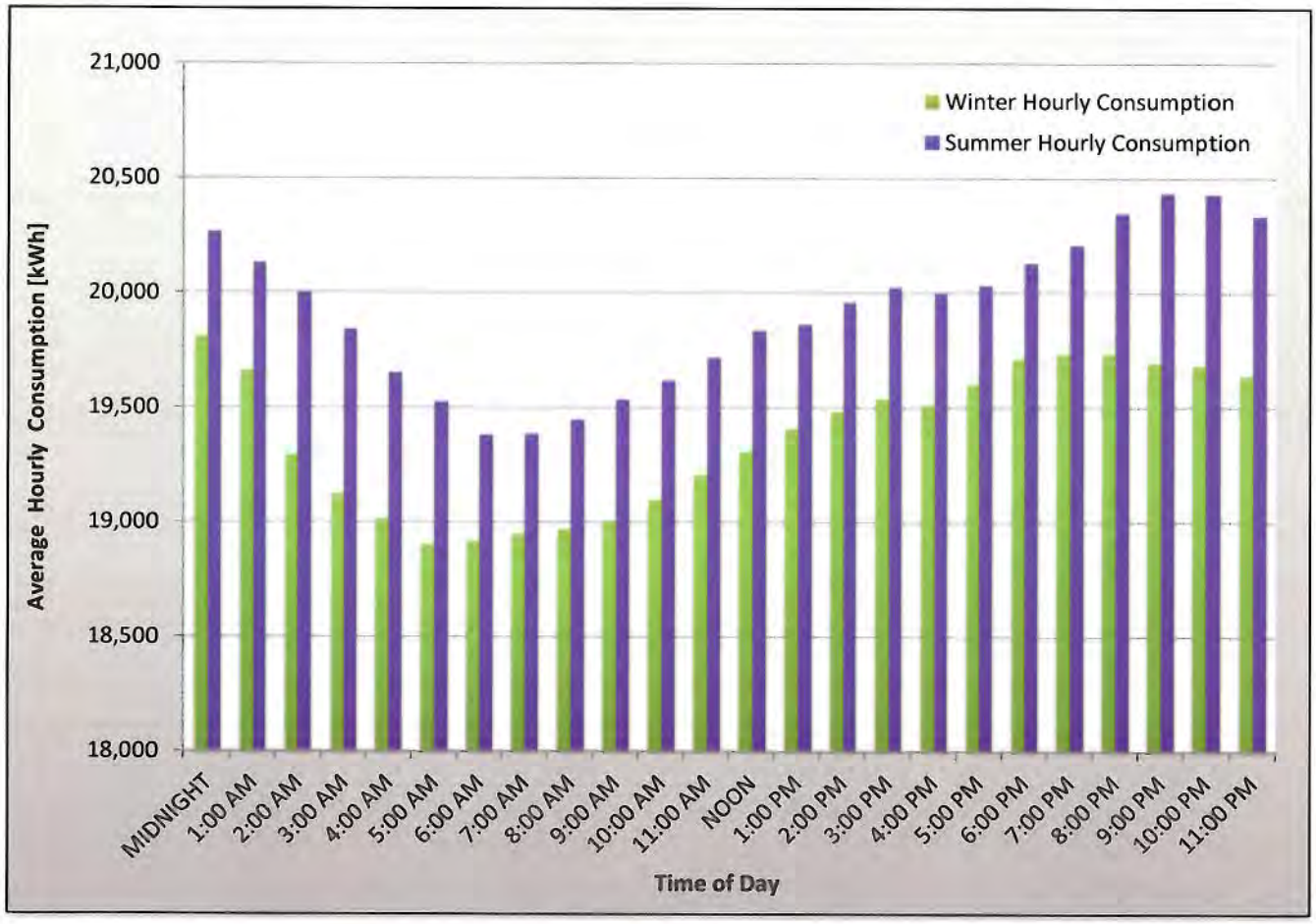
Figure 2-1: PVSC Newark Site Electrical Annual Consumption Hourly Profile



Average hourly electrical consumption for the Newark site is shown versus time of day in Figure 2-2. The winter data indicates the average hourly consumption between the months of December through February. The summer data indicates average hourly consumption between the months of June through August.

The electrical consumption profiles are similar for winter and summer months with peak electricity consumption occurring during the night hours. Figure 2-2 also indicates that PVSC consumes approximately 500 kWh less electricity per hour during the winter months, on average.

Figure 2-2: Hourly Electrical Consumption Averaged Over Winter and Summer Months Displayed by Time of Day



2.2 Site Solar Capacity Analysis

A site survey was conducted over two days to observe existing conditions at 88 locations in consideration for solar PV installations. During the survey, information was collected about each location's general conditions, obstructions, shading, proximity to existing electrical infrastructure, the electrical characteristics of that infrastructure, and structural capacity pertaining to the roof areas. This information was used to determine the feasibility of installing a solar PV array for each area and the peak capacity that is possible for the available area.

A location was deemed feasible for a solar PV installation if sufficient area is available to support 11 solar PV panels and 3.19 kW of DC output. DLB Associates assessed 88 locations for installation of solar PV equipment, but only conducted financial analyses for locations on which at least 11 solar PV panels could be installed, because this was viewed as the minimum number needed to utilize standard equipment. Locations with fewer than 11 panels were therefore excluded from both a design and economic standpoint.

The following physical assumptions were made in order to estimate the capacity of the potential solar PV system:

- Solar panel has a peak power generation rating of [290 W / 20.8 sq. ft.]
- Sufficient space is provided in solar PV arrays for maintenance aisles, and to avoid shading from adjacent panels, resulting in an average power generation density of:
  - Roof areas [7.5 W / sq. ft. of available area]
  - Ground areas [9.0 W / sq. ft. of available area]
  - Parking Lot areas [13.0 W / sq. ft. of available parking space]
- DC to AC de-rate factor is 0.80.
- Arrays are mounted with fixed-tilt angle as specified in Introduction section of report:
  - Roof is 15 degrees
  - Ground is 25 degrees
  - Parking Canopy is 15 degrees
  - Façade is 40 degrees
- Array azimuth angle varies and will correspond to the orientation of the building.
- Weather is typical (some years are certainly atypical and will impact actual performance).
- AC yield is specific to the array being installed at the latitude of Newark, NJ.

The tables on the following pages summarize each location assessed. Tables 2-1 through 2-3 summarize locations deemed feasible for a solar PV installation. Tables 2-4 through 2-6 summarize the monetary values utilized in the financial models and NPV calculations. Tables 2-7 through 2-9 summarize those locations not included in the financial evaluation. Tables 2-10 and 2-11 summarize technical and financial data for two alternate locations that were considered.

Table 2-1: Technical Summary of Feasible Roof Locations

Location ID Tag	Description (nearest building)	Assessment Information				
		Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Roof Mounted						
R-1	Vehicle Maintenance	25,100	10,680	276	80.0	
R-2	Vehicle Storage #2	8,400	4,650	120	34.8	
R-3	Vehicle Storage #3	8,400	4,020	104	30.2	
R-5	Administration Building	11,900	3,480	90	26.1	
R-6	Pollution & Industrial Control Building	9,800	1,320	34	9.9	
R-9	Influent Pumping Station (IPS)	6,600	2,720	70	20.3	
R-10	Grit & Screening Facility	6,400	800	20	5.8	
R-12	Wet Weather Pumping Station	23,000	5,420	140	40.6	
R-13	Warehouse Facility	42,700	25,920	670	194.3	
R-14	Oxygen Production Scrubber Building	5,300	1,180	30	8.7	
R-15	Oxygen Production Building	18,500	6,820	176	51.0	
R-17	OEM Building	18,800	3,420	88	25.5	
R-18	Switchgear Building #1	2,600	1,100	28	8.1	
R-22	Return Water Sludge Pump Station	2,600	500	11	3.2	
R-25	Oxygen Tanks Compressor Building	22,000	2,850	72	20.9	
R-29	Centrifuge Dewatering	11,500	6,550	168	48.7	a
R-30	Cake Storage	11,500	1,320	34	9.9	
R-31	Filter Press	12,000	520	12	3.5	
R-34	Sludge Thickeners Building	39,500	9,820	254	73.7	
R-35	Sludge Heat Treatment	75,000	5,550	142	41.2	b
R-36	Wallington Line Pumping Station	3,500	1,320	34	9.9	
Total Roof		**365,100**	**99,960**	**2,573**	**746.2**	

Notes:

a. The performance of a solar PV array would be degraded due to shading from the tall exhaust stack located just south of this building.

b. The performance of a solar PV array would be degraded due to shading from the heavy steam clouds that are frequently exhausted as shown in photos below.

Table 2-2: Technical Summary of Feasible Ground Locations

PVSC - Solar PV Analysis - Technical Evaluation Summary - Feasible Locations						
Location	Description	Assessment Information				
ID Tag	(nearest building)	Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Ground Mounted						
G-1	Entrance Gate #5 - North	8,100	7,290	201	58	c
G-2	Entrance Gate #5 - South	12,500	11,250	349	101	c
G-3	Administration Building - South	19,100	17,190	533	155	
G-4	Grit & Screening - East	5,950	5,355	166	48	
G-5	Influent Pump Station - South	11,200	10,080	313	91	
G-6	Venturi Building - Northeast	6,460	5,814	180	52	
G-7	Wet Weather - Southeast	3,770	3,393	105	31	c
G-8	Elevator To Utility - North	12,000	10,800	335	97	
G-9	Elevator To Utility - South	12,800	11,520	358	104	
G-10	Oxygen Production - East	23,400	21,060	654	190	
G-11	Supernatant Plant - North	26,500	23,850	740	215	
G-14	South Property Line	98,200	88,380	2,743	795	
G-15	Wilson & Doremus Ave. - West	37,000	33,300	1,033	300	
G-16	Electric Substation #1 - North	11,400	10,260	318	92	
G-17	Wilson & Doremus Ave. - East	80,100	72,090	2,237	649	
G-18	PVSC Driveway to Witco Property - Sout	9,810	8,829	274	79	
G-22	Filter Press - South	17,000	15,300	475	138	
G-24	Newark Bay Docks - North	7,340	6,606	205	59	
G-25	Newark Bay Docks - South	76,500	68,850	2,137	620	
G-26	Former Witco - East	284,000	255,600	7,932	2,300	
G-27	Former Witco - West	133,800	120,420	3,737	1,084	
G-28	PVSC Driveway to Witco Property - Nort	9,000	8,100	251	73	
G-29	Vehicle Maintenance - North	10,400	9,360	290	84	
Total Ground		**916,330**	**824,697**	**25,569**	**7,415.0**	

Notes:

c. The area available for a solar PV array is reduced due to shading from trees located in and around this ground area.

Table 2-3: Technical Summary of Feasible Parking Lot Canopy Locations

PVSC - Solar PV Analysis - Technical Evaluation Summary - Feasible Locations						
Location	Description	Assessment Information				
ID Tag	(nearest building)	Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Parking Lot Canopy						
C-1	Vehicle Maintenance - West	14,500	1,148	264	77	
C-2	Entrance Gate #5 - North	8,500	1,053	242	70	
C-3	Administration Building - West	9,000	622	143	41	
C-4	Administration Building - North	7,000	526	121	35	
C-5	Security Building - South	12,000	1,148	264	77	
C-6	Pollution & Industrial Control - South	19,500	1,388	319	93	
C-7	Influent Pump Station - West	5,000	479	110	32	
C-9	Supernatant Plant - North	7,000	1,101	253	73	
C-10	Warehouse Facility - South	14,000	1,483	341	99	
C-11	OEM - West	45,000	3,493	803	233	
C-12	Return Waste Sludge Pump - West	2,500	479	110	32	
C-15	Filter Press - East	6,500	766	176	51	
C-17	Decant Tanks - South	3,000	335	77	22	
C-18	Sludge Storage Tanks - South	5,000	670	154	45	
C-19	Wallington Pump Station - North	4,600	957	220	64	
Total Canopy		**163,100**	**15,647**	**3,597**	**1,043.1**	

Table 2-4: Financial Summary of Feasible Roof Locations

Location ID Tag	Description (nearest building)	AC Yield Annual [kWh]	Estimated Costs Standard Installation	Electrical Infrastructure	Annual Maintenance	Roof Replacement	Structural Upgrade	Total Installation
Roof Mounted								
R-1	Vehicle Maintenance	94,084	$560,280	$300,000	$3,602	$426,700	$0	$1,286,980
R-2	Vehicle Storage #2	40,906	$243,600	$100,000	$1,566	$0	$0	$343,600
R-3	Vehicle Storage #3	35,452	$211,120	$100,000	$1,357	$0	$0	$311,120
R-5	Administration Building	30,680	$182,700	$50,000	$1,175	$0	$0	$232,700
R-6	Pollution & Industrial Control Building	11,590	$69,020	$20,000	$444	$166,600	$735,000	$990,620
R-9	Influent Pumping Station (IPS)	23,862	$142,100	$30,000	$914	$165,000	$0	$337,100
R-10	Grit & Screening Facility	6,818	$40,600	$15,000	$261	$160,000	$0	$215,600
R-12	Wet Weather Pumping Station	47,724	$284,200	$75,000	$1,827	$391,000	$0	$750,200
R-13	Warehouse Facility	228,393	$1,360,100	$200,000	$3,886	$854,000	$0	$2,414,100
R-14	Oxygen Production Scrubber Building	10,227	$60,900	$20,000	$392	$0	$265,000	$345,900
R-15	Oxygen Production Building	59,996	$357,280	$100,000	$2,297	$314,500	$0	$771,780
R-17	OEM Building	29,998	$178,640	$50,000	$1,148	$319,600	$0	$548,240
R-18	Switchgear Building #1	9,545	$56,840	$20,000	$365	$65,000	$0	$141,840
R-22	Return Water Sludge Pump Station	3,750	$22,330	$5,000	$144	$52,000	$0	$79,330
R-25	Oxygen Tanks Compressor Building	24,544	$146,160	$30,000	$940	$440,000	$0	$616,160
R-29	Centrifuge Dewatering	45,815	$341,040	$80,000	$2,192	$0	$0	$421,040
R-30	Cake Storage	11,590	$69,020	$20,000	$444	$287,500	$862,500	$1,239,020
R-31	Filter Press	4,091	$24,360	$5,000	$157	$240,000	$0	$269,360
R-34	Sludge Thickeners Building	86,585	$515,620	$150,000	$3,315	$413,750	$0	$1,079,370
R-35	Sludge Heat Treatment	43,565	$288,260	$100,000	$1,853	$600,000	$0	$988,260
R-36	Wallington Line Pumping Station	11,590	$69,020	$20,000	$444	$70,000	$0	$159,020
Total Roof		860,805	$5,223,190	$1,490,000	$28,720	$4,965,650	$1,862,500	$13,541,340

Notes for all Financial Summary Tables:

1. AC Yield data were generated by PVWatts software supported by NREL using a weather model for a typical year.
2. Installation Costs include equipment and labor for a typical installation for the specific type of mounting.
3. Electrical costs include atypical upgrades to the existing electrical infrastructure, including remote tie-in.
4. Annual Maintenance costs include standard maintenance staffing and equipment replacement.
5. Roof Replacement costs are industry standard estimates based on roof type and square footage.
6. Structural Upgrade costs are industry standard benchmark costs for roof type and required capacity.
7. Total Installation costs include Standard Installation, Electrical Infrastructure, Annual Maintenance, Roof Replacement (for roof-mounted), and Structural Upgrade (for roof-mounted) costs.

Table 2-5: Financial Summary of Feasible Ground Locations

Location ID Tag	Description (nearest building)	AC Yield Annual [kWh]	Estimated Costs			
			Standard Installation	Electrical Infrastructure	Annual Maintenance	Total Installation
Ground Mounted						
G-1	Entrance Gate #5 - North	49,856	$408,240	$100,000	$2,624	$508,240
G-2	Entrance Gate #5 - South	86,555	$708,750	$150,000	$4,556	$858,750
G-3	Administration Building - South	188,937	$1,082,970	$200,000	$3,094	$1,282,970
G-4	Grit & Screening - East	58,857	$337,365	$100,000	$2,169	$437,365
G-5	Influent Pump Station - South	110,790	$635,040	$175,000	$4,082	$810,040
G-6	Venturi Building - Northeast	63,902	$366,282	$100,000	$2,355	$466,282
G-7	Wet Weather - Southeast	26,105	$213,759	$100,000	$1,374	$313,759
G-8	Elevator To Utility - North	118,704	$680,400	$150,000	$4,374	$830,400
G-9	Elevator To Utility - South	126,617	$725,760	$175,000	$4,666	$900,760
G-10	Oxygen Production - East	231,472	$1,326,780	$250,000	$3,791	$1,576,780
G-11	Supernatant Plant - North	262,137	$1,502,550	$300,000	$4,293	$1,802,550
G-14	South Property Line	971,392	$5,567,940	$800,000	$35,794	$6,367,940
G-15	Wilson & Doremus Ave. - West	366,003	$2,097,900	$400,000	$13,487	$2,497,900
G-16	Electric Substation #1 - North	112,768	$646,380	$150,000	$4,155	$796,380
G-17	Wilson & Doremus Ave. - East	792,347	$4,541,670	$750,000	$29,196	$5,291,670
G-18	PVSC Driveway to Witco Property - South	97,040	$556,227	$200,000	$3,576	$756,227
G-22	Filter Press - South	168,164	$963,900	$25,000	$2,754	$988,900
G-24	Newark Bay Docks - North	72,607	$416,178	$150,000	$2,675	$566,178
G-25	Newark Bay Docks - South	756,736	$4,337,550	$800,000	$12,393	$5,137,550
G-26	Former Witco - East	2,809,320	$16,102,800	$2,000,000	$46,008	$18,102,800
G-27	Former Witco - West	1,323,546	$7,586,460	$1,000,000	$21,676	$8,586,460
G-28	PVSC Driveway to Witco Property - North	89,028	$510,300	$200,000	$3,281	$710,300
G-29	Vehicle Maintenance - North	102,876	$589,680	$150,000	$3,791	$739,680
Total Ground		8,985,758	$51,904,881	$8,425,000	$216,163	$60,329,881

Table 2-6: Financial Summary of Feasible Parking Lot Canopy Locations

Location ID Tag	Description (nearest building)	AC Yield Annual [kWh]	Estimated Costs Standard Installation	Electrical Infrastructure	Annual Maintenance	Total Installation
Parking Lot Canopy						
C-1	Vehicle Maintenance - West	89,994	$689,040	$100,000	$3,445	$789,040
C-2	Entrance Gate #5 - North	82,494	$631,620	$100,000	$3,158	$731,620
C-3	Administration Building - West	48,747	$373,230	$75,000	$1,866	$448,230
C-4	Administration Building - North	41,247	$315,810	$75,000	$1,579	$390,810
C-5	Security Building - South	89,994	$689,040	$100,000	$3,445	$789,040
C-6	Pollution & Industrial Control - South	108,743	$832,590	$150,000	$4,163	$982,590
C-7	Influent Pump Station - West	37,497	$287,100	$100,000	$1,436	$387,100
C-9	Supernatant Plant - North	86,244	$660,330	$100,000	$3,302	$760,330
C-10	Warehouse Facility - South	116,242	$890,010	$250,000	$4,450	$1,140,010
C-11	OEM - West	273,731	$2,095,830	$250,000	$4,657	$2,345,830
C-12	Return Waste Sludge Pump - West	37,497	$287,100	$100,000	$1,436	$387,100
C-15	Filter Press - East	59,996	$459,360	$100,000	$2,297	$559,360
C-17	Decant Tanks - South	26,248	$200,970	$100,000	$1,005	$300,970
C-18	Sludge Storage Tanks - South	52,496	$401,940	$75,000	$2,010	$476,940
C-19	Wallington Pump Station - North	74,995	$574,200	$50,000	$2,871	$624,200
Total Canopy		1,226,166	$9,388,170	$1,725,000	$41,119	$11,113,170

Table 2-7: Technical Summary of Roof Locations Not Suitable For Financial Evaluation

Location ID Tag	Description (nearest building)	Assessment Information				
		Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Roof Mounted						
R-4	Security Building	1,000	0	0	0	f
R-7	Primary Clarifiers HVAC Building #7	1,200	0	0	0	f
R-8	Primary Clarifiers HVAC Building #8	1,200	0	0	0	f
R-11	New Gate House T.I.L.W.	500	0	0	0	f
R-16	Switchgear Building #3	2,000	0	0	0	f
R-19	Sodium Hypochlorite Facility	400	0	0	0	f
R-20	Effluent Pumping Station (EPS)	3,600	0	0	0	f
R-21	Supernatant Treatment	6,900	320	8	0	f
R-23	Switchgear Building #4	1,800	180	4	0	f
R-24	Lime Building	2,700	0	0	0	f
R-26	Secondary Clarifiers HVAC Building #2	1,300	0	0	0	f
R-27	Secondary Clarifiers HVAC Building #3	1,300	0	0	0	f
R-28	Old Chlorine Building	2,600	100	2	0	f
R-32	Head House	2,500	0	0	0	f
R-33	Old Sludge Station	2,100	280	6	0	f
R-37	Yantacaw Line Pumping Station	850	0	0	0	f
R-38	Sludge Pump Station	4,800	0	0	0	f
Total Roof		36,750	880	20	0	

Notes:

f. This roof does not have sufficient space to install 11 solar PV panels and therefore was not considered for the financial evaluation.

Table 2-8: Technical Summary of Ground Locations Not Suitable For Financial Evaluation

PVSC - Solar PV Analysis - Technical Evaluation Summary - Locations Not Evaluated Financially						
Location ID Tag	Description (nearest building)	Assessment Information				
		Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Ground Mounted						
G-12	Supernatant Plant - West	121,600	109,440	0	0	g
G-13	Far Southwest Undeveloped	380,600	342,540	0	0	g
G-19	Chlorine Contact Tank - West	7,300	6,570	0	0	h
G-20	Chlorine Contact Tank - South	19,200	17,280	0	0	h
G-21	Old Chlorine Building - South	4,500	4,050	0	0	h
G-23	Old Sludge Pump - North	8,700	7,830	0	0	i
G-30	Wallington Pumping Station - South	23,000	20,700	0	0	j
G-31	Yantacaw Pumping Station - North	3,800	3,420	0	0	k
Total Ground		568,700	511,830	0	0	

Notes:

g. This ground area has substantial overgrown wetlands and therefore is unsuitable for a PV installation.

h. The performance of a solar PV array would be degraded due to shading from buildings surrounding this ground area.

i. A new building is expected to be built in this location; this location was excluded from the analysis.

j. This ground area experiences flooding from the adjacent Passaic River and therefore is unsuitable for a PV installation.

k. This ground area is currently used as an access driveway and therefore is not available for a solar PV installation.

Table 2-9: Technical Summary of Parking Lot Canopy Locations Not Suitable For Financial Evaluation

Location ID Tag	Description (nearest building)	Assessment Information				
		Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Parking Lot Canopy						
C-8	Grit & Screening Facility - East	3,000	0	0	0	h
C-13	Thickener Tanks - West	2,000	0	0	0	h
C-14	Thickener Tanks - North	15,000	0	0	0	h
C-16	Old Sludge Pump - East	2,000	0	0	0	h
Total Canopy		22,000	0	0	0	

Notes:

h. The performance of a solar PV array would be degraded due to shading from buildings surrounding this area.

Table 2-10: Technical Summary of Alternative Locations

Location ID Tag	Description (nearest building)	Assessment Information				
		Gross Area [sq. ft.]	Available PV Area [sq. ft.]	Panel Qty.	Capacity [kW]	Footnote
Alternate Options to Consider						
A-1	Existing Off-Site Building Roof	930,000	790,500	20,444	5,929	d
A-2	Building Façade - Cake Storage (R-30)	4,200	2,940	51	15	e
Total Alternative		**934,200**	**793,440**	**20,495**	**5,943.5**	

Notes:

d. This is an existing roof of a neighboring building, the availability of which has not been confirmed.

e. This is an example of other means for installation solar PV panels. The complete PVSC site has not been analyzed for this alternative.

Table 2-11: Financial Summary of Alternative Locations

Location ID Tag	Description (nearest building)	AC Yield	Estimated Costs			
		Annual [kWh]	Standard Installation	Electrical Infrastructure	Annual Maintenance	Total Installation
Alternate Options to Consider						
A-1	Existing Off-Site Building Roof	6,969,056	$41,501,250	$1,500,000	$118,575	$43,119,825
A-2	Building Façade - Cake Storage (R-30)	18,092	$110,250	$50,000	$662	$160,912
Total Alternative		6,987,148	$41,611,500	$1,550,000	$119,237	$43,280,737

Notes:

1. It was assumed that location A-1 would require no roof repair or replacement costs.

Site Plan Overview

The following pages contain drawings S-1 through S-5 that were developed to label each location at the Newark site for reference. The label consists of a letter and number to identify each location assessed. The letter designates the type of mounting a solar PV array would utilize:

- "R" is for roof-mounted solar PV arrays.
- "G" is for ground-mounted solar PV arrays.
- "C" is for canopy-mounted solar PV arrays that are associated with parking areas.

The locations in the drawings that were deemed feasible and evaluated financially are labeled and shaded. The locations that were not evaluated financially are labeled, but not shaded.

Attachment 8

EXHIBIT No. 3

B203 Allowance Clarifications

Bid Item Number	Allowance	Amount in 100% Bid Form Submitted on July 2, 2019	Final Amount for August 1, 2019 Advertisement	Basis of Allowance Estimate
32	Allowance for Unspecified Borings, Test Trenches, and Test Pits	$50,000	$50,000	6 Test Pits at $7500 each - rounded to $50,000
33	Allowance for CCTV Inspection, Cleaning and Root Removal of Existing Storm Drainage Systems	$75,000	$75,000	18 Pipe segments @ $4000 each for equipment rental and root removal, rounded to $75,000
34	Allowance for Handling and Disposal of Hazardous Materials	$7,100,000	$7,100,000	No prior soil or groundwater testing has been performed on-site for the project. Soils are assumed to be contaminated non-hazardous under the lump sum portions of the contract. If material are classified as Hazardous through classification during the project they will need to be disposed of at a facility that accepts the specific hazardous materials found. Since the type of potential hazardous material is currently unknown, a potential bidder cannot assign a unit price since the cost of disposal cannot be determined. The most appropriate way to handle this is through an allowance that will allow for a negotiation of total price based on the material type, disposal cost, and transportation cost. Allowance estimate is based on +/- 75,000 CY excess material @1.25 tons / CY (+/-95,000tons) @ $75 upcharge over the cost of contaminated non-hazardous disposal - $7.1 M
35	Allowance for Repair, Abandonment and Relocation of On-site and Off-site Utilities Not Identified in the Bid Documents	$3,000,000	$900,000	Up to 3,750 LF of utility replacement including excavation, dewatering, backfill and materials estimated at $240/LF
36	Allowance for Costs Associated with Startup and Testing Not Specified in the Bid Documents	$80,000	$80,000	Effort required for start up and testing of electrical and mechanical equipment and associated coordination with PVSC operations is uncertain in advance. Estimate is based on a total of $28,000 for 14 days of manufacturer representative, and $33,600 for 28 days for labor crew. This is for the 4 major pumping stations plus the Witco Site pump station. Rounded to $70,000. The floodwall system included security and mechanical systems for closure gate operations. An additional $10,000 is estimated at 80 hours of testing @ $125/hr for testing of these systems.
37	Allowance for Costs Associated with Pumping Station Excavation and Foundation Work not Specified in the Bid Documents	$350,000	$350,000	This allowance is for any unforeseen conditions associated with excavation and foundation work at the three major stormwater pump stations which include deep excavations. Unknowns include the level of dewatering that my be required. A total of $100,000 is estimated for each of the three major stormwater pump stations and $50,000 has been added for the Witco Site pump station.
38	Allowance for Costs Associated with Environmental Restoration Not Specified in the Bid Documents	$450,000	$450,000	Total costs for on-site environmental restoration is unknown pending NJDEP permit modifications. Mitigation credits may be obtained offsite. This is highly likely for freshwater wetlands mitigation. Riparian zone mitigation may be accomplished on-site. The estimate is based on $100,000 for each of the 3 Stormwater Pumping Stations that are currently located in grassed areas within the riparian zone, and $150,000 for the linear Floodwall and Collection System Areas. Total allowance is $450,000.
39	Allowance for Removal of Boulders	$600,000	$600,000	Boulders can be encountered within the excavations. The allowance is based on an estimate of 4,000 tons @$150 CY. 4,000 tons @ +/- 1.5 tons per CY is equal to 2,666 CY or just over 3.5% of total material anticipated to be hauled offsite.
40	Allowance for Removal of Rock	$350,000	$300,000	Geologic Conditions vary through the site and cannot be fully defined by geotechnical investigations. Rock stratum may be encountered in excavations for the project. The allowance is based on an estimate of +/- 2,000 tons of rock @$150/CY.
41	Allowance for Collection System Modifications	$3,250,000	$1,400,000	The allowance estimate is based on the potential need to amend the current drainage design with up to 1,500 lf of pipe in sizes varying from 24" dia to 48" dia at varying depths at an approximate average cost of $300 / lf. It also includes the provision for approximately 20 manholes, junction boxes and inlets of varying sizes at an approximate average price of $20,000 ea based on the anticipation that the majority would be oversized structures. 40% or $400,000 is added for installation including excavation, potential dewatering and potential for the need for select fill.
42	Allowance for Pile Testing Not Specified in the Bid Documents	$200,000	$80,000	Pile testing beyond the base contract may be needed depending on the type of subsurface material encountered. The allowance estimate is based on four extra load tests for $20,000 each.
43	Allowance for Additional Structural Concrete and Utility Concrete Encasement Work Not Specified in the Bid Documents	$700,000	$700,000	This allowance is based on the potential need to concrete encase electrical duct banks, water lines, sewer lines or other unknown utilities. The estimate is based on 2,333 CY of concrete at $300 CY including procurement, placement and reinforcement.
44	Allowance for Vinyl Sheet Piles Not Specified in the Bid Documents	$50,000	$50,000	This allowance provides for the provision of additional vinyl sheetpile where not currently anticipated, 2,000 SF at $25 per SF.
45	Allowance for Jet Grouting Not Specified in the Bid Documents	$185,000	$185,000	This allowance provides for the provision of additional jet grouting. 100 CY at $1,850 per CY.
46	Allowance for Soil Erosion and Sediment Control Measures Not Specified in the Bid Documents	$35,000	$35,000	Based on the potential need for additional silt fence 3500 lf @ $6 per lf, 20 additional inlet protection @$500 each, plus and additional $10,000 for extra soil stockpile protection - rounded to $35,000
47	Allowance for Site Restoration Not Specified in the Bid Documents	$45,000	$116,000	Collection system modifications (Bid Item 41) may require additional site restoration. Allowance amount is based on the potential need for additional seeding, sidewalk, or curb that may be needed to restore the site. Estimated is based on 1000 CY of topsoil at $65 per CY, 1200 LF of curb at $30 per LF, and 1500 sf of sidewalk at $10 per SF, plus miscellaneous seeding.
48	Allowance for Bituminous Paving Not Specified in the Bid Documents	$130,000	$130,000	Allowance is based on the potential need for an additional 18,000 SF of paving at $7 per SF. Total rounded up to $130,000.
49	Allowance for Costs Associated with Access Constraints due to Plant Operations or Other Construction Contracts	$1,500,000	$1,500,000	Over the course of the contract, constraints may require that the contractor demobilize and remobilize. The allowance is based on 50 instances at $30,000 each
50	Allowance for Engineer's Field Office Supplies	$70,000	$70,000	Based on the potential for extra supply needs for 5 years at $14,000 per year

Bid Item Number	Allowance	Amount in 100% Bid Form Submitted on July 2, 2019	Final Amount for August 1, 2019 Advertisement	Basis of Allowance Estimate
51	Allowance for Electrical Work Not Specified in the Bid Documents	$150,000	$150,000	Based on 1,680 feet of 1.5" RGS at $25 per FT, plus 1,150 lf of #14 600V copper cable in conduit plus appurtenant materials @ average price of $85/lf
52	Allowance for Electronic Security Systems Not Specified in the Bid Documents	$2,250,000	$2,250,000	Full security systems for the Floodwall B041 are not provided within the contract bid documents. System needs and equipment cannot be clearly specified due to technologies that will change over the course of the project and for varying needs to integrate with PVSC systems being addressed by other projects. The B203 contract provides power and fiber systems to a patch panel from where the security system provider will install systems coordinated with PVSC. The allowance is based on the security system service provider proposal dated June 17, 2019 with a 15% contingency and 12% markup.
53	Allowance to Provide Temporary Power to Pumping Stations	$1,000,000	$1,000,000	Based on 12 months of a rental generator, this estimated cost for the NE and SE pumping stations plus $26,000 for fuel and maintenance are: NE Pumping Station - $422,000 (Based on monthly cost of a 1.5 MW generator of $35,000 for one year, $5,000 one time transportation cost) SE Pumping Station - $302,000 (Based on monthly rental cost of a 1 MW generator of $25,000 for one year, $5,000 one time transportation cost). West Pumping Station - $200,000 – assumption is that this can be fed temporarily from the STP. $50,000 for Witco Pump station based on assumption that this can be fed temporarily from the Sludge Handling Facilities. Cost for labor and materials to run temporary feeds based on experience with temporary power lines.
54	Allowance for Installation of Fire Alarm System and Programming	$500,000	$500,000	Full fire alarm systems are not provided within the contract bid documents for Pumping Stations B042. System needs and equipment cannot be clearly specified due to technologies that will change over the course of the project and for varying needs to integrate with PVSC systems being addressed by other projects. Based on quote from a manufacturer for retrofit of a system within an existing building for $175,000. This project contains 3 new buildings and it is assumed economy of scale can be applied.
55	Allowance for System Integrator for HVAC System Programming	$100,000	$100,000	System integration needs are uncertain. Estimate is based on PVSC experience with other capital projects
56	Allowance for Installation of Electronic Key Card System at Electrical Buildings to Fiber Patch Panels	$500,000	$500,000	Based on quote from a manufacturer for retrofit of a fire alarm system within an existing building for $174,000. The manufacturer that provided the quote is the same manufacturer that will install and program the fire alarm system. It is assumed that the hardware (panel, door locks, etc.), labor for installation, and programming of the keycard system are roughly the same for cost for hardware, installation, and programming of the fire alarm system. This project contains 3 new, smaller buildings and is assumed economy of scale can be applied.
57	Allowance for Routing and Connecting Fiber From Electrical Manholes to Fiber Patch Panels	$100,000	$100,000	The location of the Fiber Patch Panels for the Pumping Stations B042 and for Witco pump stations which the Contractor needs to tie into is currently unknown, and therefore the distance of the fiber run is unknown. Previous contracts were used as a basis, having an allowance of $250,000 for unknown cabling, including fiber, for a plant-wide contract. The area covered by the Pumping Stations is less and it is anticipated that $100,000 ($33,000 per pumping station) would be sufficient to coordinate, furnish, and install fiber from manholes to a fiber patch panel, location TBD.
58	Allowance for Temporary Utility Pole Support	$450,000	$450,000	Based on 20 pole supports of varying complexity @ and duration requirements at $7500 each, plus 12,000 SF of support of excavation at $25 per SF
59	Allowance for Site Safety, Security and Site Logistics - PVSC Security and Safety Department	Not previously included	$900,000	Based on 40 hour week at average rate of burdened labor of $150/hr for PVSC security officer for total of 150 weeks over the duration of the contract.
60	Allowance for Maintenance and Protection of Traffic - City of Newark Streets	$550,000	$550,000	Maintenance and Protection of Traffic needs to be coordinated with the City of Newark. Estimate is based on 6,000 feet concrete traffic barrier at $75 per foot + 3 solar messenger traffic boards at $15,000 each and $5,000 for additional signage, plus 36 days cones and crash truck @ $1,200 per day.
61	Allowance for Uniformed Police Officers for Traffic Control - City of Newark Streets	$1,500,000	$1,500,000	Maintenance and Protection of Traffic needs to be coordinated with the City of Newark. 2 full-time officers for 2.5 years at $300,000 per officer per year
62	Allowance for Independent Commercial Testing Services, as Approved by Owner	$1,000,000	$1,000,000	Estimated at 0.5% of Total contract value - rounded to $1,000,000
63	Allowance for Asphalt Cement and Fuel Price Adjustments	$500,000	$500,000	50,000 tons material at $10 per ton
64	Allowance for Costs Associated with Providing Murals on the Outside of the Floodwall Not Specified in the Bid Documents	$300,000	$300,000	Owners estimate
	Total	$27,120,000	$23,971,000	

Attachment 9

Passaic Valley Sewerage Commission

Substation and Cables

UHBAJ37 – PW #4701

Cost Amendment Request

($ 78,980,731 added to the Project Worksheet)

February 20, 2020

DAMAGE DESCRIPTION:

The damages to Passaic Valley Sewage Authority's (PVSC) wastewater treatment plant occurred as a result of flooding from the 12+ FT storm surge from Newark Bay, and the subsequent loss of power. The eligible damages are plant-wide and have been captured on 47 project worksheets. Multiple analyses by subject matter experts have been conducted and reviewed by FEMA and the State to determine the most practicable mitigation solution and investment of Federal dollars. The conclusion of these analyses was that the only effective method of mitigating the wastewater treatment plant against future similar events of flooding and power outages would be to construct a floodwall and an onsite standby power system. The installation of these measures would require modifying the plant's storm-water drainage system, construction of pump stations to pump storm-water from inside to outside the wall, and installation of passive flood gates within the flood wall to allow for ingress and egress to the plant. As this is a critical facility, the flood wall will be built to the 500-year event level, plus freeboard (further explanation contained below). Due to the complexity of the Hazard Mitigation Proposal (HMP) and the associated Benefit Cost Analysis (BCA), a significant amount of backup documentation comprises the entire Proposal; the documentation includes 31 separate attachments. Thus, it is appended as part of this amendment as a stand-alone supplement entitled "Hazard Mitigation Proposal." Quoting from the original 4701 Project Worksheet, "The final placement and configuration of the mitigation measures at this location shall be determined in the field by PVSC and will take into account all existing and applicable laws, regulations, and concerns."

The following mitigation (resiliency) contracts comprise certain elements of this cost amendment and are complimentary to the overall B203 contract. All were bid competitively under PVSC's normal procurement policy. The PSE&G work (as further described within) does conform to PVSC's policy, however it was executed under their sole source provisions:

B203:	**Construction of Perimeter Floodwall (B041)**
	Stormwater Pumping Stations (B042)
	Stormwater Collection System (B043)
B089-2:	**Gate 7**
B074:	**WITCO Facility**
B112:	**Replacement of NPW Pumps**
PSE&G	**Relocation Agreement – Phase I**

CHANGES IN COST

In accordance with FEMA Policy 9526.1 Hazard Mitigation Funding, and under authority of Section 406(e) Repair, Restoration, and Replacement of Damaged Facilities of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5172 and Title 44 Code of Federal Regulations (CFR) §206.226 Restoration of damaged facilities, PVSC is submitting this Amendment request to FEMA for discretionary authority to continue to fund

mitigation measures in conjunction with the repair of the damaged facilities. The mitigation measures are related to eligible disaster-related damages and do directly reduce the potential of future, similar disaster damages to the eligible facility.

Under Section 406, PVSC wishes to amend the estimated cost for portions of the current approved Hazard Mitigation Proposal (HMP), and hereby submits a request for the change, supported by actual costs. It is noted that the changes described below continue to provide that the mitigation work is still needed, is technically feasible, and will be performed as part of the overall project.

It is worthy to summarize the history of the estimated costs associated with Project Worksheet 4701. The HMP was prepared and ultimately approved on August 14, 2013. The accompanying CEF estimated the costs at $246,712,103, and included the following resiliency projects:

- Floodwall (FW)
- Pumping Stations (PS)
- Standby Power Generating Facility (SPGF)

These HMP costs were included in the **Version 0** Project Worksheet awarded on 8/22/14, which also contained estimates for the following repair work:

- Sites #1, 2, 3, and 5 (both Work Completed and Work to be Completed - $839,768
- Site #4 (Sub M) - $96,001
- Site #6 (Electric Feeder Cables) - $44,341,873
- Deductions for salvage and NFIP – ($2,487,335)
- Direct Administration - $173,971

The total obligated amount for Version 0 was $289,676,381

Version 1 was awarded on 9/18/14 and added costs for the construction of temporary feeder electric feeder cables so that ultimately the cables and feeders located within tunnels and galleries could be replaced while still maintaining plant process. This additional amount was added ($21,078,975), bringing the obligated amount up to $310,755,356.

Subsequent to that, **Version 2** was advanced to award on 6/22/15. Within that Version were additional HMP resiliency projects that were originally omitted. The accompanying CEF was estimated at $96,239,050, and was awarded on April 6, 2015. The projects included:

- Relocation of Electrical Switchgear / MCC's
- Sump Pump Panel Relocations
- Repair to Tunnel Bulkheads (apart from PW 4168)
- Addition of a Non-Potable Water Pump
- Stormwater Collection infrastructure

The total obligated amount for Version 2 was $406,994,406, which is where it stands today.

One of the stipulations for a Hazard Mitigation Proposal to be approved, is that the mitigation measures must be determined to be cost effective. The approved method to determine cost

effectiveness used under this HMP was the Benefit Cost Analysis (BCA). A project is considered cost effective under this analysis when the BCA ratio (BCR) is greater than 1.0. As per FEMA RP 9526.1 section VII.B.3, a Benefit Cost Analysis was conducted with strict adherence to FEMA BCA guidance. A BCR of 1.18 was initially generated. Both CEF's where then examined against the BCA and are summarized in the following table.

HMP	DATE	PREPARED BY	BENEFITS ($M)	COSTS ($M)	BCR
$246M	8/6/13	Jack Malone	$315,237	$267,276	1.18
$96M	4/6/15	Pat McPartlan	$632,792	$364,288	1.74
	Composite (both HMP's together)		$948,029	$631,564	1.50

A summary copy of the CEF's and BCA ratio are included in the Appendix **EXHIBIT No. 1**. The following account is paraphrased from the Version 0 PW: "10/25/2013 – As per the BCA, when and if fluctuations to the final/projected dollar amounts on the individual PWs (whose damages are addressed with the HMP) *there will only be a nominal impact on the benefit cost ratio* (on an order of an increase or decrease of a hundredth of the ratio, i.e. the 0.01 portion of the number) and therefore *no impact to the eligibility of the proposed mitigation will occur*. (*Emphasis added*). Due to the size and complexity of this mitigation proposal, an independent review (spanning between May – October 2013) of all aspects of this mitigation proposal was conducted by Leroy Horwedel (HM 406 TFL) independently of the HM 406 Specialist (Jack Malone) who wrote this HMP and conducted the BCA. All the contents of this HMP have been reviewed and determined eligible as a result of that review. Based on all these reviews, and the concurrence of headquarters, the proposed mitigation has been determined technically feasible, practicable, and cost effective with a defensible benefit cost ratio of 1.29. Therefore, as per all the provisions of FEMA Recovery Policy 9526.1, dated March 30, 2010, the proposed mitigation has been determined eligible for 406 Public Assistance Mitigation funding.

In addition to the BCA, FEMA also evaluates the hazard mitigation projects for cost effectiveness, otherwise known as "reasonable costs." Reasonable cost is defined as, if, in its nature and amount, it does not exceed that which would be incurred by a prudent person under the circumstances prevailing at the time the decision was made to incur that cost. In other words, a cost is considered reasonable if it is both fair and equitable for the type of work being performed. The competitive bid process is a commonly accepted method of assuring fair and equitable costs. Competitive bids are historical documentation, which is a listed means of establishing reasonable costs by FEMA.

The following contracts comprise the elements of this cost amendment, and were all bid competitively under PVSC's normal policy:

B203: **Construction of Perimeter Floodwall (B041)**
Stormwater Pumping Stations (B042)
Stormwater Collection System (B043)
B089-2: **Gate 7**
B074: **WITCO Facility**
B112: **Replacement of NPW Pumps**

CONTRACT NO. B203
CONSTRUCTION OF PERIMETER FLOODWALL (B041), STORMWATER PUMPING STATIONS (B042), AND STORMWATER COLLECTION SYSTEM (B043)

This contract (B203) combined the Floodwall, Stormwater Pumping Stations and Stormwater Collection Systems into one contract, chiefly due to superior scheduling, duration, and management efficiencies. It was advertised and competitively bid on November 8, 2019. Ten qualified firms responded with bids, ranging from $225,900,000 to $384,217,000. The total bid price consists of five lump sum items, twenty-six-unit price items, and thirty-three allowance items. The lowest numerical bidder was Railroad/Posillico – JV, LLC, a joint venture created by Railroad Construction Company, Inc., Paterson, NJ and Posillico Civil, Inc., Farmingdale, NY, with a total bid price of $225,900,000.

The engineer's opinion of probable construction costs for the B203 project was $232,835,804, which is 3% higher than the lowest numerical bid. In contrast, the sum-total of the FEMA CEF (YEAR 2013) was as follows:

• Floodwall & Pumping Stations (Combined in CEF)		$129,157,565
• Stormwater Collection	+	$4,464,729
TOTAL CEF		$133,622,294
B203 Contract Cost		$225,900,000
Less CEF	-	$133,622,294
Incremental Increase Between FEMA CEF and Actual Cost		**$ 92,277,706**

Contract award documentation is included in the Appendix as **EXHIBIT No. 2**.

Net cost increase: + $92,277,706

The *incremental* cost cited above includes two areas that need further discussion; allowance items and the stormwater pumps.

Allowance Items: There are 33 allowance items as part of Contract B203. The engineer's estimate (the cost not-to-exceed price) contained as part of the contract bid form, are included in the contract award amount of $225,900,000. That is, they are not over or in addition to. (Please refer to **EXHIBIT No. 3** in the Appendix a more detailed description of these allowance items and how the costs were determined. This document was prepared for NJDEP with regard to approving the EIT funding). Generally speaking, the allowance items constitute a quantity which cannot be determined until the contract is in force. These items are for unforeseen or unknown conflicts that may be determined to be necessary for the completion of the project but can't be quantified in the bid specifications. Thus, the scope of services is yet to be determined. The terms, conditions, and method of measurement and payment is specified for each individual allowance item under the Supplemental General Conditions, specifically Article 11. Written authorization by the Owner for utilization of any part of the allowances for any such work shall be required.

Allowances are funds that are controlled by the Owner; the Contactor has no ownership of the funds until the allowances are released in writing. All the allowances are subject to price negotiations with the Contractor. Where sub-contractors are required, the Contactor may be directed to provide proposals from 2 or more sub-contractors. Payment for the Work shall be made at a negotiated price (either Unit Cost or Lump Sum) agreed upon by the Owner and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as necessary. Measurement shall be on an as needed basis, with payment being made on the cost of actual services performed, as determined by the Engineer.

Because the actual costs are indeterminate at this time, PVSC is removing the Allowance Item cost from this amendment request, with the understanding and expectation that when the scope becomes necessary, PVSC will exercise the procedure outlined above for negotiation, approval and performance for same. Subsequent request for reimbursement, with the proper documentation, is anticipated. The total contract value for the allowance items is $23,971,000.

Net cost reduction: - $23,971,000

Stormwater Pumps: As discussed further below, Critical Infrastructure designation requires PVSC to design for n+1. The 'n' in this equation stands for the number of components necessary to run the system. The '+1' means there is one independent backup should a component of that system fail. The B203 contract calls for spare pumps (on the shelf), which were meant to be the "plus one." However, in further researching this subject, it was determined that the stormwater pumping stations were designed with a redundant main pump in place. As such, the spares would be considered N+1+1 and therefore ineligible for reimbursement. It should be noted that this only applies to the Stormwater Main Pumps, not the much smaller dewatering pumps. In the latter case the "shelf" pump is the +1 pump.

These main "N+1+**1**" pumps (tertiary "shelf" pump) will be subtracted from the net increase of the actual bid cost for Contract B203 and reflected in the cost amendment detail further below in this request.

A summary of each pumping station, and the number of pumps proposed, is as shown in the following table:

STORMWATER (MAIN) PUMPS			
Pump Station	Number of Pumps Provided Under Contract	Number of Pumps Installed (N+1)	Number of Spare Pumps ("shelf" units)
W	6	5	1
NE	5	4	1
SE	4	3	1
TOTAL	15	12	3

DEWATERING PUMPS

Pump Station	Number of Pumps Provided Under Contract	Number of Pumps Installed	Number of Spare Pumps ("shelf" units, N+1)
West	3	2	1
NE	3	2	1
SE	3	2	1

Again, note that it is only the tertiary (n+1+**1** (shelf pump)) main pumps that are non-reimbursable (i.e a total of three; one at each location). The dewatering pumps are fully reimbursable. The itemized bid price for the Stormwater Pumping Stations was $40,750,000. Merely pro-rating the cost of three main pumps over the total 15 would not be accurate since the main pumps on the shelf are only subject to material cost, absent of installation. The contractor is required to develop a Schedule of Values (SOV) as one of the first tasks upon given Notice to Proceed. Within the SOV will be the cost of the various pumps although, it may not be broken out into sufficient detail to isolate the material cost of one pump. However, the mobilization cost will include the cost of materials, and in there will be the itemized invoice for material cost of pump. Once this is known, PVSC can submit this actual cost. Until then, it is proposed to estimate the cost of the 3 pumps in totality at $1,500,000 for the purposes of advancing this cost amendment. Please refer to **EXIBIT No. 2** for plans and specifications of the pumps in question.

Net cost reduction: - $1,500,000

CONTRACT NO. B089-2:
GATE NO. 7

The main gate serving the daily needs of the plant is designated as Gate 3. Gate #3 is the only entry/exit location in the entire plant to provide access for all business operations; service deliveries, maintenance supplies, warehoused goods, contractors, and most significantly the Trucked-in Liquid Waste traffic (TILW). For context, in 2019 Gate #3 processed entry and exit of over 8,000 visitors, vendors and guests, 11,000 contractors and 80,000 Liquid Waste Trucks encompassing 25% of the State of NJ. An early milestone for the Floodwall/Stormwater Collection construction (Contract B203) requires that Gate #3 be taken out of service for an extended period. As such, an alternate access point would be required. Gate #7 was thus identified to facilitate entry/exit for the TILW, delivery vehicles, and plant personnel, while also optimizing/maintaining the overall construction schedule. In order to complete Gate #7 and have it operational before Contract B203 construction, a stand-alone contract was strategically implemented to remove the Gate 7 associated construction from the B203 Contract. The Scope of Work consisted generally of new concrete entrance paving, a new concrete railroad trundle crossing, security booths, drainage infrastructure, TILW recording hardware, and required associated security infrastructure. It must be understood that Gate 7 construction was always part of the project, however it was merely advanced within the construction schedule.

Contract B089-2 is a two-year agreement with Railroad Construction. The Task Order (Project Number 7 in this case) is/was similar to what/how the FEMA-approved Contract B079A functions. That is, a specific Scope of Work, along with previously prepared construction plans in this case, was identified and presented to the contractor in order for them to develop a written proposal. The Proposal was then evaluated, modified as necessary, and properly negotiated to ensure fair and reasonable costs. The two-year term agreement contract is structured as a cost-not-to-exceed, however due to the procedure of PVSC/JV internal review, the costs are properly vetted to reflect a competitive bid process. These costs for this stand-alone Task Order are thereby offset by the costs which would have otherwise been born within Contract B203. (Gate 7 work/cost was eliminated from B203). In essence, PVSC is "pre-paying" for the work that is/was ultimately necessary under the resiliency construction. Clearly the biggest advantage to this change is the positive impact to the construction schedule, and to limit negative impacts to plant process operations. By advancing the work, there is no risk inherent to the B203 Contractor's construction progression.

Utilizing the Terms and Conditions of Contract B089-2 (Project No.7), PVSC received a Proposal from Railroad Construction Company, Inc. to construct the components of the Floodwall associated with Gate No. 7. PVSC Engineering and Program Management reviewed the Proposal and found it responsive to the project needs and the not to exceed cost of $4,465,494.00 to be fair and reasonable. Notice to Proceed was issued on 7/1/19, with Substantial Completion accomplished on 12/20/19. Contract has been closed out at their contracted cost: $4,465,494. Contract Documentation is included in the Appendix as **EXHIBIT No. 4**.

Net cost increase: + $4,465,494

It should be noted that it is by coincidence that RRC had been previously awarded the two-year term agreement contract, and subsequently won the B203 Contract as a joint venture with Pasillico.

CONTRACT NO. B074
WITCO FACILITY

Contract B074 was implemented as a cost savings measure by consolidating the anticipated multi-contractor staging requirements associated with the FEMA Mitigation construction projects, into one effort. Those efforts would have otherwise been duplicated by each contractor; therefore an "economy of scale" was implemented. These mobilization and contract duration tasks include(d) temporary services (site trailers, maintenance, utility hookups and service), safety and security (guard, barricades/fencing, signage/signals, and fire protection), and storage & staging (access driveway, offsite parking, material laydown areas, equipment storage). The CEF includes costs for these "soft" expenditures as part of the calculus in arriving at a final estimate. Once the base costs are totaled (Part "A"), subsequent factors are applied in cumulative order for those items mentioned above. Specifically, Part B.1 General

Requirements, and Part C.3 Access, Storage & Staging, are included in the CEF total. Pulling out those cost for *all* the mitigation projects from the CEF, the sum total adds to approximately $21.4M. Please refer to the Appendix, **EXHIBIT No. 5** for a detailed summary of these costs.

Work to be performed under Contract No. B074 included the supply and installation of pre-fabricated office containers, restroom containers, exterior stairs and platforms, parking lot fencing, container tie down systems, electrical distribution system and site lighting necessary to construct the Witco contractor staging area. Plans and specifications were prepared, and the Engineer's estimated cost was $3,200,700.

On August 17, 2017, five (5) bids were received for Contract No. B074 — Witco Property Contract Staging Area Project, ranging from $3,347,743 to $4,846,000. PVSC and the Program Management team reviewed the bids and contractors' references and found Kyle Conti Construction, with a contract amount of $3,347,743.00, to be the lowest responsive and responsible bidder. Based upon this, the contract was recommended and awarded, with a Notice to Proceed issued on 1/2/18. Substantial Completion was accomplished on 9/28/18.

The contract has been closed out at a cost below their contract bid. A significant savings has been realized by proceeding in this consolidated manner; over $18M in comparison to the CEF.

Net cost increase: + $3,144,390.

CONTRACT NO. B119:
REPLACEMENT OF NPW PUMPS

In evaluating the vulnerability of the treatment equipment/systems to a tunnel flooding event the non-potable water (NPW) pumps were identified as a critical component that must be maintained in operation. The NPW pumps, located in the basement of the Effluent Pump Station (EPS), supply cooling water to the Sludge Heat Treatment (SHT) Facility and a loss would result in the plant's inability to process sludge. Any long-term loss of function would be catastrophic to the sludge dewatering process (ZIMPRO), which is why this resiliency project was added as part of the second approved HMP.

The decision was made to add an additional submersible type pump which would allow the existing 3 pumps to continue operating even in the event of any localized flooding in the EPS basement. Estimated costs for the replacement were included in the 4-6-15 CEF prepared by FEMA. At such time, the Scope of Work didn't include the infrastructure to support pumping to ZIMPRO, in particular the variable frequency drive. Therefore, the very rough estimate was only $717,000 (Base A cost of $400,000. See Attachment 1 for CEF documentation).

The SOW includes furnishing all labor, materials, supplies, equipment and other facilities required by the Contract Documents for the completion of PVSC's Non-Potable Water Pump Resiliency Upgrades Project. Reimbursement is only for the new fourth pump (the existing three are being funded as a capital improvement project). Work includes, but is not limited to,

suction and discharge piping, valves, equipment, instrumentation and associated variable frequency drive. B112 Contract Plans (dated January 2019) and Specifications (dated January 2019) are included in the Appendix as **EXHIBIT No. 6**. The contract was advertised for bid on July 3, 2019, and bids were received on August 8, 2019. It was awarded on November 14, 2019 in the amount of $4,115,000 (Attachment No. 4).

In anticipation of the need to segregate out the resiliency pump from the capital improvement pumps (3), PVSC bid the job with separate line items. Bid Item No. 1 was for the NPW pump at $2,965,000, which is the only the eligible Scope that will be submitted for reimbursement. The net cost increase is thus 2,965,000 – 717,000 = 2,248,000.

Net cost increase: + $2,248,000

PSE&G
RELOCATION AGREEMENT – PHASE I

The overall mitigation project requires the protection, relocation, and/or adjustment of electrical and gas distribution facilities in conflict with the proposed work. These systems are owned and operated by PSE&G. PSE&G maintains the legal right to occupy the public right-of-way and therefore the cost of all utility relocations shall be borne by PVSC. The Phase I Utility Relocation covers the area at the northern and western borders of the project; Wilson Ave & Avenue P intersection (electric), and Avenue P and Rutherford Street (gas).

PSE&G, as the owner of these facilities, is the sole source provider. Federal procurement regulations allow for non-competitive proposals, including “sole source” contracting when only one source can provide the needed service. The utility relocation can only be done by PSE&G, and thus qualifies as sole source. The federal regulations addressing non-competitive procurement methods are provided in 2 C.F.R 200.320(f). Item 1 below is the relevant portion for the utility relocation.

> (f) Procurement by noncompetitive proposals. Procurement by noncompetitive proposals is procurement through solicitation of a proposal from only one source and may be used only when one or more of the following circumstances apply:
>
> (1) the item is only available from a single source;
>
> (2) the public exigency or emergency for the requirement will not permit a delay resulting form competitive solicitation;
>
> (3) the Federal awarding agency or pass-through entity expressly authorizes noncompetitive proposals in response to a written request from the non-Federal entity…

By formal Resolution, PVSC has entered into a signed Relocation Agreement (“Agreement”) with PSE&G for the purposes of performing the utility relocations in a timely and workmanlike manner consistent with the applicable plans and specifications. PSE&G will provide construction oversight to ensure the work is performed to their standard and at an acceptable pace. A formal Scope of Work has been prepared in concert between the two parties prior to

executing the Agreement. Described as **Exhibit No. 7** in the Appendix, the Scope of Work provides a detailed breakdown with regard to item, quantity, location, length, size, etc. A cost estimate is also included within Exhibit No. 7.

The following cost estimates have been approved by both parties as reasonable:

- Relocation / De-energizing of Circuits Along Ave P and Wilson Ave $ 379,360
- Relocate / Retire 20 Inch Steel Gas Main in Conflict with Culvert Drain System and Floodwall Construction + $ 1,936,781

+ $ 2,316,141

Net cost increase: + $2,316,141

COST AMENDMENT:

PVSC agrees and understands that the costs for non-mitigation Scope of Work in the various contracts shall not be submitted for reimbursement.

Based on the above explanation and attached documentation, PVSC is hereby requesting to amend the Federal obligated amount to UHBAJ37 – Project Worksheet #4701 with an increase to the threshold due to actual reasonable costs as follows:

B203: Floodwall, Pumping Stations, Stormwater Collection (net increase between actual contract bid and CEF)		**$ 92,277,706**
B089-2: Gate 7		**$ 4,465,494**
B074: WITCO Facility		**$ 3,144,390**
B119: Replacement of NPW Pumps		**$ 2,248,000**
PSE&G Utility Relocation – Phase I		**+ $ 2,316,141**
	Sub-Total	**$ 104,451,731**
Allowances Reduction		**$ 23,971,000**
Stormwater Pumps Reduction		**- $ 1,500,000)**
	Total	**$ 78,980,731**

DESIGN ELEMENTS

Certain design element clarifications are necessary as a result of inquiry by FEMA Region II personnel. These are regarding aspects of the design of Contract B203 (which consists of the Floodwall, the Stormwater Pumping Stations, and the Stormwater Collection Systems). Upon FEMA's further suggestion, PVSC wishes to memorialize for the record several design parameters which perhaps are being misconstrued as being inconsistent with the approved

Hazard Mitigation Proposal, dated August 14, 2013. It must be made clear that the following issues DO NOT represent Scope of Work (SOW) changes. That is, all the FEMA notations concern mitigation items that are already contained in the Scope of Work (for example, the height of the floodwall, or the capacity of the stormwater pumps). What they do represent are clarifications to the design recommendations, with reasons why these aspects were proposed as they are in the resultant contract drawings. They are modifications, not changes, which are driven by all existing and applicable laws, regulations, and sound engineering practice in arriving at the final design. These modifications are further supported by the narrative contained below.

The purpose of the HMP is to establish the eligible mitigation activity, describe what will be accomplished, and explain how the mitigation activity will be implemented. The mitigation activity must be described in sufficient detail in order to conceive a cost estimate. In some cases, modifications to the approved SOW do arise. Eligible modifications are defined as changes to the details of implementation of the approved activity with no change to the type of the activity. Examples of modifications to the SOW include altering the design of the foundation for a structure elevation project or adjusting the diameter of a drainage pipe.

Specific modifications that FEMA has noted are with the 1) final design height of the floodwall, 2) the design size/capacity of the stormwater pumping stations, 3) the number of proposed turbines in the Standby Power Generating Facility (SPGF), and 4) the capacity of the SPGF itself. It should be noted that the latter two are not part of B203, and will therefore be discussed under a future amendment request.

Critical Infrastructure:

First and foremost, the information contained within needs to be predicated with the fact that PVSC is categorized and recognized as a “critical infrastructure facility.” This is important as it relates to several of the design issues raised by FEMA and will be further elaborated on below in the pertinent sections.

On February 12, 2013 the Obama administration issued Presidential Policy Directive 21 (PPD-21) entitled “Critical Infrastructure Security and Resilience.” Note this precedes the date of the approved HMP, so it was/is therefore in effect. Aside from listing the merits of protecting the United States’ critical infrastructure, this document establishes national policy on critical infrastructure security and resilience. This directive also identifies 16 critical infrastructure sectors and designates the Environmental Protection Agency as one of these critical infrastructure sector-specific agencies (SSA). Each SSA develops a sector-specific plan through a coordinated effort involving its public and private sector partners. The Environmental Protection Agency is designated as the Sector-Specific Agency for the Water and Wastewater Systems Sector. Thus, PVSC is designated as a Critical Infrastructure facility.

Critical Infrastructure are the assets, systems, and networks, whether physical or virtual, so vital to the United States that their incapacitation or destruction would have a debilitating effect on

security, national economic security, public health or safety, or any combination thereof. As such, PVSC must maintain a redundant design with their process and operations. This is known as “n+1” resiliency. N+1 simply means that there is a backup in place (whether it is power, pumping, or other mechanical/electric systems) should any single system component fail. The ‘n’ in this equation stands for the number of components necessary to run the system. The ‘+1’ means there is one independent backup should a component of that system fail.

Appropriate documentation is included in the Appendix as **EXHIBIT No. 8**.

1) Floodwall Elevation:

Following PDD-21, in 2015 the Obama Administration issued Executive Order 13690 (also in **EXHIBIT No. 8**), which regulates flood risk management and improving the resilience of communities and Federal assets against the impacts of flooding. Quoting from Executive Order 13690 (January 30, 2015), Section 2, subsection i:

“… The floodplain shall be established using one of the following approaches:

1. Unless an exception is made under paragraph (2), the floodplain shall be:
   (i) the elevation and flood hazard area that result from using a climate informed science approach that uses the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science. This approach will also include an emphasis on whether the action is a critical action as one of the factors to be considered when conducting the analysis;
   (ii) the elevation and flood hazard area that result from using the freeboard value, reached by adding an additional 2 feet to the base flood elevation for non-critical actions and by adding an *additional 3 feet to the base flood elevation for critical actions;* (emphasis added).
   (iii) the area subject to flooding by the *0.2 percent annual chance flood*; (emphasis added) or
   (iv) the elevation and flood hazard area that result from using any other method identified in an update to the FFRMS.”

The design documents in the HMP established the top of wall elevation that range in elevation from 17 ft to 19 ft (NAVD). Current design proposes floodwall elevations that increase these elevations to 19 ft and 21 ft, respectively. Subsequent to the acceptance of the HMP (August 2013), and the aforementioned PPD-21 (February 2013) and Executive Order 13690 (January, 2015), the Basis of Design Report (BoDR) was finalized in May, 2016, which determined these higher elevations. The BoDR is the technical investigation which presents the basic information, criteria, logic, evaluations and considerations developed in each category (i.e. structural, hydrologic, etc.) to prepare the Preliminary Engineering Report. It *expands upon the HMP to reflect the further analyses, evaluations and selections/decisions made to arrive at the Preliminary Design level*. This supporting technical information is then used to develop the preliminary floodwall design and subsequent bid documents. The BoDR is included in the Appendix as **EXHIBIT No. 9.**

The conceptual floodwall design submitted with the HMP utilized FEMA's Advisory Base Flood Flood Elevations (ABFEs) published in 2013 to establish the 0.2% annual chance of exceedance (ACE) event as the basis for the project design water surface elevations. This is also known as the 500-yr event. These design values resulted in the top of floodwall at Elevation 19 feet NAVD and Elevation 17 feet NAVD for Zones VE and AE, respectively. Design for a 0.2% ACE conforms to NJDEP requirements, is consistent with the amendment to the 1977 Executive Order 11988 (Section 6 (c) iii) for facilities that perform critical actions and is consistent with FEMA funding requirements.

The floodwall elevations were established including 2.6 feet of sea level change and 2.0 feet of stillwater elevation uncertainty. Wave loads, with an acceptable amount of overtopping, governed the Top of Wall elevations as shown in table below.

SITE	TRANSECT	2070 STILLWATER ELEVATION (ft, NAVD88)	DESIGN ELEVATION (ft, NAVD88)
East	1	18.7	21.0
East	2	18.7	21.0
East	3	18.7	20.0
West	Inland	18.7	19.0
West	Inland	18.7	19.0

Consistent with the directives of EO 13690 as quoted above (vis-à-vis additional 3 feet to the base flood elevation), the BoDR methodology concluded with the East Floodwall proposed to have the top of floodwall elevation set at elevation **21.0 feet.** Similarly, the West Floodwall was determined to be set at Elevation **19.0 NAVD**.

2) Stormwater Pumping Station Inflow:

FEMA also inquired about the design of the stormwater pumping stations, specifically about the inflow rate. "Why was the stormwater pump station for the west basin designed for a peak inflow of 260 cfs when the 24-hr rainfall of 9.06 inches will only produce an inflow of 36 cfs? Similarly, why were the two stormwater pump stations for the east basin designed for a combined peak flow of 134 cfs when the 24-hr peak rainfall of 9.06 inches and over-topping along 1,500 feet of the east basin will only produce a combined inflow of 33 cfs?"

In the final BoDR for the Stormwater Pumping (Appendix **EXHIBIT No. 10**), the design criteria elements used to perform the analysis included:

- Design Rainfall Event = 100-Year, 24-Hour Storm
- Design Rainfall Event Rainfall Depth = 9.04"
- Concurrent Coastal Event = 500-Year

  - External Inflows = 0.01 cfs/LF of floodwall experiencing overtopping during Concurrent Coastal Event (this did not factor into the West Side flows)
- Boundary Conditions
  - Flood Gates are closed
  - Only rain that falls inside of the walls contributes to collection system
  - Rain that falls in open tanks within PVSC does not contribute
  - Water only leaves the site via pump stations, and their capacities to lift water over the floodwall.
  - Tailwater Condition = Top of Floodwall
- Modeling Methodology = TR-55 hydrologic method
- Hydrograph Development = Soil Conservation Services (SCS) Method
- SCS Rainfall Distribution = Type III (based on location of site)
- Freeboard Criteria = The collection system was designed so that the maximum allowable flooding elevation is at least 0.5 feet below the FFE of all buildings within the PVSC site

The Type III Distribution for Essex County, NJ and 100-Year, 24-Hour storm is shown below. This distribution shows a small increase in rainfall depth at the beginning and end of the 24-hour duration, with the greatest increases in rainfall depth coming during at Hour 12.

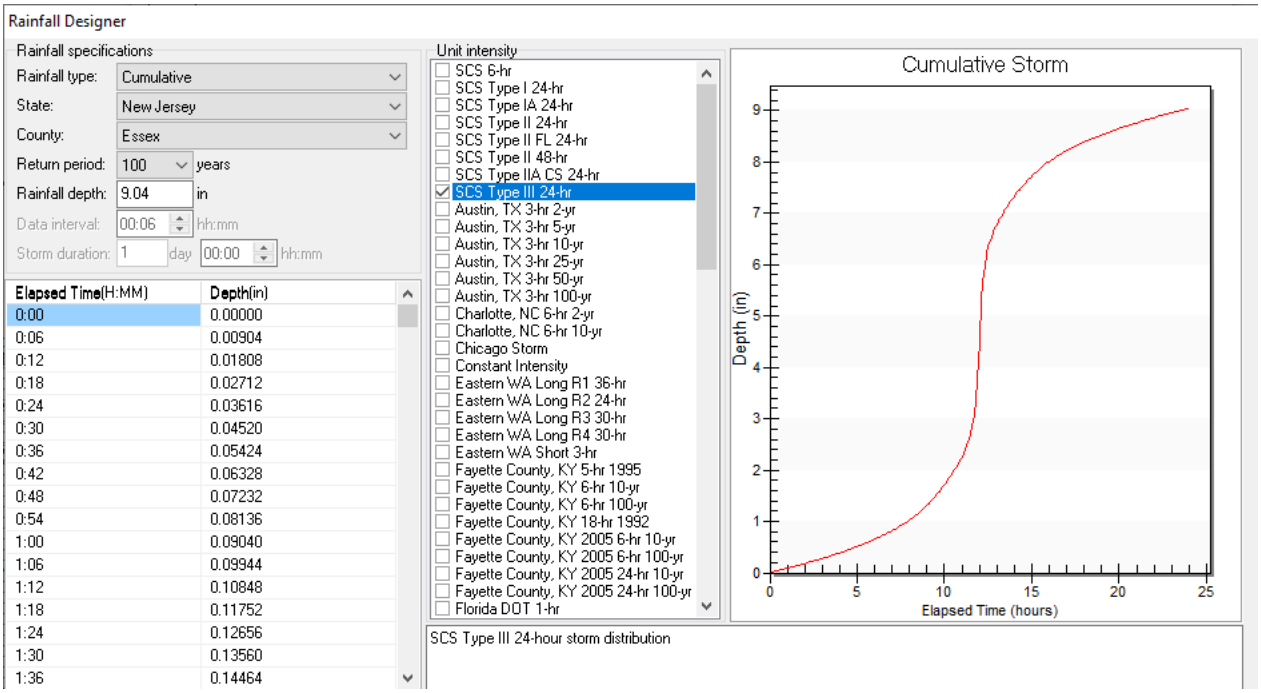


Figure 1: Type III Distribution Curve for Essex County, NJ (100-Year, 24-Hour Storm)

To model the system, a hydrologic analysis of each individual sub-basin was performed. For each basin the characteristics were identified – cover type, soil type, time of concentration, etc. And for each sub-basin, the runoff was directed to the catch basin flowing to it topographically. The modeled collection system included catch basins, manholes and pipes, rim elevations, pipe sizes, and inverts.

When the models were run for the Design Storm, the peak flow (as opposed to the total rainfall), generally came shortly after hour 12 of the 24-hour storm event. The image below contains tables from the model showing the peak flow in the two pipes that flow into the Western Pump Station during the Design Storm event. Note that one pipe shows a peak flow of 179.25 cfs, while the other shows 85.34 cfs for a total inflow to the pump station of 264.59. (However, since the peak flows do not occur at exactly the same time, the peak flow at the wet well is shown as 264.15 cfs,, per the following images).

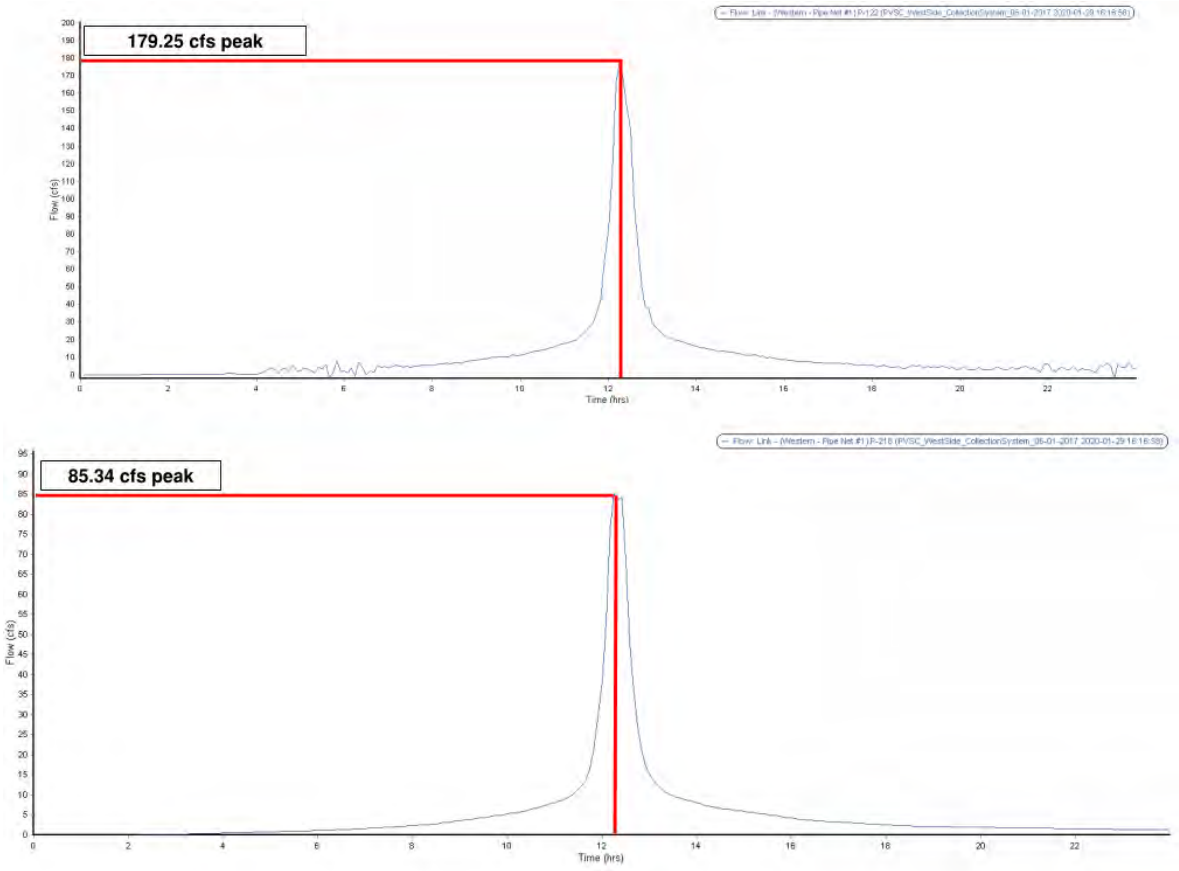


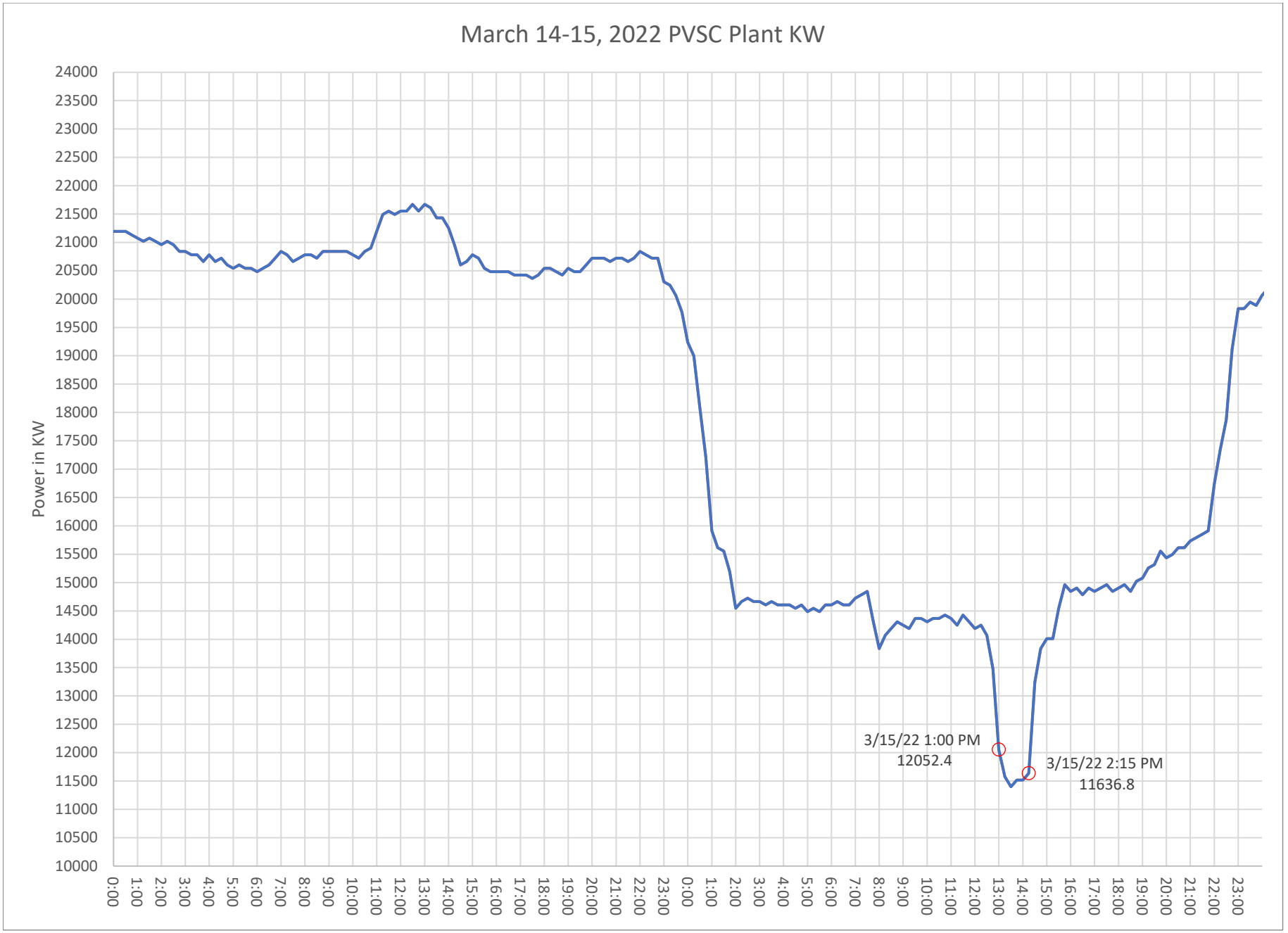
Figure 2: Peak Flows in Pipes Leading to West Pump Station

It is during this short period of the Design Storm that the collection system, and more importantly, the pump stations, need to be sized to handle. If the pump station is not sized to handle 260+ cfs of flow during this brief peak, the catch basins within the West Side of the site will overflow and eventually reach and exceed the FFE of the buildings on-site (freeboard criteria).

The spreadsheet/calculations provided by FEMA (also contained in **EXHIBIT No. 10**) appear to have calculated the rainfall intensity by dividing the rainfall depth by 24 hours. This approach generates a significantly lower peak flow than that generated by the BoDR analysis. This would explain the discrepancy between FEMA's calculated flow rate of 33 cfs, and the calculated design flow rate of 260 cfs.

As the HMP did not include, nor was it the intent, the level of detailed analysis necessary to design the stormwater systems, this is not even considered a modification. It is merely the evolution of designing the mitigation Scope. Furthermore, the values obtained are not conservative in design, as they are consistent with the policy and regulations that the facility is required to mitigate to.

Attachment 10


March 14-15, 2022 PVSC Plant KW
Power in KW
24000
23500
23000
22500
22000
21500
21000
20500
20000
19500
19000
18500
18000
17500
17000
16500
16000
15500
15000
14500
14000
13500
13000
12500
12000
11500
11000
10500
10000
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00
3/15/22 1:00 PM
12052.4
3/15/22 2:15 PM
11636.8

Attachment 11

Passaic Valley Sewerage Commission (PVSC) Mitigation Analysis

Table of Contents **Page Number**

Overview:

This 406 Public Assistance Hazard Mitigation Proposal (406 HMP) is for the construction of an Onsite Standby Power System and a Flood Protection System to mitigate eligible damages caused by loss of power and storm surge. The proposal includes the construction of an onsite power generating facility to provide standby electric power and a floodwall around the entire perimeter of the PVSC treatment facility. The Onsite Standby Power System shall be able to keep the treatment facility in operation if the electric feeds from the utility companies are lost. The Floodwall shall protect all electrical substations, critical process areas, equipment galleries, utility tunnels, force account equipment, the new Onsite Standby Power System and support areas for plant operation. Combined these two mitigation measures will protect PVSC from storm surge from the Newark Bay, the loss of the main and back-up utility power feeds to the main electrical distribution substation, Substation 1. By protecting the PVSC Plant from the above hazards the proposed mitigation measures will work to prevent future eligible damages to the Plant's treatment and process systems.

The two main problems faced when deciding on the best mitigation approaches were what is the best way to prevent PVSC from losing power and what is the best way to prevent flood damages from occurring at PVSC. The approaches considered centered around two main themes, is it better to take a systemic approach to solving the problems or is it better to address the problems with a site specific approach.

The PVSC has identified several alternatives that may provide adequate mitigation for Standby Electric Power and Flood Protection. Three alternatives for Standby Electric Power and five alternatives for Flood Protection have been considered. First a technical analysis will be performed to see if the project alternatives are technically feasible. A practicability analysis will then be completed for the alternatives using the FEMA's guidelines in 44CFR 9.9(c) which considered such factors as (1) Environmental constraints and likelihood of obtaining required permits, (2) Social impacts, (3) Design challenges created by scale of project, availability of land, physical constraints and adverse operational affects during and after construction, (4) Economics and (5) Effectiveness of an alternative in achieving the mitigation purpose.

The methodology used in the Alternatives Analysis is to first determine the best alternative for Standby Electrical Power. Then the best alternative for Flood Protection is determined through the analysis process. Each alternative will be individually assessed through a technical analysis before a practicability analysis is performed based on the criteria above and summarized. Based on these analyses each selection is summarized for practicability and overall effectiveness. This streamlines the analysis and allows a

comparison to be made between the different Standby Electric Power and Flood Protection alternatives based on practicability. For example, the analysis may show that Alternative (2) for Standby Electric Power is the best alternative for standby power then the question is which Flood Protection alternative is the best. This question would then be resolved by the technical and practicability analyses of the Flood Protection alternatives. The methodology is essentially an exercise in deductive reasoning. In the end, selection of the best combination of standby electric power and flood protection shall hinge on the overall practicability of the solutions and how well the combination integrates into the Plant's operations while addressing the two problems of losing power and flooding during a major storm similar to or worse than Superstorm Sandy.

Protection of the PVSC treatment facility from loss of power and flooding is paramount in ensuring that this critical infrastructure remains in operation during a similar or more severe storm event in the future. The final recommendation analysis will focus on the goal of selecting the best combination of Standby Electric Power and Flood Protection alternatives which prevent future eligible storm damages by analyzing the findings of the technical analysis in addition to considering the criteria used for the practicability analysis for each alternative.

Standby Electric Power Alternatives:

There are three alternatives being considered for power maintenance to the site. A brief description of each follows:

Power Alternative 1 - Third Utility Feeder

Description

The site is currently fed power from PSE&G at a voltage of 138 kV. There are two separate services from separate substations servicing the site. This voltage is stepped down in Substation 1 to the utilization voltage of 13.8 kV. In the mitigation option considered here, it is proposed that a third feeder be added from the utility. This feeder would provide some level of increased reliability, although not in direct control of the facility and if the two existing feeders failed during Sandy how much more reliable would a third feeder really be for Standby Power. We did consider the possibility of adding a third feeder at 13.8 kV (which is available along Doremus Ave.) However, this service level lost power during

Sandy also, and for an even longer timeframe than the 138 kV systems were unavailable.

Mitigation Measures

In order to provide a new 138 kV feeder, major changes will be required at Substation 1. These changes would include the addition of a new overhead bus system, oil circuit breakers, switches and transformers similar to the two sets of similar equipment currently installed. This equipment would be installed in parallel with the existing two lineups of equipment.

An incoming feeder would be run underground into the site from Doremus Avenue. The feeder would consist of underground solid dielectric cable run by the Utility from an as yet to be determined location. There is a charge for the installation of this feeder from the PSE&G.

The equipment required to be installed would include incoming 138 kV potheads, three 138 kV oil circuit breakers, three hook 138 kV operated isolation switches, one 138 kV-13.8 kV, 33 MVA oil filled transformer, two 13.8 kV circuit breakers and miscellaneous controls and control wiring. The area required for this equipment, including code required clearances between existing equipment and fences, is approximately 115 feet by 215 feet. The equipment would need to be located to the east or west of the existing equipment which is aligned along a north-south axis.

Along the east side these dimensions would place the new fence line approximately 90 feet east of the existing fence. This would locate the equipment off of the property and in Doremus Avenue itself. Along the west side this same 90 feet would be required. This orientation would require the additional expense of relocating substation 2 and place the equipment in the primary clarifier tanks. See the attached sketch.

It is not known how far PSE&G would need to run this feeder, or where this feeder might come from. All of the PSE&G electric service in this vicinity was without power for almost the entire time that the PVSC facility was without power. It is unlikely that this additional feeder would have a higher reliability than that of the current two feeders.

Another option considered was to reinforce the power system coming in to the site and bring power in from the new Hess power plant. PVSC has contacted Hess regarding the provision of power to this site in the past and been told that

Hess would not be able to provide power to the PVSC facility (copy of correspondence attached).

Cost Estimate

Upgrade to Substation 1 to accommodate Third Utility Service $2,000,000

Utility charges for construction of third feeder may be as much as $40,000,000+

Practicability Analysis

The viability of this alternative is largely dependent on the assumed reliability of the regional power distribution system under another unusually large storm event.

PJM Interconnection, the Regional Transmission Organization covering the management of the electric power grid serving the PVCS plant, reported that Hurricane Sandy resulted in over 140 transmission lines being taken out of service, as well as over 40 generators. There was no known source of utility power within a reasonable geographical distance of the plant that was not affected by the storm. The prospect of locating a power source that will not be vulnerable to the next storm is questionable.

There is a history of widespread and often extended outages affecting the power supply and distribution system surrounding PVSC. These events include the Northeast Blackout of 2003, the North American Ice Storm of 1998, the New York City Blackout of 1977 and the Northeast Blackout of 1965.

The addition of a third utility feeder will not increase the prospect of significantly improving the uptime of the plant unless the power source is fed from a substation that is a considerable distance from the plant. An investigation of the regional blackouts above indicates that predicting the cause and progression of a future blackout makes it difficult to predict where a safe and reliable source of power would come from.

Adding a third utility feeder to the plant may not provide any additional reliability in the power system to the PVSC plant during very large storm events.

- **Environmental Analysis**

  The installation of a third utility feeder does not present any significant environmental impact to the surrounding area. This alternative does not include any on site power generation, so there is no impact on air quality or risk of water pollution from spilled fuel. The additional electrical equipment at the plant may contain insulating oils, but the risk of a spill is not significantly greater than the risk of spills from the existing electrical equipment in Substation 1.

- **Social Analysis**

  The feeder from the utility's substation is expected to run along existing utility right-of-ways. These right-of-ways are outside of the battery limits of the plant and so are outside of the scope of this project.

- **Constructability Analysis**

  Substation 1 can be expanded north of the existing yard to accommodate the equipment for the third high voltage service entrance. The construction of this work should not disrupt the plant as the field is currently unoccupied and it is reasonable to expect that the connection of the new service to the plant's distribution system can be done without a power outage, although the plant will be fed from a single source of power during the tie-in and switch-over.

  The constructability of the utility feeder from a reliable third utility substation is not known, as an acceptable third source has not been identified at this time.

- **Economic Analysis**

  The cost of the Third Utility Feeder is the lowest of the potential alternatives; however, this alternative is the least reliable and could result in major economic losses if power is lost during another large storm or other catastrophic event.

Power Alternative 2: Individual Standby Power Generators

Description

As a second mitigation measure PS&S/Witt is investigating the use of standby generators at each of the buildings/sites in the facility. These generators would all be diesel engine type generator sets located above the flood plain at each building. An independent fuel source would need to be provided at each generator location. Access will be required at each generator location for refueling during an event lasting more than 24 hours. In addition, arrangements must be made with local fuel hauling vendors to ensure that adequate reserves are available to keep the facility running. This could be problematic during an extended power outage as seen during Superstorm Sandy's aftermath when there were widespread full shortages in addition to being problematic during extended flooding as the ability to successfully deal with fuel logistics during a flood would cause major issues for refueling each generator location and for restocking fuel supplies.

Mitigation Measures

The individual generators would be sized based on the maximum load used at that particular site. The generators will be provided with an automatic transfer switch, a local fuel tank (with 24 hours of fuel), added switchgear and control wiring and devices. There will also be connections to the local SCADA panels in each building. This will allow the plant controllers the ability to monitor these generators from the central control room. The following is a list of the proposed generators by substation or switchgear number:

Genset No	Qty.	Size (kW)	Load Served	Input BTU/Hr	Diesel rate (g/hr)	Diesel Storage (24 hr)	Comments/Buildings Served
G1	1	2500	Switchgear 2	22,490,000	173	4152	OEM, EPS, Primaries, Switchgear Bldg., Tunnels
G2	1	2000	Switchgear 3	18,720,000	144	3456	IPS, DC 3-4
G3	1	2500	MCC-1B(1&2)	22,490,000	173	4152	IPS
G4	1	2500	Swgr 1C (A)	22,490,000	173	4152	WWPS
G5	1	2500	Swgr 1C (B)	22,490,000	173	4152	WWPS
G6	1	2000	Swgr 1D	18,720,000	144	3456	RAS
G7	1	2500	East Swgr.	22,490,000	173	4152	O2 Decks
G8	1	2000	O2 Production	18,720,000	144	3456	
G9	1	2000	West Swgr.	18,720,000	144	3456	
G10	1	2500	Swgr. G	22,490,000	173	4152	
G11 (A-C)	2	4000	Swgr. 2	71,500,000	275	13200	Parallel gensets for EPS
G12	1	600	Swgr. 32	5,590,000	43	1032	
G13-G16	4	2000	Swgr. 6&7	74,880,000	144	13824	
G17	1	2500	Swgr. 4	22,490,000	173	4152	
G18	1	2500	Swgr.15	22,490,000	173	4152	
G20	1	2000	Swgr. 12A	18,720,000	144	3456	Sludge Heat Treat
G21	1	2000	Swgr.12B	18,720,000	144	3456	Sludge Heat Treat
G22	1	1500	Swgr. 11	14,040,000	108	2592	Sludge Heat Treat
G23	1	1000	Filter Press	9,360,000	72	1728	
G24	1	2000	Swgr. 10	18,720,000	144	3456	Sludge Heat Treat
G25	1	2000	Swgr. 10	18,720,000	144	3456	Sludge Heat Treat
G26	1	600	Sludge Storage	5,590,000	43	1032	
G27	1	2000	Swgr. 9	18,720,000	144	3456	Sludge Heat Treat
G28	1	1500	Swgr. CE	14,040,000	108	2592	
G29	1	1500	Swgr. CE	14,040,000	108	2592	
G30	1	1500	Swgr. CW	14,040,000	108	2592	
G31	1	1250	Swgr. DC-17	12,220,000	94	2256	
G32	1	1250	Zimpro Boiler	12,220,000	94	2256	
			Totals	595,920,000		110,016	

The total capacity of these generators is, by the nature of the individual sizing criteria, much larger than the total load of the facility. The total kW of generators provided in this scenario would be 58,700, almost twice the size of the incoming service. This is due to the fact that the overall facility demand is smaller than the individual building demands when totaled due to coincidental demands at the various sites. In addition, the incremental sizes of the generators add to the overall load differential.

Based on previous experience with permitting facilities of this type and preliminary indication from NJDEP, it is very unlikely that the PVSC would be granted a modification of their existing air permit by the NJDEP or EPA for these generators. Also the NJDEP has additional requirements for fuel storage tanks greater than 1500 gallons.

There would many unknowns and contingencies in trying to retrofit these generators into the different processes and buildings, in addition to installing a large enough diesel tank to run the generator for enough days to make standby

generation work under adverse conditions. There are major financial costs and risks associated with maintaining enough fuel just in case something happens. For instance, just to have enough fuel in place to run the Plant for 72 hours would require PVSC to have 330,000+ gallons of diesel on hand just in case. This would require a huge expense and be an operational and logistics nightmare and not provide any operational margin of safety. In addition, PVSC would need to exercise the generators at least once a month for a couple of hours, which would require a great deal of fuel and manpower.

Cost Estimate

The base construction base cost for the installation of individual Standby Generators $106,000,000.

Practicability Analysis

- **Environmental Analysis**

  The amount of diesel fuel being stored in all of the generators represents a significant amount of fuel. The belly mounted fuel tanks of the generators are to be equipped with double wall containment and leak detectors. The leak detectors and fuel gauge is to be tied to the Plant's SCADA system for alarm and reporting purposes.

  The generators are intended for standby use only, and are not expected to require an air permit for operation; however, the generators will be restricted in the number of hours that they are permitted to run per year in order to maintain their exempt status. The operating restrictions will depend on both the plant's general air permit and the design of the generator itself. The rules for determining the number of hours that the generator will be allowed to operate per year and still maintain exempt status will be dependent on the measured stack NOx and VOC emissions of the operating unit. EPA Tier II rated units are permitted to be used for stationary emergency only operation, but the number of operating hours may be more restrictive than desirable for this application. Installation of Tier III or Tier IV units would extend the permitted operating hours, and an optional SCR (Selective Catalytic Reduction) unit can be added to the exhaust to further extend the allowable run times.

- **Social Analysis**

  The addition of multiple generators in the plant should not impact the surrounding community. Noise could be a consideration, but the surrounding community does not include any known sensitive receptors that would be affected by generators using standard sound attenuation devices. The generators are to be enclosed in non-sound attenuated outdoor enclosures with standard exhaust silencers.

- **Constructability Analysis**

  Integrating 32 new diesel generators into an existing power distribution system presents a number of engineering and construction sequence challenges. The design concept includes packaged engine generators with outdoor enclosures and 24 hour belly mounted fuel tanks. A power feeder will be connected to the individual process area's substation, but it is not known at this time if this will be done a distribution voltage levels or utilization voltage levels. This connection needs to be carefully designed and tailored to the needs of each process area as all of this work is in and around existing systems. Construction needs to be properly sequenced to permit the continual operation of the plant during tie-in and cut-over.

- **Economic Analysis**

  The cost of installing individual generators presents a viable standby power solution as a cost comparable to the centralized Onsite Standby Electric Power Generating Facility. Note that the generators are expected to be set up to automatically exercise for 1/2 hour per week and should be set up on a quarterly maintenance and annual or bi-annual load test schedule. The fuel and labor cost of the activities need to be incorporated into the plant's operating budget.

- **Summary Analysis**

  The environmental issues coupled with the operational and logistical issues make the effectiveness of this alternative very questionable. If this could get permitted would this even work without the protection of a floodwall? How long would it take to actually refuel all 110,000+ gallons for the 32 generators at 28 different sites? What kind of equipment and manpower resources would be required to just refuel the generators? What kind of resources would it take to exercise these generators monthly? These kind of basic functionality questions that cannot easily be answered beg the question is this worth it at any cost. While this appears to be technically feasible the practicability of this alternative is questionable and functionality is only attainable under the right conditions with a significant drain on resources.

  A large number of diesel generators represent a significant maintenance obligation. Due consideration needs to be made to the reality that individual generators may be down for service during an unscheduled power emergency, and contingency plans should be made to operate the plant under the loss of any individual generator.

  The practicability of refueling the generators during a severe weather emergency requires additional investigation. It is not advisable to store more than 24 hours of fuel in a generator's local fuel tank as this much fuel is unlikely to be consumed in over two years of periodic generator exercising operations resulting in old fuel being stored in the generator's local storage tanks. While diesel fuel does not deteriorate nearly as quickly as gasoline, diesel fuel that is older than two years may present a reliability problem. While It would seem impractical to deliver fuel to generators if the plant's access roads are flooded, diesel fuel tanks sized larger than 24 hours is not recommended.

  The possibility of utilizing natural gas generators would necessitate the increase in capacity of a number of the generators as natural gas generators do not possess the starting torque of a similar sized diesel generator, and starting torque is necessary for starting the large pumps and motors in this facility. The prospect of using natural gas generators in lieu of diesel would necessitate an increase of roughly 25% to 30% to cover the cost of the larger generators.

Power Option 3: Onsite Standby Power System

Description

The last option explored is the provision of a new power plant on the site. This plant would provide power to the entire facility utilizing on site generators. The average daily maximum load for the facility is 23 MW, the wet weather maximum (seen during Hurricane Irene) is approximately 38 MW and the minimum averages to around 14 MW.

Various types of generating facilities have been considered. These include reciprocating engines or gas turbines as a power source. Reciprocating engines have several limitations. The maximum size available for reciprocating engines is approximately 4 MW. Based on the maximum load seen at this facility a generating station utilizing this type of generator would require at least 8 generators. This would require sizable on-site fuel storage capacity. In order to provide a minimum of 120 hours of standby power (the length of the Sandy outage), approximately 200,000 gallons of diesel oil storage would be required. In addition, the emissions from these generators are much higher than gas turbines and as seen in option 2 would not be likely to be approved for an air permit modification by the EPA.

The gas combustion turbine generator option is the most likely choice for this site. The emissions are very low (although scrubbers will still be required) and the fuel would not need to be stored on-site. These turbines utilize natural gas at high pressure to spin a turbine very much like a jet engine. This turbine is used to then turn a generator for the power. These turbines are very reliable and are the generator of choice for most new utility company plants. Typically, the turbine size is selected to match the minimum load so that one generator can be used as close to full power as possible to maximize efficiency. Therefore, we are suggesting that multiple 19 MW generators be installed.

In order to maximize the reliability of the plant, some redundancy is required. In this case, we are recommending that three (3) generators be installed. Each of these generators would be sized at 19 MW. This will allow one turbine to be out of service for maintenance at any time and still provide the required plant power loads in the event of an emergency. It also allows PVSC to be free of the utility, which has failed during previous events. These generators would be used to provide Standby Power for the facility with the Utility connection being maintained as the primary power source.

The new power plant will need to be located at a location above the FEMA ABFE Zone A level. The best location on the site is on the west side of Doremus Avenue south of Garfield St. within the plant. About half of the proposed site is currently above the Zone A elevation and a minimal amount of fill would be required.

The plant will be designed as an indoor plant with the combustion turbines located within a metal sided building. The proposed building will be approximately 240 feet by 120 feet and 60 feet tall. There will be one combined stack for the three turbines at a height of 100 feet. The foundation for the structure will be a structural slab on some form of driven piles. The roof will be a flat roof with a membrane type roofing system.

All balance of plant equipment including electrical switchgear, gas compressor, air compressors, distributed control system and continuous emissions monitoring system are included in the project to provide a stand-alone power plant.

The three generators will be connected to a single electrical switchgear lineup which will control the generator output and allow generators to come on line as dictated by the load. Control of the plant output and synchronization will be provided by Programmable Logic Controllers (PLC) which will be connected to the plant SCADA system. The generators will be connected in parallel to allow the entire plant to be fed. The output arrangement will provide two feeders to connect to the existing A bus and B bus in the existing substation 1. Electrical feeders will be run to substation 1 on the west side of Doremus Avenue. The feeders will be 15 kV feeders run in an underground ductbank. The conduits will be run in a concrete encased ductbank from the power plant to the substation. This ductbank will be required to be pile supported. Where possible, especially under Doremus Avenue, the ductbank will be located on the roof of the existing tunnel to limit the number of pile supports required.

At substation 1, new switchgear will be provided to connect the power plant to the existing systems. This connection will require additional relays and controls to be added to the existing main breakers in the plant. The new switchgear will be added in a walk-in enclosure in the existing substation yard. It will be elevated via grading and/or ramps to a point above the Zone A elevation.

In order to provide the proper gas pressure for the turbines, gas compressors are required. We are proposing to add two gas compressors each capable of providing gas to all three turbines. This will provide the same level of redundancy as in the electrical system.

A diesel generator is also included in the design to "black start" the plant. The turbine generators require power to turn a motor in the system prior to turbine combustion. A generator system is required to start or restart the system for the scenarios where the plant has shut down and utility power is not available. This generator would be located in a walk-in type enclosure immediately adjacent to the power plant and will have a base fuel tank capable of providing 12 hours of operation to restart the plant.

Cost Estimate

$63,200,000

Practicability Analysis:

- **Environmental Analysis**

  There are air permitting issues with this project but since this is a natural gas turbine power plant the issues are relatively small compared to diesel generation. The NJDEP does not foresee major issues with the permitting and PVSC/PS&S have been coordinating with NJDEP.

- **Social Analysis**

  There does not appear to be any historical or cultural issues regarding this project since it will be located on an old industrialized site in an old heavily industrialized area.

- **Constructability Analysis**

  This will be a straightforward design with new construction occurring in an undeveloped portion of the Plant. It will hook into Substation 1 with some modification required and the power will be distributed through existing electrical systems. The PVSC will have to hook up a high pressure gas line and build compression stations but this is fairly routine and should not present a major problem and it will simplify supply logistics since PVSC would be essentially hooked up to the Gulf of Mexico for fuel. There will be little interference with day-to-day operations while the project is under construction since this will be built on an undeveloped area of the Plant. This will also be non-disruptive after construction and require very little effort to exercise the system and to fuel the Plant in preparation of a storm and during a power outage.

- **Economic Analysis**

  The economics of this power solution are strong when you look at the overall cost of the construction plus the ongoing operation of the facility. Economies of scale should be achievable Working on one large power site, in an undeveloped area of the Plant and on new construction is much more efficient than trying to retrofit existing structures around the Plant.

- **Summary Analysis**

  There are fewer and less serious environmental issues than the Individual Standby Power Generator alternative. There are very minor constructability issues when compared to Alternatives 1 & 2. Alternative 1 is fatally flawed with reliability issues. Alternative 2 has serious constructability and design challenges but even worse it has major functional issues, which call into question the effectiveness of the alternative. Economies of scale should be achievable with a project of this size that is new construction on an undeveloped site. Based on these observations this appears to be the strongest candidate overall for Standby Electrical Power.

Flood Protection Alternatives:

The following flood protection alternatives have been considered.

Flood Protection Alternative 1: No Action

Description

The first alternative is to take no action. While this might grade high on many of the assessment criteria and be the most cost-effective in the short-term, it is overly reliant on luck and, therefore, woefully inadequate in achieving the mitigation goal, which is to prevent future storm related damages.

While Hurricane Sandy was an intensely powerful low pressure storm, it was not a high wind, big rain event that is characteristic of many major storms and therefore, the storm surge and flooding were not as severe as what one can expect from a major storm. Because of this the PVSC was able to start recovering from the catastrophic damages to their process equipment fairly quickly and PSE&G was also able to start making repairs to their grid quickly. Although PVSC incurred over $90 million in physical damages and the damages to its regional customers are in the billions, they avoided complete devastation to all of their process galleries, major structural issues and were able to mobilize resources quickly to start their recovery, in large part because Sandy was not a high wind, big rain event.

So while the effects of Sandy were devastating to PVSC and the region and are reason enough to mitigate the Plant against future storm damages it is prudent to consider what a more powerful storm could do to PVSC.

Higher winds would cause more wind damage to the grid system and prevent utilities from responding as quickly since they cannot deploy until winds are below 30 MPH. Higher winds also bring bigger storm surges and greater flooding, cause more building damages and bring greater potential for structural damages. A bigger storm surge would have been a major issue for the sludge processes, which sit on higher ground, since larger volumes of water would have inundated the galleries and more extensive flooding would have occurred on the ground floors. A big rain event would bring a greater potential for prolonged flooding as storm surge prevents drainage of surface waters, cause more downed trees and limb damage which would adversely affect the grid system, cause more localized flooding and in the case of PVSC, overburden the collection system and flood the

plant unless the gates are shut off. Once the gates are shut off you have issues with sewage backing up into residencies, which occurred during Sandy, unless the Plant is bypassed and CSO's are diverted into Newark Bay and the Passaic River, which occurred during Sandy. A big rain event would amplify all of the issues with the CSOs, collection system and District lines coming into the Plant, especially when power is lost. In short, we all know the devastating effects to the Plant and resulting imminent threats to public health and the environment caused by a Sandy type event to PVSC, its District and the LWA customers but these effects and threats would be orders of magnitude higher during a high wind, big rain event if there is no mitigation put in place to protect the Plant from future storm damages.

Summary Analysis

Due to the critical nature of the facility and its public health importance for the region the Governor's Office, NJDEP and PVSC's executive leadership have made their intentions known that they expect the Plant be made more resilient so the Plant's PPE can be protected. FEMA is also supportive of this desire.

For these reasons it would be irresponsible to take no action to mitigate the Plant against future eligible damages. PVSC is too critical of a facility to lose function during and after an event like a Hurricane. Therefore, this option has been taken off of the table and will no longer be considered.

Flood Protection Alternative 2: Component Flood Proofing

Description

The second option is to do site specific flood proofing throughout PVSC treatment facility. This would be accomplished by a combination of raising critical processes and equipment, and strategically flood proofing individual areas and buildings. On the surface this appears to achieve the mitigation goal but there are several considerations that must be addressed.

The PVSC Plant is essentially two campuses with 56 buildings, so even with flood proofing individual areas and buildings the site would still flood from storm surge and during a big rain event. This leads to the issue that with so many different flood proofing systems dispersed across the two campuses, the potential for maintenance problems, operational error and/or failure is compounded. Just

one of the problem will compromise the effectiveness of the entire flood proofing effort when one of these problems causes an individual area or building flood proofing component to fail during a flood producing storm, which will expose the lower levels of the PVSC Plant to more catastrophic flooding.

In addition, essential PVSC process areas would be isolated by floodwaters. Flooding of the grounds would create building and process “islands” across the Plant grounds. This would make any of the “islands” inaccessible from the surface and prevent any maintenance or operations support from responding to any process problems occurring during the storm and the flood. It would be too dangerous to use the tunnel system when the grounds were flooded as the chances for loss of life would be high since one could easily be trapped in the tunnels if a flood proofing measure failed and allowed floodwaters to infiltrate the tunnel system. Since this option allows the Plant to be flooded by storm surge off of Newark Bay, it is questionable if this option would reliably achieve the mitigation goal because the potential for something to go wrong is too great.

There are also issues with this option when assessing it by the other criteria. The design challenges presented by retrofitting the different processes and openings with flood proofing would introduce numerous unknowns and contingencies into the design and construction phases since many of the processes and openings will present unique problems that will require unique flood proofing solutions. This will compound the complexity of the design and construction. Due to the uniqueness and number of the different processes and openings that will need to be flood proofed while keeping the Plant operational, economies of scale will not be achievable. The challenges of retrofitting the flood proof systems into the processes and openings while the Plant stays in operation will introduce adverse operational affects during and after construction. During construction important access points to treatment processes, galleries and buildings will be closed, main thoroughfares for equipment and personnel will be closed and there will undoubtedly be conflicts between maintenance, storm repairs and construction. After construction there will be issues with the maintenance of the individual flood proofing systems, installing flood proofing measures that need to be activated when the emergency plan is activated and since some of the flood proofing for treatment processes will entail a wall being built there will be access challenges for equipment and personnel.

Description of Individual Flood Proofing Measures

The following describes the general type of construction associated with each individual flood proofing measure. The number of the flood proofing measures 1-15 is to be used in conjunction with the drawings and cost estimate to identify the individual flood proofing measure applicable to each PW. For example, on the drawings, the graphics 15-4, 15-6, and 15-10 for the PW UHBAJ15 – Grit and Screening indicates that there are three individual flood proofing measures to be applied, which are 1 – Raise Walls, 6 – Raise Doors, and 10 – Construct Stairs.

1. Raise Walls

Raising walls is in concept to extend walls of structures so that the top of the wall is at the BFE. Constructing additional wall segments on existing walls could cause excessive loading. Therefore, where walls are to be raised, an attached wall system would be constructed. The wall would function in concept the same as a flood wall. The wall would be of reinforced concrete construction. Since the wall is attached, special foundation construction such as piles would not be necessary. Where walls are raised and essentially block existing accesses, new stairs would be required outside and inside the wall. The construction of these is addressed in a separate item.

Raising walls would include site work such as preparation, excavation and backfill, and stone. Site work would also include pavement, curbs and walks removal/demolition with restoration of same, including lawns and grasses. The wall construction would include form work, re-bar installation and concrete.

2. Construct Flood Wall

Constructing flood walls would involve constructing a free-standing wall which would not be attached to an adjacent structure. The top of the wall would be at the BFE. The flood walls would be of reinforced concrete. Since the walls are not attached, special foundation would be required. At various locations, the walls would block off points of existing accesses, in particular, where they cross plant roads. Access would be provided via automatic flood gates. These are described in another work

item. The flood wall construction would include site work such as preparation, excavation and backfill, pavement, curb and walks removal and restoration along with lawns and grasses, pile foundation and rock anchors. The wall construction would include form work, re-bar installation and concrete.

3. Automatic Flood Gates

These gates would be furnished to provide access at various locations in flood walls. These walls can be provided in various lengths and heights and are hollow panels that lie flat in frames under normal conditions, and allow pedestrian and vehicular traffic to go over. At the on-set of contact with flood waters, the gates automatically close by raising using the rising waters and sealing against a frame. The top of the gates would be consistent with the flood wall. The construction would include site work such as preparation, excavation, backfill, pavement, curb and walks removal and restoration along with lawns and grasses. The construction would also involve installation of the gate and frame.

4. Raise Buildings

With this flood proofing means, entire structures and/or buildings would be raised so that entrances and equipment would be raised to at least the BFE. The buildings with their contents would be reconstructed in kind. With these additional stairs would be required inside and outside. Depending on the type of facility and location, the construction would include the typical items of site work as described in above items of this section. In addition, the work would also involve reinforced concrete and structural steel, typical architectural construction, piping and associated appurtenances, building utilities and process equipment work. This item would require potentially extensive means to maintain facilities in operation.

5. Tunnel Bulkheads

At various locations in the tunnel system, bulkheads would be installed to block off sections. These bulkheads would be reinforced concrete walls with watertight “submarine” type doors. These walls would be

constructed to allow piping, electrical conduit and trays penetrations. These would be sealed. This work would also address impacts to HVAC components. The work would include form work, re-bar installation, concrete, piping, electrical, HVAC and work to accommodate the pipe support rack systems. This work would also include modifications and temporary process bypassing depending on the situation.

6. Raise Doors

Where there are few accesses that would be affected by flood waters, in particular facility access via doors, the doors would be raised to at least the BFE. The work would involve demolition of the existing door(s), closing the existing opening to match existing surrounding construction, demolition for new doors, and installation of new doors and frames. This would also require the addition of stairs inside and outside.

7. Raise Ventilation Shafts

At various locations where ventilation shafts create an above grade access, they would be raised to at least the BFE. The shafts would be extended in kind to match existing construction. Depending on the conditions, some site work may be required of a minor nature.

8. Close Openings

Where there are openings that are not critical below the BFE, they would be closed. This would include some demolition such as removing frame work. The opening would be closed off with materials to match existing surrounding construction. In most cases, this would involve masonry work.

9. Watertight Covers

The watertight covers are hatches that would withstand flood waters. These would be used instead of raising certain structures, in particular and mostly where raising would not be practical. Installing watertight hatches also becomes a more cost effective flood proofing measure. The

predominant situation is for access manholes for buried electrical conduits. The work would involve demolition of part of the top of the manhole structures to remove existing frames and covers. The watertight frames and covers would be cast into the top. No other major types of work would be required.

10. Construct Stairs

Where the flood proofing means is by raising walls, raising buildings or equipment is utilized to provide areas, new stairs are required. Exterior and interior stairs would be constructed. These would consist of aluminum stairs and platforms. The elevation of the platforms would be at or above the BFE. No major site work or concrete or mechanical work would be required.

11. Raise Equipment

This means of flood proofing would be used where there is no building and building a wall around would not be practical. The work involved would vary due to the varied types of equipment within the plant. The predominant situation under this option is raising the mixers of the oxygen decks and the supernatant treatment plants. Some substations would also be included. This would involve extensive needs to maintain the existing facilities in operation.

12. Flood Proof Openings

This means would be utilized where it could be practical to temporarily close an opening upon anticipated flood waters. This would involve installing channels to form slide guides on either side of an opening. These are intended to accept stop log type panels that would be placed in the slides upon need and then removed. The existing openings would be then again be utilized under normal conditions. The features would incorporate sealing of the sides and bottom. The top of the slide panels would be at the BFE. No major site work or mechanical work or demolition would be required.

13. Install Flood Proof Doors

This means of flood proofing would involve the installation of doors that could withstand flood waters. This would be used where there are few openings and/or only doors as openings. The work would involve demolition of the existing door(s) and installing a new flood proof frame and door set. No major site or mechanical work would be required.

14. Relocate Equipment

This means would be utilized where another adjacent location such as a second floor of a building is available. With this, all critical equipment would be relocated to a second floor. The first floor would undergo "wet proofing." This allows components to contact flood waters and minimize or prevent water damage. The type of work would involve a combination of architectural, mechanical, electrical, and finishes types at work. This would not involve major site work.

15. Construct New Facility

This means is closely related to raising buildings and/or equipment. With this means an entire new facility would be built. This would be in situations where modifications would impact almost an entire facility and maintaining operation simultaneously would be difficult and not practical. This would allow the existing facility to operate normally while the new is being constructed. Depending on the individual situation, this would involve site work of various types, structural, concrete, process, mechanical, architectural, building mechanical and electrical type of work.

Mitigation Associated with each PW

UHBAJ05 – Oxygen Production

The means for flood proofing the Oxygen Production facilities is to construct a flood wall around the perimeter of the existing Oxygen Production facilities. The flood wall would be a free-standing, continuous wall. This wall would surround the overall oxygen Production facilities consisting of the Oxygen Production

Facility, the Oxygen Production Yard, and the Oxygen Scrubber Facility (Oxygen Scrubber). The top of the wall would be at the BFE of 17.00. To permit access, the flood wall system would also have automatic flood gates. Maintenance of Plant Operations (MOPO) must be considered. The impact on MOPO would be regarding access. Temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 - Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ06 – Oxygen Scrubber

The means for flood proofing the Oxygen Scrubber is to construct a flood wall around the perimeter of the existing Oxygen Production facilities. The flood wall would be a free-standing, continuous wall. This wall would surround the overall oxygen Production facilities consisting of the Oxygen Production Facility, the Oxygen Production Yard, and the Oxygen Scrubber. The top of the wall would be at the BFE of 17.00. To permit access, the flood wall system would also have automatic flood gates. Since this is related to the wall system for oxygen production, the aspects for MOPO would be the same. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ08 – Grit and Screenings Incinerator

Due to the multiple features involved, the means for flood proofing the Grit and Screenings Incinerator is via a combination of new construction and to flood proof openings. The new construction would entail constructing a new grit loading facility, incorporating features that address flood proofing. Openings that are below the BFE of 17.00 would be flood proofed. To address MOPO, the existing loading facility would have to remain in operation while the new facility is being constructed. Temporary access would also be required. The top of flood proofing openings work would be at least equal to the BFE of 17.00. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 12 – Flood Proof Openings
- 15 – Construct New Facility

UHBAJ09 – Warehouse

The means to flood proof the warehouse would be to raise the walls at the main entrance and flood proof openings. To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 12 – Flood Proof Openings

UHBAJ10 – Employee Services Building

The Employee Services Building is located in the foot print area of the Old Sludge Storage Tanks and in close proximity to the Old Sludge Pump Station (UHBAJ28). Due to the multiple building openings, proximity of the two (2) buildings, and other immediate site features, the means for flood proofing is to construct a continuous free-standing flood wall around the area encompassing the employee services building, the old sludge pump station, and the immediate adjacent area. The top of wall is to be at the BFE for this area of the treatment plan of 19.00. For access, the wall system will include automatic flood gates To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ11 – Oxygen Decks

The means for flood proofing the Oxygen Decks would involve providing flood proofing for several construction features of the oxygen decks. They are the compressor building, dehumidification buildings #5 and #6, one (1) of the two (2) effluent channels, which is open topped, and vents in the oxygen deck top slab over the oxygenation tanks and raising the mixers. The means for flood proofing the compressor and dehumidification buildings #5 and #6 would essentially be the same – raising the buildings so that entrances and other openings are above the BFE. The means for flood proofing the open effluent channel is to raise the top of the wall of the oxygen decks at the perimeter of the channel and join this into the flood wall system for the Primary Clarifiers and Final Clarifiers which is described in those sections. The top of the wall would be at the BFE of 17.00. The flood wall system would also include automatic flood gates that are normally open and lie flat and raise at the onset of flood water. The means for flood proofing the vents in the top slab would be to raise these vents. The mixers are to be raised so elements that could allow water to enter would be above the BFE. To address MOPO, temporary access would have to be provided to various

structures. Also, the mixer work would have to be phased and temporary blowers would have to be provided to minimize process impacts. In relating to the drawings and the associated cost estimate, the major items are as follows:

- 1 – Raise Walls
- 3 – Automatic Flood Gates
- 4 – Raise Buildings
- 7 – Raise Ventilation Shafts
- 11 – Raise Equipment

UHBAJ13– Return and Waste Sludge

The means for flood proofing the Return and Waste Sludge Pump Station is in concept to raise the walls around the perimeter of the influent area of pump station via an attached wall system and raise door accesses, construct stairs, and flood proof openings at various locations. The top of the wall is to be at the BFE of 17.00. In order to provide access inside the wall, stairs are to be constructed. In addition, building accesses on the south and west side would be flood proofed. TO address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major item of work is as follows:

- 1 – Raise Walls
- 10 – Construct Stairs
- 12 – Flood Proof Openings

UHBAJ14 – Wet Weather Pump Station

The means for flood proofing the Wet Weather Pump Station is to construct a flood wall, raise an entrance, and flood poof and close openings at various locations. The top of the flood walls is to be at the BFE of 17.00 and would be constructed at the north side entrance. New stairs will also be required for access here to the building. The overhead doors on the west side and south side would be flood proof. The work also includes raising the entrance on the east side. In addition, the work would include closing window and lower openings in the foundation wall and door openings at the south side of the building. To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 6 – Raise Doors
- 8 – Close Openings
- 10 – Construct Stairs

- 12 – Flood Proof Openings

UHBAJ15 – Grit and Screening

The means for flood proofing the Grit and Screening facility in concept is to raise the walls around the grit tanks and influent area to the tanks via an attached wall system . The top of the wall is to be at the BFE of 17.00. To continue to provide access, stairs to the walkway will need to be reconstructed at the influent area, stairs on both sides of the grit tanks will also be required, and exterior and interior stairs will be needed for the screenings building. The doors to the screening building will also need to be raised. Since the walls of the building do not have to be raised, they may have to be reinforced to resist the hydrostatic loading. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 6 – Raise Doors
- 10 – Construct Stairs

UHBAJ16 – Cake Storage

The Cake Storage facility is located between the Filter Press facility and the Sludge Centrifuge facility. Due to the multiple building openings, proximity of the two (2) other buildings, and other immediate site features, the means for flood proofing is to construct a continuous free-standing flood wall around the area encompassing the Cake Storage facility, the Filter Press facility, and the Sludge Centrifuge facility. The top of wall is to be at the BFE for this area of the treatment plan of 19.00. For access, the wall system will include automatic flood gates. In addition, flood doors would also be provided. To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 11 – Raise Equipment
- 13 – Install Flood Proof Doors

UHBAJ17 – Administration Building

The means to flood proofing the Administration Building is to relocate electrical equipment on the first floor to the second floor. The first floor would otherwise remain and would be treated to “wet flood proof” the first floor. This would

allow the first floor to be flooded, however, the "wet flood proof" means would provide protection from water damage. In addition, various openings would be flood proofed. To address MOPO, new and/or temporary electrical equipment would be required. Temporary access would also be required. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 12 – Flood Proof Openings
- 14 – Relocate Equipment

UHBAJ18 – Decant Tanks

The Decant Tanks are located east of and directly next to the Sludge Heat Treatment facility. Adjacent to the Decant Tanks are the Old Sludge Storage Tanks, the Sludge Storage Tanks, and the Sludge Pumping Station. Due to the proximity of these other facilities and surrounding site conditions, the means for flood proofing the Decant Tanks is to construct free-standing flood walls between the various adjacent facilities. Flood walls would be constructed between the Old Sludge Storage Tanks and Sludge Storage Tank #1, between the Old Sludge Storage Tanks and between Decant Tanks #1, #3, and #5. Flood walls would also be constructed from Decant Tank #5 to Sludge Storage Tank #2. In addition, flood walls from the Old Sludge Storage Tanks and Decant Tank #1 to the Sludge Heat Treatment facility would be constructed. These series of individual flood walls would also be part of the flood proofing means for the sludge pumping station and the Sludge Heat Treatment facility, the top of the walls would be at the BFE for this part of the plant of 19.00. For access, automatic flood gates would be constructed. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ20 – Effluent Pump Station

The means for flood proofing the Effluent Pump Station would be via the continuous wall system intended to flood proof the Primary Clarifiers, Final Clarifiers, to the Chlorination Building adjacent to the Effluent Pump Station, the Operation and Maintenance Building, the Oxygenation Tanks Effluent Channel, the Dehumidification Buildings between the Primary Clarifiers and the Final Clarifiers, and the Switch Gear Buildings #1 and #3, and adjacent sub-stations. The top of the wall system is to be at the BFE of 17.00. The construction of this wall system will also require that portions of this wall system be constructed as a free-standing flood wall. This type of wall would be in the area around Switch Gear Building #1, Substation #1, around the Effluent Pump Station, walls at

connecting plant "streets", and the area between the Primary and Final Clarifiers. In order to provide vehicular access, automatic flood gates are to be constructed as part of the wall system at plant "street" access locations. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 10 – Construct Stairs

UHBAJ21 – Filter Press

The Filter Press facility is located east and directly next to the Cake Storage facility. The means for flood proofing the Cake Storage facility and Filter Press facility is via the continuous wall system intended to also flood proof the Sludge Centrifuge facility. The description of this wall system is provided in the work descriptions for the Cake Storage Facility. The access means would also provide access to the Filter Press facility. In addition, flood proof doors would be installed in the wall on the south side. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 13 – Install Flood Proof Doors

UHBAJ22 – Final Clarifiers

The means for flood proofing the Final Clarifiers is in concept to raise the walls around the perimeter of the final clarifiers. To avoid the potential for overloading the existing walls by constructing walls directly on the existing walls, an attached wall system would be constructed. The top of the wall system is to be at the BFE of 17.00. This wall system is part of a continuous wall system intended to flood proof the primary Clarifiers, Effluent Pump Station and adjacent Chlorination Building, the Operation and Maintenance Building, the Oxygenation Tanks Effluent Channel, the Dehumidification Buildings between the Primary Clarifiers and the Final Clarifiers, and the Switch Gear Buildings #1 and #3, and adjacent sub-stations. The construction of this wall system will also require that portions of this wall system be constructed as a free-standing flood wall. This type of wall would be in the area around Switch Gear Building #1, Substation #1, around the Effluent Pump Station, walls at connecting plant

"streets", and the area between the Primary and Final Clarifiers. In order to provide vehicular access, automatic flood gates are to be constructed as part of the wall system at plant "street" access locations. The construction of the wall system will also require reconstruction of stairs for access over the wall. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 10 – Construct Stairs

UHBAJ24 – Industrial Pollution Control (Lab)

The means for flood proofing the Lab would be to flood proof openings. This would include flood proofing accesses. To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 12 – Flood Proof Openings

UHBAJ25 – Influent Pump Station

The means for flood proofing the Influent Pump Station is in concept to raise the walls around the perimeter of the influent area of pump station via an attached wall system. The top of the wall is to be at the BFE of 17.00. The means of flood proofing would also include providing stairs and flood proofing the door on the east side. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 10 – Construct Stairs
- 12 – Flood Proof Openings

UHBAJ 26 – Main Security Building

The means to flood proof the Main Security Building is to relocate equipment from the first floor to the second floor and "wet proof" the first floor. To address MOPO, temporary access would have to be provided and temporary and/or new equipment would be required to maintain operations. In relating to the drawings and associated cost estimate, the major items of work are as

follows:

- 12 – Flood Proof Openings
- 14 – Relocate Equipment

UHBAJ28 – Old Sludge Pumping

The Old Sludge Pumping Station is located in the area of the old Sludge Thickening tanks and in the proximity of the Employee Services Building. The means for flood proofing is via the continuous wall system intended to flood proof the Employee Services Building. The description of this wall system is provided in the work descriptions for the Employee Services Building. The access means for this facility would also provide access to the old sludge pump station. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ29 – Operation and Maintenance Building

The Operation and Maintenance Building is located between the primary and Final Clarifiers. The means for flood proofing the Operation and Maintenance Building is via the continuous wall system intended to flood proof the Final Clarifiers, Effluent Pump Station and adjacent Chlorination Building, the Operation and Maintenance Building, the Oxygenation Tanks Effluent Channel, the Dehumidification Buildings between the Primary Clarifiers and the Final Clarifiers, and the Switch Gear Buildings #1 and #3, and adjacent sub-stations. The description of this wall system is provided in the work descriptions for the Primary Clarifiers, the Final Clarifiers, and the Effluent Pump Station. The access means for these facilities would also provide access to the Operations and Maintenance Building. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 10 – Construct Stairs

UHBAJ30 – Primary Clarifiers

The means for flood proofing the Primary Clarifiers is in concept to raise the walls around the perimeter of the primary clarifiers. To avoid the potential for overloading the existing walls by constructing walls directly on the existing walls, an attached wall system would be constructed. The top of the wall system is to be at the BFE of 17.00. This wall system is part of a continuous wall system intended to flood proof the Final Clarifiers, Effluent Pump Station and adjacent Chlorination Building, the Operation and Maintenance Building, the Oxygenation Tanks Effluent Channel, the Dehumidification Buildings between the Primary Clarifiers and the Final Clarifiers, and the Switch Gear Buildings #1 and #3, and adjacent sub-stations. The construction of this wall system will also require that portions of this wall system be constructed as a free-standing flood wall. This type of wall would be in the area around Switch Gear Building #1, Substation #1, around the Effluent Pump Station, walls at connecting plant "streets", and the area between the Primary and Final Clarifiers. In order to provide vehicular access, automatic flood gates are to be constructed as part of the wall system at plant "street" access locations. The construction of the wall system will also require reconstruction of stairs for access over the wall. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 1 – Raise Walls
- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 10 – Construct Stairs

UHBAJ31 – Safety Security

Safety Security refers to the multiple access gates to the PVSC plant site. The means to protect the facilities at these access locations would be to construct free-standing flood walls along each side of the gate facility, and construct flood gates in the front and back. The top of the flood wall systems would be at the BFE of 17.00 and 19.00 depending on location. To address MOPO, temporary gate facilities would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ34 – Sludge Heat Treatment

The Sludge Heat Treatment facility is located between the Decant Tanks and the Sludge Thickeners. Due to the multiple types of building areas and openings, proximity of the Decant Tanks and Sludge Thickeners, and surrounding site conditions, the means for flood proofing is a combination of flood walls connecting to adjacent treatment facilities and flood walls running along the north and south sides of the Sludge Heat Treatment Building. A free-standing flood wall would be constructed from an adjacent Old Sludge Storage Tank and extend along the north side of the Sludge Heat Treatment Building. This wall is also part of the flood proofing for the Decant Tanks. Another flood wall would be constructed from Decant Tank #1 and extended along the south side of the Sludge Heat Treatment Building. This wall is also part of the flood proofing for the Decant Tanks. In addition, two flood walls would be constructed between the Sludge Heat Treatment Building and the Sludge Thickeners. This wall would also be part of the flood proofing for the Sludge Thickeners. The top of the walls on the east side would be at the BFE of 19.00 and between the Sludge Thickeners at the BFE of 19.00. For access, the flood walls would have automatic flood gates. In addition, flood doors would be provided in the flood wall along the north and south sides of the building. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 13 – Install Flood Proof Doors

UHBAJ35 – Sludge Pumping

The Sludge Pumping facility is located east of the Decant Tanks and between Sludge Storage Tanks #1 and #2. The means of flood proofing is a combination of the free-standing flood walls intended to flood proof the Decant Tanks. This system is described in the section for the Decant Tanks. The means of flood proofing would also include constructing flood walls with flood proof doors on the east side of the building between the walls of the Sludge Storage Tanks. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 13 – Install Flood Proof Doors

UHBAJ36 – Sludge Thickeners

The Sludge Thickeners are located west of the Sludge Heat Treatment facility. The means of flood proofing is to construct automatic flood gates between each of the tanks, and free-standing flood walls between the tanks and the Sludge Heat Treatment Facility, and at the west end of the tanks. A flood walls between thickener #1 and the sludge degritting building would be constructed with a flood-proof door installed. The wall on the west side would extend from Thickener Tank #2 and run along the edge of the adjacent paved area and then south in front of the sludge de-gritting building. The top of these walls would be at the BFE for this part of the plant of 19.00. Access would also be provided via automatic flood gates. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 13 – Install Flood Proof Doors

UHBAJ37 – Substations

In addition to Substations, this section also includes flood proofing switch gear buildings and other aspects of the plant's electrical infrastructure in the form of electrical duct bank chambers. This means for flood proofing, the substations and switch gear buildings is a combination of raising facilities and protecting them via flood wall systems with flood gates that also provide flood proofing for other plant facilities. Stairs would also be required where facilities are to be raised. Raising the facilities would construct critical aspects above the BFE of 17.00 and 19.00 depending on location. The flood proofing means for the chamber is to install watertight covers. To address MOPO, temporary access as well as temporary electrical equipment would have to be provided. Phasing of construction would also be required. In relating to the drawings and the associated cost estimate, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates
- 4 – Raise Buildings
- 9 – Watertight Covers
- 10 – Construct Stairs
- 11 – Raise Equipment

UHBAJ38 – Supernatant Treatment

The means for flood proofing the Supernatant Treatment Facility in concept is to raise the walls around the perimeter of the settling tanks. The top of the wall is to be at the BFE elevation of 17.00. These are buildings in between the sets of clarifiers. These buildings would be raised. This facility includes an access to the tunnels. This would be protected by raising the ventilation shafts. In addition, this facility includes a Control Building and a Lime Building. These would be flood proofed by raising doors and louvers. Raising doors and buildings will require new stairs. In addition, there are mixers as is with the Oxygen Decks. These would be raised as with the Oxygen Decks. To address MOPO, temporary access would be required as well as temporary equipment associated with Supernatant Treatment would have to be provided. Phasing of the work would also be required. In relating to the drawings and the associated cost estimate, the major item of work is as follows:

- 1 – Raise Walls
- 4 – Raise Buildings
- 6 – Raise Doors
- 7 – Raise Ventilation Shafts
- 10 – Construct Stairs
- 11 – Raise Equipment

UHBAJ39 – Trucked-In Liquid Waste

There are two locations for receiving trucked-in liquid waste. One is located off the northeast corner of the primary clarifiers, and the other is located just beyond the entrance to the plant at Security Gate 3. The means for flood proofing the receiving facility by the primary clarifiers is via the continuous flood wall system intended to flood proof the primary and final clarifiers, the effluent pump station, and other adjacent facilities. This receiving facility is contained within the flood wall system for these. The description for the flood wall system can be found in those sections above. No means for flood proofing the receiving facility by Security Gate 3 is proposed. The top of the walls would be at the BFE for this part of plant of 17.00. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimate, the major item of work is as follows:

- 1 – Raise Walls
- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

UHBAJ40 – Tunnels

The means to flood proof the Tunnels is via a combination of modifying access and utility type connections to the tunnels, and constructing bulkheads at multiple locations throughout the tunnel system. At multiple access locations, the entrances would have new stairs to enter above the BFE of 17.00 and 19.00 depending on location. Since ventilation shafts provide a type of connection to the tunnel area, then these would have to be raised. This would be done by extending the shaft walls above the BFE of 17.00 and 19.00 depending on location. The means would also include constructing new means of access and raising and providing stairs particular access locations. To address MOPO, temporary access would have to be provided. In relating to the drawings and associated cost estimate, the major items of work are as follows:

- 4 – Raise Buildings
- 5 – Tunnel Bulkheads
- 7 – Raise Ventilation Shafts
- 10 – Construct Stairs
- 15 – Construct New Facility

UHBAJ132 – Security Gate 3

The means to flood proof Security Gate 3 is the same means as the flood proofing for Safety Security (UHBAJ31) which is constructing free-standing flood walls along each side of the gate and construct flood gates in the front and back of the security gates. To address MOPO, temporary access would have to be provided. In relating to the drawings and the associated cost estimates, the major items of work are as follows:

- 2 – Construct Flood Wall
- 3 – Automatic Flood Gates

Cost Estimate

$168,000,000 represents base construction costs

Practicability Analysis:

- **Environmental Impacts**

  Environmental impacts are minimal with this option. All of the proposed work will be onsite in the vicinity of existing structures. Flood walls may

create a visual impact on historic structures. This impact will be limited to the wet weather pumping station and venturi buildings.

- **Social impacts**

  Social impacts will also be minimal. The proposed work will have no impact on the demographics of the area.

- **Constructability**

  Construction of the flood proofing measures will be difficult because construction activities will have a major impact of the treatment facilities. Temporary facilities to maintain process and electrical systems will be necessary.

  Major disruptions to site utilities will be necessary to construct flood proofing measures. This may require temporary or permanent relocation of utilities that include temporary by-passing of critical treatment process components. In addition, changes to existing drainage systems will be necessary to handle storm water that falls within areas surrounded by flood walls.

  Normal traffic patterns will be disrupted. Access to individual process areas and equipment would be compromised by construction activities. Construction activities would have to be phased to address staging of construction and on-site storage of equipment and materials. During a storm event flood water will prevent plant personnel from travelling throughout the site to access individual process areas to operate or maintain the facility. Additional security will be needed to control unauthorized access to the site

  Critical process equipment, electrical equipment and buildings, throughout the site not protected will have to be raised above the base flood elevation.

- **Economic Analysis**

  Due to the nature of the individualized floodproofing solutions economies of scale will not be achievable because of the complexity of the project. Also ongoing operational cost to maintain and exercise any equipment will be compounded by the many different floodproofing solutions to the many different floodproofed sites.

- **Summary Analysis**

This is a very inefficient solution for Flood Protection for a plant of this size that has so many different treatment processes that make up PVSC's treatment system. This floodproofing also allows PVSC's grounds to flood making this a less than ideal floodproofing solution since the different buildings on the grounds represent processes that combine to make up PVSC's treatment system.

Flood Protection Alternative 3: Elevate Plant

Description

The third option is to raise the entire PVSC Plant site and install an Onsite Standby Power System. This would be accomplished by raising the grade of the grounds and roads around the plant in order to prevent the site from flooding in addition to installing an Onsite Standby Power System. The effectiveness of this project in reaching the mitigation goal largely depends on the ability of the design to effectively retrofit the buildings and processes so they can still function with the dramatic change in grade. That being said there are several issues with assessing this option by the assessment criteria.

There are many design challenges with this project in order to make sure that the 56 buildings and lower level process equipment can still function as intended along with the different above grade pieces of process equipment. There is no one size fits all solution to these design challenges as most of these buildings and processes perform unique functions and will be fully operable during the retrofit. Other design challenges would be how to perform all of the required civil and road work while still operating the Plant. It could also be a challenge to receive a permit because of the adverse floodplain affects that would occur in the area with a dramatic change in grade. There would be no economies of scale with the retrofits to the buildings and processes and while there would usually be economies of scale in doing the civil and road work on a Plant of this size, due to having to keep the Plant fully functioning, it is questionable if this would hold true. Retrofitting the Plant buildings and processes in this fashion along with completely redoing all of the site work and roadwork will be extremely disruptive to daily operations. During construction important access points to treatment processes, galleries and buildings will be closed, main thoroughfares for equipment and personnel will be closed and there will undoubtedly be

conflicts between maintenance, storm repairs and construction activities. Once construction is completed the presence of adverse effects will depend on the solutions the designers were able to implement to overcome the design challenges. Raising the grade of a Plant this size is something you typically do prior to construction and when performed then it is a straightforward civil project. However, when you try to retrofit the buildings and processes to function properly while staying in operation as you are re-grading the Plant you introduce an unknown amount of complexity. For instance, how do you handle all of your LWA customers while you are re-grading and rebuilding all of your roads and raising the LWA intakes? This alone makes this an unappealing option.

Cost Estimate

$1,000,000,000

Practicability Analysis:

- **Environmental Analysis**

  The floodplain impacts of raising the Plant are tremendous and would affect a huge area around the Plant and several main freight roads would be affected along with the drainage for those roads. It is possible there would now be some surface run-off implications for wetlands and other similar type environmental rules that would fall under the purview of the NJDEP.

- **Social Analysis**

  This would very likely create SHIPO concerns with view sheds and the like due to the new Plant height.

- **Constructability Analysis**

  There are so many issues with this project. First a retaining wall would have to be built on the perimeter to hold the fill in. Then you could start filling to the flood elevations from the outside in. There would be serious civil/structural and drainage issues from doing this. Then you could start on raising the buildings. There would be serious structural complexities with this retrofit as well as new operational complexities created during and after

construction. There could be foundation, steel, concrete block and piling structural issues with the buildings. There would also be new civil/structural and drainage issues from raising the buildings. Then any settling tank would have to have its walls raised. Then the roads could start being raised. This would create serious operational complexities as access roads are somewhat limited and physically constrained on the site and raising them would be very disruptive to normal operations and the LWA haul-ins. The intakes for LWA would also have to be raised. Parking lots would have to be raised. Also the raising of the Plant roads would trigger road modifications to all the access roads coming into the Plant along with roads adjacent to those. It is estimated that with a somewhat aggressive schedule Alternative 5 could be built in three years. The retaining wall around the Plant is similar, so a similar time frame could be assumed. You could probably start retrofitting the buildings and settling tanks at the same time but everything else would have to wait. Because of all the civil/structural issues and the operational complexities that occur once you get away from the perimeter progress for this project would be slow and take possibly 10 yrs. Then any Standby Electric Power solution would have to wait until the building and site are finished along with the portion of the road that allows access to the Standby Electric Power solution site or sites.

- **Economic Analysis**

  Given the scale of the retaining wall portion of the project you could probably achieve economies of scale on that portion. However, given the civil/structural complexities caused by the retrofit to the rest of the Plant that continue through the rest of the project there is probably a net diseconomies of scale for the entire project.

- **Summary Analysis**

  Where to begin with this project, first off, this is a great idea for new construction of a new facility. That is where the good news ends. This is a terrible idea for this facility. There are just too many contingencies and complexities. And it never ends. What would happen if you had a major rain event or storm surge when you were half way through with raising the Plant?

Flood Protection Alternative 4: Relocate Plant

Description

The fourth option is to relocate the entire Plant with an Onsite Standby Power System. This would be an ideal solution since you could keep the old Plant operational while the new Plant was being constructed so there would not be any loss of function associated with the mitigation. A new plant would be built with current technologies and the size and capacity of an Onsite Standby Power System would be unknown until a design was underway but the Onsite Standby Power System described in this analysis can be used as a theoretical estimate since it is not a major cost component or driver.

There is definitely a cost issue with constructing a new Plant. The current Plant cost $1 billion to construct in 1979 and using basic cost escalation it is estimated to cost approximately $3 billion today. Therefore, this is the highest relative cost option. There are also land availability issues as finding a suitable parcel of land to construct the 140+ acre Plant will be a challenge in this densely populated area. In addition, there will undoubtedly be permitting fights stemming from environmental and social justice impact reviews, NIMBY concerns and general Clean Air and Water Act permitting compliance issues for new construction. All District collection and interceptor infrastructure will have to be re-worked and new pumping and metering stations will have to be built. In taking everything in consideration, relocating the Plant would be an ideal scenario if it could be approved, land could be found and permits could be received. As this would certainly achieve the goal of preventing a loss of function, with the only real concern being if a storm were to damage the old Plant and cause a loss of function while the new one was under construction.

Cost Estimate:

Plant cost	1979	$1,000,000,000
Escalation to	2013	$2,848,000,000
Escalation to	2016	$3,010,868,617
Standby Power		$90,000,000
Collection System		$300,000,000
Estimated Total		$3,400,868,617

Practicability Analysis:

- **Environmental Analysis**

  As this would be a new massive undertaking the Environmental Reviews and Permitting requirements would be extensive. Finding a large enough parcel of land to build a new plant in this area would be challenging enough but finding a suitable and non-objectionable to the public parcel of land would be a real challenge. The new construction plans would have to fully comply with the latest Clean Air and Water Acts requirements and public involvement would also be required.

- **Social Analysis**

  There would be historical, cultural and view shed concerns. And depending on where a parcel of land could be located the concerns could be serious.

- **Constructability Analysis**

  Once a parcel of land was found and a design was approved this would not be an issue.

- **Economic Analysis**

  This estimated cost of building a new plant is by far the most expensive alternative. Without a designed project this is a ballpark figure. Depending on the technologies chosen the cost could vary. Newer technology and plant configurations may allow for a more efficient plant layout and treatment system so there may not be a one-for-one component rebuild. The power loads may not be the same and the collection system upgrades may be more or less extensive depending on where the plant is located. However, for the purposes of this exercise the estimate is indicative of the magnitude of the cost.

Flood Protection Alternative 5: Floodwall

Description

The fifth option is to construct a Floodwall. The Floodwall System will consist of a Floodwall around the perimeter of the Plant, a re-work of the drainage system for the Plant and construction of two flood pump stations. This system will prevent external floodwaters from inundating the Plant as well as preventing internal flooding from occurring due to heavy rains.

This alternative costs considerably less than the relocation option while performing just as well at preventing a loss of function with few side effects. The design challenges for the floodwall would be for typical items like structural calculations, geotechnical, piling requirements and accounting for underground utilities. It is essentially a straightforward design and there should be few unknowns and contingencies. There will be a permitting process for both the floodwall and Onsite Standby Power System. This will be a typical permitting process. Land availability and constraints would not be an issue for the floodwall as the Plant perimeter is very accessible with limited development. Due to the open ground around the Plant perimeter, economies of scale should be achievable. There should be minimal adverse operational affects during and after the construction of the floodwall since the perimeter is already fenced and access is already controlled at gates. An added benefit of the wall after construction would be the ability to bring PVSC equipment behind the floodwall as part of an emergency plan in order to protect it from flooding. Fuel for the equipment could also be staged as part of the same plan. The equipment loss from Sandy devastated PVSC and adversely affected their recovery. In addition, the perimeter grounds are not developed so staging and construction activities should not interfere with any operations. Therefore, this option is the best feasible option when all criteria are considered and it achieves the goal of preventing the loss of function quite well.

Mitigation Measures

The attached plans and profiles show the proposed alignment elevation and details for a flood wall system designed to hold back flood water from a 500-year storm. Components of the flood wall system include the flood wall, flood gates, improvements to offsite drainage system, and construction of stormwater pumping stations.

- **Flood Wall**

The profiles show that the exposed height of the flood wall will range from 6 feet to 12 feet with an average height of 8 feet above grade. The top of the walls on the eastern part of site (east of Doremus Avenue) will be at elevation 19.00 without freeboard. This is the FEMA ABFE for a 500-year storm. The top of the flood walls west of Doremus Avenue will be at elevation 17.00 without freeboard. This is the FEMA ABFE for the Coastal A-Zone.

Three options for wall construction have been considered. These options include steel sheet piling, cast-in-place concrete, and pre-cast concrete. See attached sketches for each option.

Steel sheet piling would be the least cost option. However, the life expectancy of sheet piling in an area with a high ground water table is estimated to be less than 50 years.

The cast-in-place concrete wall will have a life expectancy of more than 100 years. However, the greater life expectancy comes with a greater cost. Also, existing soils conditions vary throughout the PVSC site. Compression piles will most likely be needed to support the heavy cast-in-place concrete walls.

The use of pre-cast concrete modular construction would reduce the volume of concrete needed, and would reduce construction time, resulting in a more economical solution. The use of pre-cast concrete modular units would be ideal in areas of the site that have good soil bearing capacity. The weak link with the use of pre-cast modular units is the joints. Over time, the joint material deteriorates and joints may have to be resealed. During the life expectancy of the flood wall more than 1000 joints may have to be repaired. At a cost of $1,000 for the repair of a single joint this would result in a maintenance cost of $1,000,000.

The final design of the flood wall may include a combination of steel sheet piling, cast-in-place concrete, and pre-cast concrete modular units. Steel

sheet piling could be used in tight areas where there is no room for the construction of concrete foundations. Cast-in-place concrete with pile foundations would be used throughout the site to resist impacts from storm surges and in other areas that have poor soils conditions. It is possible that pre-cast concrete modular units may be used in areas that will not be impacted by storm surges and have good soil conditions.

- **Flood Gates**

Under normal conditions maintenance access to the site is paramount. Flood gates will be necessary to provide continuity for the flood wall during a storm event. Manual and self-closing gates are available. Manual flood gates are generally less expensive than self-closing flood gates. Self-closing flood gates rise as flood waters rise. Details of automatic flood gates are included in the appendix.

Improvement to the Offsite and Onsite Drainage Systems

Presently, there are three drainage systems in the section of the site east of Doremus Avenue. Each of these systems discharge directly to the Newark Bay. Drainage from Wilson Avenue (east of Doremus Avenue) connects to the most northerly onsite drainage system. During a storm, high water in the Newark Bay would flow back through the drainage systems to flood the site when a flood wall is constructed. In order to keep this from happening, the onsite drainage system must be separated from the Wilson Avenue drainage system and the Newark Bay storm sewer outfalls. To accomplish this, a new drainage system will need to be constructed in Wilson Avenue and a new collection system will have to be constructed onsite to connect the three onsite drainage systems so that storm water can be conveyed to a new storm water pumping station located near the Newark Bay at the southeast corner of the site. It is estimated that design flow for the storm water pumping station will be 65,000 gallons per minute. Drainage calculations are included in the appendix.

The western portion of the site (west of Doremus Avenue) has three drainage systems that discharge to Jasper Creek, a small creek on the south side of the site, and a number of smaller onsite drainage systems that connect to the city storm drainage system in Avenue "P". During Superstorm Sandy, the storm surge flowed back into Jasper Creek, preventing storm water from being discharged to Newark Bay. This resulted in flooding of the site. In order to keep this from happening after the flood wall is constructed, each of the onsite drainage systems must be separated from Jasper Creek and the drainage system in Avenue "P". Similar to the east portion of the site, a new onsite collection system will be needed to connect all of the onsite drainage system to convey storm water to another storm water pumping station located adjacent to Jasper Creek. It is estimated that the design flow for the western pumping station may be as high as 150,000 gallons per minute. Drainage calculations are included in the appendix.

As an alternate to the construction of isolated onsite drainage systems, the use of tide gates was considered and was found to be a poor solution. During normal storm events, tide gates would function well. However, during a major storm event, when flooding of the area outside of the flood wall occurs, storm water falling on the site would be trapped, resulting in flooding of the site.

Cost Estimate:

$79,200,000

Practicability Analysis:

- **Environmental Analysis**

This solution does have some environmental concerns but these are considered standard compliance concerns and will require some permitting rather than concerns that an item would violate a rule and not be allowed. So none of these concerns are considered show stoppers and the permitting process would be fairly standard.

- **Social Analysis**

  There does not appear to be any historical or cultural issues regarding this project since it will be located on an old heavily industrialized site in an old industrialized area. Flood walls may create a visual impact on historic structure. This impact will be limited to the wet weather pumping station and venturi buildings.

- **Constructability Analysis**

  Construction of the flood wall system, storm drainage piping, and pump stations will present some difficulties with construction and impacts on the treatment facilities. However, the construction difficulties and impacts could be less than with other options, in particular Option 2 and Option 3.

  Some impact on in-plant normal traffic patterns will be realized, however, these may be less than other options. The greater impact will be realized with the surrounding roads. This is due to the proximity of parts of the flood wall system to existing roads.

  Construction difficulties will be experienced with the wall construction. The soil conditions require special foundation means for the wall. These are the need for piles, a cut-off wall, and rock anchors.

  The wall configuration will impact the interaction of on-site and off-site drainage characteristics. This requires construction of storm drainage to minimize the effects to off-site areas. The wall configuration being at the perimeter of the plant will require temporary gate security. However, this is also required with other options.

  With this option, there would be substantially less difficulty with maintaining plant process operations. The impacts to plant process operations would be minimal as the construction of the wall, the storm drainage, and pump station do not directly effect individual treatment facilities. Some impact on site utilities would be experienced requiring some re-locations. This may be where some impact to process operations may be realized. However, again, there could be much less than with other options.

The construction of the storm drainage piping will impact the existing storm drainage system in the form of connecting portions of the existing system to the new piping. Some temporary means during construction to maintain existing site drainage may be required depending on phasing of the work. The disruption here, however, is again less than with other options.

Since the wall system protects all electrical and process facilities, and buildings jointly, this eliminates the need to raise individually protect, or reconstruct individual facilities and the substantially greater impacts on plant operations with other options requiring these protection means.

A great advantage with this option, as opposed to others, is that during a storm event travel is possible within the plant site.

- **Economic Analysis**

  This is an ideal, cost effective solution to the flood problem. Since the floodwall is on the perimeter of the Plant, which has a security fence around it anyway and the perimeter is largely undeveloped, economies of scale should be achievable.

- **Summary Analysis**

  Therefore, this option is the best feasible alternative when all criteria are considered and it achieves the goal of preventing future damages quite well.

Recommendation:

Protection of the PVSC treatment facility from loss of power and flooding is paramount in ensuring that this critical infrastructure remains in operation during a similar or more severe storm event in the future. The purpose of this analysis was to determine which combination of Flood Protection and Standby Electric Power achieved the goals of preventing future eligible storm damages, which were caused by loss of power and flooding, through a technical analysis in addition to considering the criteria used for the practicability analysis for each Alternative.

The two main problems faced when deciding on the best mitigation approaches were what is the best way to prevent PVSC from losing power and what is the best way to prevent flood damages from occurring at PVSC. The approaches considered centered around two main themes, is it better to take a systemic approach to solving the problems or is it better to address the problems with a site specific approach.

The first problem deliberated was how you prevent a loss of power. The three Standby Electric Power solutions proposed were (1) Third Utility Feeder, (2) Individual Standby Electric Power Generators and (3) Onsite Standby Power System.

The (1) Third Utility Feeder alternative was taken out of consideration due to the functionality of the alternative to meet the goal of the mitigation. Essentially, if PVSC had a second feed from the grid for Standby Electric Power during Superstorm Sandy and still lost power for several days due to grid failure what exactly is a third feed from the grid going to realistically accomplish that causes a different outcome during a future Sandy like event or worse event? So while this might appear to be a low cost choice, the reality is you could build several new feeds from the grid and not get a different outcome. As they say, insanity is doing the same thing over and over while expecting a different outcome.

While the (2) Individual Standby Electric Power Generators alternative appears to be cost competitive there are several unknowns and contingencies for this alternative that could drive the price up. Not as much design work has been put into this alternative to get rid of unknowns and contingencies for items like generator siting, exact loading demands and retrofitting the power into existing electrical systems. Additionally, this alternative ranks poorly on functionality during an actual storm event as the refueling demands for all 32 generators are 110,000+ gallons per day. That is around 16-20 commercial tanker trucks a day. For just three days of additional standby power that is 48-60 commercial tanker truck unloads. It is not reasonable to expect PVSC to be able to contract that kind of availability for hurricane prep nor is it reasonable to expect them

to store that much fuel onsite and then buy or rent enough delivery capacity to refuel every fuel tank for all 32 generators in a timely manner. Maintaining these generators will also be a drain on resources. Coordinating the construction, integration and testing of these generators with plant operations will also be disruptive to day-to-day operations.

The last alternative, (3) Onsite Standby Power System, is cost competitive with Alternative (2), but has gone much further into the design and therefore, has less design and construction contingencies. It grades the highest on constructability being less disruptive during and after construction since it is new construction in an undeveloped area. It is much simpler to hook in the generated power into the existing power distribution system than to do 32 different hook-ups around the Plant as with Alternative (2). In addition, it rates very high on functionality during an actual storm event. Its supply logistics are solid unlike Alternative (2) as high pressure natural gas lines have performed well in hurricanes in all parts of the country. Therefore, based on constructability, functionality in an actual storm event and overall project and operational economics this was selected as the best option.

The second problem is, now that you have selected the equipment for Standby Electric Power, how are you going to protect the new Onsite Standby Power System along with the rest of the equipment and all of the treatment processes. As seen in the aftermath of Superstorm Sandy, once grid power was restored it made no difference since there was no way to distribute the power and there was nothing functioning to distribute it to. The power distribution system was essentially destroyed by Superstorm Sandy along with all of the process equipment and until PVSC made major repairs to their electrical systems and process equipment their recovery was stuck in neutral and could only be geared up as the next phase of major repairs were completed. Therefore, five alternative solutions were assessed to protect PVSC's equipment and treatment processes from flooding; (1) No Action, (2) Component Flood Proofing, (3) Elevate Plant, (4) Relocate Plant and (5) Floodwall.

The (1) No Action alternative was taken out of consideration due to the critical nature of the facility and its public health importance for the region. Consequently, the Governor's Office, NJDEP and PVSC's executive leadership have made their intentions known that they expect the Plant be made more resilient so the Plant's PPE can be protected in a future Sandy like event.

The (2) Component Flood Proofing alternative was taken out of consideration due to the inherent complexity of the design and construction, the operational problems caused during and after construction, poor operational functionality during an actual flood

event, and ultimately a high cost for protection that still allows the Plant grounds to flood.

The (3) Elevate Plant alternative was taken out of consideration due to the insanely high cost, infinitely complex design and construction contingencies, tremendously complex construction sequencing, downright obstructionist interference with plant operations and all this with an unknown construction timeline due to project complexity.

The (4) Relocate Plant alternative was taken out of consideration due to it being the highest cost alternative, there are other shortcomings but once acceptable land was found the other shortcomings were easily overcome.

The (5) Floodwall alternative was selected as the best Flood Protection alternative. Next to taking no action this was the least expensive alternative. Along with Alternative (4) this ranked the highest on constructability and was the least disruptive to plant operations during and after construction. This alternative also ranks very high on functionality during an actual storm when compared to Alternatives (2) & (3). Therefore, this was the winning Alternative based on technical feasibility, cost and the practicability analysis.

In conclusion, it is recommended that the PVSC select the Onsite Standby Power System and Floodwall for their 406 Public Assistance Hazard Mitigation Proposal to mitigate eligible damages caused by loss of power and storm surge due to the devastating effects from Superstorm Sandy.

PASSAIC VALLEY SEWERAGE COMMISSION

ANNUAL OPERATING, MAINTENANCE AND STORM PREPARATION COSTS

	BASE COST	OPERATION	MAINTENANCE	STORM PREPARATION
Power Alternative 1 Third Electric Feed[(1)]	$42,000,000	$25,000	$50,000	
Power Alternative 2 Individual Standby Generators	$106,000,000	$220,000	$200,000	$150,000
Power Alternative 3 On-site Standby Power Generating Facility	$63,200,000	$300,000	$600,000	$50,000
Flood Protection Alternative 1 No Action	N/A			$100,000
Flood Protection Alternative 2 Flood Proofing	$168,000,000	$200,000	$229,000	$100,000
Flood Protection Alternative 3 Raise Site	$1,000,000,000	$50,000	$100,000	$50,000
Flood Protection Alternative 4 New Plant	$3,400,000,000			
Flood Protection Alternative 5 Flood Wall	$79,200,000	$240,000	$350,000	$50,000

[(1)]Includes many unknowns. Cost is approximate due to unreliability as a mitigation measure.

Attachment 12

DISCLAIMER

The following is a preliminary report of actions taken by the House of Delegates at its 2022 Meeting and should not be considered final. Only the Official Proceedings of the House of Delegates reflect official policy of the Association.

AMERICAN MEDICAL ASSOCIATION HOUSE OF DELEGATES (A-22)

Report of Reference Committee D

Ankush K. Bansal, MD, Chair

Your reference committee recommends the following consent calendar for acceptance:

RECOMMENDED FOR ADOPTION

1. Council on Science and Public Health Report 1 – Sunset Review of 2012 House Policies
2. Council on Science and Public Health Report 2 – Transformation of Rural Community Public Health Systems
3. Resolution 412 – Advocating for the Amendment of Chronic Nuisance Ordinances
4. Resolution 415 – Creation of an Obesity Task Force
5. Resolution 417 – Tobacco Control
6. Resolution 418 – Lung Cancer Screening Awareness
7. Resolution 421 – Screening for HPV-Related Anal Cancer
8. Resolution 424 – Physician Interventions Addressing Environmental Health and Justice
9. Resolution 427 – Pictorial Health Warnings on Alcoholic Beverages
10. Resolution 428 – Amending H-90.968 to Expand Policy on Medical Care of Persons with Disabilities
11. Resolution 429 – Increasing Awareness and Reducing Consumption of Food and Drink of Poor Nutritional Quality
12. Resolution 432 – Recognizing Loneliness as a Public Health Issue
13. Resolution 433 – Support for Democracy
14. Resolution 434 – Support for Pediatric Siblings of Chronically Ill Children
15. Resolution 438 – Informing Physicians, Health Care Providers, and the Public of the Health Dangers of Fossil-Fuel Derived Hydrogen
16. Resolution 439 – Informing Physicians, Health Care Providers, and the Public That Cooking with a Gas Stove Increases Household Air Pollution and the Risk of Childhood Asthma
17. Resolution 442 – Opposing the Censorship of Sexuality and Gender Identity Discussions in Public Schools

RECOMMENDED FOR ADOPTION AS AMENDED

18. Resolution 401 – Air Quality and the Protection of Citizen Health

19. Resolution 403 – Addressing Maternal Discrimination and Support for Flexible Family Leave
20. Resolution 404 – Weapons in Correctional Healthcare Settings
21. Resolution 405 – Universal Childcare and Preschool
22. Resolution 406 – COVID-19 Preventive Measures for Correctional Facilities: AMA Policy Position
23. Resolution 407 – Study of Best Practices for Acute Care of Patients in the Custody of Law Enforcement or Corrections
24. Resolution 408 – Supporting Increased Research on Implementation of Nonviolent De-escalation Training and Mental Illness Awareness in Law Enforcement
25. Resolution 410 – Increasing Education for School Staff to Recognize Prodromal Symptoms of Schizophrenia in Teens and Young Adults to Increase Early Intervention
26. Resolution 411 – Anonymous Prescribing Option for Expedited Partner Therapy
27. Resolution 413 – Expansion on Comprehensive Sexual Health Education
28. Resolution 414 – Improvement of Care and Resource Allocation for Homeless Persons in the Global Pandemic
29. Resolution 422 – Voting as a Social Determinant of Health
30. Resolution 425 – Mental Health Crisis
31. Resolution 431 – Protections for Incarcerated Mothers and Infants in the Perinatal Period
32. Resolution 436 – Training and Reimbursement for Firearm Safety Counseling
33. Resolution 440 – Addressing Social Determinants of Health Through Health IT
34. Resolution 441 – Addressing Adverse Effects of Active Shooter Drills on Children's Health
35. Resolution 443 – Addressing the Longitudinal Healthcare Needs of American Indian Children in Foster Care

RECOMMENDED FOR ADOPTION IN LIEU OF

36. Resolution 420 – Declaring Climate Change a Public Health Crisis
    Resolution 430 – Longitudinal Capacity-Building to Address Climate Action and Justice
37. Resolution 423 – Awareness Campaign for 988 National Suicide Prevention Lifeline
38. Resolution 437 – Air Pollution and COVID: A Call to Tighten Regulatory Standards for Particulate Matter

RECOMMENDED FOR REFERRAL

39. Board of Trustees Report 15 – Addressing Public Health Disinformation
40. Resolution 416 – School Resource Officer Violence De-Escalation Training and Certification

RECOMMENDED FOR NOT ADOPTION

41. Resolution 402 – Support for Impairment Research
42. Resolution 435 – Support Removal of BMI as a Standard Measure in Medicine and Recognizing Culturally-Diverse and Varied Presentations of Eating Disorders

Amendments
If you wish to propose an amendment to an item of business, click here: Submit New Amendment

1

RECOMMENDED FOR ADOPTION

(1) COUNCIL ON SCIENCE AND PUBLIC HEALTH REPORT 1 – SUNSET REVIEW OF 2012 HOUSE POLICIES

RECOMMENDATION:

Recommendation in Council on Science and Public Health Report 1 be adopted.

HOD ACTION: Recommendation in Council on Science and Public Health Report 1 adopted.

The Council on Science and Public Health recommends that the House of Delegates policies listed in the appendix to this report be acted upon in the manner indicated and the remainder of this report be filed. (Directive to Take Action)

The Council introduced their 2012 sunset report. Testimony on the Council's recommendations for disposition of 2012 House of Delegates policies was limited to individual comments. With limited testimony along with the nature of the sunset report it is surmised that amendments should not change the intent of the policy, your Reference Committee recommends that Council on Science and Public Health Report 1 be adopted.

(2) COUNCIL ON SCIENCE AND PUBLIC HEALTH REPORT 2 – TRANSFORMATION OF RURAL COMMUNITY PUBLIC HEALTH SYSTEMS

RECOMMENDATION:

Recommendations in Council on Science and Public Health Report 2 be adopted.

HOD ACTION: Recommendations in Council on Science and Public Health Report 2 adopted.

The Council on Science and Public Health recommends that the following be adopted, and the remainder of the report be filed.

1. That our AMA amend Policy H-465.994, "Improving Rural Health," by addition and deletion to read as follows:
1. Our AMA (a) supports continued and intensified efforts to develop and implement proposals for improving rural health care and public health, (b) urges physicians practicing in rural areas to be actively involved in these efforts, and (c) advocates widely publicizing AMA's policies and proposals for improving rural health care and public health to the profession, other concerned groups, and the public.
2. Our AMA will work with other entities and organizations interested in public health to:
·Encourage more research to identify the unique needs and models for delivering public health and health care services in rural communities.
·Identify and disseminate concrete examples of administrative leadership and funding structures that support and optimize local, community-based rural public health.

·Develop an actionable advocacy plan to positively impact local, community-based rural public health including but not limited to the development of rural public health networks, training of current and future rural physicians and public health professionals in core public health techniques and novel funding mechanisms to support public health initiatives that are led and managed by local public health authorities.
·Advocate for adequate and sustained funding for public health staffing and programs.
~~Study efforts to optimize rural public health.~~

2. That our AMA amend Policy D-440.924, "Universal Access for Essential Public Health Services" by addition and deletion to read as follows:
Our AMA: (1) supports equitable access to the 10 Essential Public Health Services and the Foundational Public Health Services to protect and promote the health of all people in all communities ~~updating The Core Public Health Functions Steering Committee's "The 10 Essential Public Health Services" to bring them in line with current and future public health practice~~; (2) encourages state, local, tribal, and territorial public health departments to pursue accreditation through the Public Health Accreditation Board (PHAB); (3) will work with appropriate stakeholders to develop a comprehensive list of minimum necessary programs and services to protect the public health of citizens in all state and local jurisdictions and ensure adequate provisions of public health, including, but not limited to clean water, functional sewage systems, access to vaccines, and other public health standards; and (4) will work with the National Association of City and County Health Officials (NACCHO), the Association of State and Territorial Health Officials (ASTHO), the Big Cities Health Coalition, the Centers for Disease Control and Prevention (CDC), and other related entities that are working to assess and assure appropriate funding levels, service capacity, and adequate infrastructure of the nation's public health system, including for rural jurisdictions. (Amend HOD Policy)

3. That our AMA reaffirm Policy H-478.980, "Increasing Access to Broadband Internet to Reduce Health Disparities." (Reaffirm HOD Policy)

Testimony provided was supportive of the Council's report and recommendations. The Council was commended for addressing rural public health and the need for adequate and sustained funding. It was also noted that appropriate models for delivering public health in rural areas are needed and that the concerns outlined in the reported are applicable to other underserved areas as well. Your Reference Committee recommends adoption of the report's recommendations.

(3) RESOLUTION 412 – ADVOCATING FOR THE AMENDMENT OF CHRONIC NUISANCE ORDINANCES

RECOMMENDATION:

Resolution 412 be adopted.

HOD ACTION: Resolution 412 adopted.

RESOLVED, That our American Medical Association advocate for amendments to chronic nuisance ordinances that ensure calls made for safety or emergency services are not counted towards nuisance designations (Directive to Take Action); and be it further

RESOLVED, That our AMA support initiatives to (a) gather data on chronic nuisance ordinance enforcement and (b) make that data publicly available to enable easier identification of disparities. (New HOD Policy)

Your Reference Committee heard supportive testimony on Resolution 412. Testimony provided noted the negative impact that nuisance ordinances can have, penalizing individuals for needing help for their safety. It was noted that this is a particular concern for people experiencing domestic violence. Therefore, your Reference Committee recommends that Resolution 412 be adopted.

(4) RESOLUTION 415 – CREATION OF AN OBESITY TASK FORCE

RECOMMENDATION:

Resolution 415 be <u>adopted</u>.

HOD ACTION: Resolution 415 <u>referred for decision</u>.

RESOLVED, That our American Medical Association create an obesity task force to evaluate and disseminate relevant scientific evidence to healthcare clinicians, other providers and the public (Directive to Take Action); and be it further
RESOLVED, That the obesity task force address issues including but not limited to:
- Promotion of awareness amongst practicing physicians and trainees that obesity is a treatable chronic disease along with evidence-based treatment options.
- Advocacy efforts at the state and federal level to impact the disease obesity.
- Health disparities, stigma and bias affecting people with obesity.
- Lack of insurance coverage for evidence-based treatments including intensive lifestyle intervention, anti-obesity pharmacotherapy and bariatric and metabolic surgery.
- Increasing obesity rates in children, adolescents and adults.
- Drivers of obesity including lack of healthful food choices, over-exposure to obesogenic foods and food marketing practices. (Directive to Take Action)

Your Reference Committee heard overwhelming testimony in support of forming an obesity task force. It was noted that 42 percent of Americans have obesity, with 330,000 Americans dying annually from obesity-related causes. Disparities exist in access to care for patients with obesity, and weight bias in clinical settings needs to be addressed. A member of the Board of Trustees testified that it would be better to defer strategy-related decisions to the Board and implementation decisions to Senior Management as opposed to creating a task force. Given the favorable testimony specifically regarding the creation of a task force, your Reference Committee recommends that Resolution 415 be adopted and will defer to the newly created task force to determine its scope relative to the proposed amendments regarding prevention and treatment.

(5) RESOLUTION 417 – TOBACCO CONTROL

RECOMMENDATION:

Resolution 417 be <u>adopted</u>.

HOD ACTION: Resolution 417 <u>adopted</u>.

RESOLVED, That American Medical Association policy H-490.913, "Smoke-Free and Vape-Free Environments and Workplaces," be amended by addition and deletion to read as follows: On the issue of the health effects of environmental tobacco smoke (ETS), passive smoke, and vape aerosol exposure in the workplace and other public facilities, our AMA: (1)(a) supports classification of ETS as a known human carcinogen, and (b) concludes that passive smoke exposure is associated with increased risk of sudden infant death syndrome and of cardiovascular disease, and (c) encourages physicians and medical societies to take a leadership role in defending the health of the public from ETS risks and from political assaults by the tobacco industry, and and (d) encourages the concept of establishing smoke-free and vape-free campuses for business, labor, education, and government, and (2) (a) honors companies and governmental workplaces that go smoke-free and vape-free, and (b) will petition the Occupational Safety and Health Administration (OSHA) to adopt regulations prohibiting smoking and vaping in the workplace, and will use active political means to encourage the Secretary of Labor to swiftly promulgate an OSHA standard to protect American workers from the toxic effects of ETS in the workplace, preferably by banning smoking and vaping in the workplace, and (c) encourages state medical societies (in collaboration with other anti-tobacco organizations) to support the introduction of local and state legislation that prohibits smoking and vaping around the public entrances to buildings and in all indoor public places, restaurants, bars, and workplaces, and and (d) will update draft model state legislation to prohibit smoking and vaping in public places and businesses, which would include language that would prohibit preemption of stronger local laws. (3) (a) encourages state medical societies to: (i) support legislation for states and counties mandating smoke-free and vape-free schools and eliminating smoking and vaping in public places and businesses and on any public transportation, and (ii) enlist the aid of county medical societies in local anti-smoking and anti-vaping campaigns, and and (iii) through an advisory to state, county, and local medical societies, urge county medical societies to join or to increase their commitment to local and state anti-smoking and anti-vaping coalitions and to reach out to local chapters of national voluntary health agencies to participate in the promotion of anti-smoking and anti-vaping control measures, and (b) urges all restaurants, particularly fast food restaurants, and convenience stores to immediately create a smoke-free and vape-free environment, and (c) strongly encourages the owners of family-oriented theme parks to make their parks smoke-free and vape-free for the greater enjoyment of all guests and to further promote their commitment to a happy, healthy life style for children, and (d) encourages state or local legislation or regulations that prohibit smoking and vaping in stadia and encourages other ball clubs to follow the example of banning smoking in the interest of the health and comfort of baseball fans as implemented by the owner and management of the Oakland Athletics and others, and (e) urges eliminating cigarette, pipe and cigar smoking and vaping in any indoor area where children live or play, or where another person's health could be adversely affected through passive smoking inhalation, and (f) urges state and county medical societies and local health professionals to be especially prepared to alert communities to the possible role of the tobacco industry whenever a petition to suspend a nonsmoking or non-vaping ordinance is introduced and to become directly involved in community tobacco control activities, and and (g) will report annually to its membership about

significant anti-smoking and anti-vaping efforts in the prohibition of smoking and vaping in open and closed stadia, and (4) calls on corporate headquarters of fast-food franchisers to require that one of the standards of operation of such franchises be a no smoking and no vaping policy for such restaurants, and endorses the passage of laws, ordinances and regulations that prohibit smoking and vaping in fast-food restaurants and other entertainment and food outlets that target children in their marketing efforts, and (5) advocates that all American hospitals ban tobacco and supports working toward legislation and policies to promote a ban on smoking, vaping, and use of tobacco products in, or on the campuses of, hospitals, health care institutions, retail health clinics, and educational institutions, including medical schools, and (6) will work with the Department of Defense to explore ways to encourage a smoke-free and vape-free environment in the military through the use of mechanisms such as health education, smoking and vaping cessation programs, and the elimination of discounted prices for tobacco products in military resale facilities, and (7) ~~encourages and supports~~ collaborates with local and state medical societies and tobacco control coalitions to work with (a) Native American casino and tribal leadership to voluntarily prohibit smoking and vaping in their casinos, and (b) legislators and the gaming industry to support the prohibition of smoking and vaping in all casinos and gaming venues. (Modify Current HOD Policy)

Your Reference Committee heard limited testimony that was supportive of this amendment to AMA policy. Therefore, your Reference Committee recommends that Resolution 417 be adopted.

(6) RESOLUTION 418 – LUNG CANCER SCREENING AWARENESS

RECOMMENDATION:

Resolution 418 be adopted.

HOD ACTION: Resolution 418 adopted.

RESOLVED, That our American Medical Association empower the American public with knowledge through an education campaign to raise awareness of lung cancer screening with low-dose CT scans in high-risk patients to improve screening rates and decrease the leading cause of cancer death in the United States. (Directive to Take Action)

Your Reference Committee heard testimony in support of this resolution and the role of lung cancer screening in promoting public health given that lung cancer is the leading cause of cancer death. Your Reference Committee recommends that Resolution 418 be adopted.

(7) RESOLUTION 421 – SCREENING FOR HPV-RELATED ANAL CANCER

RECOMMENDATION:

Resolution 421 be <u>adopted</u>.

HOD ACTION: Resolution 421 <u>adopted</u>.

RESOLVED, That our American Medical Association support advocacy efforts to implement screening for anal cancer for high-risk populations (New HOD Policy); and be it further
RESOLVED, That our AMA support national medical specialty organizations and other stakeholders in developing guidelines for interpretation, follow up, and management of anal cancer screening results. (New HOD Policy)

Your Reference Committee heard testimony in support of Resolution 421. It was noted that preventing HPV-related cancers, particularly within populations such as men who have sex with men and HIV-infected patient population, is essential. It was also noted that the U.S. Preventive Services Task Force should be encouraged to conduct an evidence-based review and establish screening guidelines for anal cancer. Amendments were proffered noting various cancers associated with HPV and the need for education on HPV vaccination. Your Reference Committee noted that the intent of the resolution was to focus on anal cancers and the offered amendments would broaden the scope. Therefore, your Reference Committee recommends that Resolution 421 be adopted.

(8) RESOLUTION 424 – PHYSICIAN INTERVENTIONS ADDRESSING ENVIRONMENTAL HEALTH AND JUSTICE

RECOMMENDATION:

Resolution 424 be <u>adopted</u>.

HOD ACTION: Resolution 424 <u>adopted</u>.

RESOLVED, That our American Medical Association amend policy H-135.938, “Global Climate Change and Human Health,” by addition to read as follows: Our AMA: 1. Supports the findings of the Intergovernmental Panel on Climate Change's fourth assessment report and concurs with the scientific consensus that the Earth is undergoing adverse global climate change and that anthropogenic contributions are significant. These climate changes will create conditions that affect public health, with disproportionate impacts on vulnerable populations, including children, the elderly, and the poor. 2. Supports educating the medical community on the potential adverse public health effects of global climate change and incorporating the health implications of climate change into the spectrum of medical education, including topics such as population displacement, heat waves and drought, flooding, infectious and vector-borne diseases, and potable water supplies. 3. (a) Recognizes the importance of physician involvement in policymaking at the state, national, and global level and supports efforts to search for novel, comprehensive, and economically sensitive approaches to mitigating climate change to protect the health of the public; and (b) recognizes that whatever the etiology of global climate change, policymakers should work to reduce human contributions to such changes.

4. Encourages physicians to assist in educating patients and the public on environmentally sustainable practices, and to serve as role models for promoting environmental sustainability. 5. Encourages physicians to work with local and state health departments to strengthen the public health infrastructure to ensure that the global health effects of climate change can be anticipated and responded to more efficiently, and that the AMA's Center for Public Health Preparedness and Disaster Response assist in this effort. 6. Supports epidemiological, translational, clinical and basic science research necessary for evidence-based global climate change policy decisions related to health care and treatment. 7. Encourages physicians to assess for environmental determinants of health in patient history-taking and encourages the incorporation of assessment for environmental determinants of health in patient history-taking into physician training. (Modify Current HOD Policy)

Testimony presented was supportive, noting that environmental factors are causing detrimental effects on human health. Encouraging physicians to assess for environmental factors could help improve health outcomes. Therefore, your Reference Committee recommends adoption.

(9) RESOLUTION 427 – PICTORIAL HEALTH WARNINGS ON ALCOHOLIC BEVERAGES

RECOMMENDATION:

Resolution 427 be adopted.

HOD ACTION: Resolution 427 adopted.

RESOLVED, That our AMA amend Policy H-30.940, “AMA Policy Consolidation: Labeling Advertising, and Promotion of Alcoholic Beverages,” by addition to read as follows:
AMA Policy Consolidation: Labeling Advertising, and Promotion of Alcoholic Beverages H-30.940
(1.) (a) Supports accurate and appropriate labeling disclosing the alcohol content of all beverages, including so-called "nonalcoholic" beer and other substances as well, including over-the-counter and prescription medications, with removal of "nonalcoholic" from the label of any substance containing any alcohol; (b) supports efforts to educate the public and consumers about the alcohol content of so-called "nonalcoholic" beverages and other substances, including medications, especially as related to consumption by minors; (c) urges the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) and other appropriate federal regulatory agencies to continue to reject proposals by the alcoholic beverage industry for authorization to place beneficial health claims for its products on container labels; and (d) urges the development of federal legislation to require nutritional labels on alcoholic beverages in accordance with the Nutritional Labeling and Education Act.
(2.) (a) Expresses its strong disapproval of any consumption of "nonalcoholic beer" by persons under 21 years of age, which creates an image of drinking alcoholic beverages and thereby may encourage the illegal underaged use of alcohol; (b) recommends that health education labels be used on all alcoholic beverage containers and in all alcoholic beverage advertising (with the messages focusing on the hazards of alcohol consumption by specific population groups especially at risk, such as pregnant women, as well as the dangers of irresponsible use to all sectors of the populace); ~~and~~ (c) recommends that the alcohol beverage industry be encouraged to accurately label all product containers as to ingredients, preservatives, and ethanol content (by percent, rather than by proof); and (d)

advocates that the alcohol beverage industry be required to include pictorial health warnings on alcoholic beverages.
(3.) Actively supports and will work for a total statutory prohibition of advertising of all alcoholic beverages except for inside retail or wholesale outlets. Pursuant to that goal, our AMA (a) supports continued research, educational, and promotional activities dealing with issues of alcohol advertising and health education to provide more definitive evidence on whether, and in what manner, advertising contributes to alcohol abuse; (b) opposes the use of the radio and television to promote drinking; (c) will work with state and local medical societies to support the elimination of advertising of alcoholic beverages from all mass transit systems; (d) urges college and university authorities to bar alcoholic beverage companies from sponsoring athletic events, music concerts, cultural events, and parties on school campuses, and from advertising their products or their logo in school publications; and (e) urges its constituent state associations to support state legislation to bar the promotion of alcoholic beverage consumption on school campuses and in advertising in school publications.
(4.) (a) Urges producers and distributors of alcoholic beverages to discontinue advertising directed toward youth, such as promotions on high school and college campuses; (b) urges advertisers and broadcasters to cooperate in eliminating television program content that depicts the irresponsible use of alcohol without showing its adverse consequences (examples of such use include driving after drinking, drinking while pregnant, or drinking to enhance performance or win social acceptance); (c) supports continued warnings against the irresponsible use of alcohol and challenges the liquor, beer, and wine trade groups to include in their advertising specific warnings against driving after drinking; and (d) commends those automobile and alcoholic beverage companies that have advertised against driving while under the influence of alcohol. (Modify Current HOD Policy); and be it further
RESOLVED, That our AMA advocate for the implementation of pictorial health warnings on alcoholic beverages**.** (Directive to Take Action)

Your Reference Committee heard limited, but supportive testimony on this resolution. It was noted that pictorial warnings are ten times more effective at raising awareness than written warnings and would be beneficial for people with low literacy. Therefore, your Reference Committee recommends that Resolution 427 be adopted.

(10) RESOLUTION 428 – AMENDING H-90.968 TO EXPAND POLICY ON MEDICAL CARE OF PERSONS WITH DISABILITIES

RECOMMENDATION:

Resolution 428 be adopted.

HOD ACTION: Resolution 428 adopted.

RESOLVED, That, in order to address the shared healthcare barriers of people with disabilities and the need for curricula in medical education on the care and treatment of people with a range of disabilities, our American Medical Association amend by addition and deletion H-90.968 “Medical Care of Persons with Developmental Disabilities” to include those with a broad range of disabilities while retaining goals specific to the needs of those with developmental disabilities:
Medical Care of Persons with ~~Developmental~~ Disabilities, H-90.968

1. Our AMA encourages: (a) clinicians to learn and appreciate variable presentations of complex functioning profiles in all persons with ~~developmental~~ disabilities including but not limited to physical, sensory, developmental, intellectual, learning, and psychiatric disabilities and chronic illnesses; (b) medical schools and graduate medical education programs to acknowledge the benefits of education on how aspects in the social model of disability (e.g. ableism) can impact the physical and mental health of persons with ~~Developmental D~~disabilities; (c) medical schools and graduate medical education programs to acknowledge the benefits of teaching about the nuances of uneven skill sets, often found in the functioning profiles of persons with developmental disabilities, to improve quality in clinical care; (d) education of physicians on how to provide and/or advocate for ~~quality,~~ developmentally appropriate and accessible medical, social and living support for patients with ~~developmental~~ disabilities so as to improve health outcomes; (e) medical schools and residency programs to encourage faculty and trainees to appreciate the opportunities for exploring diagnostic and therapeutic challenges while also accruing significant personal rewards when delivering care with professionalism to persons with profound ~~developmental~~ disabilities and multiple co-morbid medical conditions in any setting; (f) medical schools and graduate medical education programs to establish and encourage enrollment in elective rotations for medical students and residents at health care facilities specializing in care for the ~~developmentally~~ disabled; and (g) cooperation among physicians, health & human services professionals, and a wide variety of adults with ~~developmental~~ disabilities to implement priorities and quality improvements for the care of persons with ~~developmental~~ disabilities.

2. Our AMA seeks: (a) legislation to increase the funds available for training physicians in the care of individuals with ~~intellectual~~ disabilities~~/developmentally disabled individuals~~, and to increase the reimbursement for the health care of these individuals; and (b) insurance industry and government reimbursement that reflects the true cost of health care of individuals with ~~intellectual~~ disabilities~~/developmentally disabled individuals~~.

3. Our AMA entreats health care professionals, parents, and others participating in decision-making to be guided by the following principles: (a) All people with ~~developmental~~ disabilities, regardless of the degree of their disability, should have access to appropriate and affordable medical and dental care throughout their lives; and (b) An individual's medical condition and welfare must be the basis of any medical decision. Our AMA advocates for the highest quality medical care for persons with profound ~~developmental~~ disabilities; encourages support for health care facilities whose primary mission is to meet the health care needs of persons with profound ~~developmental~~ disabilities; and informs physicians that when they are presented with an opportunity to care for patients with profound ~~developmental~~ disabilities, that there are resources available to them.

~~4. Our AMA will continue to work with medical schools and their accrediting/licensing bodies to encourage disability related competencies/objectives in medical school curricula so that medical professionals are able to effectively communicate with patients and colleagues with disabilities, and are able to provide the most clinically competent and compassionate care for patients with disabilities.~~

4. Our AMA will collaborate with appropriate stakeholders to create a model general curriculum/objective that (a) incorporates critical disability studies; and (b) includes people with disabilities as patient instructors in formal training sessions and preclinical and clinical instruction.

5. Our AMA recognizes the importance of managing the health of children and adults with developmental and intellectual disabilities as a part of overall patient care for the entire community.

6. Our AMA supports efforts to educate physicians on health management of children and adults with intellectual and developmental disabilities, as well as the consequences of poor

health management on mental and physical health for people with intellectual and developmental disabilities.
7. Our AMA encourages the Liaison Committee on Medical Education, Commission of Osteopathic College Accreditation, and allopathic and osteopathic medical schools to develop and implement a curriculum on the care and treatment of people with a range of ~~developmental~~ disabilities.
8. Our AMA encourages the Accreditation Council for Graduate Medical Education and graduate medical education programs to develop and implement curriculum on providing appropriate and comprehensive health care to people with a range of ~~developmental~~ disabilities.
9. Our AMA encourages the Accreditation Council for Continuing Medical Education, specialty boards, and other continuing medical education providers to develop and implement continuing programs that focus on the care and treatment of people with a range of ~~developmental~~ disabilities.
10. Our AMA will advocate that the Health Resources and Services Administration include persons with ~~intellectual and developmental~~ disabilities ~~(IDD)~~ as a medically underserved population.
11. Specific to people with developmental and intellectual disabilities, a uniquely underserved population, our AMA encourages: (a) medical schools and graduate medical education programs to acknowledge the benefits of teaching about the nuances of uneven skill sets, often found in the functioning profiles of persons with developmental and intellectual disabilities, to improve quality in clinical education; (b) medical schools and graduate medical education programs to establish and encourage enrollment in elective rotations for medical students and residents at health care facilities specializing in care for individuals with developmental and intellectual disabilities; and (c) cooperation among physicians, health and human services professionals, and a wide variety of adults with intellectual and developmental disabilities to implement priorities and quality improvements for the care of persons with intellectual and developmental disabilities.
(Modify Current HOD Policy)

Your Reference Committee heard testimony in support of broadening the range of disabilities listed in current AMA policy. It was noted that improving the quality of education in medical schools for those with disabilities is critical. Therefore, your Reference Committee recommends that Resolution 428 be adopted.

(11) RESOLUTION 429 – INCREASING AWARENESS AND REDUCING CONSUMPTION OF FOOD AND DRINK OF POOR NUTRITIONAL QUALITY

RECOMMENDATION:

Resolution 429 be adopted.

HOD ACTION: Resolution 429 adopted.

RESOLVED, That our American Medical Association advocate for the end of tax subsidies for advertisements that promote among children the consumption of food and drink of poor nutritional quality, as defined by appropriate nutritional guiding principles (Directive to Take Action); and be it further
RESOLVED, That our AMA amend H-150.927, “Strategies to Reduce the Consumption of Beverages with Added Sweeteners” by addition to read as follows:

H-150.927 – STRATEGIES TO REDUCE THE CONSUMPTION OF FOOD AND BEVERAGES WITH ADDED SWEETENERS
Our AMA: (1) acknowledges the adverse health impacts of sugar- sweetened beverage (SSB) consumption and food products with added sugars, and support evidence-based strategies to reduce the consumption of SSBs and food products with added sugars, including but not limited to, excise taxes on SSBs and food products with added sugars, removing options to purchase SSBs and food products with added sugars in primary and secondary schools, the use of warning labels to inform consumers about the health consequences of SSB consumption and food products with added sugars, and the use of plain packaging; (2) encourages continued research into strategies that may be effective in limiting SSB consumption and food products with added sugars, such as controlling portion sizes; limiting options to purchase or access SSBs and food products with added sugars in early childcare settings, workplaces, and public venues; restrictions on marketing SSBs and food products with added sugars to children; and changes to the agricultural subsidies system; (3) encourages hospitals and medical facilities to offer healthier beverages, such as water, unflavored milk, coffee, and unsweetened tea, for purchase in place of SSBs and apply calorie counts for beverages in vending machines to be visible next to the price; ~~and~~ (4) encourages physicians to (a) counsel their patients about the health consequences of SSB consumption and food products with added sugars and replacing SSBs and food products with added sugars with healthier beverage and food choices, as recommended by professional society clinical guidelines; and (b) work with local school districts to promote healthy beverage and food choices for students; and (5) recommends that taxes on food and beverage products with added sugars be enacted in such a way that the economic burden is borne by companies and not by individuals and families with limited access to food alternatives; and (6) supports that any excise taxes are reinvested in community programs promoting health. (Modify Current HOD Policy)

Your Reference Committee heard limited testimony in favor of this resolution, noting that seventy percent of kids' nutrition is now derived from ultra-processed food. It was also noted that advertising heavily informs children's food knowledge, preferences, and consumption patterns that can lead to excess calorie intake. Therefore, your Reference Committee recommends that Resolution 429 be adopted.

(12) RESOLUTION 432 – RECOGNIZING LONELINESS AS A PUBLIC HEALTH ISSUE

RECOMMENDATION:

Resolution 432 be adopted.

HOD ACTION: Resolution 432 adopted.

RESOLVED, That our American Medical Association release a statement identifying loneliness as a public health issue with consequences for physical and mental health (Directive to Take Action;) and be it further
RESOLVED, That our AMA support evidence-based efforts to combat loneliness. (New HOD Policy)

Testimony presented was strongly supportive of this resolution, noting that there is a growing body of research demonstrating a strong link between social isolation and loneliness and adverse health outcomes. The Surgeon General of the United States has noted that loneliness

is a public health concern and is the root cause of a number of epidemics. It was also noted that recognizing loneliness as a public health issue is the best next step in combating loneliness. Your Reference Committee agrees and recommends adoption as amended.

(13) RESOLUTION 433 – SUPPORT FOR DEMOCRACY

RECOMMENDATION:

Resolution 433 be <u>adopted</u>.

HOD ACTION: Resolution 433 <u>adopted</u>.

RESOLVED, That our American Medical Association unequivocally support the democratic process, wherein representatives are regularly chosen through free and fair elections, as essential for maximizing the health and well-being of all Americans (New HOD Policy); and be it further

RESOLVED, That our AMA strongly oppose attempts to subvert the democratic process (Directive to Take Action); and be it further

RESOLVED, That our AMA assert that every candidate for political office and every officeholder in the public trust must support the democratic process and never take steps or support steps by others to subvert it. (Directive to Take Action)

Your Reference Committee heard testimony in support of this resolution, noting the importance of having policy in place to speak out in favor of democracy should civil unrest occur in the future. Therefore, your Reference Committee recommends that Resolution 433 be adopted.

(14) RESOLUTION 434 – SUPPORT FOR PEDIATRIC SIBLINGS OF CHRONICALLY ILL CHILDREN

RECOMMENDATION:

Resolution 434 be <u>adopted</u>.

HOD ACTION: Resolution 434 <u>adopted</u>.

RESOLVED, That our American Medical Association support programs and resources that improve the mental health, physical health, and social support of pediatric siblings of chronically ill pediatric patients. (Directive to Take Action)

Testimony presented was supportive, stating that it is important to ensure support and resources are provided to family members and siblings of chronically ill pediatric patients, a subset of the population with nuances that deserve to be addressed. Interventions exist that have demonstrated positive outcomes for the children who participated, including improvement in emotional, physical, and self-esteem functioning. Therefore, your Reference Committee recommends adoption.

(15) RESOLUTION 438 – INFORMING PHYSICIANS, HEALTH CARE PROVIDERS, AND THE PUBLIC OF THE HEALTH DANGERS OF FOSSIL-FUEL DERIVED HYDROGEN

RECOMMENDATION:

Resolution 438 be <u>adopted</u>.

HOD ACTION: Resolution 438 <u>adopted</u>.

RESOLVED, That our American Medical Association recognize the health, safety, and climate risks of current methods of producing fossil fuel-derived hydrogen and the dangers of adding hydrogen to natural gas (HP) (New HOD Policy); and be it further
RESOLVED, That our AMA educate its members, and, to the extent possible, health care professionals and the public, about the health, safety, and climate risks of current methods of producing fossil fuel-derived hydrogen and the dangers of adding hydrogen to natural gas (Directive to Take Action); and be it further
RESOLVED, That our AMA advocate to appropriate government agencies such as the EPA and the Department of Energy, and federal legislative bodies, regarding the health, safety and climate risks of current methods of producing fossil fuel derived hydrogen and the dangers of adding hydrogen to natural gas. (Directive to Take Action)

Testimony presented on this resolution was limited, but supportive, noting that although the use of hydrogen is a proposed method to reduce carbon emissions, much of the currently available hydrogen is derived from fossil fuels, which contributes to climate change. It was also noted that the use of hydrogen technologies directly contributes to climate change by increasing methane leakage due to increased pipeline corrosion. Therefore, your Reference Committee recommends adoption.

(16) RESOLUTION 439 – INFORMING PHYSICIANS, HEALTH CARE PROVIDERS, AND THE PUBLIC THAT COOKING WITH A GAS STOVE INCREASES HOUSEHOLD AIR POLLUTION AND THE RISK OF CHILDHOOD ASTHMA

RECOMMENDATION:

Resolution 439 be <u>adopted</u>.

HOD ACTION: Resolution 439 <u>adopted</u>.

RESOLVED, That our American Medical Association recognize the association between the use of gas stoves, indoor nitrogen dioxide levels and asthma (New HOD Policy); and be it further
RESOLVED, That our AMA inform its members and, to the extent possible, health care providers, the public, and relevant organizations that use of a gas stove increases household air pollution and the risk of childhood asthma and asthma severity; which can be mitigated by reducing the use of the gas cooking stove, using adequate ventilation, and/or using an appropriate air filter (Directive to Take Action); and be it further
RESOLVED, That our AMA advocate for innovative programs to assist with mitigation of cost to encourage the transition from gas stoves to electric stoves in an equitable manner. (Directive to Take Action)

Testimony presented was supportive of Resolution 439, noting the increases in nitrogen oxides in household air due to the use of gas stoves are well documented as is increased asthma among chlidren living in the home. It was also noted that asthma disproportionately burdens communities of color and economically disadvantaged populations. Some concerns were raised about the power grid in some communities not being able to support a move to electric appliances. Your Reference Committee notes that this resolution does not mandate a transition to electric stoves, but calls for advocacy for innovative programs to assist with mitigation to encourage the transition from gas stoves to electric stoves. Therefore, your Reference Committee recommends adoption.

(17) RESOLUTION 442 – OPPOSING THE CENSORSHIP OF SEXUALITY AND GENDER IDENTITY DISCUSSIONS IN PUBLIC SCHOOLS

RECOMMENDATION:

Resolution 442 be <u>adopted</u>.

HOD ACTION: Resolution 442 <u>adopted</u>.

RESOLVED, That our AMA opposes censorship of LGBTQIA+ topics and opposes any policies that limit discussion or restrict mention of sexuality, sexual orientation, and gender identity in schools or educational curricula; and be it further

RESOLVED, That our AMA will support policies that ensure an inclusive, well-rounded educational environment free from censorship of discussions surrounding sexual orientation, sexuality, and gender identity in public schools.

Your Reference Committee heard testimony that was in support of this resolution. It was noted that children are marginalized and shamed and are at increased risk of dying by suicide due to bullying based on sexual orientation and gender identify. Therefore, your Reference Committee recommends that Resolution 442 be adopted.

RECOMMENDED FOR ADOPTION AS AMENDED

(18) RESOLUTION 401 – AIR QUALITY AND THE PROTECTION OF CITIZEN HEALTH

RECOMMENDATION A:

That the first Resolve of Resolution 401 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association ~~review the~~ support the Environmental Protection Agency's ~~guidelines~~ proposal, under the Clean Air Act to ~~for monitoring~~ regulate ~~the~~ air quality for heavy metals and other air toxins ~~which is~~ emitted from smokestacks~~,~~. The risk of dispersion through are and soil should be ~~taking into~~ consideredation~~,~~ particularly for ~~the risks to citizens~~ people living downwind of smokestacks (Directive to Take Action); and be it further

RECOMMENDATION B:

That the second Resolve of Resolution 401 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA urge the EPA to ~~develop a report based on a review of the EPA's~~ finalize updated mercury, cadmium, and air toxic regulations ~~guidelines~~ for monitoring air quality emitted from power plants and other industrial sources, ~~smokestacks~~ ensuring that recommendations to protect the public's health are enforceable ~~included in the report~~. (Directive to Take Action)

RECOMMENDATION C:

Resolution 401 be adopted as amended.

HOD ACTION: Resolution 401 adopted as amended.

RESOLVED, That our American Medical Association review the Environmental Protection Agency's guidelines for monitoring the air quality which is emitted from smokestacks, taking into consideration the risks to citizens living downwind of smokestacks (Directive to Take Action); and be it further

RESOLVED, That our AMA develop a report based on a review of the EPA's guidelines for monitoring air quality emitted from smokestacks ensuring that recommendations to protect the public's health are included in the report. (Directive to Take Action)

Your Reference Committee heard testimony in support of this resolution. It was stated that industrial impacts on the environment have repeatedly been proven to predispose or worsen certain health conditions and that regulation can improve health. It was also noted better air quality will improve child health outcomes. Amendments were provided to strengthen the resolution and specifically address enforcement. Your Reference Committee agrees with these suggestions, which help clarify the EPA's role, and recommends that Resolution 401 be adopted as amended.

(19) RESOLUTION 403 – ADDRESSING MATERNAL DISCRIMINATION AND SUPPORT FOR FLEXIBLE FAMILY LEAVE

RECOMMENDATION A:

That the first Resolve of Resolution 403 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association encourage key stakeholders to implement policies and programs that help protect against ~~maternal~~ parental discrimination and promote work-life integration for physician parents, which should encompass prenatal parental care, equal parental leave for birthing and non-birthing parents, and flexibility for childcare (Directive to Take Action)

RECOMMENDATION B:

Resolution 403 be adopted as amended.

RECOMMENDATION C:

That the title of Resolution 403 be changed to read as follows:

ADDRESSING PARENTAL DISCRIMINATION AND SUPPORT FOR FLEXIBLE FAMILY LEAVE

HOD ACTION: Resolution 403 adopted as amended with a change in title.

ADDRESSING PARENTAL DISCRIMINATION AND SUPPORT FOR FLEXIBLE FAMILY LEAVE

RESOLVED, That our American Medical Association encourage key stakeholders to implement policies and programs that help protect against maternal discrimination and promote work-life integration for physician parents, which should encompass prenatal care, parental leave, and flexibility for childcare (Directive to Take Action); and be it further

RESOLVED, That our AMA urge key stakeholders to include physicians and frontline workers in legislation that provides protections and considerations for paid parental leave for issues of health and childcare. (Directive to Take Action)

Your Reference Committee heard overwhelming testimony in support of addressing parental discrimination, with amendments proffered to make the language more inclusive of a broader range of parental roles. This is a pressing issue for a significant portion of physicians who do not have access to paid leave and who are forced to choose between their career and their family, which has been a particular concern during the COVID-19 pandemic. Parental discrimination is associated with higher rates of self-reported burnout and this resolution will benefit the social and mental well-being of physicians and their families. Therefore, your Reference Committee recommends that Resolution 403 be adopted as amended.

(20) RESOLUTION 404 – WEAPONS IN CORRECTIONAL HEALTHCARE SETTINGS

RECOMMENDATION A:

That the second Resolve of Resolution 404 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA ~~study~~ work with appropriate stakeholders ~~and~~ to make evidence-based recommendations regarding the presence of weapons in correctional healthcare facilities. (Directive to Take Action)

RECOMMENDATION B:

Resolution 404 be adopted as amended.

HOD ACTION: Resolution 404 adopted as amended.

RESOLVED, That our American Medical Association advocate that physicians not be required to carry or use weapons in correctional facilities where they provide clinical care (Directive to Take Action); and be it further
RESOLVED, That our AMA study and make recommendations regarding the presence of weapons in correctional healthcare facilities. (Directive to Take Action)

Your Reference Committee heard testimony in support of Resolution 404. Testimony noted that new policies require correctional staff, including physicians, to carry less-lethal weapons such as pepper spray and rapid rotation batons; and such policy interferes with the physician-patient relationship. It was also noted that physicians must have a choice in whether they carry weapons. Testimony was presented against referral for study due to the lack of data available on the presence of weapons in correctional health care facilities. Your Reference Committee agreed with this sentiment noting that it is best to work with appropriate stakeholders who understand the risks and benefits of physicians carrying weapons in correctional facilities. Therefore, your Reference Committee recommends Resolution 404 be adopted as amended.

(21) RESOLUTION 405 – UNIVERSAL CHILDCARE AND PRESCHOOL

RECOMMENDATION A:

Resolution 405 be amended by addition to read as follows:

RESOLVED, That our American Medical Association advocate for universal access to high-quality and affordable ~~child-directed and play-based~~ childcare and preschool. (Directive to Take Action)

RECOMMENDATION B:

Resolution 405 be adopted as amended.

HOD ACTION: Resolution 405 adopted as amended.

RESOLVED, That our American Medical Association advocate for universal access to high-quality and affordable childcare and preschool. (Directive to Take Action)

Your Reference Committee heard overwhelming testimony in support of this resolution, emphasizing the importance of high-quality care and its ability to close the academic achievement gap, as well as providing economic benefits to parents able to engage in the labor force. Enrollment in preschool or high-quality childcare directly and indirectly improves children's health outcomes. Universal preschool or high-quality childcare is also an issue of equity. Enabling children from all socioeconomic backgrounds to access early childhood education that will prepare them for success is an important step towards disrupting cycles of poverty. An amendment was suggested to add "child-directed and play-based" childcare and preschool, which is a type of early childhood education where children are given the autonomy to choose activities based on their current interests. Your Reference Committee agrees with this addition and therefore, recommends that Resolution 405 be adopted as amended.

(22) RESOLUTION 406 – COVID-19 PREVENTIVE MEASURES FOR CORRECTIONAL FACILITIES: AMA POLICY POSITION

RECOMMENDATION A:

That the first Resolve of Resolution 406 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association advocate for all employees working in a correctional facility or detention center to be up to date with vaccinations against COVID-19, unless there is a valid medical contraindication~~/religious exception~~ (Directive to Take Action)

RECOMMENDATION B:

That the second Resolve of Resolution 406 be amended by addition to read as follows:

RESOLVED, That our AMA advocate for all employees working in a correctional facility or detention center, not up to date with vaccination for COVID-19 to be COVID rapid tested each time they enter a correctional facility or detention center, as consistent with Centers for Disease Control and Prevention (CDC) or local public health guidelines (Directive to Take Action); and be it further

RECOMMENDATION C:

That the third Resolve of Resolution 406 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA advocate for correctional facility or detention center policies that require non-employed, non-residents (e.g. visitors, contractors, etc.) to either show evidence of being up to date for COVID-19 vaccines or show proof of a negative COVID test ~~completed within 24 hours prior to each~~ when they enter ~~entry into~~ a correctional facility or detention center as consistent with CDC or local public health guidelines, at no cost to the visitor; (Directive to Take Action); and be it further

RECOMMENDATION D:

That the fourth Resolve of Resolution 406 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA advocate that all people inside a correctional facility or detention center wear an appropriate mask at all times, except while eating or drinking or at a ~~safe (~~6 ft.~~)~~ distance from anyone else if local transmission rate is above low risk as determined by the CDC ~~Centers for Disease Control and Prevention~~ (Directive to Take Action); and be it further

RECOMMENDATION E:

That the fifth Resolve of Resolution 406 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA advocate that correctional facilities or detention centers be able to request and receive all necessary funding for ~~the above endemic~~ COVID-19 vaccination and testing, according to CDC or local public health guidelines. (Directive to Take Action)

RECOMMENDATION F:

Resolution 406 be adopted as amended.

RECOMMENDATION G:

That the title of Resolution 406 be changed to read as follows:

COVID-19 PREVENTIVE MEASURES FOR CORRECTIONAL FACILITIES AND DETENTION CENTERS

HOD ACTION: Resolution 406 adopted as amended with a change in title.

COVID-19 PREVENTIVE MEASURES FOR CORRECTIONAL FACILITIES AND DETENTION-CENTERS

RESOLVED, That our American Medical Association advocate for all employees working in a correctional facility to be up to date with vaccinations against COVID-19, unless there is a valid medical contraindication/religious exception (Directive to Take Action); and be it further

RESOLVED, That our AMA advocate for all employees not up to date with vaccination for COVID-19 to be COVID rapid tested each time they enter a correctional facility (Directive to Take Action); and be it further

RESOLVED, That our AMA advocate for correctional facility policies that require non-employed, non-residents (e.g. visitors, contractors, etc.) to either show evidence of being up to date for COVID-19 or show proof of negative COVID test completed within 24 hours prior to each entry into a correctional facility (Directive to Take Action); and be it further

RESOLVED, That our AMA advocate that all people inside a correctional facility wear an appropriate mask at all times, except while eating or drinking or at a safe (6 ft.) distance from anyone else if local transmission rate is above low risk as determined by the Centers for Disease Control and Prevention (Directive to Take Action); and be it further

RESOLVED, That our AMA advocate that correctional facilities be able to request and receive all necessary funding for the above endemic COVID-19 vaccination and testing. (Directive to Take Action)

Your Reference Committee heard testimony in support of Resolution 406. It was noted aggregate settings may house persons at increased risk for disease morbidity and mortality from COVID-19 illness. An amendment was proffered to remove the mention of religious exemptions noting that it is contradictory to existing AMA policy. Another amendment suggested adding detention centers, in addition to correctional facilities. Your Reference Committee agreed with these suggested amendments. Testimony raised concern about required testing of visitors, which may increase inequities and make it more difficult for families to visit their loved ones. Therefore, your Reference Committee recommends Resolution 406 be adopted as amended. The title has been changed to reflect the inclusion of detention centers.

.

(23) RESOLUTION 407 – STUDY OF BEST PRACTICES FOR ACUTE CARE OF PATIENTS IN THE CUSTODY OF LAW ENFORCEMENT OR CORRECTIONS

RECOMMENDATION A:

Resolution 407 be <u>amended by addition and deletion</u> to read as follows:

RESOLVED, That our American Medical Association study best practices for interactions between hospitals, <u>other acute care facilities,</u> clinicians, and members of law enforcement or correctional agencies to ensure that patients in custody of such law enforcement or correctional agencies (including patients without decision-making capacity), their surrogates, and the ~~health care providers~~ <u>clinicians</u> caring for them are provided the autonomy and privacy protections afforded to them by law and in concordance with professional ethical standards and report its findings to the AMA House of Delegates by the 2023 Annual Meeting. (Directive to Take Action)

RECOMMENDATION B:

Resolution 407 be <u>adopted as amended</u>.

HOD ACTION: Resolution 407 <u>adopted as amended</u>.

RESOLVED, That our American Medical Association study best practices for interactions between hospitals, clinicians, and members of law enforcement or correctional agencies to ensure that patients in custody of such law enforcement or correctional agencies (including patients without decision-making capacity), their surrogates, and the health care providers caring for them are provided the autonomy and privacy protections afforded to them by law and in concordance with professional ethical standards and report its findings to the AMA House of Delegates by the 2023 Annual Meeting. (Directive to Take Action)

Your Reference Committee heard testimony in support of Resolution 407. It was noted that a study of best practices would be of great value in standardizing and providing appropriate acute care, especially in facilities where physicians have few guidelines. One amendment proffered noted that the scope of this resolution should include other acute care facilities. Your Reference Committee agreed with this amendment. Therefore, your Reference Committee recommends that Resolution 407 be adopted as amended.

(24) RESOLUTION 408 – SUPPORTING INCREASED RESEARCH ON IMPLEMENTATION OF NONVIOLENT DE-ESCALATION TRAINING AND MENTAL ILLNESS AWARENESS IN LAW ENFORCEMENT

RECOMMENDATION A:

The first Resolve of Resolution 408 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association support increased research on non-violent de-escalation tactics for law enforcement encounters with ~~the mentally ill~~ people who have mental illness and/or developmental disabilities. (New HOD Policy)

RECOMMENDATION B:

Resolution 408 be adopted as amended.

RECOMMENDATION C:

That the title of Resolution 408 be changed to read as follows:

SUPPORTING INCREASED RESEARCH ON IMPLEMENTATION OF NONVIOLENT DE-ESCALATION TRAINING FOR LAW ENFORCEMENT

HOD ACTION: Resolution 408 adopted as amended with a change in title.

SUPPORTING INCREASED RESEARCH ON IMPLEMENTATION OF NONVIOLENT DE-ESCALATION TRAINING FOR LAW ENFORCEMENT

RESOLVED, That our American Medical Association support increased research on non-violent de-escalation tactics for law enforcement encounters with the mentally ill (New HOD Policy); and be it further

RESOLVED, That our AMA support research of fatal encounters with law enforcement and the prevention thereof. (New HOD Policy)

Your Reference Committee heard testimony in support of this resolution. It was noted that the lack of a national governmental database for arrest-related deaths results in a reliance on incomplete data procured by third-party databases, thereby making it difficult to understand the role mental illness plays in arrest-related deaths. It was also noted that de-escalation tactics have shown to enhance civilian compliance and are effective in minimizing arrest-related deaths. Unfortunately, law enforcement officials are often not adequately trained to respond or de-escalate situations involving individuals in a state of psychiatric crisis. An amendment suggested updating and broadening the language to be inclusive of people with developmental disabilities. Your Reference agrees with this suggestion and recommends that Resolution 408 be adopted as amended.

(25) RESOLUTION 410 – INCREASING EDUCATION FOR SCHOOL STAFF TO RECOGNIZE PRODROMAL SYMPTOMS OF SCHIZOPHRENIA IN TEENS AND YOUNG ADULTS TO INCREASE EARLY INTERVENTION

RECOMMENDATION A:

Resolution 410 be <u>amended by addition and deletion</u> to read as follows:

RESOLVED, That our American Medical Association work with the American Psychiatric Association and other entities to support research of establishing education programs to teach <u>secondary and higher education</u> ~~high school and university~~ staff to recognize ~~the early~~ prodromal symptoms of schizophrenia to increase early intervention. (Directive to Take Action)

RECOMMENDATION B:

Resolution 410 be <u>adopted as amended</u>.

HOD ACTION: Resolution 410 <u>adopted as amended</u>.

RESOLVED, That our American Medical Association work with the American Psychiatric Association and other entities to support research of establishing education programs to teach high school and university staff to recognize the early prodromal symptoms of schizophrenia to increase early intervention. (Directive to Take Action)

Your Reference Committee heard testimony in support of this resolution. It was stated that education programs on the prodromal symptoms of schizophrenia could be integrated into existing trainings for school staff. It was also suggested that “early” be deleted as it’s repetitive of “prodromal.” Therefore, your Reference Committee recommends that Resolution 410 be adopted as amended.

(26) RESOLUTION 411 – ANONYMOUS PRESCRIBING OPTION FOR EXPEDITED PARTNER THERAPY

RECOMMENDATION A:

Resolution 411 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association work with electronic medical record vendors to create a ~~an anonymous~~ prescribing option for the purpose of expedited partner therapy. (Directive to Take Action)

RECOMMENDATION B:

Resolution 411 be adopted as amended.

RECOMMENDATION C:

That the title of Resolution 411 be changed to read as follows:

PRESCRIBING OPTION FOR EXPEDITED PARTNER THERAPY

HOD ACTION: Resolution 411 adopted as amended with a change in title.

PRESCRIBING OPTION FOR EXPEDITED PARTNER THERAPY

RESOLVED, That our American Medical Association work with electronic medical record vendors to create an anonymous prescribing option for the purpose of expedited partner therapy. (Directive to Take Action)

Your Reference Committee heard testimony supportive of Resolution 411. Testimony noted that many partners might not be treated for STIs despite exposure through a partner and expedited partner therapy (EPT) is one method to alleviate that barrier. Some testimony stated that referral was appropriate to better understand the nuances involved in the implementation of anonymous prescribing for expedited partner therapy. Your Reference Committee noted that anonymous prescribing is state-based and is therefore not broadly applicable. It was also noted that anonymous prescribing can have unintended consequences such as allergic reactions and adverse drug to drug interactions if physicians do not have the appropriate medical history of a patient in which medication is prescribed for. Your Reference Committee agreed to strike out the word anonymous to address this concern and keep it in alignment with current AMA policy supporting EPT, which does not reference anonymous prescribing. Therefore, your Reference Committee recommends that Resolution 411 be adopted as amended.

(27) RESOLUTION 413 – EXPANSION ON COMPREHENSIVE SEXUAL HEALTH EDUCATION

RECOMMENDATION A:

RESOLVED, That our American Medical Association amend Policy H-170.968, "Sexuality Education, Sexual Violence Prevention, Abstinence, and Distribution of Condoms in Schools," by addition and deletion to read as follows:

(1) ~~Recognizes that the primary responsibility for family life education is in the home, and additionally s~~ Supports the concept of ~~a complementary family life and~~ sexuality education in the home, when possible, as well as developmentally appropriate sexuality education programming in the schools at all levels, at local option and direction;

(2) Urges schools at all education levels to implement comprehensive, developmentally appropriate sexuality education programs that: (a) are based on rigorous, peer reviewed science; (b) incorporate sexual violence prevention; (c) show promise for delaying the onset of sexual activity and a reduction in sexual behavior that puts adolescents at risk for contracting human immunodeficiency virus (HIV) and other sexually transmitted diseases and for becoming pregnant; (d) include an integrated strategy for making condoms ~~dental dams,~~ and other effective barrier protection methods available to students and for providing both factual information and skill-building related to reproductive biology, sexual abstinence, sexual responsibility, contraceptives including condoms, alternatives in birth control, and other issues aimed at prevention of pregnancy and sexual transmission of diseases; (e) utilize classroom teachers and other professionals who have shown an aptitude for working with young people and who have received special training that includes addressing the needs of LGBTQ+ ~~gay, lesbian, and bisexual~~ youth; (f) appropriately and comprehensively address the sexual behavior of all people, inclusive of sexual and gender minorities; (g) include ample involvement of parents, health professionals, and other concerned members of the community in the development of the program; (h) are part of an overall health education program; and (i) include culturally competent materials that are language-appropriate for Limited English Proficiency (LEP) pupils;

(3) Continues to monitor future research findings related to emerging initiatives that include abstinence-only, school-based sexuality education, and consent

communication to prevent dating violence while promoting healthy relationships, and school-based condom availability programs that address sexually transmitted diseases and pregnancy prevention for young people and report back to the House of Delegates as appropriate;

(4) Will work with the United States Surgeon General to design programs that address communities of color and youth in high risk situations within the context of a comprehensive school health education program;

(5) Opposes the sole use of abstinence-only education, as defined by the 1996 Temporary Assistance to Needy Families Act (P.L. 104-193), within school systems;

(6) Endorses comprehensive family life education in lieu of abstinence-only education, unless research shows abstinence-only education to be superior in preventing negative health outcomes;

(7) Supports federal funding of comprehensive sex education programs that stress the importance of ~~abstinence in~~ preventing unwanted teenage pregnancy and sexually transmitted infections via comprehensive education, ~~and also teach about~~ including contraceptive choices, abstinence, and safer sex, and opposes federal funding of community-based programs that do not show evidence-based benefits; and

(8) Extends its support of comprehensive family-life education to community-based programs promoting abstinence as the best method to prevent teenage pregnancy and sexually-transmitted diseases while also discussing the roles of condoms and birth control, as endorsed for school systems in this policy;

(9) Supports the development of sexual education curriculum that integrates dating violence prevention through lessons on healthy relationships, sexual health, and conversations about consent; and

(10) Encourages physicians and all interested parties to ~~conduct research and~~ develop best-practice, evidence-based, guidelines for sexual education curricula that are developmentally appropriate as well as medically, factually, and technically accurate. (Modify Current HOD Policy)

RECOMMENDATION B:

Resolution 413 be adopted as amended.

HOD ACTION: Resolution 413 adopted as amended.

RESOLVED, That our American Medical Association amend Policy H-170.968, "Sexuality Education, Sexual Violence Prevention, Abstinence, and Distribution of Condoms in Schools," by addition and deletion to read as follows:

(1) ~~Recognizes that the primary responsibility for family life education is in the home, and additionally s~~ Supports the concept of a ~~complementary~~ family life and sexuality education program in the schools at all levels, at local option and direction;

(2) Urges schools at all education levels to implement comprehensive, developmentally appropriate sexuality education programs that: (a) are based on rigorous, peer reviewed science; (b) incorporate sexual violence prevention; (c) show promise for delaying the onset of sexual activity and a reduction in sexual behavior that puts adolescents at risk for contracting human immunodeficiency virus (HIV) and other sexually transmitted diseases and for becoming pregnant; (d) include an integrated strategy for making condoms dental dams, and other barrier protection methods available to students and for providing both factual information and skill-building related to reproductive biology, sexual abstinence, sexual responsibility, contraceptives including condoms, alternatives in birth control, and other issues aimed at prevention of pregnancy and sexual transmission of diseases; (e) utilize classroom teachers and other professionals who have shown an aptitude for working with young people and who have received special training that includes addressing the needs of LGBTQ+ ~~gay, lesbian, and bisexual~~ youth; (f) appropriately and comprehensively address the sexual behavior of all people, inclusive of sexual and gender minorities; (g) include ample involvement of parents, health professionals, and other concerned members of the community in the development of the program; (h) are part of an overall health education program; and (i) include culturally competent materials that are language-appropriate for Limited English Proficiency (LEP) pupils;

(3) Continues to monitor future research findings related to emerging initiatives that include abstinence-only, school-based sexuality education, and consent communication to prevent dating violence while promoting healthy relationships, and school-based condom availability programs that address sexually transmitted diseases and pregnancy prevention for young people and report back to the House of Delegates as appropriate;

(4) Will work with the United States Surgeon General to design programs that address communities of color and youth in high risk situations within the context of a comprehensive school health education program;

(5) Opposes the sole use of abstinence-only education, as defined by the 1996 Temporary Assistance to Needy Families Act (P.L. 104-193), within school systems;

(6) Endorses comprehensive family life education in lieu of abstinence-only education, unless research shows abstinence-only education to be superior in preventing negative health outcomes;

(7) Supports federal funding of comprehensive sex education programs that stress the importance of ~~abstinence in~~ preventing unwanted teenage pregnancy and sexually transmitted infections via comprehensive education, ~~and also teach about~~ including contraceptive choices, abstinence, and safer sex, and opposes federal funding of community-based programs that do not show evidence-based benefits; and

(8) Extends its support of comprehensive family-life education to community-based programs promoting abstinence as the best method to prevent teenage pregnancy and sexually-transmitted diseases while also discussing the roles of condoms and birth control, as endorsed for school systems in this policy;

(9) Supports the development of sexual education curriculum that integrates dating violence prevention through lessons on healthy relationships, sexual health, and conversations about consent; and

(10) Encourages physicians and all interested parties to ~~conduct research and~~ develop best-practice, evidence-based, guidelines for sexual education curricula that are developmentally

appropriate as well as medically, factually, and technically accurate. (Modify Current HOD Policy)

Your Reference Committee heard testimony in support of Resolution 413. An amendment was offered to remove dental dams noting that they are not a scientifically proven method of barrier protection. Another amendment was proffered to consider that sex education from family life might not be the primary method of education. It was noted that some family lives are not ideal for talking about sexual education due to certain educational, cultural, religious backgrounds, or other circumstances. Your Reference Committee considered these amendments and amended the policy to recognize the role of sexuality education in the home, when possible. We believe this language is more inclusive of varying home dynamics. Therefore, your Reference Committee recommends that Resolution 413 be adopted as amended.

(28) RESOLUTION 414 – IMPROVEMENT OF CARE AND RESOURCE ALLOCATION FOR HOMELESS PERSONS IN THE GLOBAL PANDEMIC

RECOMMENDATION A:

Resolution 414 be amended by the addition of a resolve to read as follows:

Resolved, that our AMA make available existing educational resources from federal agencies and other stakeholders related to the needs of housing-insecure individuals.

RECOMMENDATION B:

Resolution 414 be adopted as amended.

RECOMMENDATION C:

That the title of Resolution 410 be changed to read as follows:

IMPROVEMENT OF CARE AND RESOURCE ALLOCATION FOR HOUSING-INSECURE PERSONS IN THE GLOBAL PANDEMIC

HOD ACTION: Resolution 414 adopted as amended with a change in title.

IMPROVEMENT OF CARE AND RESOURCE ALLOCATION FOR HOUSING-INSECURE PERSONS IN THE GLOBAL PANDEMIC

RESOLVED, That our American Medical Association support training to understand the needs of housing insecure individuals for those who encounter this vulnerable population through their professional duties (New HOD Policy); and be it further

RESOLVED, That our AMA support the establishment of multidisciplinary mobile homeless outreach teams trained in issues specific to housing insecure individuals (New HOD Policy); and be it further

RESOLVED, That our AMA reaffirm existing policies H-160.903, "Eradicating Homelessness," and H-345.975, "Maintaining Mental Health Services by States" (Reaffirm HOD Policy); and be it further

RESOLVED, That our AMA reaffirm existing policy H-160.978, "The Mentally Ill Homeless," with a title change "Housing Insecure Individuals with Mental Illness". (Reaffirm HOD Policy)

The testimony presented on Resolution 414 was supportive. Access to safe and affordable housing is a social determinant of health. Testimony noted that housing insecurity is a broader term than homelessness. It was recognized that housing insecurity creates significant barriers to accessing health care treatment and preventive services and puts people at greater risk for worse health outcomes. A number of edits were suggested. Your Reference Committee thought that some were outside of the scope of this resolution, such as screening for latent tuberculosis infection. However, your Reference Committee agrees that it would be helpful to make existing educational resources on this issue available from federal agencies and other stakeholders. Your Reference Committee also recommends a change in title for consistency. Therefore, your Reference Committee recommends that Resolution 414 be adopted as amended.

(29) RESOLUTION 422 – VOTING AS A SOCIAL DETERMINANT OF HEALTH

RECOMMENDATION A:

That the second Resolve of Resolution 422 be amended by addition to read as follows:

RESOLVED, That our AMA recognizes that gerrymandering which disenfranchises individuals/communities ~~as a partisan effort that, functions in part to~~ limits access to health care, including but not limited to the expansion of comprehensive medical insurance coverage, and negatively impacts health outcomes (New HOD Policy); and be it further

RECOMMNEDATION B:

That Resolution 422 be adopted as amended.

HOD ACTION: Resolution 422 adopted as amended.

RESOLVED, That our American Medical Association acknowledge voting is a social determinant of health and significantly contributes to the analyses of other social determinants of health as a key metric (New HOD Policy); and be it further

RESOLVED, That our AMA recognize gerrymandering as a partisan effort that functions in part to limit access to health care, including but not limited to the expansion of comprehensive medical insurance coverage, and negatively impacts health outcomes (New HOD Policy); and be it further

RESOLVED, That our AMA collaborate with appropriate stakeholders and provide resources to firmly establish a relationship between voter participation and health outcomes. (Directive to Take Action)

Your Reference Committee heard testimony in favor of acknowledging voting as a social determinant of health. It was noted that this is a timely issue given the upcoming elections. Gerrymandering may or may not be legal depending on the circumstances under which it may exist. If gerrymandering is beyond partisan and begins to disenfranchise individuals/communities, then it negatively impacts health outcomes and is therefore a social determinant of health..Your Reference Committee amended the language in the second Resolve clause to reflect this. Therefore, your Reference Committee recommends that Resolution 422 be adopted as amended.

(30) RESOLUTION 425 – MENTAL HEALTH CRISIS

RECOMMENDATION A:

That the first Resolve of Resolution 425 be <u>amended by addition and deletion</u> to read as follows:

RESOLVED, That our American Medical Association work expediently with all interested national medical organizations, national mental health organizations, and appropriate federal government entities to convene a federally-sponsored blue ribbon panel and develop a widely disseminated report on mental health treatment availability and suicide prevention in order to:
1) Improve suicide prevention efforts, through support, payment and insurance coverage for mental and behavioral health and suicide prevention services, including, but not limited to, the National Suicide Prevention Lifeline;
2) Increase access to affordable and effective mental health care through expanding and diversifying the mental and behavioral health workforce;
3) Expand research into the disparities in youth suicide prevention;
4) Address ~~disparities~~ <u>inequities</u> in suicide risk and rate through education, policies and development of suicide prevention programs that are culturally and linguistically appropriate;
5) Develop and support resources and programs that foster and strengthen healthy mental health development; and
6) Develop best practices for minimizing emergency department delays in obtaining appropriate mental health care for patients who are in mental health crisis.
(Directive to Take Action)

RECOMMENDATION B:

Resolution 425 be adopted as amended.

HOD ACTION: Resolution 425 adopted as amended.

RESOLVED, That our American Medical Association work expediently with all interested national medical organizations, national mental health organizations, and appropriate federal government entities to convene a federally-sponsored blue ribbon panel and develop a widely disseminated report on mental health treatment availability and suicide prevention in order to:
1) Improve suicide prevention efforts, through support, payment and insurance coverage for mental and behavioral health and suicide prevention services, including, but not limited to, the National Suicide Prevention Lifeline;
2) Increase access to affordable and effective mental health care through expanding and diversifying the mental and behavioral health workforce;
3) Expand research into the disparities in youth suicide prevention;
4) Address disparities in suicide risk and rate through education, policies and development of suicide prevention programs that are culturally and linguistically appropriate;
5) Develop and support resources and programs that foster and strengthen healthy mental health development; and
6) Develop best practices for minimizing emergency department delays in obtaining appropriate mental health care for patients who are in mental health crisis. (Directive to Take Action)
RESOLVED, That our American Medical Association support physician acquisition of emergency mental health response skills by promoting education courses for physicians, fellows, residents, and medical students including, but not limited to, mental health first aid training (Directive to Take Action); and be it further
RESOLVED, That our AMA reaffirm AMA Policy D-345.994 and H-345.984. (Reaffirm HOD Policy)

Your Reference Committee heard limited testimony in support of Resolution 425. It was noted that the COVID-19 pandemic has exacerbated our nation's mental health crisis and action is needed. It was also suggested that the word "disparities" be replaced with "inequities." Your Reference Committee agrees and recommends that Resolution 425 be adopted as amended.

(31) RESOLUTION 431 – PROTECTIONS FOR INCARCERATED MOTHERS AND INFANTS IN THE PERINATAL PERIOD

RECOMMENDATION A:

That the first resolve of Resolution 431 be amended by addition to read as follows:

RESOLVED, That our American Medical Association encourage data collection on pregnancy and other reproductive health outcomes of incarcerated people and research efforts to characterize the health needs for pregnant inmates, including efforts that utilize data acquisition directly from pregnant inmates (Directive to Take Action); and be it further

RECOMMENDATION B:

That the third resolve of Resolution 431 be amended by deletion to read as follows:

RESOLVED, That our AMA oppose the ~~immediate~~ separation of infants from incarcerated pregnant individuals post-partum; (Directive to Take Action) and be it further

RECOMMENDATION C:

That the fifth resolve of Resolution 431 be amended by addition to read as follows:

RESOLVED, That our AMA amend policy H-430.990 by addition to read as follows:

Bonding Programs for Women Prisoners and their Newborn Children H-430.990

Because there are insufficient data at this time to draw conclusions about the long-term effects of prison nursery programs on mothers and their children, the AMA supports and encourages further research on the impact of infant bonding programs on incarcerated women and their children. However, since there are established benefits of breast milk for infants and breast milk expression for mothers, the AMA advocates for policy and legislation that extends the right to breastfeed directly and/or privately pump and safely store breast milk to include incarcerated mothers. The AMA recognizes the prevalence of mental health and substance abuse problems among incarcerated women and continues to support access to appropriate services for women in prisons. The AMA recognizes that a large majority of incarcerated females who may not have developed appropriate parenting skills are mothers of children under the age of 18. The AMA encourages correctional facilities to provide parenting skills and breastfeeding/breast pumping training to all female inmates in preparation for their release from prison and return to their children. The AMA supports and encourages further investigation into the long-term effects of prison nurseries on mothers and their children. (Modify Current HOD Policy)

RECOMMENDATION D:

Resolution 431 be adopted as amended.

HOD ACTION: Resolution 431 adopted as amended.

RESOLVED, That our American Medical Association encourage research efforts to characterize the health needs for pregnant inmates, including efforts that utilize data acquisition directly from pregnant inmates (Directive to Take Action); and be it further

RESOLVED, That our AMA support legislation requiring all correctional facilities, including those that are privately-owned, to collect and report pregnancy-related healthcare statistics with transparency in the data collection process (Directive to Take Action); and be it further

RESOLVED, That our AMA oppose the immediate separation of infants from incarcerated pregnant individuals post-partum; (Directive to Take Action) and be it further

RESOLVED, That our AMA support solutions, such as community-based programs, which allow infants and incarcerated postpartum individuals to remain together (Directive to Take Action); and be it further

RESOLVED, That our AMA amend policy H-430.990 by addition to read as follows:

Bonding Programs for Women Prisoners and their Newborn Children H-430.990

Because there are insufficient data at this time to draw conclusions about the long-term effects of prison nursery programs on mothers and their children, the AMA supports and encourages further research on the impact of infant bonding programs on incarcerated women and their children. However, since there are established benefits of breast milk for infants and breast milk expression for mothers, the AMA advocates for policy and legislation that extends the right to breastfeed and/or pump and store breast milk to include incarcerated mothers. The AMA recognizes the prevalence of mental health and substance abuse problems among incarcerated women and continues to support access to appropriate services for women in prisons. The AMA recognizes that a large majority of incarcerated females who may not have developed appropriate parenting skills are mothers of children under the age of 18. The AMA encourages correctional facilities to provide parenting skills and breastfeeding/breast pumping training to all female inmates in preparation for their release from prison and return to their children. The AMA supports and encourages further investigation into the long-term effects of prison nurseries on mothers and their children. (Modify Current HOD Policy)

Your Reference Committee heard testimony in support of Resolution 431. It was noted that it is essential to protect bonding between a mother and their newborn which has been shown to have a positive effect on the child's development. Amendments were proffered noting that people who are incarcerated should have access to direct breastfeeding and access to privately pump. Another amendment offered noted that data collection on the pregnancy and reproductive health outcomes of incarcerated people is needed. Your Reference Committee agreed with these amendments. Therefore, your Reference Committee recommends that Resolution 431 be adopted as amended.

(32) RESOLUTION 436 – TRAINING AND REIMBURSEMENT FOR FIREARM SAFETY COUNSELING

RECOMMENDATION A:

That the first Resolve of Resolution 436 be amended by addition and deletion to read as follows:

RESOLVED, That our American Medical Association support the inclusion of ~~gun~~ firearm-related violence and suicide epidemiology, as well as ~~and~~ evidence-based firearm-related injury prevention education in ~~medical school curricula~~ undergraduate and graduate

medical education training programs, where appropriate (Directive to Take Action)

RECOMMENDATION B:

That Resolution 436 be adopted as amended.

HOD ACTION: Resolution 436 adopted as amended.

RESOLVED, That our American Medical Association support the inclusion of gun violence epidemiology and evidence-based firearm-related injury prevention education in medical school curricula (Directive to Take Action); and be it further

RESOLVED, That our AMA amend Policy H-145.976, "Firearm Safety Counseling in Physician-Led Health Care Teams," by addition to read as follows:

Firearm Safety Counseling in Physician-Led Health Care Teams, H-145.976

1. Our AMA: (a) will oppose any restrictions on physicians' and other members of the physician-led health care team's ability to inquire and talk about firearm safety issues and risks with their patients; (b) will oppose any law restricting physicians' and other members of the physician-led health care team's discussions with patients and their families about firearms as an intrusion into medical privacy; and (c) encourages dissemination of educational materials related to firearm safety to be used in undergraduate medical education.
2. Our AMA will work with appropriate stakeholders to develop state-specific guidance for physicians on how to counsel patients to reduce their risk for firearm-related injury or death, including guidance on when and how to ask sensitive questions about firearm ownership, access, and use, and clarification on the circumstances under which physicians are permitted or may be required to disclose the content of such conversations to family members, law enforcement, or other third parties.
3. Our AMA will support the development of reimbursement structures that incentivize physicians to counsel patients on firearm-related injury risk and prevention. (Modify Current HOD Policy)

Testimony presented was supportive of this resolution, noting that firearm violence is a largely preventable public health crisis and physicians should be trained and incentivized to talk about firearm safety with their patients. The Council on Medical Education indicated their support for the first Resolved. One amendment suggested that firearm-related injury preventiona and firearm suicide education be added to appropriate medical education training. Your Reference Committee agrees with these amemdments and recommends that Resolution 436 be adopted as amended.

(33) RESOLUTION 440 – ADDRESSING SOCIAL DETERMINANTS OF HEALTH THROUGH HEALTH IT

RECOMMENDATION A:

Resolution 440 be amended by the addition of third and Resolve to read as follows:

RESOLVED, That our AMA advocate for adequate standards and capabilities for electronic health records to effectively tag and protect sensitive data before it can

be shared or reshared (Directive to Take Action); and be it further

Recommendation B:

Resolution 440 be amended by the addition of a fourth Resolve to read as follows:

RESOLVED, That our AMA support ongoing monitoring and data collection regarding unintended harm to patients from sharing information on social determinants of health and social risk (Directive to Take Action).

RECOMMENDATION C:

Resolution 440 be adopted as amended.

HOD ACTION: Resolution 440 adopted as amended.

RESOLVED, That our American Medical Association advocate for data interoperability between physicians' practices, public health, vaccine registries, community-based organizations, and other related social care organizations to promote coordination across the spectrum of care, while maintaining appropriate patient privacy (Directive to Take Action); and be it further

RESOLVED, That the AMA adopt the position that electronic health records should integrate and display information on social determinants of health and social risk so that such information is actionable by physicians to intervene and mitigate the impacts of social factors on health outcomes (Directive to Take Action)

Testimony on Resolution 440 was supportive. It was noted that data interoperability is needed to promote care coordination, while protecting patient privacy. An amendment was offered, noting support for the idea, but concern for potential unintended consequences such as in a pediatric setting where parents of a child are separated or divorced and data should not be shared with one parent about the other parent's health. Your Reference Committee agrees that these amendments are important and there recommends that Resolution 440 be adopted as amended.

(34) RESOLUTION 441 – ADDRESSING ADVERSE EFFECTS OF ACTIVE SHOOTER DRILLS ON CHILDREN'S HEALTH

RECOMMENDATION A:

That the first Resolve of Resolution 441 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA support that any school system conducting active-shooter or live-crisis drills does so in an evidence-based and ~~all school systems~~

~~conduct evidence-based active shooter drills in a~~ trauma-informed manner that
a. is cognizant of children's physical and mental wellness,
b. considers prior experiences that might affect children's response to a simulation,
c. avoids creating additional traumatic experiences for children, and
d. provides support for students who may be adversely affected; and be it further

RECOMMENDATION B:

That the second resolve of Resolution 441 be amended by addition and deletion to read as follows:

RESOLVED, That our AMA work with relevant stakeholders to raise awareness of ways to conduct active-shooter or live-crisis drills that are safe for children and developmentally ~~age-~~appropriate.

RECOMMENDATION C:

That Resolution 441 be amended by the addition of a third Resolve to read as follows:

RESOLVED, That our AMA advocate for research into the impact of live-crisis exercises and drills on the physical and mental health and well-being of children including the goals, efficacy, and potential unintended consequences of crisis-preparedness activities involving children (Directive to Take Action);

RECOMMENDATION D:

Resolution 441 be adopted as amended.

RECOMMENDATION E:

That the title of Resolution 441 be changed to read as follows:

ADDRESSING ADVERSE EFFECTS OF ACTIVE-SHOOTER AND LIVE-CRISIS DRILLS ON CHILDREN'S HEALTH

HOD ACTION: Resolution 441 adopted as amended with a change in title.

ADDRESSING ADVERSE EFFECTS OF ACTIVE-SHOOTER AND LIVE-CRISIS DRILLS ON CHILDREN'S HEALTH

RESOLVED, That our AMA support that all school systems conduct evidence-based active shooter drills in a trauma-informed manner that
a. is cognizant of children's physical and mental wellness,
b. considers prior experiences that might affect children's response to a simulation,
c. avoids creating additional traumatic experiences for children, and
d. provides support for students who may be adversely affected; and be it further
RESOLVED, That our AMA work with relevant stakeholders to raise awareness of ways to conduct active shooter drills that are safe for children and age-appropriate.

Your Reference Committee heard testimony in support of Resolution 441. It was noted that there are unintended consequences of active-shooter and live-crisis drills and best practices are needed to ensure these drills do not cause psychological harm for children. Traumatic events (including sexual abuse, doemstic violence, elder abuse, and combat trauma) are associated with long-term physical and pshychological effects. One amendment offered noted that ways to conduct active-shooter drills should be developmentally-appropriate instead of age-appropriate. Another amendment called for a study of the impact of these drills on the well-being of children. Your Reference Committee agrees with these amendments. Therefore, your Reference Committee recommends that Resolution 441 be adopted as amended. The title was changed to reflect the inclusion of live-crisis drills.

(35) RESOLUTION 443 – ADDRESSING THE LONGITUDINAL HEALTHCARE NEEDS OF AMERICAN INDIAN CHILDREN IN FOSTER CARE

RECOMMENDATION A:

That the first Resolve of Resolution 443 be amended by addition and deletion to read as follows:

RESOLVED, The AMA recognizes the Indian Child Welfare Act of 1978 as a ~~the gold standard~~ model in American Indian and Alaska Native child welfare legislation;

RECOMMENDATION B:

Resolution 443 be adopted as amended.

HOD ACTION: Resolution 443 adopted as amended.

RESOLVED, The AMA recognizes the Indian Child Welfare Act of 1978 as the gold standard in child welfare legislation; and be it further
RESOLVED, The AMA supports federal legislation preventing the removal of American Indian and Alaska Native children from their homes by public and private agencies without cause; and be it further
RESOLVED, The AMA will work with local and state medical societies and other relevant stakeholders to support legislation preventing the removal of American Indian and Alaska

Native children from their homes by public and private agencies without cause; and be it further

RESOLVED, The AMA supports state and federal funding opportunities for American Indian and Alaska Native child welfare systems.

Your Reference Committee heard testimony in support of Resolution 443. The foundational principles of the tribal welfare systems are of great importance in order for children to maintain their cultural identity. Furthermore, it was stated that disruption from family, culture and community is traumatizing for children. The United States Supreme Court is currently reviewing a Fifth Circuit Court of Appeals' decision, in a case challenging the constitutionality of the Indian Child Welfare Act (ICWA), so we recognize this resoultion is timely. However, your Reference Committee was uncomfortable with the term "gold standard" in reference to the ICWA and instead suggests referring to it as a model in child welfare legislation. Your Reference Committee recommends that Resolution 443 be adopted as amended.

RECOMMENDED FOR ADOPTION IN LIEU OF

(36) RESOLUTION 420 – DECLARING CLIMATE CHANGE A PUBLIC HEALTH CRISIS
RESOLUTION 430 – LONGITUDINAL CAPACITY-BUILDING TO ADDRESS CLIMATE ACTION AND JUSTICE

RECOMMENDATION:

Alternate Resolution 420 <u>be adopted lieu of Resolution 420 and Resolution 430</u>.

DECLARING CLIMATE CHANGE A PUBLIC HEALTH CRISIS

RESOLVED, That our American Medical Association declare climate change a public health crisis that threatens the health and well-being of all individuals (Directive to Take Action); and be it further

RESOLVED, That our AMA protect patients by advocating for policies that: (1) limit global warming to no more than 1.5 degrees Celsius, (2) reduce US greenhouse gas emissions aimed at carbon neutrality by 2050, and (3) support rapid implementation and incentivization of clean energy solutions and significant investments in climate resilience through a climate justice lens (Directive to Take Action); and be it further

RESOLVED, That our AMA develop a strategic plan for how we will enact our climate change policies including advocacy priorities and strategies to decarbonize physician practices and the health sector with report back to the House of Delegates at the 2023 Annual Meeting. (Directive to Take Action)

HOD ACTION: Alternate Resolution 420 <u>adopted in lieu of Resolution 420 and Resolution 430</u>.

Resolution 420
RESOLVED, That our American Medical Association declare climate change a public health crisis that threatens the health and well-being of all individuals (Directive to Take Action); and be it further
RESOLVED, That our AMA protect patients by advocating for policies that: (1) limit global warming to no more than 1.5 degrees Celsius, (2) reduce US greenhouse gas emissions, and (3) achieve a reduced-emissions economy (Directive to Take Action); and be it further

RESOLVED, That our AMA develop a strategic plan for how we will enact our climate change policies including advocacy priorities and strategies to decarbonize physician practices and the health sector with report back to the House of Delegates at the 2023 Annual Meeting. (Directive to Take Action)

Resolution 430
RESOLVED, That our American Medical Association: (1) Declare climate change an urgent public health emergency that threatens the health and well-being of all individuals; (2) Aggressively advocate for prompt passage of legislation and policies that limit global warming to no more than 1.5 degrees Celsius over pre-industrial levels and address the health and social impacts of climate change through rapid reduction in greenhouse gas emissions aimed at carbon neutrality by 2050, rapid implementation and incentivization of clean energy solutions, and significant investments in climate resilience through a climate justice lens; (3) Study opportunities for local, state, and federal policy interventions and advocacy to proactively respond to the emerging climate health crisis and advance climate justice with report back to the House of Delegates; and (4) Consider the establishment of a longitudinal task force or organizational unit within the AMA to coordinate and strengthen efforts toward advocacy for an equitable and inclusive transition to a net-zero carbon society by 2050, with report back to the House of Delegates. (Directive to Take Action)

Your Reference Committee heard testimony in strong support of Resolutions 420 and 430. Testimony noted that this is the “fight of our lives” and there is no better place to invest resources. The Council on Science and Public Health noted several activities the AMA is already engaged in to address the climate crisis and efforts to achieve decarbonization of the health sector. The Board noted that task forces are not necessarily the best approach or most effective mechanism for prompt action and ask for flexibility to accomplish the goal. Your Reference Committee believes that calling on the AMA to develop a strategic plan around climate change, with consideration for a task force, is the best approach to accomplish the intended goal and therefore recommends adoption of Alternate Resolution 420.

(37) RESOLUTION 423 – AWARENESS CAMPAIGN FOR 988 NATIONAL SUICIDE PREVENTION LIFELINE

RECOMMENDATION:

That Alternate Resolution 423 be <u>adopted in lieu of Resolution 423</u>.

RESOLVED, That our AMA: (1) utilize their existing communications channels to educate the physician community and the public on the new 9-8-8 National Suicide Prevention Lifeline program and (2) work with the Federation and other stakeholders to advocate for adequate federal and state funding for the 9-8-8 system, and (3) collaborate with the Substance Abuse and Mental Health Services Administration and the 9-8-8 partner community to strengthen suicide prevention and mental health crisis services.

HOD ACTION: Alternate Resolution 423 <u>adopted in lieu of Resolution 423</u>.

RESOLVED, That our American Medical Association utilize their existing communications channels to educate the physician community and the public on the new 9-8-8 program. (Directive to Take Action)

Testimony presented was in strong support of this resolution. It was recognized that the 9-8-8 program will depend on awareness of its existence as well as funding of the program. It was noted that to date only a handful of state have provided the needed funding. Amendments, which were supported by the authors, called for the AMA to advocate for federal and state funding for the 9-8-8 program as well as to collaborate with SAMHSA and the broader 9-8-8 partner community. Your Reference Committee agrees with these suggestions and recommends Alternate Resolution 423 be adopted.

(38) RESOLUTION 437 – AIR POLLUTION AND COVID: A CALL TO TIGHTEN REGULATORY STANDARDS FOR PARTICULATE MATTER

RECOMMENDATION:

That Policies H-135.946, "Protective NAAQS Standard for Fine Particulate Matter (PM 2.5)" and D-135.978, "978 Protective NAAQS Standard for Particulate Matter (PM 2.5 & PM 10)" be <u>reaffirmed in lieu of Resolution 437</u>.

HOD ACTION: That Policies H-135.946, "Protective NAAQS Standard for Fine Particulate Matter (PM 2.5)" and D-135.978, "978 Protective NAAQS Standard for Particulate Matter (PM 2.5 & PM 10)" <u>reaffirmed in lieu of Resolution 437.</u>

RESOLVED, That our American Medical Association AMA advocate for stronger federal particulate matter air quality standards than currently in place and improved enforcement that will better protect the public's health. (Directive to Take Action)

Testimony presented was supportive of Resolution 437, stating that deaths attributable to air pollution would be much reduced with more stringent air quality measures. It was also noted that the Environmental Protecton Agency expects to issue proposed rulemaking on this issue in Summer 2022 and this resolution will ensure that the AMA weighs in. However, the Council on Science and Public Health noted that existing policy already establishes protective National Ambient Air Quality Standards (NAAQS) for fine particulate matter and directs the AMA to review the proposal and offer comments. It was noted that the proposed resolution was vague compared to existing policy. Your Reference Committee agrees and therefore, recommends reaffirmation of existing policy in lieu of Resolution 437.

Policies recommended for reaffirmation:

H-135.946 Protective NAAQS Standard for Fine Particulate Matter (PM 2.5)
Our AMA supports more stringent air quality standards for particulate matter. We specifically request a NAAQS that provides improved protection for our patients which includes:

- 12 µg/m3 for the average annual standard
- 25 µg/m3 for the 24-hour standard
- 99th percentile used for compliance determination.

D-135.978 Protective NAAQS Standard for Particulate Matter (PM 2.5 & PM 10)
At such time as a new EPA Proposed Rule on National Ambient Air Quality Standards for Particulate Matter is published, our AMA will review the proposal and be prepared to offer its support for comments developed by the American Thoracic Society and its sister organizations.

RECOMMENDED FOR REFERRAL

(39) BOARD OF TRUSTEES REPORT 15 – ADDRESSING PUBLIC HEALTH DISINFORMATION

RECOMMENDATION:

That the Board of Trustees Report 15 be referred.

HOD ACTION: Board of Trustees Report 15 adopted.

The Board of Trustees recommends that the following be adopted, and the remainder of this report be filed.

1. That Policy D-440.914, "Addressing Public Health Disinformation Disseminated by Health Professionals," be amended by addition and deletion to read as follows:
Our AMA will: (1) collaborate with relevant health professional societies and other stakeholders: (a) on efforts to combat public health disinformation disseminated by health professionals in all forms of media, ~~and~~ (b) ~~to~~ address disinformation that undermines public health initiatives ~~by~~, and (c) implement a comprehensive strategy to address health-related disinformation disseminated by health professionals that includes:
(1) Maintaining AMA as a trusted source of evidence-based information for physicians and patients.
(2) Ensuring that evidence-based medical and public health information is accessible by engaging with publishers, research institutions and media organizations to develop best practices around paywalls and preprints to improve access to evidence-based information and analysis.
(3) Addressing disinformation disseminated by health professionals via social media platforms and addressing the monetization of spreading disinformation on social media platforms.
(4) Educating health professionals and the public on how to recognize disinformation as well as how it spreads.
(5) Considering the role of health professional societies in serving as appropriate fact-checking entities for health-related information disseminated by various media platforms.
(6) Encouraging continuing education to be available for health professionals who serve as fact-checker to help prevent the dissemination of health-related disinformation.
(7) Ensuring licensing boards have the authority to take disciplinary action against health professionals for spreading health-related disinformation and affirms that all speech in which a health professional is utilizing their credentials is professional conduct and can be scrutinized by their licensing entity.
(8) Ensuring specialty boards have the authority to take action against board certification for health professionals spreading health-related disinformation.
(9) Encouraging state and local medical societies to engage in dispelling disinformation in their jurisdictions.; ~~and~~
~~(2) study disinformation disseminated by health professionals and its impact on public health and present a comprehensive strategy to address this issue with a report back at the next meeting of the House of Delegates~~. (Modify Current HOD Policy)

2. That Policies D-440.914, "Addressing Public Health Disinformation Disseminated by Health Professionals, "D-440.915, "Medical and Public Health Misinformation in the Age of Social

Media," and H-460.978, "Communication Among the Research Community, the Media and the Public" be reaffirmed (Reaffirm HOD Policy).

Testimony on Board of Trustees Report 15 was mixed. The report proposed a broad strategy to address the public health crisis of health-related disinformation spread by health professionals. Legitimate concerns were raised particularly around the proposed definition of "disinformation" included in the report, which specifically includes the intent to cause harm. It was noted that disinformation and misinformation are harmful, whether or not there is intent to cause harm, but the ramifications of applying one versus the other may be criminal in nature. Therefore, your Reference Committee recommends that this report be referred to the board for additional study and clarification, particularly around the definitions.

(40) RESOLUTION 416 – SCHOOL RESOURCE OFFICER VIOLENCE DE-ESCALATION TRAINING AND CERTIFICATION

RECOMMENDATION:

Resolution 416 be <u>referred</u>.

HOD ACTION: Resolution 416 <u>referred</u>.

RESOLVED, That our American Medical Association highly recommend mandatory conflict de-escalation training for all school resource officers (New HOD Policy); and be it further
RESOLVED, That our AMA actively advocate to the National Association of School Resource Officers to develop a program for certification of School Resource Officers including but not limited to violence de-escalation training requirements, expiration date, renewal continuing education requirements and a revocation procedure in the rare event of misconduct. (Directive to Take Action)

Your Reference Committee heard mixed testimony of Resolution 416. There was supportive testimony of the first resolve clause noting that mandatory conflict de-escalation training is needed and not all school resource officers across the country currently receive this nationally recognized basic and advanced training. One comment noted that rather than a certification program for school resource officers, best practice guidelines should be developed as a "one-size" certification may not fit the needs of all individual school districts. Most testimony in opposition stated that the second resolve clause needs further study to understand its efficacy and therefore supported referral. Your Reference Committee agreed with this testimony noting that it is unknown if current de-escalation training is evidence-based, and this issue is to complex and should be studied. Therefore, your Reference Committee recommends that Resolution 416 be referred.

RECOMMENDED FOR NOT ADOPTION

(41) RESOLUTION 402 – SUPPORT FOR IMPAIRMENT RESEARCH

RECOMMENDATION:

Resolution 402 not be adopted.

HOD ACTION: Resolution 402 not adopted.

RESOLVED, That our American Medical Association study the impairment of drivers and other operators of mechanized vehicles by substances, fatigue, medical or mental health conditions, and that this report include whether there are office or hospital-based methods to efficiently and effectively assess impairment of drivers with recommendations for further research that may be needed. (Directive to Take Action)

Your Reference Committee heard significant testimony on the complexity of this issue. It was recommended that impairment evaluations be handled by specialists in that field rather than physicians. Concerns surrounding liability were also highlighted. The Council on Science and Public Health questioned the broad scope of the study. Given these concerns, your Reference Committee recommends that Resolution 402 not be adopted.

.

(42) RESOLUTION 435 – SUPPORT REMOVAL OF BMI AS A STANDARD MEASURE IN MEDICINE AND RECOGNIZING CULTURALLY-DIVERSE AND VARIED PRESENTATIONS OF EATING DISORDERS

RECOMMENDATION:

That Resolution 435 be not adopted.

HOD ACTION: Resolution 435 referred.

RESOLVED, That our American Medical Association recognize the significant limitations and potential harms associated with the widespread use of body mass index (BMI) in clinical settings and supports its use only in a limited screening capacity when used in conjunction with other more valid measures of health and wellness (Directive to Take Action); and be it further

RESOLVED, That our AMA support the use of validated, easily obtained alternatives to BMI (such as relative fat mass, body adiposity index, and the body volume index) for estimating risk of weight-related disease (New HOD Policy); and be it further

RESOLVED, That our AMA amend policy H-440.866, "The Clinical Utility of Measuring Body Mass Index and Waist Circumference in the Diagnosis and Management of Adult Overweight and Obesity," by addition and deletion to read as follows:

The Clinical Utility of Measuring ~~Body Mass Index~~ Weight, Adiposity, and Waist Circumference in the Diagnosis and Management of Adult Overweight and Obesity, H-440.866 Our AMA supports:

(1) greater emphasis in physician educational programs on the risk differences ~~among ethnic and age~~ within and between demographic groups at varying weights and levels of adiposity

~~BMI~~ and the importance of monitoring waist circumference in all individuals ~~with BMIs below 35 kg/m2~~;
(2) additional research on the efficacy of screening for overweight and obesity, using different indicators, in improving various clinical outcomes across populations, including morbidity, mortality, mental health, and prevention of further weight gain; and
(3) more research on the efficacy of screening and interventions by physicians to promote healthy lifestyle behaviors, including healthy diets and regular physical activity, in all of their patients to improve health and minimize disease risks. (Modify Current HOD Policy); and be it further
RESOLVED, That our AMA amend policy H-150.965, by addition to read as follows in order to support increased recognition of disordered eating behaviors in minority populations and culturally appropriate interventions:
H-150.965 – EATING DISORDERS
The AMA (1) adopts the position that overemphasis of bodily thinness is as deleterious to one's physical and mental health as obesity; (2) asks its members to help their patients avoid obsessions with dieting and to develop balanced, individualized approaches to finding the body weight that is best for each of them; (3) encourages training of all school-based physicians, counselors, coaches, trainers, teachers and nurses to recognize unhealthy eating, binge-eating, dieting, and weight restrictive behaviors in adolescents and to offer education and appropriate referral of adolescents and their families for culturally-informed interventional counseling; and (4) participates in this effort by consulting with appropriate and culturally informed educational and counseling materials pertaining to unhealthy eating, binge-eating, dieting, and weight restrictive behaviors. (Modify Current HOD Policy)

Your Reference Committee heard substantial testimony in opposition to the removal of Body Mass Index (BMI) as a standard measure in clinical practice. While it is acknowledged that BMI is an imperfect measure whose racist derivation justifies the resolution's intent, it was noted that without a better measure to replace it, removing BMI would have unintended consequences and adverse impacts on patients' health care given the widespread use of BMI in many formulas. This is a complex issue. As such, your Reference Committee recommends referring it to the proposed obesity task force to address, recommending they take on all of the issues identified in the resolution, including, but not limited to, psychiatric, metabolic, and other conditions. Therefore, your Reference Committee recommends that Resolution 435 be not adopted.

Madam Speaker, this concludes the report of Reference Committee D. I would like to thank Jade A. Anderson, MD; Nicolas Argy, MD, JD, Man-Kit Leung, MD, Jean R. Hausheer, MD, Laurel Ries, MD, and Sherif Z. Zaafran, MD; all those who testified before the Committee as well as our AMA staff, Andrea Garcia, Delaney Pannier, Karen Reinbold, and Mary Soliman.

Jade A. Anderson, MD
Resident & Fellows Section

Jean R. Hausheer, MD, FACS
Oklahoma State Medical Association

Nicolas Argy, MD, JD
Massachusetts Medical Society

Laurel Ries, MD (Alternate)
Minnesota Medical Association

Man-Kit Leung, MD
California Medical Association

Sherif Z. Zaafran, MD (Alternate)
Texas Medical Association

Ankush K. Bansal, MD
Florida Medical Association
Chair

Exhibit 3

Overburdened Community Stressor Summary

Block Group: 340130074001 **Municipality: Newark City** **County: Essex** **OBC Criteria: Minority**

Combined Stressor Total	
Block Group Value: Combined Stressor Total	**21**
Greatest Stressed OBC Neighbor CST Value if applicable	**NA**
County	15
State	13
Geographic Point of Comparison	**13**
Adverse Cumulative Stressors	**Higher than 50th Percentile**

Concentrated Areas of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Ground-Level Ozone (3-year average days above standard)	**1.221**	0.333	0.589	**0.333**	**Yes**
Fine Particulate Matter ($PM_{2.5}$) (3-year average days above standard)	**0.704**	1.026	0.737	**0.737**	**No**
Cancer Risk from Diesel Particulate Matter (estimated cancer risk/million)	**230.855**	144.440	82.081	**82.081**	**Yes**
Cancer Risk from Air Toxics Excluding Diesel Particulate Matter (estimated cancer risk/million)	**54.010**	47.463	37.520	**37.520**	**Yes**
Non-Cancer Risk from Air Toxics (Combined Hazard Quotient)	**4.101**	2.994	1.649	**1.649**	**Yes**

Mobile Sources of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Traffic – Cars, Light- and Medium-Duty Trucks (Annual Average Daily Traffic (AADT)-mile/square mile)	**234,765.775**	37,895.931	23,035.121	**23,035.121**	**Yes**
Traffic – Heavy-Duty Trucks (AADT-mile/square mile)	**25,220.374**	233.567	403.339	**233.567**	**Yes**
Railways (rail mile/square mile)	**1.523**	0.000	0.000	**0.000**	**Yes**

Contaminated Sites					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Known Contaminated Sites (weighted sites/square mile)	**39.944**	5.187	1.784	**1.784**	**Yes**
Soil Contamination Deed Restrictions (percent area)	**19.442**	0.000	0.000	**0.000**	**Yes**
Ground Water Classification Exception Area/Currently Known Extent Restrictions (percent area)	**37.134**	0.000	0.000	**0.000**	**Yes**

Transfer Stations, or Other Solid Waste Facilities, Recycling Facilities, Scrap Metal Facilities					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Solid Waste Facilities (sites/square mile)	**0.429**	0.000	0.000	**0.000**	**Yes**
Scrap Metal Facilities (sites/square mile)	**4.361**	0.000	0.000	**0.000**	**Yes**

Point-Sources of Water Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Surface Water (percent of uses impaired)	**74.342**	85.064	91.937	**85.064**	**No**
Combined Sewer Overflows (count)	**0.000**	NA	NA	**NA**	**No**

May Cause Potential Public Health Impacts					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Drinking Water (count of public drinking water violations or exceedances, or percent of private well testing exceedances)	**1**	NA	NA	**NA**	**Yes**
Potential Lead Exposure (percent houses older than 1950)	**0.000**	51.761	14.217	**14.217**	**No**
Lack of Recreational Open Space (population/acre of open space within 0.25 mile)	**7,652.000**	25.271	18.727	**18.727**	**Yes**
Lack of Tree Canopy (percent lack of tree canopy)	**93.083**	60.295	61.247	**60.295**	**Yes**
Impervious Surface (percent impervious surface)	**90.271**	40.686	34.734	**34.734**	**Yes**
Flooding (Urban Land Cover) (percent urban land use area flooded)	**86.159**	0.714	2.378	**0.714**	**Yes**

Density/Proximity Stressors					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Emergency Planning Sites (sites/square mile)	**1.991**	0.179	0.038	**0.038**	**Yes**
Permitted Air Sites (sites/square mile)	**3.289**	1.477	0.775	**0.775**	**Yes**
NJPDES Sites (sites/square mile)	**0.133**	0.028	0.000	**0.000**	**Yes**

Social Determinants of Health					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Unemployment (percent unemployed)	**0.000**	4.277	3.798	**3.798**	**No**
Education (percent without high school diploma)	**36.792**	1.760	3.125	**1.760**	**Yes**

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Data Source: Environmental Justice (EJ) Law Combined Stressor Summary for New Jersey, published 7/31/2024

Exhibit 4

Overburdened Community Stressor Summary

Block Group: 340139801001 **Municipality: Newark City** **County: Essex** **OBC Criteria: Low Income and Minority**

Combined Stressor Total	
Block Group Value: Combined Stressor Total	**23**
Greatest Stressed OBC Neighbor CST Value if applicable	**NA**
County	15
State	13
Geographic Point of Comparison	**13**
Adverse Cumulative Stressors	**Higher than 50th Percentile**

Concentrated Areas of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Ground-Level Ozone (3-year average days above standard)	**0.333**	0.333	0.589	**0.333**	**No**
Fine Particulate Matter ($PM_{2.5}$) (3-year average days above standard)	**1.000**	1.026	0.737	**0.737**	**Yes**
Cancer Risk from Diesel Particulate Matter (estimated cancer risk/million)	**232.029**	144.440	82.081	**82.081**	**Yes**
Cancer Risk from Air Toxics Excluding Diesel Particulate Matter (estimated cancer risk/million)	**59.315**	47.463	37.520	**37.520**	**Yes**
Non-Cancer Risk from Air Toxics (Combined Hazard Quotient)	**5.687**	2.994	1.649	**1.649**	**Yes**

Mobile Sources of Air Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Traffic – Cars, Light- and Medium-Duty Trucks (Annual Average Daily Traffic (AADT)-mile/square mile)	**254,900.450**	37,895.931	23,035.121	**23,035.121**	**Yes**
Traffic – Heavy-Duty Trucks (AADT-mile/square mile)	**14,462.593**	233.567	403.339	**233.567**	**Yes**
Railways (rail mile/square mile)	**4.059**	0.000	0.000	**0.000**	**Yes**

Contaminated Sites					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Known Contaminated Sites (weighted sites/square mile)	**45.696**	5.187	1.784	**1.784**	**Yes**
Soil Contamination Deed Restrictions (percent area)	**6.876**	0.000	0.000	**0.000**	**Yes**
Ground Water Classification Exception Area/Currently Known Extent Restrictions (percent area)	**5.946**	0.000	0.000	**0.000**	**Yes**

Transfer Stations, or Other Solid Waste Facilities, Recycling Facilities, Scrap Metal Facilities					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Solid Waste Facilities (sites/square mile)	**0.152**	0.000	0.000	**0.000**	**Yes**
Scrap Metal Facilities (sites/square mile)	**2.382**	0.000	0.000	**0.000**	**Yes**

Point-Sources of Water Pollution					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Surface Water (percent of uses impaired)	**100.000**	85.064	91.937	**85.064**	**Yes**
Combined Sewer Overflows (count)	**1.000**	NA	NA	**NA**	**Yes**

May Cause Potential Public Health Impacts					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Drinking Water (count of public drinking water violations or exceedances, or percent of private well testing exceedances)	**1**	NA	NA	**NA**	**Yes**
Potential Lead Exposure (percent houses older than 1950)	**0.000**	51.761	14.217	**14.217**	**No**
Lack of Recreational Open Space (population/acre of open space within 0.25 mile)	**7,652.000**	25.271	18.727	**18.727**	**Yes**
Lack of Tree Canopy (percent lack of tree canopy)	**86.342**	60.295	61.247	**60.295**	**Yes**
Impervious Surface (percent impervious surface)	**67.099**	40.686	34.734	**34.734**	**Yes**
Flooding (Urban Land Cover) (percent urban land use area flooded)	**88.748**	0.714	2.378	**0.714**	**Yes**

Density/Proximity Stressors					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Emergency Planning Sites (sites/square mile)	**1.111**	0.179	0.038	**0.038**	**Yes**
Permitted Air Sites (sites/square mile)	**3.480**	1.477	0.775	**0.775**	**Yes**
NJPDES Sites (sites/square mile)	**0.046**	0.028	0.000	**0.000**	**Yes**

Social Determinants of Health					
Stressor	**Block Group Value**	County Non OBC 50th	State Non OBC 50th	**Geographic Point of Comparison**	**Adverse Stressor**
Unemployment (percent unemployed)	**0.000**	4.277	3.798	**3.798**	**No**
Education (percent without high school diploma)	**26.430**	1.760	3.125	**1.760**	**Yes**

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Data Source: Environmental Justice (EJ) Law Combined Stressor Summary for New Jersey, published 7/31/2024

Exhibit 5

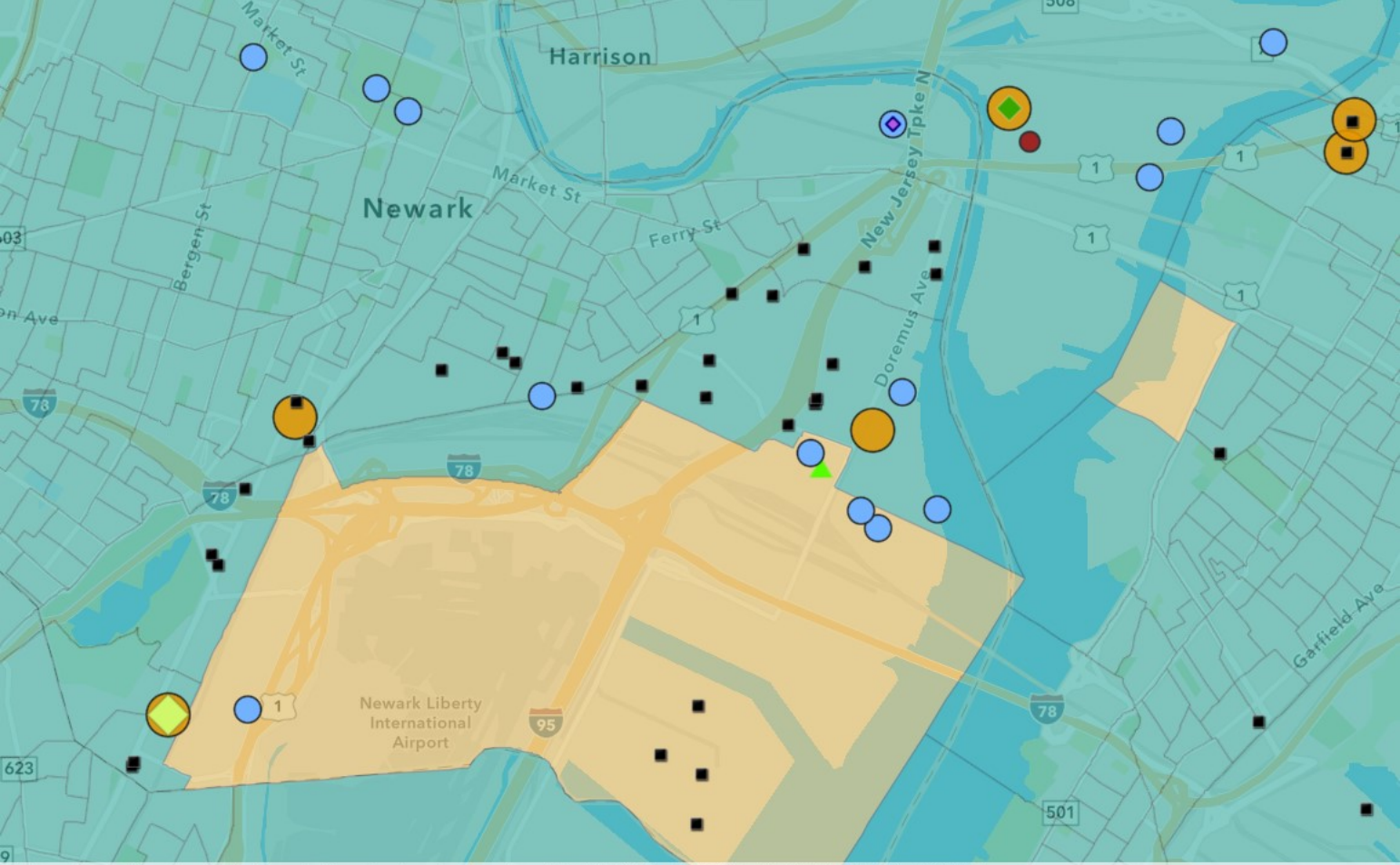

Harrison
Newark
Market St
Market St
Ferry St
Bergen St
New Jersey Tpke N
Doremus Ave
Garfield Ave
Newark Liberty International Airport
78
78
78
95
1
1
1
1
1
623
501
508

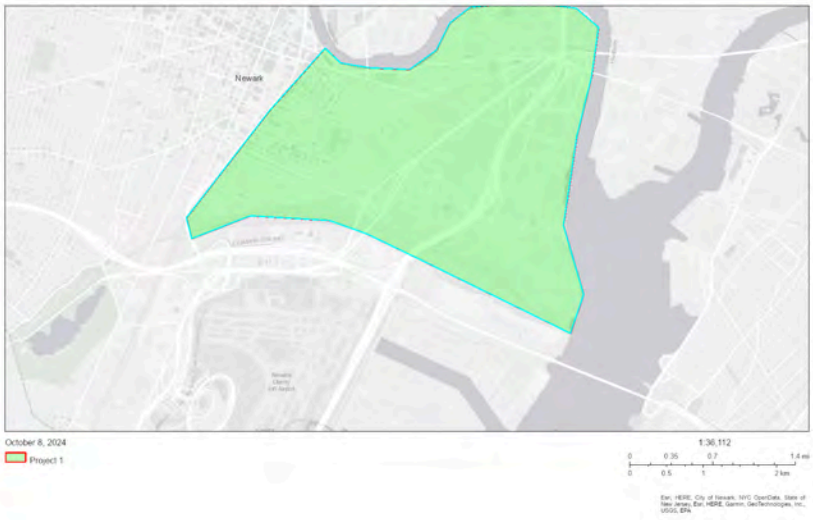
Exhibit 6

EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Newark, NJ

the User Specified Area
Population: 59,555
Area in square miles: 5.31



LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
English	15%
Spanish	47%
Other Indo-European	37%
Total Non-English	85%

COMMUNITY INFORMATION

- Low income: 48 percent
- People of color: 74 percent
- Less than high school education: 28 percent
- Limited English households: 44 percent
- Unemployment: 9 percent
- Persons with disabilities: 16 percent
- Male: 54 percent
- Female: 46 percent
- 80 years — Average life expectancy
- N/A — Per capita income
- Number of households: 20,376
- Owner occupied: 18 percent

BREAKDOWN BY RACE

- White: 26%
- Black: 7%
- American Indian: 0%
- Asian: 1%
- Hawaiian/Pacific Islander: 0%
- Other race: 9%
- Two or more races: 7%
- Hispanic: 50%

BREAKDOWN BY AGE

From Ages 1 to 4	6%
From Ages 1 to 18	23%
From Ages 18 and up	77%
From Ages 65 and up	8%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	50%
Speak Other Indo-European Languages	49%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2018-2022. Life expectancy data comes from the Centers for Disease Control.

Report for the User Specified Area
Report produced October 8, 2024 using EJScreen Version 2.3

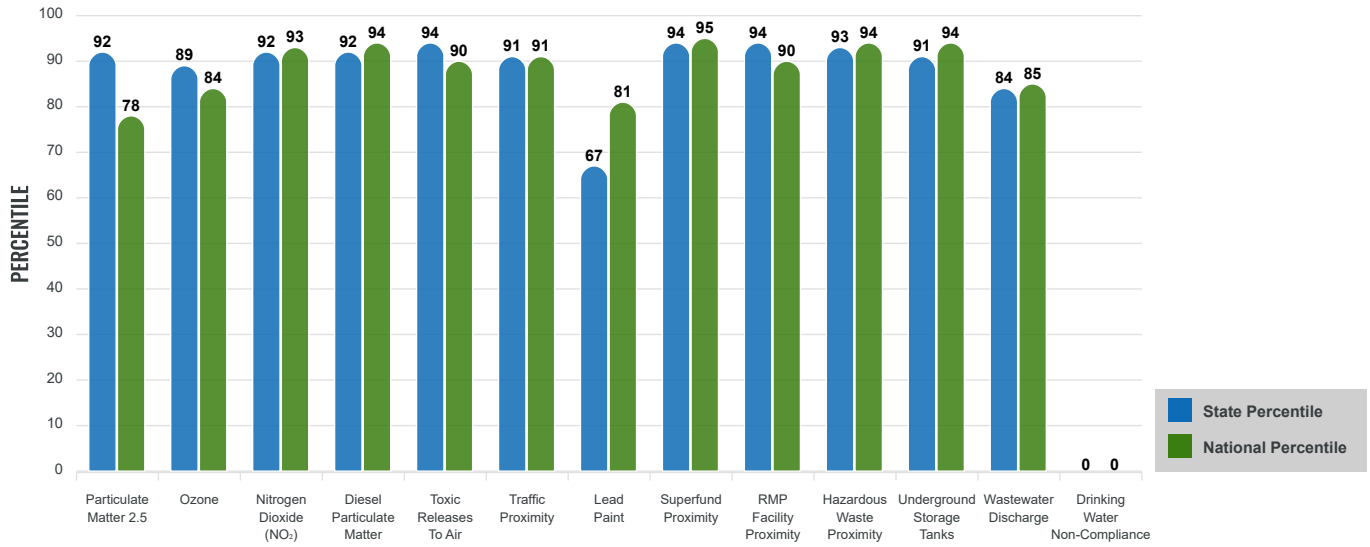
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

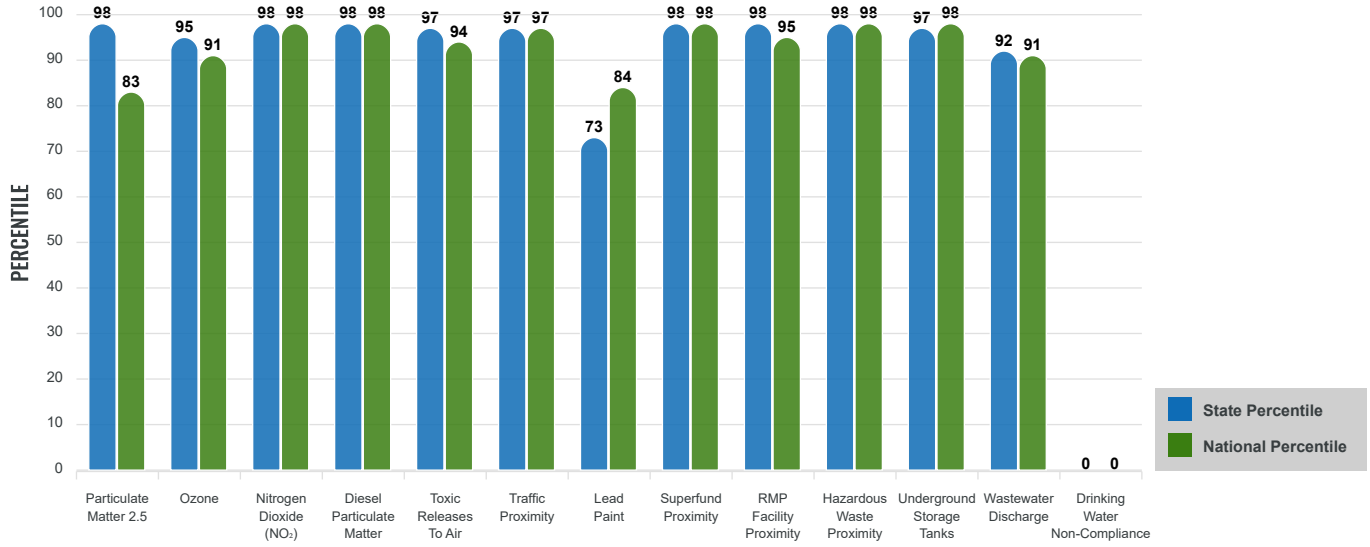
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low income, percent persons with disabilities, percent less than high school education, percent limited English speaking, and percent low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



Report for the User Specified Area

Report produced October 8, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
ENVIRONMENTAL BURDEN INDICATORS					
Particulate Matter 2.5 ($\mu g/m^3$)	8.19	7.64	87	8.45	51
Ozone (ppb)	62.6	61.4	72	61.8	61
Nitrogen Dioxide (NO_2) (ppbv)	16	9	93	7.8	97
Diesel Particulate Matter ($\mu g/m^3$)	0.5	0.282	92	0.191	95
Toxic Releases to Air (toxicity-weighted concentration)	2,600	1,100	95	4,600	77
Traffic Proximity (daily traffic count/distance to road)	3,600,000	1,600,000	90	1,700,000	86
Lead Paint (% Pre-1960 Housing)	0.27	0.43	33	0.3	56
Superfund Proximity (site count/km distance)	4.8	1.6	94	0.39	98
RMP Facility Proximity (facility count/km distance)	1.2	0.38	92	0.57	84
Hazardous Waste Proximity (facility count/km distance)	18	5.9	94	3.5	95
Underground Storage Tanks (count/km^2)	61	15	96	3.6	99
Wastewater Discharge (toxicity-weighted concentration/m distance)	420	3400	67	700000	67
Drinking Water Non-Compliance (points)	0	2.7	0	2.2	0
SOCIOECONOMIC INDICATORS					
Demographic Index USA	2.25	N/A	N/A	1.34	83
Supplemental Demographic Index USA	2.76	N/A	N/A	1.64	93
Demographic Index State	2.39	1.29	85	N/A	N/A
Supplemental Demographic Index State	2.77	1.32	95	N/A	N/A
People of Color	74%	46%	76	40%	80
Low Income	48%	21%	88	30%	80
Unemployment Rate	8%	6%	72	6%	76
Limited English Speaking Households	44%	7%	98	5%	98
Less Than High School Education	28%	9%	93	11%	90
Under Age 5	6%	5%	59	5%	58
Over Age 64	8%	17%	18	18%	18

*Diesel particulate matter index is from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 2
Hazardous Waste, Treatment, Storage, and Disposal Facilities 6
Water Dischargers 179
Air Pollution 187
Brownfields 17
Toxic Release Inventory 72

Other community features within defined area:

Schools 8
Hospitals 1
Places of Worship 19

Other environmental data:

Air Non-attainment ..... Yes
Impaired Waters ..... Yes

Selected location contains American Indian Reservation Lands* ..... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community ..... Yes
Selected location contains an EPA IRA disadvantaged community ..... Yes

Report for the User Specified Area

Report produced October 8, 2024 using EJScreen Version 2.3

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	18%	18%	50	20%	34
Heart Disease	5.1	5.2	51	5.8	37
Asthma	10.6	9.5	83	10.3	61
Cancer	4.3	6.5	9	6.4	11
Persons with Disabilities	16.4%	10.8%	88	13.7%	71

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	37%	11%	92	12%	93
Wildfire Risk	0%	6%	0	14%	0

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	25%	9%	91	13%	85
Lack of Health Insurance	42%	7%	99	9%	99
Housing Burden	Yes	N/A	N/A	N/A	N/A
Transportation Access Burden	Yes	N/A	N/A	N/A	N/A
Food Desert	Yes	N/A	N/A	N/A	N/A

Report for the User Specified Area

Report produced October 8, 2024 using EJScreen Version 2.3

Exhibit 7

NEW JERSEY SENATE

MAJORITY LEADER
M. TERESA RUIZ
SENATOR, 29TH DISTRICT
166 BLOOMFIELD AVENUE
NEWARK, NJ 07104
TEL. 973-484-1000
FAX. 973-484-1008
senruiz@njleg.org

COMMITTEES:
VICE CHAIR, LEGISLATIVE OVERSIGHT
BUDGET

July 19, 2024

Passaic Valley Sewerage Commissioners,

We, the undersigned community groups and elected officials, are writing to urge you to withdraw your permit application to build a toxic backup power station in the already overburdened Ironbound neighborhood.

The Ironbound neighborhood is a 4-square mile overburdened, low-income, black and brown community that already hosts 3 fossil-fuel power plants, a 17-mile superfund site, and the state's largest incinerator and waste treatment facility. A proposal to add a 4th power plant, a power plant for every square mile of the community, is a gross and racist act of environmental injustice on the Ironbound and Newark community. Overburdened communities like the Ironbound have suffered enough from the effects of environmental racism that have facilitated the siting of toxic and polluting facilities right next to homes, schools, places of worship, and more. An addition of a 4th power plant is a blatant sacrifice of the health of black and brown Ironbound residents and the Newark community, for the "greater good".

Since the power outages and sewage overflow caused by Superstorm Sandy in 2012, Newark has faced record rainfall and flooding during more recent Hurricanes such as Ida, and power reliability has been maintained. New Jersey Transit's TransitGrid project, which proposed a similar backup power plant, was canceled because of the conclusion that it was no longer needed given billion dollar investments by public utilities to harden the grid. We have repeatedly asked PVSC to explore truly clean alternatives for backup power, like solar and battery storage, and revisit the decade old assessment that is used as justification for why clean alternatives would be inefficient.

PVSC's proposal to build a 4th power plant in the Ironbound disregards community health and places the burden on the backs of the already overburdened community. Since 2014 when this proposal was made public, community members and groups have voiced their opposition and concerns to this proposal in numerous ways. Thousands of testimonies have been made during

PVSC's monthly meetings, comments and letters have been sent in shaming this proposal as a disregard for Environmental Justice. On April 20th, 2024 over 150 people showed up to Ironbound Community Corporation (ICC)'s March for Clean Air to march against PVSC's proposal of a 4th power plant.

We, as elected leaders representing Districts 29 and 28, alongside the strong support of community groups and fellow elected officials, express profound disappointment in this decision. In light of the urgent challenges posed by climate change, unprecedented heat waves, and the growing availability of clean energy alternatives, we find it morally irresponsible for PVSC to advance a project of this nature. The Ironbound is categorized as an "overburdened community" by the New Jersey Department of Environmental Protection (NJDEP) and the proposed project, that NJDEP has admitted will increase air pollutants and exacerbate cumulative health stressors, is a blatant disregard for the Environmental Justice Law in New Jersey.

In conclusion, leaders from Districts 29 & 28, alongside numerous community groups, allies, and elected officials, urge the PVSC Board of Commissioners to reconsider and withdraw their proposal. The construction of a fourth power plant in the Ironbound neighborhood is unjust and unnecessary, exacerbating existing environmental burdens and health risks. We demand that PVSC prioritize environmental justice and abandon this project immediately. The health and future of Newark, Essex County, and New Jersey depend on making responsible and equitable decisions regarding our communities' well-being.

Sincerely,

M. Teresa Ruiz
Senate Majority Leader- District 29

Renee C. Burgess
Renee C. Burgess
Senator – District 28

Eliana Pintor Marin
Assemblywoman - District 29

Garnet R. Hall
Assemblywoman – District 28

Shanique Speight
Assemblywoman – District 29

Cleopatra G. Tucker
Cleopatra G. Tucker
Assemblywoman – District 28

Joseph DiVincenzo Jr.
Essex County Executive

Ras J. Baraka
Ras J. Baraka
Mayor City of Newark

LaMonica McIver
Council President

Michael J. Silva
Michael J. Silva
East Ward Council Member

Anibal Ramos Jr.
Anibal Ramos Jr.
North Ward Council Member

Dupré Kelly
Dupre L Kelly
West Ward Council Member

Patrick O. Council
Patrick O. Council
South Ward Council Member

Louise Scott-Rountree
Louise Scott-Rountree
Council Member at Large

Carlos M. Gonzalez
Carlos M. Gonzalez
Council Member at Large

Luis A. Quintana
Luis A. Quintana
Council Member at Large

C. Lawrence Crump
C. Lawrence Crump
Council Member at Large

Organizations:
Alternatives for Community and Environments
Chief Mann
Clean Water Action
Delaware Riverkeeper Network
Divest New Jersey Coalition
Don't Gas the Meadowlands
EarthJustice
Empower NJ
Environment New Jersey
Fair Share Housing
First Congregational Church of Montclair
Food and Water Watch
Greater Newark HUD Tenants Coalition
GreenFaith
Homes for All Newark
Housing and Community Development Network of New Jersey
Ironbound Super Neighborhood Council
La Casa de Don Pedro
League of Women Voters of New Jersey
Masakhane Center
Merry Yoga
MoveOn.org Hoboken
New Jersey Alliance for Immigrant Justice
New Jersey Chapter of the Sierra Club
New Jersey CitizenAction
New Jersey Environmental Justice Alliance
New Jersey Tenants Organization
New Labor
Newark Environmental Commission
Newark Green Team
North Jersey Sierra Group
Northern NJ NOW
Pax Christi NJ
Ramapough Lunaape Nation, NJ-NY
Rev. Moacir Weirich
Reyes Grocery
Shop y Swap
South Ward Environmental Alliance
SPARK - Save the Park and Riverfront Park
St. Stephan's Grace Community
The Best Food Market
The Bruja Doula
The Curly Vegan LLC

The Wei LLC
Tishman Environment and Design Center,
The New School
Universalist Unitarian Faith Action
Water Spirit
Weequahic Park Association

Exhibit 8

FOR IMMEDIATE RELEASE
DATE 9/18/24

MEDIA CONTACT
Kimberly Jones-Wise; kimberly@faithinnewjersey.org; (732) 713-3238

An Open Letter to the Passaic Valley Sewerage Commission

Dear Members of the Passaic Valley Sewerage Commission,

As Faith in New Jersey, we write to you from a place of deep concern and moral conviction, urging you to vote 'no' on the construction of a new gas-fired power plant in Newark's East Ward. As representatives of faith communities, we are compelled to speak out against actions that harm our neighbors, particularly the most vulnerable among us. We are also compelled to remind you about the interconnectedness of us all as inhabitants of this planet and that we all have an inherent responsibility to care for our Earth.

Newark, and specifically the Ironbound neighborhood, is already one of New Jersey's most overburdened communities. The residents here, predominantly immigrants, Black and brown people, have long been exposed to disproportionate levels of industrial pollution. This has resulted in a range of severe health issues, including some of the highest rates of asthma in the state, alongside increased incidences of cardiovascular disease, diabetes, and cancer. Every day, families live under the weight of these health crises, made worse by three existing fossil fuel power plants and New Jersey's largest garbage incinerator, among other polluting facilities.

The introduction of another power plant, regardless of its purported clean energy credentials, would only exacerbate these conditions. The proposed plant's reliance on natural gas and hydrogen raises significant concerns. Hydrogen, while touted as a cleaner alternative, poses safety risks due to its potential to leak and its potential production of nitrous oxide, which is highly explosive. This is not the clean energy solution our community needs or deserves.

Our fight against this plant is part of a broader struggle against environmental racism and the prioritization of profit over people. The residents of the Ironbound have made their stance clear—they do not want or need another source of pollution in their neighborhood. This is not merely a matter of preference but of survival and dignity. They have already endured too much.

In April 2023, New Jersey's Environmental Justice Law was enacted, empowering the Department of Environmental Protection to reject permits for new facilities that would exacerbate pollution in already overburdened communities. This law was a landmark achievement, reflecting our shared commitment to protecting vulnerable populations from further harm. The proposed power plant directly contradicts the spirit and intent of this law.

Furthermore, historical context underscores the futility of constructing this plant. Eleven years ago, PVSC's facilities were overwhelmed by Superstorm Sandy. Since then, significant investments have been made to fortify existing infrastructure, ensuring resilience against future storms. PSEG's $2.1 billion investment in infrastructure hardening has demonstrated the effectiveness of preparing existing facilities rather than building new ones.

We urge you to reflect on the moral and ethical implications of this decision. As stewards of our community's well-being, it is your duty to prioritize the health and safety of the Ironbound residents over corporate interests. Better, cleaner alternatives exist that do not further endanger our neighbors or the earth which we all inhabit.

Let us choose a path of justice and compassion, upholding the values that bind us as a community. We call on you to stand with the people of Newark and vote against the construction of this power plant. At the end of the day, the fact remains that water flows and wind blows therefore any environmental pollution affects us all. But, together, we can work towards a future that is truly clean and equitable for all.

In solidarity and hope,

Charlene Walker, Executive Director, Faith in New Jersey
Rev. Paul Graves, Clearway Baptist Church Newark, NJ
Rev. Robert Clegg, New Covenant Baptist Church, Newark , NJ
Rev. Kevin Greenwood, Morning Star Baptist Church, Newark, NJ
Rev. Tamara L. Bethea, Abundant Hope Christian Center, Newark, NJ
Rev. Niles Wilson Greater Cornerstone Baptist Church, Newark, NJ
Rev. Stephanie McKay, First Mount Zion Baptist Church, Newark, NJ
Rev. Moacir Weirich, St. Stephan's Grace Community Church, Newark, N.J.
Rev. Cynthia Jackson, Allen AME Church, Newark, NJ
Rev. Amagu Zedriga Chris Aleti, St. Lucy’s Roman Catholic Church, Newark, NJ
Rev. Hallie Richardson, Mount Vernon Baptist Church, Newark, NJ
Rev. Terrence Dunlap, St. James Baptist Church, Newark, NJ
Rev. Brent Sterling, High Hope Missionary Baptist, Newark, NJ
Rev. Edward Allen, Philemon Baptist Church, Newark, NJ
Rev. Gregory Crawford, Living Waters Apostolic Ministries, Newark, NJ
Rev Camilo Cruz, St. Patrick's Pro-Cathedral & St. John’s Church, Newark, NJ
Rev. Phillip Waters, St. Mary’s Church Newark Abbey, Newark, NJ
Rev. Joseph Fairley, New Vision Church, Newark, NJ
Rev. Johnny Caldwell, New Born Baptist Church, Newark, NJ
Rev. Orlando Vick Sr., Greater Providence Missionary Baptist Church, Newark, NJ
Rev. Ralph Branch Jr., Mt. Calvary Missionary Baptist Church, Newark, NJ
Rev. Michael Thomas, New Dawn Baptist Church, Newark, NJ

Rev. Johnnie Jones, New Light Missionary Baptist Church, Newark, NJ
Rev. Tyronne Singletary, Little Friendship Missionary Baptist Church, Newark, NJ
Rev. Richard Green, The Upperroom House of Worship, Newark, NJ
Bishop Ronald L. Owens - FINJ Board President, New Hope Baptist Church, Metuchen, NJ
Bishop Wayne Johnson, Bible Way Deliverance Center, Roselle, NJ
Rabbi Joel Abraham, Board Secretary, Scotch Plains/Fanwood
Rev. Geralda Aldajuste, St. Paul United Methodist Church, Willingboro, NJ
Deacon Omar Aguilar, Our Lady of Guadalupe Shrine, Lindenwold, NJ
Bro. Saffet Catovic - FINJ Board Treasurer, Islamic Society of Central Jersey, S. Brunswick, NJ
Rev. David Ford, St. Matthews Baptist Church, Roselle, NJ
Rev. Carmine Pernini, Zion Evangelical Lutheran Church, Rahway, NJ
Rev. Barry Wise - FINJ Board Vice President, Greater Mount Moriah Baptist Church, Linden, NJ
Rev. Alphonsus Platt, Nia Fellowship, West Orange NJ
Rev. Dr. William O Henry, Everlasting Life Foundation Ministry, Paterson, NJ
Rev. Amir Khan, New Beginnings, Camden, NJ
Rev. Nyzia Easterling Saving Grace Ministries, Camden, NJ
Deacon Shawn Butler, Kaighn Avenue Baptist Church, Camden, NJ
Rev. Tim Merrill, Imani Fellowship, Camden, NJ
Rev. Spencer Rogers, Kingdom Life Fellowship, Camden, NJ
Rev. Tiffany Alston, KIngs Way International, Camden, NJ
Rev. Norman Alston, KIngs Way International, Camden, NJ
Imam Faheem Lea, Quba School and Islamic Center, Camden, NJ
Rev. Jesse Brown, Christus Evangelical Lutheran Church, Camden, NJ
Rev. Nate Thompson Church of the Open Door Ministries, Trenton, NJ
Right Rev. Michael H. Odom, Sr. Whole Life Community Church, Totowa, NJ
Rev. Dorthy Harris, St. Mary's Evangelical Christian Church, Jersey City, NJ
Rev. Erik Kussman, St. Bartholomew Lutheran Church, Trenton, NJ
Rev. Michael Howard, Greater Is He Ministries, Trenton, NJ
Rev. Alfred Dingle, Faith Temple Baptist Church, Jersey City, NJ
Rev. Cameron Pryer, Grace Christian Church, Jersey City, NJ
Rev. Errold Lanier, Good News Bible Mission, Jersey City, NJ
Rev. Hattie Ross, True Gospel Holiness Church, Jersey City, NJ
Rev. Norris Gadsden, New Redeemer Reformed Episcopal Church, Jersey City, NJ
Rev. James Brown, From Streets to Christ, Paterson, NJ
Rev. Willie Francois III, Fountain Baptist Church, Summit, NJ
Rev. Marcus Lambright, Community Presbyterian, Mountainside, NJ
Rev. Karen Hernandez-Granzen, Westminster Presbyterian Church, Trenton, NJ
Rev. Russell Owen, Transformative Leadership Consultation Services, Camden NJ
The Ven. Prof. Gideon Uzomechna, The Anglican Church of the Messiah, Plainfield, NJ.
Cantor Risa Wallach, Temple Beth-El, Hillsborough, NJ.
Rev. Jack Martin, Kelley Retirement Home, Caldwell, NJ
Rev. Toby Sanders, Beloved Community Community Church, Trenton, NJ

Rev. Prescott Butler, Orange/Irvington United Methodist Church, Orange, NJ
Rev. Alan Lawrence, New Beginnings Faith Fellowship, Orange, NJ
Rev. Ramon Callazo, Santa Isabel Lutheran Church, Elizabeth, NJ
Rev. Brenda Lumzy-Hicks, Mount Calvary Missionary Church, New Brunswick, NJ
Rev. Fred E. Sharp, Concord Missionary Baptist Church, Perth Amboy, NJ
Rev. William Ingram, Shiloh Baptist Church, Elizabeth, NJ
Rev. Jean Maurice, Temple of Unified Christians, East Orange, NJ
Rev. Sharae Ford, Metropolitan Baptist Church, Scotch Plains, NJ
Rev. George Britt, Mt. Teman AME Church, Elizabeth, NJ
Rev. Derrick Dumas, First Baptist Church of Linden, Linden, NJ
Rev. Steven Wilson Sr., Mt. Calvary Baptist Church, Jersey City, NJ
Rev. Nathaniel Bullock Jr., New Life Worship Ministries, Linden/Monroe, NJ

Exhibit 9

DEP urged to block proposed Newark power plant

MICHAEL SOL WARREN | OCTOBER 3, 2024 | ENERGY & ENVIRONMENT

Key air permit center of latest fight to halt sewerage commission plan for already polluted region

Eight-year-old Sapphire Tate arranges signs before a protest against a proposed backup power plant for a sewage treatment facility in Newark, N.J., on Wednesday, April 20, 2022.

Dozens of local residents and activists gathered at a community center in Newark's Ironbound to urge state environmental officials to block controversial plans for a new natural gas power plant in the neighborhood.

The New Jersey Department of Environmental Protection held a hearing Tuesday to take public comment on a proposed air permit. The permit is a step to allow the Passaic Valley Sewerage Commission to operate its proposed natural gas power plant at its sewage treatment plant. That power plant is needed, the authority says, to keep the operation running during future power outages.

The PVSC's power plant proposal dates to 2014, and stems from efforts to improve the sewage facility's storm resilience in the wake of Superstorm Sandy. That storm knocked the facility offline for more than two days, causing 840 million gallons of raw sewage to be dumped into Newark Bay.

In the years since, the power plant proposal has faced intense opposition from local residents, environmentalists and elected officials across Newark and Essex County. Now, state regulators are on the verge of granting a key air pollution permit for the project.

"The department is proposing to approve this permit. The basis for approval is the facility's compliance with all applicable state and federal air pollution control laws and rules," Kenneth Ratzman, the assistant director for the DEP's Air Quality Regulation and Planning Element, said in his opening statement. "If anyone demonstrates to the department the facility would not comply with any of the applicable air pollution control laws and rules, the department's proposed decision to approve this permit or the requirements imposed in the draft permit may be changed."

A total of 31 people, some in the room and others over Zoom, voiced their feelings about the project to the DEP officials during the hearing. All of those speakers called on DEP to reverse course and reject the permit. None spoke in favor.

"Maybe you've received written comments in support, but those people are not here," said Tracey Stephens, the chair of the Green Team ministry at the First Congregational Church of Montclair.

The Ironbound is already home to three natural gas power plants, an incinerator and heavy truck traffic serving Port Newark, warehouses and industrial facilities. Adding this power plant would only exacerbate the already burdened area, the opponents said.

Brendan Da Silva, an Ironbound resident who works as a real estate agent in the area, said Tuesday was his first time attending this sort of public hearing. He said he recently became a father and is expecting a second child soon, and has since become more concerned about quality of life for his children in the neighborhood.

“I don’t want to leave the Ironbound. But if I have a kid and I stay here, am I a good father?” Da Silva said.

DEP has attempted to address these concerns with an environmental justice approval for the project issued in July. That approval came with conditions that PVSC must accept in order to proceed — conditions that aim to create a net reduction in the area’s air pollution by requiring PVSC to upgrade outdated equipment, install new pollution controls, solar power and battery storage, and limit how often it would be able to run the new gas plant.

Many pointed what they said was the apparent hypocrisy of Gov. Phil Murphy’s administration allowing a new natural gas power plant to be built, despite the governor’s goal of transitioning New Jersey to 100% renewable energy.

“Our future should be powered by innovation, not fossil fuels,” said Chloe Desir, an environmental justice organizer for the Ironbound Community Corporation and a member of the DEP’s Environmental Justice Advisory Council.

Some speakers questioned the need for the power plant in keeping the sewage facility online. They noted that PSE&G has invested heavily in strengthening the region’s power grid, and that work spurred NJ Transit to cancel similar plans for a power plant in Kearny. Speakers also pointed out that the PVSC sewage plant was offline for roughly two days in the aftermath of Sandy – yet PVSC is seeking to have a source of backup power capable of powering the facility for two weeks.

Jonathan Smith, an attorney for Earthjustice, raised multiple concerns with the draft permit itself. He called on DEP to amend the draft to require continuous air quality monitoring at the PVSC facility wherever possible, and to require that PVSC must only replace boilers at the facility with zero-emissions options like heat pumps.

“The major flaw of this permit is that it’s allowing a fourth gas plant in the Ironbound,” Smith said. “But putting that aside, there’s lots of other issues.”

Smith also questioned why the draft permit does not include the emissions reductions that are supposed to be created by the conditions DEP put on the power plant proposal as part of its environmental justice approval in July.

“The permit should set site-wide emissions limits that incorporate those emissions reductions of the EJ conditions, otherwise the EJ conditions mean nothing,” Smith said. “And if this approach means that PVSC has to comply with some EJ conditions first, before it can operate the gas plant in order to not exceed the plantwide emissions limits, then that’s exactly what the EJ law intended.”

Smith and his fellow Earthjustice attorney Colin Parts also warned that DEP and PVSC, both of which accept federal funds, may be in violation of the federal Civil Rights Act if the power plant is built. That law requires that any entity receiving federal money cannot use that money to discriminate based on race. PVSC plans to pay for the power plant with money awarded by the Federal Emergency Management Agency.

“Here we have one of the areas of the state with the highest percentage of people of color, one of the areas of the state with the highest percentage of low-income people, and one of the areas of the state that is already the most overburdened,” Smith said. “And this is exactly where PVSC proposes to build its new gas plant and its exactly where DEP proposes to permit that new gas plant.”

Earthjustice and other advocacy groups first raised the civil rights concerns in 2023. In July, as part of its environmental justice approval, DEP said its required conditions address those concerns.

The DEP officials at the hearing did not answer questions or respond to comments. They took notes and promised to address all points made in a formal response document to be released after the public comment period closes on Oct. 29.

If the DEP issues the permit, the power plant is not guaranteed to become reality. Smith said Earthjustice will consider taking legal action to challenge the permit if DEP does issue it.

“The fight doesn’t stop there, it’s definitely going to be ongoing,” Smith said.

Beyond that, the PVSC’s board of commissioners still needs to vote on whether or not to accept the conditions laid out by the DEP in the department’s environmental justice approval.

There is no clear timeline for when the PVSC commissioners may vote, but the next opportunity will be at their meeting on Oct. 17. An agenda for that meeting has not yet been made available.

DEPARTMENT OF ENVIRONMENTAL PROTECTION **IRONBOUND**

NATURAL GAS POWER PLANT **NEWARK**

PASSAIC VALLEY SEWERAGE COMMISSION **PVSC**

Exhibit 10

Reliability Analysis of Gas Turbine Power Plant Based on Failure Data

Amal El Berry*, M. A. Badr* and Marwa M. Ibrahim*

*Mechanical Engineering Department, Engineering Research Division, National Research Centre (NRC) 12622, Egypt

***Abstract*-- To predict the reliability of a product or a system, life data from a representative sample of the system performance is fitted to the suitable statistical distribution. Reliability analysis techniques have been accepted as standard tools for the planning, design, operation, and maintenance of thermal power plants. Therefore, the parameterized distribution can be used to estimate important life characteristics such as reliability, or probability of failure at a given time, mean life, and failure rate.**

In today's competitive environment reliability analysis is the most important requirement of almost all types of systems, subsystems, and complex systems; whether they are mechanical, electrical, or electronic devices. To alleviate failures and improve the performance and increase the operational life of these components and systems, key performance indicators such as: Failure Rate, Reliability, Availability, and Maintainabilityare investigated.Weibull++/ALTA is used to fit the available data set concerning three sets of gas turbines (GT) operating in a power plant to estimate the probability density function (PDF), plant reliability, and failure rate of each set and for the whole plant. In this study data of a gas turbines (GT) power plant (three groups of GTs) is used. Two methods for parameter estimation are applied in the data fitting stage: Maximum Likelihood (MLE) and Rank Regression Analysis X –axis (RRX).

Using Mean Time Between Failure (MTBF) data, the results show that the system overall reliability is 97% at 413 hr while using Down Time (DT) data the system reaches the same reliability at 289 hr. Also at 800 hr, the reliability of Group-1 is 74% while the reliability of Group-2 and Group-3 is 83% and 45% respectively. Downtime losses and cost of maintenance of the power plant can be minimized by implementing a proper mix of maintenance and repair approaches on system reliability failure rate.

***Index Term*-- Reliability, Gas Turbine, MeanTime between Failures, Failure Rate, Mean Time to Repair, WeibullDistribution**

ABBREVIATIONS

Aggregate Criterion	DESV	Maximum Likelihood	MLE
Availability	A	Mean Time Between Failure	MTBF
Combined Cycle Power Plants	CCPP	Mean Time To Failure	MTTF
Cumulative Distribution Function	CDF	Mean Time To Repair	MTTR
Condition Monitoring	CM	Median Ranks	MED
Correlation Coefficient Test	CC	Non-Homogeneous Poisson Process	NHPP
Down Time	DT	Probability Density Function	PDF
Fisher Matrix Confidence Bounds	FM	Pseudo Failure Characteristic	PFC
Gas Turbine	GT	Rank Regression Analysis X –Axis	RRX
Kolmogorov-Smirnov Test	K-S	Reliability	R(t)
Likelihood Value Test	LHV		

1. INTRODUCTION

Reliability life data analysis refers to the analysis and modeling of observed data over the product life to estimate important features such as system (or component) reliability, failure rate, or mean time to failure (MTTF). Several studies for reliability assessment were; and still are, conducted. Mechanical equipment reliability evaluation is highly important in condition-based maintenance to lower costs and increase equipment efficiency;which is the reason, that it an important research field for reliability analysis of mechanical equipment and life prediction.

1.1 Reliability Approaches and Indices

Failed machine must be removed from service for either repair or replacement; this occurrence is known as a failure and may have a negative impact on the system's ability to provide the load required and impact on the system reliability. A general approach to system reliability assessment is to determine one or a number of its reliability indices that measure some aspects of system reliability performance such as Mean time between failure (MTBF), failure rate (λ) and Mean time to repair (MTTR) [1].Numerous studies have found empirical models that are

focused on Weibull, exponential, uniform, and other distributions.

Lack of reliability data leads to reduction of production, excessive expenditure, equipment failure, and downtime. As a result, reliability analysis techniques have increasingly become adopted as standard tools for planning, constructing, running, and maintaining thermal power plants. The efficiency of the generating system is subdivided into adequacy and security [2], [3].

Reliability prediction approach depends upon the product development stages and its related reliability metric [4]. Reliability prediction methods address application of mathematical models and component data for the purpose of estimating the field reliability of a system before failure data are available for the system. Various reliability prediction methods, their concepts of application, advantages, and disadvantages were discussed by Thakur and Sakravdia[5].

The classical approach fits equipment failure rates to statistical models[6]; while in the data-mining approach, it is modeled using a data-mining algorithm; decision tree instruction, establishing logical, mathematical, and statistical relations between MTTF and its various factors of impact (equipment conditions, failure history, etc.). Component failure rates depend on time, and therefore can be viewed as time series. Unplanned equipment failures and their consequences have significant effect on the total operating cost of the system.

Duane proposed the power law model on the failures of a complex repairable system; where the accumulated MTBF was linearly related to the operating time on log-log scale [7]. On the other hand, Barabady and Kumar[8]used various statistical distributions including Weibull, exponential, normal, and log normal distribution to analyze the reliability of a crushing plant, in order to identify the bottlenecks in the system and to find the components or subsystems with low reliability for a given designed performance.

To get a proper maintenance plan for individual components in a complex system, Son et al [9] introduced Soft Computing Methodology. They used a combination of neural network and evolutionary algorithm to discover the relationship between individual parts of a complex system, to improve their reliability.

Kuang[10]suggested a new model of reliability evaluation based on quality loss and the development of quality characteristics. Wang [11]showed that the limited intensity procedure was appropriate for the reliability assessment of degradation in machine tools with regular maintenance behavior, while Li [12]examined the device reliability assessment based on acoustic emissions signals. Another research proposed a method of reliability assessment based on the distribution of the degradation path related to the signal characteristics [13]. The signal characteristics of the machining process were used in this research to replace traditional time data and fit equipment degradation model with the characteristic of a pseudo failure.

The demand for reliable products and manufacturing processes with lower cost is persistently growing, especially in the electronic industry. Factors, reliability, and cost determine the warranty period allocation for electronic equipment, Wu et al [14].

1.2 Reliability of Electric Components and Devices

A study reviewing the failure physics approach that is used in developing highly reliable semiconductor devices was presented [15]. The study summarized device failures in fieldand discussed a failure rate prediction model. Pecht[16] discussed the role of reliability prediction in design, development, and deployment of electronic equipment; overviews the history of reliability predictions for electronics.

The complete time series of end-of-life electronic products for empirical failure rate can be used as an empirical knowledge base of product reliability.Jónás et al developed a novel approach focused on the application of both analytical decomposition of the time series of empirical failure rates and soft computational techniques to predict bathub-shaped failure rate curves of consumer electronic products [17]. Another method suggested by Perera[18] provided an index of reliability for the estimation of mobile phone failure rates. However there was a significant correlation between the reliability index and the failure rate.

1.3Reliability of Electric Power Generation System

Globally, the reliable availability of electricity is seen as an effective and indispensable mechanism for the rapid industrial and economic growth of any nation [19]. Types of PV modules failure such as hot spot, diode failure and glass breakage are highly dependent on the PV module design technology and the installation site environmental conditions [20]. Bravoet al. [21] used realistic operation and maintenance data to estimate the failure rates, grouped by components and the relative effect of failures on the PV plant's energy balance. Results showed that the impact of failures in all evaluated PV plants energy losses are small, reaching a maximum value of 0.96 percent of net energy yield.

Reliability of generation system is mainly dependent on the generators reliability. Xu Zhang et al. [22]presented a reliability analysis of floating wind turbines to overcome the high cost of searching failure causes.Evaluation of floating wind power system is based upon its structure and function, which provide explicit internal relation of system and the

requirement of failure modes analysis using dynamic fault tree analysis. Failure rate of an offshore wind turbine gearbox was estimated based on the data available for similar onshore wind turbine systems [23].

Techno-economical decisions ofpower plant equipment maintenance were based on the reliability modeling of the combined cycle power plants and steam turbine power plants, Sabouhi[24]. The author proposed reliability-oriented sensitivity indices to identify the plant critical components.

As gas turbine (GT) is considered acrucial component of electric power and aerospace industries, it had prompted a great number of researches in the fields of material, mechanical, and electrical engineering to increase their efficiency. Some gas turbine components work in an extreme environment of high temperatures which impacts the maintenance cycle, and performance of the turbine. Some available statistical techniques such as Pareto analysis, Weibull probability density function, and calculation of MTBF and Laplace test can be used to develop failure and reliability analysisand provide an accurate diagnosis [3].

System failure events and maintenance actionsof a GT were derived from condition monitoring (CM) data and were fitted to a non-homogeneous Poisson process (NHPP) using maximum likelihood estimation (MLE)[25], [26]. The modified CM data set was used to estimate the parameters of the system reliability models. These models represent the failure levels of the gas turbine fordifferent life cycle intervals.

GT power plant reliability is a function of failure rate, maintenance which in turn depends on the equipment or systems MTBF and MTTR. Other factors affecting GT reliability are turbine or system design complexity, rank, and age. Aneke et al [27] attempted to find the crucial component in the GT power plant, determine the relationship between the failure rate and the availability of GT power plants, and consequently its reliability. Another research examined the performance indices of selected Nigerian GT power stations [28].

In the same context, Chang evaluated the effect of high thermo mechanical fatigue on the GT lifetimeduring a steady-state operation [29]. The study results showed that the generating units were underused because of inadequate routine maintenance and fault development of the equipment.

The above reviewed literature exhibits the importance of estimating the failure rate and reliability of all types of systems or components that require data availability over reasonably long period of time. As for GT power plant reliability estimation depends on availability of MTBF and MTTR data. In the current work two data fitting techniques; maximum likelihood estimation (MLE) method, and rank regression analysis (RRX) are used.The performance distributions are then evaluated using three forms goodness of fit tests to compare the resulting distributions.To select the best-fitted distribution, the aggregate ranking criterion is used.

2. METHODOLOGY

As stated above data gathering, analysis, and fitting plays an important role in reliability study. The parameters of the fitted data distributionsare used to analyze the failure rate, reliability, availability, and maintainability of gas turbine power plants. The success of such research work depends on the availability of statistical data from a target company; a case study, beside the knowledge of reliability theories and fitting statistical models.To evaluate system (or component) different reliability functions such as failure rate, availability, etc are calculated; the following subsections present different tools that are used to estimate the reliability and maintainability of any mechanical or electric component/or system.

2.1 Basic Concepts and Approaches for Reliability Analysis

The techniques of reliability analysis were increasingly accepted as standard tools for the planning, design, operation and maintenance of various mechanical or electrical systems[27] for;

- Ability to fulfill basic needs
- Efficiency to make effective use of the energy supplied
- Reliability to start or continue operating
- Maintainability of return to service quickly after one failure

2.1.1 Mean Time between failures (MTBF)

This is a measure of how long the equipment will; on average, function as defined before an unplanned failure occurs. This can be determined by testing the system for a total time period T during which N-faults occur. The fault is repaired, and it puts the system back on test when the repair time is removed from the total check T period. The MTBF index is given by equation (1)[27], [30]:

$$\text{MTBF} = \frac{T}{N} = \frac{1}{F} \quad \text{(hours), F = expected failure rate. (1)}$$

This error would allow for assumption from the gain. All things are identical, the system with the biggest MTBF is considered to be the most effective.

2.1.2 Frequency of Failure or Failure Rate (F)

This index is sensitive to sampling errors, as the method is being tested for a single sample of its total life. This error would allow for removal from the result the system with the highest MTBF, therefore is considered the most efficient. This is a very major deficiency; because there may be cases where it is more beneficial to have short repair times than high MTBF. A better measure of reliability is therefore needed which takes into account the repair time.

2.1.3 Mean time to Repair (MTTR)

This is a measurement of how long it will take on average to get the equipment back to normal service status if it fails, as shown in the following equations [27], [30].

$$\text{MTTR} = \frac{\varphi t}{\varphi n} \quad (2)$$

Where: φt= total outage hours per year.
φn= No. of failure per year

$$\text{Also, MTTR} = \frac{1}{\mu} \quad (3)$$

Where μ =expected repair rate.

2.1.4 Availability (A)

This is a measurement of the percentage of time that equipment is able to produce the end product at a certain acceptable level defined. For a turbine in a power plant, availability is a function of the fraction of time that the nominal power output is being generated It is calculated by dividing the whole time in a given period into two categories that are:

a) 'Up Time', UT: 'when the machine is in operation'.
b) 'Down Time', DT: Where the machine is defective or failed to fix. The total period is then UT + DT and availability exhibited in equations 4&5[27]:

$$A = \frac{UT}{UT+DT} \quad (4)$$

$$A = \frac{MTBF}{MTBF+MTTR} \quad (5)$$

2.1.5 Reliability ($R_{(t)}$)

Reliability is considered and identified by Kuo et al. [31], [32] as the capability of the equipment to perform its required task satisfactorily under defined conditions over a given time period. It can also be said that reliability is the possibility that the equipment will work without fail over time t as shown in the equation below [27], [32].

$$R_{(t)} = e^{\frac{t}{MTBF}} \quad (6)$$

Using equation (1) in equation (6), we have

$$R_{(t)} = e^{-Ft} \quad (7)$$

Where; t = specified period of failure-free operation

2.2 Data fitting and Parameters' Estimation

Also these data are commonly referred to as Weibull's reliability life data results. Life data from a representative sample of units is fitted to the correct statistical distribution to estimate the life of all items within the population. To fit into a statistical model, it is important to estimate the parameters of the statistical distribution which will make the equation closely fit the data. The function with probability density (pdf) is the mathematical function representing the distribution. The pdf can be interpreted mathematically or on a plot where the x-axis represents time. The pdf of the statistical total distributions is shown in the following subsections.

2.2.1 Weibull Distribution

The 3-parameter Weibull pdf is given by[33], [34]:

$$f(t) = \frac{\beta}{\eta}\left(\frac{t-\gamma}{\eta}\right)^{\beta-1} e^{-\left(\frac{t-\gamma}{\eta}\right)^{\beta}} \quad (8)$$

Where: $f(t) \geq 0$, $t \geq 0$ or γ, $\beta > 0$, $\eta > 0$, $-\infty < \gamma < +\infty$
Also; η = scale parameter, or characteristic life
β = shape parameter (or slope)
γ = location parameter (or failure free life)

For 3-parameter Weibull model, the scale parameter,η,determines where the bulk of the distribution is located. The shape parameter,β defines the distribution shape and the location parameter,γ,presents the location of the distribution in time.

The 2- parameter Weibull pdf is given by [33], [34]:

The 2-parameter Weibull *pdf* is obtained by setting $\gamma = 0$, and is given by:

$$f(t) = \frac{\beta}{\eta}\left(\frac{t}{\eta}\right)^{\beta-1} e^{-\left(\frac{t}{\eta}\right)^{\beta}} \quad (9)$$

2.2.2 Gamma Distribution

The gamma distribution can be viewed as a generalization of the exponential distribution with mean= 1/λ, λ> 0. An exponential random variable with mean = 1/λ, represents the waiting time until the first event to occur, where events are generated by a Poisson process with mean λ,

while the gamma random variable X represents the waiting time until the a[th]event to occur. Therefore,

$$X = \sum_i^a Y \quad (10)$$

Where *YI, ... ; Yn* are independent exponential random variables with mean= 1/λ.

The probability density function of Gamma distribution is given by[33]:

$$f(x;\alpha,\beta) = \frac{1}{\Gamma(\alpha)\beta^{\alpha}} e^{-x/\beta} x^{\alpha-1}, x > 0,\ \alpha > 0,\ \beta > 0 \quad (11)$$

Where α is the shape parameter, β is the scale parameter, and Γ is the gamma function which has the formula

2.2.3 G-Gamma Distribution

The generalized gamma X (α, β, *y*) is used to imply that the generalized gamma distribution of the random variable X has real positive parameters α, β, and *y*. In equation 12 [33], a generalized gamma random variable X with a scale parameter α and form parameters β has the following probability density function.

$$f(x) = \frac{\gamma x^{\gamma\beta-1} e^{-(x/\alpha)^{\gamma}}}{\alpha^{\gamma\beta}\Gamma(\beta)},\ x>0 \quad (12)$$

3. CASE STUDY

In this section a case study describing the reliability analysis of gas turbine power plant as subsystems and overall is presented. To investigate reliability and failure modes of electricity generation system that is based on gas turbines, data are obtained from a previous study of a power plant in literature [27]. The plant power is generated from three groups of gas turbines (GT). These data were collected over a time period of 10years (from 2005 to 2015). The10-years datafor group-1are exhibited in Table I, while the total set of data are shown in appendix A.

Table I
Case study GT, Group-1 published data [27]

Year	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
No. of Failures	45	75	48	87	48	30	51	20	36	36
MTBF (h)	891.1	871.3	932.5	632.5	2540.5	1736.4	1608.0	370.2	632.7	1574.2
Downtime (h)	1415.3	1331.7	2754.9	1247.0	603.9	650.0	1621.1	1382	693.2	2934.4
MTTR (h)	283.74	221.19	1053.27	147.99	164.85	244.5	470.3	695.2	418.8	1090.1

3.1 Application of Weibull++ ALTA Package

The aim of life data analysis is to apply a statistical distribution to fault time data in order to understand a product's reliability performance over time or to make predictions of future behavior. Several life features can be derived from the study, such as probability of failure, reliability, mean life, or failure rate. A quantitative accelerated life testing data analysis is conducted where the fault behavior of the product within normal conditions could be extrapolated in a shorter time to obtain reliability information about a product (e.g., mean life, probability of failure, etc.). Weibull++ ALTA package provides lifetime distributions and analytical methods as follows:

- "1, 2 and 3 parameter Weibull"
- "1 and 2 parameter Exponential"
- "Normal and Lognormal"
- "Gamma and Generalized Gamma"
- "Logistic and Log logistic"
- "Gumbel"
- "Bayesian-Weibull (with prior knowledge of the Weibull shape parameter)"
- "2, 3 and 4 subpopulation Mixed Weibull" (for situations when there are different trends in the data and distinct failure mode for each data point can't be identified)

All of the above distributions were applied in the mean time between failures (MTBF) and down time data (DT) to get the best fit, as shown in the section on goodness of fit section.

3.2 Goodness of Fit Tests

Using goodness-of-fit test the fitted distributions are determined. There are several ways to determine goodness-of-fitness. Chi-square, among the most popular methods used in statistics, "Kolmogorov-Smirnov test", "Anderson-Darling test", and the "Shapiro-Wilk test"[33].Weibull++/ALTA package; used in this analysis, provides three "fitness tests" in order to rate the fit distributions to determine the best fit; these tests are:

- "Kolmogorov-Smirnov (K-S)"; tests for the statistically significant correlation between the expected results and those obtained from the distribution fitted.
- "Correlation coefficient (CC)"; analyses how well the plotted match a straight line.

- "Likelihood Value (LHV)"; estimates the log-likelihood value, given the distribution parameters.

3.3 Parameter Estimation

Determining the best fit distribution, reliability is then estimated using the reliability function of the fitted distribution. There are several methods of parameter estimation that can be used to estimate the distribution parameters such as: the maximum likelihood estimation (MLE) method, rank regression analysis, median ranks (MED), and Fisher matrix confidence bounds (FM).

In order to obtain the distribution parameters, the regression line is applied to the data points on the plot when the parameters are determined using a rank regression analysis. Therefore, the plot can be used to determine the extent to which the distribution fits a given set of data. If the line of regression closely follows the points on the plots the fit is stronger.

MLE method on the contrary, obtains the line solution using probability function, not by plotting the data points. Therefore the line is not supposed to follow the points of the plot;hence the plot should not be used in this case to determine the fit of a distribution.

4. RESULTS AND DISCUSSION

After estimating the parameters, the best fitted distribution is determined; as follows in sub-section 4.1. System reliability is then determined using the reliability function of the fitted distribution.

4.1 Best Fit Distribution (Rank & Weight) Method

Using "Weibull++/ ALTA", MTBFGas Turbine data;shown in table 1, are fitted using both MLEand RRX, then the output distributions aretested using K-S goodness of fit test, Correlation Coefficient (CC) test and Likelihood Value (LHV) test.

To select the best-fitted distribution, the aggregate ranking criterion is used. This method is based on calculating an aggregate criterion (referred to as DESV) using the three rankings values and weights assigned to the individual criteria using equation (13)[33], [35]. The method assumes that the lowest DESV value corresponds to the best-fitting theoretical distribution.

$$\text{DESV} = (\text{K-S Rank} \times \text{K-S Weight}) + (\text{CC Rank} \times \text{CC Weight}) + (\text{LHV Rank} \times \text{LHV Weight}) \quad (13)$$

Performing goodness-of-fit statistics; for the three criteria, ranks of different probability distributions are obtained. To assign weights to the criteria, the default values of weights selected by the software package are used in the current case study. Finally, using the described DESV aggregate criterion shown in Equation 13, the final ranking of the eleven theoretical distributions was obtained. As previously stated, the distribution with the lowest DESV value was identified as the best-fitting according to the aggregate criterion, and was assigned number 1 in the ranking. Theobtained lowest value of the DESV statistic was 3P-Weibull distribution for both parameter estimation methods; MLE and RRX as illustrated in tables II, III.

Implementing this method, the results of the ranking procedure of gas turbine data (MTBF) for Group-1; (Table-I), are summarized in Table-II for MLE method and Table-3 for RRX method while the results for Group 2& 3 are exhibited in appendix B.The first column exhibits the type of the probability distribution, and the second shows the probability of rejection of the working hypothesis for the Kolmogorov–Smirnov (K-S) statistic. The third column displays “Correlation coefficient”(CC) which gives the mean absolute deviation of the theoretical Cumulative Distribution Function (CDF) from the empirical CDF. The fourth column exhibits theLikelihood Value (LHV) which measures the goodness of fit determined using the log-likelihood criterion. The value of calculated DESV is shown in the fifth column.

Table II
DESV Results of Group-1 fitted Data using MLEMethod

Distribution	K-S		CC		LHV		DESV
	Rank	Weight	Rank	Weight	Rank	Weight	
1P- Exponential	11	62.329	10	9.434	10	-83.212	1040
2P- Exponential	5	6.722	8	7.579	1	-77.794	330
Normal	7	11.161	9	7.589	9	-82.535	820
Lognormal	3	4.863	2	5.435	4	-80.013	340
2P-Weibull	6	6.998	4	6.052	7	-80.982	630
3P-Weibull	**1**	**0.337**	**1**	**5.270**	**3**	**-78.644**	**200**
Gamma	9	12.626	5	6.429	6	-80.479	710
G- Gamma	8	12.028	7	7.138	2	-78.109	490
Logistic	4	5.379	6	6.690	8	-82.318	620
Log-logistic	2	4.142	3	5.865	5	-80.354	360
Gumble	10	25.294	11	10.078	11	-84.639	1060

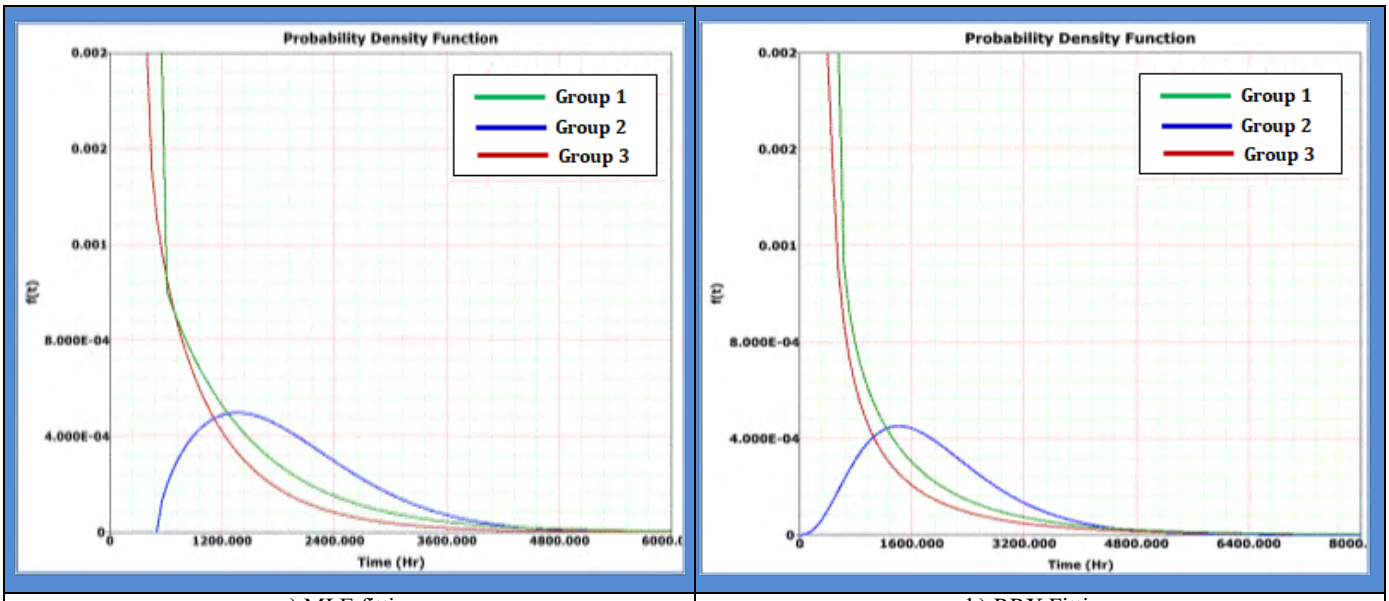
Table III
DESV Results of Group-1 fitted Data using RRX Method

Distribution	K-S		CC		LHV		DESV
	Rank	Weight	Rank	Weight	Rank	Weight	
1P- Exponential	11	68.598	10	10.186	10	-83.226	1050
2P- Exponential	5	0.0143	8	4.424	1	-79.882	200
Normal	7	11.394	9	7.597	9	-82.532	780
Lognormal	3	2.682	2	5.115	4	-80.096	420
2P-Weibull	6	15.326	4	6.961	7	-81.267	750
3P-Weibull	**1**	**0.004**	**1**	**4.293**	**3**	**-78.832**	**100**
Gamma	9	0.306	5	5.479	6	-80.689	500
G- Gamma	8	0.023	7	4.858	2	-80.116	330
Logistic	4	16.042	6	7.612	8	-82.505	870
Log-logistic	2	5.123	3	5.234	5	-80.409	550
Gumble	10	31.255	11	10.384	11	-88.457	1050

From tablesII & III, the presented analysis of MTBF of Group-1 of gas turbines plant shows that the best-fitted distribution, according to the aggregate criterion, is 3P-Weibull. It should also be noted that with successive failures, the aggregate method may indicate a different best-fit distributionfornewly gathered data, if there is significantdifference from that previously analyzed.

4.2 Effect of Each Group on System Reliability

Fig. 1 exhibits the probability density function of the three groups of gas turbines, (Fig. 1-a) for MLE while (Fig. 1-b) for RRX. Similarly, Fig.2&3 show the failure rate and reliability distributions for the two fitting methods.



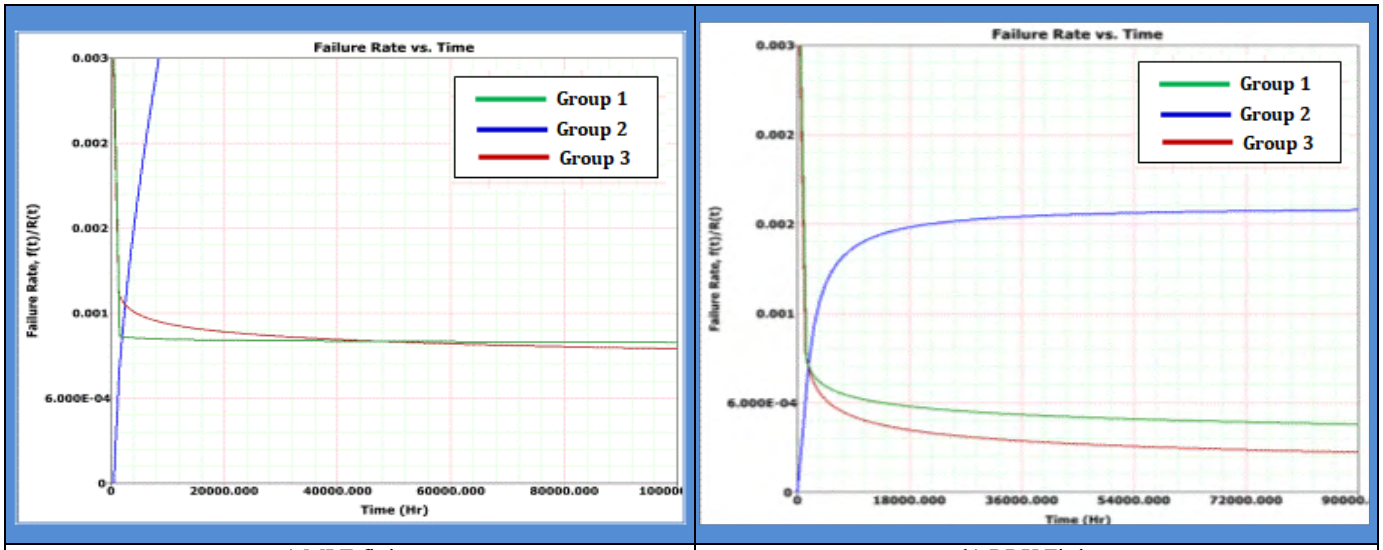
a) MLE fitting

MLE Group 1: 3P-Weibull
β=0.990772345332908; η=953.784118313584; γ =554.4287499999
MLE Group 2: 3P-Weibull
β=1.63126001495037; η=1538.49048068486; γ=499.636600000001
MLE Group 3: 3P-Weibull
β = 0.926494696535683; η =676.871753743079; γ =395.306425

b) RRX Fitting

RRX Group 1: 3P-Weibull
β=0.857693592163682; η=987.45816761145; γ =554.42874999999
RRX Group 2: Gamma
μ=6.25283941026393; K=3.71175476969922;
RRX Group3: 3P-Weibull
β =0.727542389223561; η =729.560613666666; γ =395.306425

Fig.1. Probability Density Function of the Three Gas Turbine Groups for MLE & RRX Methods



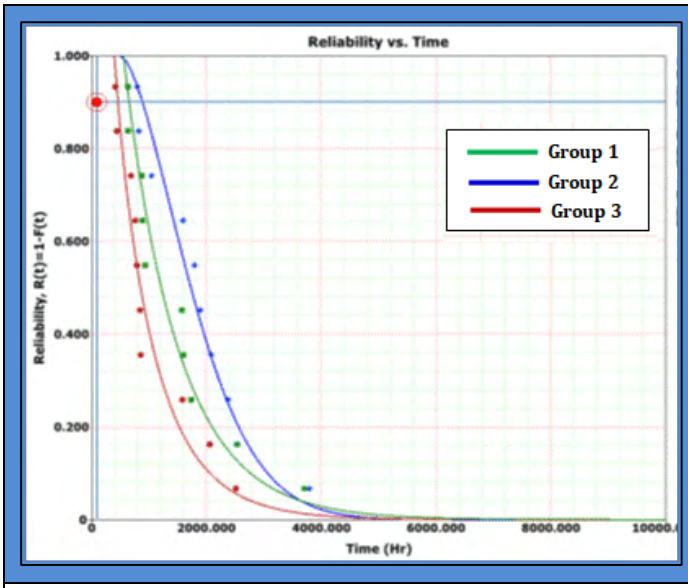
a) MLE fitting

MLE Group 1: 3P-Weibull
β=0.990772345332908; η=953.784118313584; γ =554.4287499999
MLE Group 2: 3P-Weibull
β=1.63126001495037; η=1538.49048068486; γ=499.636600000001
MLE Group 3: 3P-Weibull
β=0.926494696535683; η=676.871753743079; γ=395.306425

b) RRX Fitting

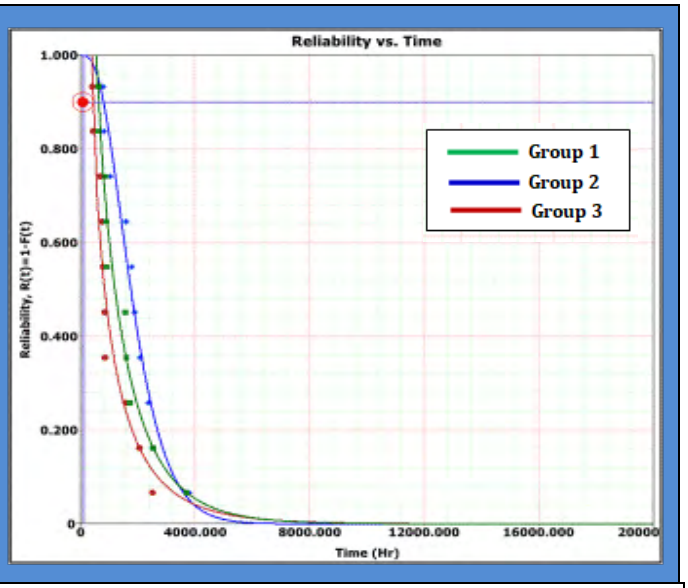
RRX Group 1: 3P-Weibull
β=0.857693592163682; η=987.45816761145; γ =554.42874999999
RRX Group 2: Gamma
μ=6.25283941026393; K=3.71175476969922;
RRX Group3: 3P-Weibull
β=0.727542389223561; η=729.560613666666; γ=395.306425

Fig. 2. Failure Rate of the ThreeGas Turbine Groups for MLE & RRX Methods



a) MLE fitting

MLE Group 1: 3P-Weibull
β=0.990772345332908; η=953.784118313584; γ =554.428749999999
MLE Group 2: 3P-Weibull
β=1.63126001495037; η=1538.49048068486; γ=499.636600000001
MLE Group 3: 3P-Weibull
β = 0.926494696535683; η =676.871753743079; γ =395.306425



b) RRX Fitting

RRX Group 1: 3P-Weibull
β=0.857693592163682; η=987.45816761145; γ =554.428749999999
RRX Group 2: Gamma
μ =6.25283941026393; K=3.71175476969922;
RRX Group3: 3P-Weibull
β = 0.727542389223561; η =729.560613666666; γ = 395.306425

Fig. 3. Reliability of the Three Gas Turbine Groups for MLE & RRX Methods

From fig. 1, 2, and 3, it is clear that all the3 groups best fitting distributions are 3P-Weibull distribution except group 2 of RRX method; which is Gamma distribution. Also, figures (1, 2, and 3) show that the parameters of each group have the same values for both methods.

From fig. 1, PDF values for each group using MLE & RRX are almost equal, and the same applies on fig. 2, 3.This leads to the conclusionthat parameter estimation (MLE or RRX) method doesn't affect the resulting values. From fig. 3 it could be seen that at time = 871 hr, the reliability of Group-1 reaches around 74% for both parameter estimation methods; MLE & RRX, also for Group-3 at 760 hr, the reliability is 64.5% using both methods.

Form fig. 2 in case of MLE method, Groups 1& 3 failure rate decreasedfrom 0.003 to 0.001 in about 4000hrs while for RRX method the failure rate reached 0.00035at the same time. For group-2, the failure rate highly increased to reach 0.0022 at 4000hrfor RRX method and >0.003 at the same time(4000 hr)for MLE method. Hence, Groups (1&3)have lower failure rates compared with Group-2.

The value of Weibull distribution shape parameter (β) has an effect on failure calculation [36].Xie et al. stated thatWeibull distribution showed to fit the failure characteristics of equipment at different stages of its life, by merely changing the value of the shape parameter appropriately. Shape parameter $\beta < 1$ represents decreasing failure rate stage, $\beta = 1$ represents constant failure rate and $\beta > 1$ represents increasing failure rate stage. This explains the decreasing failure rate of Groups 1&3 (Fig. 2) as $\beta < 1$ for both cases. As for Group-2, $\beta = 1.6312$ (i.e. > 1) that is why the failure rate highly increased.
Form fig.3,it could be seen that for both MLH or RRX methods, the reliability of Group-1 reached 93% after 632 hr while Groups 2&3 reached the same reliability value after 794 and 413 hr, respectively. This means that Group-3 has the minimum reliability at a specific time compared to groups 1&2, while group 2 has the maximum reliability at the same time.

4.3 Reliability Performance of Overall System

Fig.4 illustrates gas turbines overall system failure rate using MLE and RRX methodswhile fig. 5 exhibits thesystem reliability.

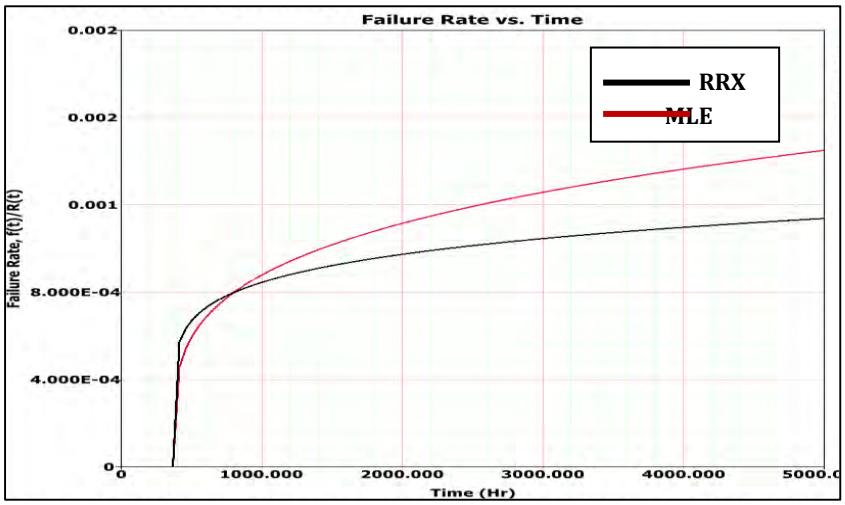


Fig.4. Gas TurbineOverall System Failure Rate

From fig. 4, it is clear that system failure rate using MLE is higher than RRX method. In the beginning of system operation, the two methods have the same trend of failure rate till 0.0006 then the rate ofincrease of MLE curve is higher thanRRX. After 5000 hrMLE failure rate reaches 0.0015 whileRRX reaches0.0009.

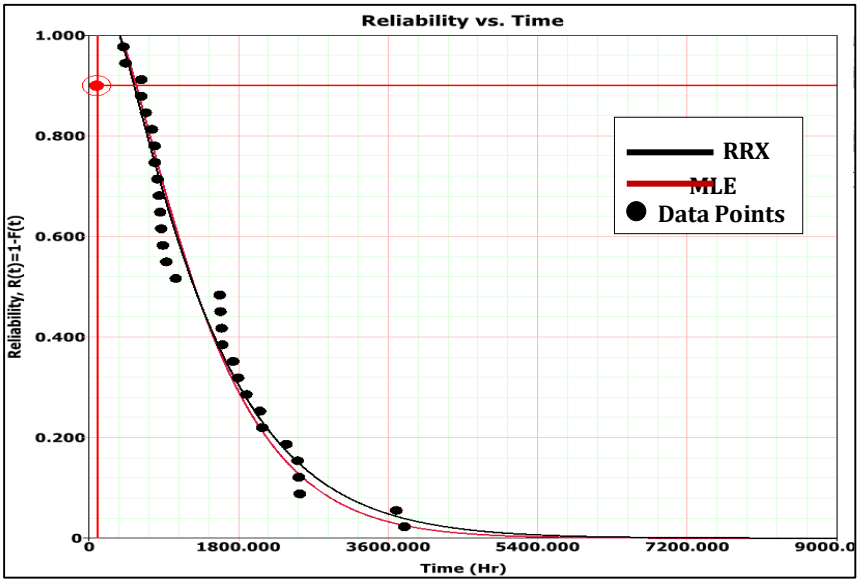


Fig.5. Gas TurbineOverall System Reliability Using MTBF Data

As shown in figure5, it was found that value of system overall reliability by MLE and RRX is almost the same. At 1800 hr, reliability is around 30% using MLH or RRX methods. Similarly, at 3600 hr the reliability of MLE is 5% while it is 7% of RRX method. Also, it could be seen that the system reliability reaches 90% at around 400hrs.

All the above figures; MTBF data were used. Downtime (DT) data werealso used to investigateGT system reliability and it is compared with the results of MTBF data. Figure 6 illustrates reliability of GT overall system using DT data.

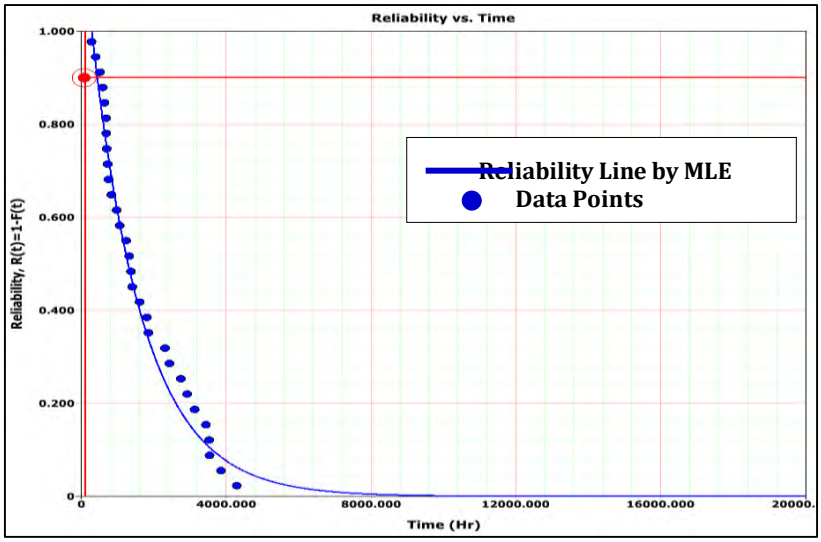


Fig.6. Gas Turbine Overall System Reliability Using DT Data

From fig. 6, it is clear that system overall reliability; using DT data, reaches 97%at 289hrcompared to413 hr using MTBF (fig. 5). The reason is that downtime is the total timethe machine isnotworking whether it is due to failure, maintenance, or schedule,etc, while MTBF is the time due to failure only.

5. CONCLUSIONS

Gas Turbine power plant reliability is a function of the failure rate, which in turn depends on the equipment or systems' Mean Time between Failures (MTBF) and Downtime (DT). Those also depend on the complexity of the design, the environment, the age of the equipment or system and the availability of spare parts to some extent. The failure rate is a main measuring index for system availability.Data fitting is the first step in reliability estimation, in this study two curve fitting methods are used MLE and RRX. The obtained results show that:

- Both pdf parameters have the same value using both investigated curve fitting methods.
- Group-1 reliability reached 93% at 632 hr while groups 2&3 reached the same reliability level at 794 and 413 hr, respectively using MLH or RRX method.
- Group-3 has the highest failure rate in the power plant, while Group-2 has the highest reliability.
- System overall reliability was calculated using MTBF & DT data. The results showed that the system reliability reaches 97% at around 413 hr in case of MTBF and 289 hr in case of DT data.

6. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

[1] Adegbulugbe A. O, “Balancing the Acts in the Power Sector: The Unfolding Story of Nigeria Independent Power Projects,” 2007.

[2] H. Rahmat-Allah, M. Moazzami, and A. Nasiri, “Power system reliability enhancement by using PowerformerTM,” Serbian J. Electr. Eng., vol. 6, no. 2, pp. 315–331, 2009, doi: 10.2298/sjee0902315r.

[3] Wang P and Billinton R, “Reliability Assessment of a Restructured Power System using Reliability Network Equivalent Techniques,” IEEE Proc. Gener. Transm. Distrib., vol. 150, no. 5, pp. 555–560, 2003.

[4] Denson W, “Rebuttal to: A critique of the Reliability Analysis Centre Failure Rate Model for Plastic Encapsulated Microcircuits,” IEEE Trans Reliab., vol. 47, no. 4, pp. 419–424, 1998.

[5] Y. S. Thakur and D. K. Sakravdia, “Reliability Prediction Methods for Electronic Devices and Systems- A Review,” vol. 13, no. 17, pp. 13063–13069, 2018.

[6] H. Fan, “Data mining and statistical analysis of construction equipment failure,” 2012 Proc. 29th Int. Symp. Autom. Robot. Constr. ISARC 2012, 2012, doi: 10.4017/gt.2012.11.02.629.628.

[7] J. T. Duane, “Learning Curve Approach to Reliability Monitoring,” IEEE Trans. Aerosp., vol. 2, no. 2, pp. 563–566, 1964.

[8] Javad Barabady and Uday Kumar, “Reliability analysis of mining equipment: A case study of a crushing plant at Jajarm Bauxite Mine in Iran,” Reliab. Eng. Syst. Saf., vol. 93, no. 4, pp. 647–653, 2008.

[9] H. J. K. and M. W. S. Y. T. SON1), B. Y. KIM1), K. J. PARK2), H. Y. LEE3), “STUDY OF RCM-BASED MAINTENANCE PLANNING FOR COMPLEX STRUCTURES USING SOFT COMPUTING TECHNIQUE,” Int. J. Automot. Technol., vol. 10, no. 5, p. 635−644, 2009, doi: 10.1007/s12239.

[10] C. L. and Z. Y. Kuang F., Dai W., “Assessment method and applications for reliability manufacturing process based on quality loss,” Comput. Integr. Manuf. Syst, vol. 21, pp. 1571–1578, 2015.

[11] Wang, Z.M. and Yang, J.G., “Reliability assessment of multiple NC machine tools with minimal repair,” J. Shanghai Jiaotong Univ., vol. 437, no. 7, pp. 127–130, 2011.

[12] Y. S. H. and Z. P. . Li H.K., Wang Y.H., “Estimation of Operational Reliability for Milling Cutter Based on Acoustic Emission Signa,” J. Dalian Univ. Technol., vol. 54, pp. 418–423, 2014.

[13] W. Dai, Y. Chi, Z. Lu, M. Wang, and Y. Zhao, “Research on reliability assessment of mechanical equipment based on the performance-feature model,” Appl. Sci., vol. 8, no. 9, 2018, doi: 10.3390/app8091619.

[14] and H. C. Wu C. C., Chou C. Y, "Optimal burn-in time and warranty length under fully renewing combination free replacement and pro-rata warranty," Reliab. Eng. Syst. Saf., vol. 92, no. 7, pp. 914–920, 2007.

[15] N. Telegraph and T. Corporation, "NTT Technical Review, May 2013, Vol. 11, No. 5," vol. 217.

[16] K. C. Kapur and M. Pecht, "Reliability Engineering in the Twenty-First Century," Reliab. Eng., no. 1980, pp. 1–17, 2014, doi: 10.1002/9781118841716.ch1.

[17] T. Jónás, G. Árva, and Z. E. Tóth, "Forecasting failure rates of electronic goods by using decomposition and fuzzy clustering of empirical failure rate curves," Period. Polytech. Soc. Manag. Sci., vol. 26, no. 1, pp. 10–18, 2018, doi: 10.3311/PPso.9026.

[18] U. D. Perera, "Reliability index - a method to predict failure rate and monitor maturity of mobile phones," in RAMS '06. Annual Reliability and Maintainability Symposium, 2006, 2006.

[19] J. J. Popoola, A. A. Ponnle, and T. O. Ale, "Reliability Worth Assessment of Electric Power Utility in Nigeria : Residential Customer Survey Results," Methodology, vol. 14, no. 3, pp. 217–224, 2011.

[20] D. Moser et al., "Technical Risks in PV Projects Development and PV Plant Operation D1.1. D2.1," Sol. Bankability Proj., vol. 1, pp. 1–109, 2016.

[21] I. Lillo-Bravo, P. González-Martínez, M. Larrañeta, and J. Guasumba-Codena, "Impact of energy losses due to failures on photovoltaic plant energy balance," Energies, vol. 11, no. 2, 2018, doi: 10.3390/en11020363.

[22] X. Zhang, L. Sun, H. Sun, Q. Guo, and X. Bai, "Floating offshore wind turbine reliability analysis based on system grading and dynamic FTA," J. Wind Eng. Ind. Aerodyn., vol. 154, pp. 21–33, 2016, doi: 10.1016/j.jweia.2016.04.005.

[23] U. Bhardwaj, A. P. Teixeira, and C. G. Soares, "Reliability prediction of an offshore wind turbine gearbox," Renew. Energy, vol. 141, pp. 693–706, 2019, doi: 10.1016/j.renene.2019.03.136.

[24] H. Sabouhi, A. Abbaspour, M. Fotuhi-Firuzabad, and P. Dehghanian, "Reliability modeling and availability analysis of combined cycle power plants," Int. J. Electr. Power Energy Syst., vol. 79, pp. 108–119, 2016, doi: 10.1016/j.ijepes.2016.01.007.

[25] L. P. Perera, M. M. Machado, D. A. P. Manguinho, and A. Valland, "System Failures of Offshore Gas Turbine Engines in Maintenance Perspective," IFAC-PapersOnLine, vol. 49, no. 28, pp. 280–285, 2016, doi: 10.1016/j.ifacol.2016.11.048.

[26] L. P. Perera, M. M. Machado, A. Valland, and D. A. P. Manguinho, "Modelling of system failures in gas turbine engines on offshore platforms," IFAC-PapersOnLine, vol. 28, no. 6, pp. 194–199, 2015, doi: 10.1016/j.ifacol.2015.08.031.

[27] P. No, "Effect of failure rates on system reliability of a gas turbine power plant," vol. 4, no. 7, pp. 68–73, 2017.

[28] S. O. Oyedepo, R. O. Fagbenle, and S. S. Adefila, "Assessment of performance indices of selected gas turbine power plants in Nigeria," Energy Sci. Eng., vol. 3, no. 3, pp. 239–256, 2015, doi: 10.1002/ese3.61.

[29] S. Lampreia, V. Vairinhos, V. Lobo, and J. Requeijo, "A Statistical State Analysis of a Marine Gas Turbine," Actuators, vol. 8, no. 3, p. 54, 2019, doi: 10.3390/act8030054.

[30] M. Ben-Daya, S. O. Duffuaa, J. Knezevic, D. Ait-Kadi, and A. Raouf, Handbook of maintenance management and engineering, no. July. 2009.

[31] W. Kuo and M. Zuo, Optimal reliability modeling. 2003.

[32] O. Obodeh and F. O. Isaac, "Performance indicators for Sapele thermal power station, Nigeria: 1997-2006," Adv. Mater. Res., vol. 367, no. 1, pp. 667–675, 2012, doi: 10.4028/www.scientific.net/AMR.367.667.

[33] K. Krishnamoorthy, Handbook of statistical distributions with applications. 2006.

[34] S. J. Bavuso, "Aerospace applications of Weibull and Monte Carlo simulation with importance sampling," Proc. Annu. Reliab. Maintainab. Symp., pp. 208–210, 1997, doi: 10.1109/rams.1997.571708.

[35] J. W. Lee, Elisa T., Statistical Methods forSurvival Data Analysis. USA: A JOHN WILEY & SONS, INC., PUBLICATION, 2003.

[36] M.XieY.TangT.N.Goh, "A modified Weibull extension with bathtub-shaped failure rate function," Reliab. Eng. Syst. Saf., vol. 76, no. 3, pp. 279–285, 2002.

AppendixA

10 Year Reliability indices of Transcorp Power Plant, UgheliDelta State Nigeria[27]

Year	2006			2007			2008			2009			2010		
	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV
Number of failures	45	69	96	75	57	66	48	33	78	87	41	42	48	46	96
Downtime(h)	1415.3	3137.1	3548.6	1331.7	1068.06	3449.88	2754.9	2444.43	4302.9	1247.07	408.79	1861.14	603.9	839.38	2320.59
MTTR(h)	283.74	517.59	648.66	221.19	260.19	697.59	1053.27	1170.09	878.13	147.99	110.46	507.06	164.85	251.73	492.99
MTBF(h)	891.09	825.75	685.86	871.32	1598.13	844.17	932.48	1896.96	441.93	632.49	1797.01	1584.48	2540.52	2528.34	760.83

Year	2011			2012			2013			2014			2015		
	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV	Δ II	Δ III	Δ IV
Number of failures	30	20	54	51	46	36	20	16	40	36	41	52	36	82	141
Downtime(h)	650.04	735.32	3864.9	1621.14	763.46	526.08	1382	289.08	986.32	693.16	707.88	698.58	2934.45	3540.12	1821.06
MTTR(h)	244.5	416.04	1170.9	470.34	833.67	1263.1	695.24	223.72	264.72	418.87	618.48	654.12	1080.15	1025.3	280.13
MTBF(h)	1736.4	2086	2513.5	1608.09	3798.96	2059.64	3701.22	794.64	789.84	632.72	1046.49	858.54	1574.22	2378.86	413.97

Δ II ≡ Group 1, Δ III ≡ Group 2, Δ IV ≡ Group 3

Appendix B

Group-1 Distributions Weight (MLE)

	Distribution	AVGOF	AVPLOT	LKV
1	1P-Exponential	62.32889302	9.434060215	-83.21224932
2	2P-Exponential	6.722205685	7.579398894	-77.79427467
3	Normal	11.16090187	7.589021181	-82.535271
4	Lognormal	4.863109752	5.43553778	-80.01342775
5	2P-Weibull	6.998701413	6.052421155	-80.98229849
6	3P-Weibull	0.3378768055	5.270331685	-78.64389584
7	Gamma	12.62646061	6.429122262	-80.47941816
8	G-Gamma	12.02821333	7.138679659	-78.10912873
9	Logistic	5.379304524	6.690290946	-82.31816015
10	Loglogistic	4.142699475	5.865502521	-80.35462473
11	Gumbel	25.29413866	10.07804344	-84.63999468

AVGOF: K-S AVPLOT: CC LKV: LHV

Exhibit 11

SELECTION AND IMPLEMENTATION OF ALTERNATIVES FOR LONG TERM CONTROL PLANNING FOR COMBINED SEWER SYSTEMS - REGIONAL REPORT

Submitted on behalf of the following participating Permittees By the Passaic Valley Sewerage Commission:

Passaic Valley Sewerage Commission (NJ0021016)
City of Bayonne (NJ0109240)
Borough of East Newark (NJ0117846)
Town of Harrison (NJ0108871)
Jersey City Municipal Utilities Authority (JCMUA) (NJ0108723)
Town of Kearny (NJ0111244)
City of Newark (NJ0108758)
North Bergen Municipal Utilities Authority (NBMUA) (NJ0108898)
City of Paterson (NJ0108880)

Passaic Valley Sewerage Commission
Essex County
600 Wilson Avenue
Newark, New Jersey

"Protecting Public Health and the Environment"

October 2020

GREELEY AND HANSEN
CDM Smith

EXECUTIVE SUMMARY

ES-1 Purpose of report

This Passaic Valley Sewerage Commission (**PVSC**) and the entities who own and operate contributing combined sewer collection systems have jointly prepared this Long Term Control Plan (LTCP) plan for controlling Combined Sewer Overflows (CSOs) in the PVSC Treatment District. This Regional LTCP compiles the results of the nine individual Selection and Implementation of Alternative Reports (SIARs) into a regional CSO control alternative for the PVSC Treatment District.

ES-2 Background of PVSC system

PVSC serves 1.5 million people in 48 municipalities in parts of Bergen, Essex, Hudson, Passaic and Union counties. Eight of the municipalities in the treatment district have combined sewer systems (CSS). The CSS municipalities within the PVSC District include Bayonne, East Newark, Harrison, Jersey City, Kearny, Newark, North Bergen and Paterson.

The New Jersey Department of Environmental Protection (NJDEP) issued PVSC and the eight CSS municipalities with New Jersey Pollutant Discharge Elimination System (NJPDES) permits requiring the development of CSO LTCPs. The CSO LTCP will identify cost effective infrastructure improvements to reduce pollution from the CSO discharges. The permit also requires extensive community outreach and public participation during the development of the CSO LTCP including the creation of a Supplemental CSO Team.

This report constitutes the Regional LTCP encouraged by the Permits. The individual SIARs for each municipality and PVSC, included as **Appendices F** through **N** to this report, fulfill the SIAR submittal required under each Permit submittal schedule. To date, all required reports scheduled by the Permit have been submitted and approved by the New Jersey Department of Environmental Protection (NJDEP).

ES-3 Approach

The approach to the PVSC Regional LTCP was formed in accordance the municipalities' NJDPES Permits and the guidelines of the US EPA's CSO Policy. The CSO Policy establishes a framework for the coordination, planning, selection, and implementation of CSO controls required for Permittee compliance with the Clean Water Act (CWA). The CSO Policy describes three major steps in the overall LTCP approach: system characterization, development and evaluation of alternatives, and selection and implementation of controls.

The CSO Policy also states that "In addition to considering sensitive areas, the long-term control plan should adopt either the Presumption Approach or the Demonstration Approach." Each of the municipalities have selected the Presumption Approach. Under this approach, CSO controls are presumed to protect the water quality based requirements of the CWA if at least 85% of the combined sewage collected in the CSS during precipitation events is captured or treated, provided the permitting authority determines that such presumption is reasonable.

The proposed LTCP meets the presumptive 85% level of control, based on hydrologic and hydraulic (H&H) modeling of a typical year per EPA guidelines. 2004 was selected as the typical year based on analysis of a 46-year period from 1970 to 2015 as detailed in the Typical Hydrologic Year Report included in **Appendix B** of this report.

ES-4 Screening of CSO Control Technologies

In order to determine the appropriate CSO control technologies, a screening was completed to determine those technologies that have the greatest potential to meet the requirements of the NJPDES Permit. This screening did not consider cost, and only excluded CSO control technologies not technically or physically appropriate for the Permittees within the PVSC Treatment District. After screening, the following technologies were advanced for further consideration:

- STP Treatment Capacity Upgrade
- Disinfection
- Green Infrastructure (GI)
- Sewer Separation
- Storage Tanks
- Storage Tunnels
- Combination of the above technologies

The CSO Control Technologies screening process is further detailed in the PVSC Regional Development and Evaluation Alternatives Report (DEAR) for the PVSC Treatment District included in **Appendix D** and in Section D of this report.

ES-5 Development and Evaluation of CSO Control Alternatives

The development and evaluation of CSO control alternatives was based on several factors both monetary and non-monetary for future selection of the CSO control alternative that would constitute the final Long Term Control Plan. The factors used to evaluate the alternatives were as follows:

- Remaining Overflow Volume and Frequency
- Ability to Meet Water Quality Standards
- Siting/Land Availability
- Institutional Issues
- Public Receptiveness
- Cost

The Regional DEAR and Section E of this report provide further detail on the alternative development and evaluation process.

ES-6 Public Participation

During the development of the LTCP, the CSO municipalities within the PVSC Treatment District jointly conducted various public outreach activities in order to implement a process that actively involves the public, which includes communities within the PVSC Treatment District

and the Woodcliff-Guttenberg Service Area. The diverse set of public activities included creation of a Supplemental CSO team to serve "as an informal work group [to act] as a liaison between the general public and the decision makers for the Permittee," as required by NJPDES Permit Part IV.G.2.C. The Supplemental CSO Team comprises invited members of the impacted and interested public, such as rate payers, industrial users, residents in proximity of CSO, and residents who use and enjoy the downstream waters.

Other public measures included regular interest group meetings, direct solicitation for input from non-CSO Permittees, formation of a Model Evaluation Group (MEG), social media outreach, briefings for elected and appointed officials, and participation in water resource and utility management conferences.

ES-7 Recommended Long Term Control Plan

The Long Term Control Plan recommendations are based upon information and evaluations performed during the earlier phases of the planning process, including the characterization of the receiving waters, hydraulic and water quality modeling, screening of CSO control technologies, and development and evaluation of alternatives, public participation, and the nine minimum controls. Following completion of these permit requirements, the selection and implementation of alternatives for regional implementation took place and is further discussed in this report in Section H.

Since the submission of the Regional DEAR, PVSC and the eight other Permittees have conducted several meetings to discuss the decided upon two options for the recommended LTCP. The first is the Municipal Alternative, where each Permittee independently implements CSO control technologies to achieve no less than 85% capture by volume of wet weather flow within their geographic boundary's combined sewer system. Secondly, there is the Regional Alternative where the 85% capture criterion is achieved across the PVSC District as a combined effort of all the Permittees. Not all Permittees will reach 85% capture individually in the Regional Alternative, but the combination of CSO control technologies used across the entire region will meet this criterion. This alternative primarily consists of two major improvements: 1) construction of a parallel interceptor to the main interceptor, and 2) construction of a secondary bypass at the PVSC Water Resources Recover Facility ("WRRF") which increases wet weather flow treatment capacity to 720 MGD. These improvements will then be coupled with local CSO control technologies in order to constitute the entire Regional Alternative.

The SIARs developed by each of the Permittees (included as Appendices to this LTCP) discuss selection of alternatives to be implemented by each Permittee independently from the other CSO Communities, if the Municipal Alternative is selected by the individual Permittee (in lieu of the Regional Alternative). This report discusses selection of a Regional Alternative to be implemented at the regional level, and the adjustments of the CSO control technologies proposed in these SIARs. Section H of this report highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

Table ES-1 summarizes the alternative (either the Municipal Alternative or the Regional Alternative) that each Permittee has selected. For those Permittees that have selected the Regional Alternative, those Permittees are committing to working towards a negotiated cost

allocation/sharing Agreement for the Regional Alternative (prior to beginning the implementation of the Regional Alternative). If these cost allocation/sharing negotiations are not successful, each of these Permittees would then implement the Municipal Alternative as discussed in each of the Permittees' individual Selection and Implementation of Alternatives Reports included in **Appendices F** through **N**.

Table ES-1: Permittee Alternative Selection

Permittee	NJPDES #	Selected Alternative
Bayonne	NJ0109240	Regional
East Newark	NJ0117846	Regional
Harrison	NJ0108871	Regional
JCMUA	NJ0108723	Regional
Kearny	NJ0111244	Municipal
Newark	NJ0108758	Regional
NBMUA	NJ0108898	Regional
Paterson	NJ0108880	Regional

Table ES-2 summarizes the CSO control technologies to be implemented under the Regional Alternative CSO LTCP, for those Permittees that have selected the Regional Alternative. The CSO control technologies to be implemented under the Municipal Alternative, for those Permittees that have selected the Municipal Alternative, is shown in each Permittee's individual SIARs. Implementation of the Regional plan, or Regional Alternative, is subject to cost allocation agreements across the various Permittees. Should regional implementation not be feasible due to a cost allocation agreement not being achieved within a specified time frame, each permittee will implement the LTCP delineated in the individual SIARs, and referred to as the Municipal Alternative, upon NJDEP approval.

Additionally, each project will be optimized using adaptive management as the LTCP implementation proceeds. To that end, included in the plan is adaptive management, which provides an opportunity for PVSC and the Permittees to conduct post construction monitoring, after partially implementing strategic projects of the plan to re-assess the implementation schedule. These projects will be monitored to determine if they are operating as intended, and 85% percent capture is achieved. PVSC and the Permittees are committed to the projects necessary to achieve the goals set forth in the NJPDES Permit. However, if this post construction monitoring indicates a modification to the investment or actions are needed, those investments and actions will be evaluated, and an adaptive management plan, will be developed for review and approval by the NJDEP. If necessary, this adaptive management plan will also incorporate any new technologies or group similar projects to reduce costs, pending regulatory approval and other anticipated factors. Minimizing community impacts is one of the cornerstones and key benefits of the Regional Alternative; however, construction and implementation activities are anticipated to include some public and private impacts. Some re-purposing of public land will likely be required, as well as a need for rights of way, and potentially the acquisition of land now in private or public ownership.

Table ES-2: Regional PVSC Treatment District LTCP CSO Control Technologies

Permittee	CSO Control Technology	Quantity/Size	Unit
Bayonne	Storage Tank at BA001/002	10.5	MG
Bayonne	Storage Tank at BA007	3.2	MG
Bayonne	Storage Tank at BA021	2.0	MG
Bayonne	Forcemain Upgrade (pipe sizes increased to 36" Pipe)	6019	LF
Bayonne	Increased wastewater conveyance of wet-weather flows to PVSC for treatment to 27.8 MGD	10.2	MGD
East Newark	Sewer Separation	20.0	Acres
Harrison	Green Infrastructure Program (Fixed Investment)	750,000	$
Harrison	Sewer Separation at 004 (11 ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 remaining)	49.5	Acres
Jersey City	I/I Source Control Piping Rehabilitation, 12"-96"	87,890	LF
Jersey City	Sewer Separation at Bates	28.9	Acres
Jersey City	Green Infrastructure for 7% impervious area	188.0	Acres
Jersey City	Storage Tank at JC001, JC002	6.2	MG
Jersey City	Storage Tank at JC003, JC004, JC005	7.1	MG
Kearny	Sewer Separation at Outfall KE010	34	Acres
Kearny	Sewer Separation at KE006	199	Acres
Newark	Regulator Modifications on Main Interceptor	N/A	N/A
Newark	Increasing Flow from South Interceptor through Peddie St. Regulator Modifications	N/A	N/A
Newark	Green Infrastructure	212.7	Acres
Newark	Water Conservation Program	N/A	N/A
NBMUA	Storage Tank at School (NB003)	5.0	MG
NBMUA	Closure of outfall NB014	N/A	N/A
NBMUA	Green infrastructure	1.0	Acres
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres
Paterson	Planned Sewer Separation for PT023	29.8	Acres
Paterson	19th Ave. Relief Sewer for PT030	7706	LF
Paterson	Green Infrastructure for 2.5% Impervious Area	75.0	Acres
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	2.1	MG
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	720.0	MGD
All	Parallel Interceptor to Main Interceptor	29296	LF

ES-8 Budgeting and Funding

The total capital cost associated with the Recommended Regional Alternative is $1,220 million, with an annual O&M cost projected at $3.55 million and total Life Cycle Cost of $1,274 million. PVSC will bear the $45 million capital cost for the PVSC WRRF secondary bypass alone, which reduces the total capital cost that must be allocated to $1,175 million. The specific cost allocation of these costs by municipality will need to be finalized during negotiations between participating Permittees. As discussed previously, the total costs borne by each municipality will be less than or equal to the Municipal Alternative for each Permittee as the capital cost for the Recommended Regional Alternative is approximately $545 million lower than the total cost for the Municipal Alternative. The negotiations between participating Permittees on how to allocate these cost savings and regional plan facilities is ongoing.

The financial impacts and Financial Capability Assessment associated with the Recommended Regional Plan for each Permittee cannot be finalized until the cost allocation negotiations associated with this plan are completed as this will dictate the share of the total $1,175 million capital cost each municipality will pay. It can be stated that the financial impacts of the Regional Plan will be less than or equal to that presented for the Municipal Plan for each Permittee given the significant cost savings available. The Financial Capability Assessment for each Permittee under the Municipal Plan is presented in the individual SIARs for each municipality appended to this report.

ES-9 Implementation Schedule

The following **Table ES-3** presents the proposed schedule and associated capital cost opinion for implementation of the Recommended Regional CSO LTCP. This schedule assumes that a regional cost-sharing approach is negotiated by the participating municipalities. The implementation schedule for those Permittees that have selected the Municipal Alternative is included in the individual SIAR of that respective Permittee. In addition to the capital improvements presented in **Table ES-3**, it is anticipated that negotiations for regional cost sharing between participating Permittees will span a 6-month period. The negotiations are not expected to affect the overall implementation schedule for the program as design and implementation of projects, particularly Green Infrastructure, sewer separation, and I/I reduction projects, common to both the Regional and Municipal Plans can proceed while negotiations are underway.

Table ES-3: Regional LTCP Implementation Schedule

Year[1]	Permittee	Milestone	Capital Cost ($M)
2021 - 2025	Bayonne	Increase Wet Weather Pump Station Capacity to 27.8 MGD	$12.0
	Bayonne	Force Main Upgrade	$23.0
	East Newark	Water Front Sewer Separation	$2.1
	Harrison	Green Infrastructure Program	$0.4
	Jersey City MUA	I/I Source Control Piping Rehabilitation	$36.8
	Jersey City MUA	Sewer Separation at Bates St.	$10.8
	Kearny	Sewer Separation for KE010	$10.2
	Newark	Regulator Modifications on Main Interceptor	$0.0
	North Bergen MUA	Storage Tank	$26.5
	Paterson	Planned Sewer Separation for PT023	$8.9
2026 - 2030	East Newark	Thread Mill Sewer Separation	$3.9
	Harrison	Green Infrastructure Program	$0.8
	North Bergen MUA	Closure of Outfall NB014	$0.1
	North Bergen MUA	Green Infrastructure	$0.4
	PVSC	WRRF Secondary Bypass to 720 MGD	$45.2
2031 - 2035	Newark	Green Infrastructure	$90.2
	All	Parallel Interceptor to Main Interceptor	$219.0
2036 - 2040	Bayonne	Storage Tank at BA007	$47.5
	Harrison	Sewer Separation at HR005	$15.3
	Jersey City MUA	Green Infrastructure	$92.1
	Jersey City MUA	Storage Tank for JC001/JC002	$104.8
	Newark	Increasing Flow from South Interceptor (Paddie St. Regulator Modifications)	$0.4
	Newark	Water Conservation Program	$1.5
	Paterson	19th Avenue Relief Sewer	$49.9
2041 - 2045	Bayonne	Storage Tank for BA021	$32.2
	Jersey City MUA	Storage Tank for JC003/JC004/JC005	$116.7
2046 - 2050	Bayonne	Storage Tank for BA001/BA002	$131.6
	Bayonne	Green Infrastructure Phases 1, 2, & 3	$15.6
	Kearny	Sewer Separation for KE006	$59.7
2051 - 2055	Paterson	Storage Tunnel	$33.7
2056 - 2060	Paterson	Green Infrastructure	$29.3

[1] Date ranges given refer to the anticipated periods of time that a project milestone will be placed into operation.

SECTION A - INTRODUCTION AND BACKGROUND

A.1 SUMMARY OF CHANGES

This is the Regional LTCP for PVSC and the entities who own and operate contributing combined sewer collection systems within the PVSC Treatment District. This LTCP compiles the results of the nine individual Selection and Implementation of Alternatives Reports for the PVSC Treatment District. In future versions of this report, this section will include summaries of changes and when they were incorporated as appropriate.

A.2 TITLE OF PLAN AND APPROVAL

Title: PVSC Regional Long Term Control Plan Report

Preparer:

Project Officer: _____ 9/25/2020
Michael J. Hope, PE, Greeley and Hansen LLC — Date

QA Officer: _____ 9/25/2020
Timothy J. Dupuis, PE, CDM Smith — Date

Passaic Valley Sewerage Commission:

PVSC
Program Manager: _____ 9/15/2020
Thomas Laustsen, PE, Chief Operating Officer, PVSC — Date

PVSC
QA Officer: Marques Eley 9/15/2020
Marques Eley, PE, Senior Engineer, PVSC — Date

New Jersey Department of Environmental Protection

DEP Permits: _____
Joseph Mannick, CSO Coordinator — Date

DEP QA: _____
Marc Ferko, Office of Quality Assurance — Date

Selection and Implementation of Alternatives Regional Report

Submitted by
Passaic Valley Sewerage Commission:

NJPDES Number NJ0021016 (Passaic Valley Sewerage Commission)

Approval of this submittal:

Permittee: _____ 9/25/2020

Thomas Laustsen, PE — Date
Chief Operating Officer, Passaic Valley Sewage Commission

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/2020

Thomas Laustsen, PE — Date
Chief Operating Officer, Passaic Valley Sewage Commission

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0109240 (Bayonne City)

Approval of this submittal:

Permittee: _____ 9.29.20

Timothy Boyle Date
Exec. Director, MUA, Bayonne City

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9.29.20

Timothy Boyle Date
Exec. Director, MUA, Bayonne City

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0117486 (East Newark)

Approval of this submittal:

Permittee: _____ 9/25/20

Frank Pestana — Date
Licensed Operator, Borough of East Newark

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Frank Pestana — Date
Licensed Operator, Borough of East Newark

Selection and implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108871 (Harrison)

Approval of this submittal:

Permittee: _____ 9/15/2020

Rocco Russomano — Date
Town Engineer, Town of Harrison

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/15/2020

Rocco Russomano — Date
Town Engineer, Town of Harrison

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108723 (Jersey City MUA)

Approval of Report:

Permittee: Jose R. Cunha (RJW) 9/30/20

Jose R. Cunha — Date
Executive Director, Jersey City MUA

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: Jose R. Cunha (RJW) 9/30/20

Jose R. Cunha — Date
Executive Director, Jersey City MUA

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0111244 (Kearny)

Approval of this submittal:

Permittee: Michael J Neglia 9/29/2020

Michael J, Neglia, PE, PLS, CME — Date
Town Engineer, Town of Kearny

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: Michael J Neglia 9/29/2020

Michael J, Neglia, PE, PLS, CME — Date
Town Engineer, Town of Kearny

CERTIFICATION ADDENDUM: SUBMISSION OF THIS NJPDES CERTIFICATION ALSO INCLUDES THE ATTACHED RESOLUTION, ADOPTED BY THE KEARNY MAYOR AND COUNCIL AT THE SEPTEMBER 22, 2020 MAYOR AND COUNCIL MEETING. IN ADDITION, IT IS NOTED HERE FOR CLARITY THAT THE TOWN OF KEARNY, AT THIS TIME, WILL NOT BE PARTICIPATING IN THE REGIONAL SOLUTION. AS IS INDICATED IN THE TOWN OF KEARNY'S INDIVIDUAL SELECTION AND IMPLEMENTATION OF ALTERNATIVES REPORT, THE TOWN OF KEARNY WILL BE PURSING AN INDIVIDUAL MUNICIPAL ALTERNATIVE.

Meeting: 09/22/20 07:00 PM

Kearny Town Council
402 Kearny Avenue
Kearny, NJ 07032

ADOPTED

RESOLUTION 2020-436

DOC ID: 11795

Resolution Authorizing Neglia Engineering Associates to Submit a Long-Term Control Plan ("LTCP") Addressing Combined Sewer Overflows to the New Jersey Department of Environmental Protection ("NJDEP") on Behalf of the Town of Kearny.

WHEREAS, the Town of Kearny is a "Combined Sewer Overflow" (CSO) municipality; and

WHEREAS, all CSO municipalities are authorized to use CSOs by the United States Environmental Protection Agency ("USEPA") pursuant to its National Pollutant Discharge Elimination System permitting program; and

WHEREAS, it is the national policy of USEPA and the state policy of the New Jersey Department of Environmental Protection ("NJDEP") to reduce and/or completely eliminate the volume of wastewater that flows out of CSOs and into local waterbodies without any treatment; and

WHEREAS, in accordance with its national CSO policy, USEPA has required all permitted entities to create "long term control plans," pursuant to which each permitted entity must identify all actions that the entity will implement to achieve the goals and level of CSO control that USEPA sets forth in its national CSO policy; and

WHEREAS, in 2015, the NJDEP required all New Jersey CSO Municipalities to develop a CSO Long Term Control Plan ("LTCP") in order to comply with USEPA's national CSO policy, which must be submitted to USEPA and NJDEP for review and approval on October 1, 2020; and

WHEREAS, Neglia Engineering Associates was previously authorized to prepare the required LTCP to ensure that the Town of Kearny achieves the goals and level of CSO control that USEPA sets forth in its national CSO policy; and

WHEREAS, Neglia Engineering Associates has developed a LTCP which calls for sewer separation within portions of the Town, along with implementation of green infrastructure by way of ordinance revisions; and

WHEREAS, the cost of the aforementioned sewer separation, which will achieve the goals and level of CSO control that USEPA sets forth in its national CSO policy, is projected to cost $69,900,000.00, and would be completed over a period of thirty (30) years following approval of the LTCP; and

WHEREAS, the Town of Kearny previously passed a resolution calling on the Governor as well as the members of our United States Congressional Delegation to provide economic relief for the purpose of facilitating the implementation and construction of a LTCP for the control of the Town's combined sewer overflow points (Resolution 2020-406); and

Resolution 2020-436 Meeting of September 22, 2020

WHEREAS, the developed LTCP is subject to review and approval by NJDEP as well as USEPA; now, therefore, be it

RESOLVED, by the Mayor and Town Council of the Town of Kearny that the Mayor and Council be and is hereby authorized that Neglia Engineering Associates is permitted to submit the developed LTCP to NJDEP on October 1, 2020.

RESOLVED, that the Town Clerk shall publish notice of this resolution according to law.

NEA FILE: KEARMUN18.013

Michael Neglia
ADOPTED: September 22, 2020

I hereby certify that the foregoing resolution was adopted by the Council on **September 22, 2020**.

PATRICIA CARPENTER
TOWN CLERK

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Carol Jean Doyle, Council Member
SECONDER:	Alberto G. Santos, Mayor
AYES:	Doyle, McCurrie, Eckel, Cardoso, Konopka, DeCastro, Santana, Ficeto, Santos

SEP 28, 2020
Neglia Eng.

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108758 (Newark)

Approval of this submittal:

Permittee: _____ 9/25/20

Ras J. Baraka — Date
Mayor, City of Newark

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Ras J. Baraka — Date
Mayor, City of Newark

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108988 (North Bergen Municipal Utilities Authority)

Approval of this submittal:

Permittee: _____ 9/25/20

Frank Pestana Date
Executive Director, North Bergen Municipal Utilities Authority

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Frank Pestana Date
Executive Director, North Bergen Municipal Utilities Authority

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108880 (Paterson)

Approval of this submittal:

Permittee: _____ 9/15/2020

William Rodriguez — Date
Director of Public Works, City of Paterson

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/15/20

William Rodriquez — Date
Director of Public Works, City of Paterson

A.3 DISTRIBUTION LIST

Passaic Valley Sewerage Commission
Thomas Laustsen, PE, Chief Operating Officer
Patricia Lopes, Director of Process Control Engineering and Regulatory Compliance
Marques Eley, PE, Senior Engineer

Participating Permittees:

Bayonne:	Timothy Boyle, Superintendent of Public Works
East Newark:	Frank Pestana, Licensed Operator
Harrison:	Rocco Russomano, Town Engineer
Jersey City:	Rich Haytas, Senior Engineer
Kearny:	Michael J. Neglia, Town Engineer
Newark:	Ras J. Baraka, Mayor of Newark
North Bergen:	Frank Pestana, Executive Director
Paterson:	Manny Ojeda, Director of Public Works

New Jersey Department of Environmental Protection
Dwayne Kobesky, Surface Water Permitting
Joseph Mannick, Surface Water Permitting
Marc Ferko, Office of Quality Assurance

A.4 PROGRAM CONTACT INFORMATION

Contact information for those parties involved in the Selection and Implementation of Alternatives Report is as follows:

Thomas Laustsen
Chief Operating Officer
PVSC
600 Wilson Avenue
Newark, NJ 07105

Marques Eley
Senior Engineer
PVSC
600 Wilson Avenue
Newark, NJ 07105

Patricia Lopes
Director of Process Control and Regulatory Compliance
PVSC
600 Wilson Avenue
Newark, NJ 07105

Michael J. Hope
Greeley and Hansen LLC
1700 Market Street
Suite 2130
Philadelphia, PA 19103

Timothy J. Dupuis
CDM Smith
77 Hartland Street
Suite 201
East Hartford, CT 06108

Dwayne Kobesky
NJDEP Water Quality
Surface Water Permitting
PO Box 420
401 E State St, 2nd Floor
Trenton, NJ 08625-0420

Joseph Mannick
NJDEP Water Quality
Surface Water Permitting
PO Box 420
401 E State St, 2nd Floor
Trenton, NJ 08625-0420

Marc Ferko
NJDEP Office of Quality Assurance
PO Box 420
401 E State St, 2nd Floor
Trenton, NJ 08625-0420

Timothy Boyle
Superintendent Public Works
City of Bayonne
630 Avenue C
Bayonne, NJ 07002

Rocco Russomano
Town Engineer
Harrison Town
318 Harrison Avenue
Harrison, NJ 07029

Rich Haytas
Senior Engineer
Jersey City MUA
555 Route 440
Jersey City, NJ 07305

Michael J. Neglia,
Town Engineer
Town of Kearny
34 Park Avenue - P.O. Box 426
Lyndhurst, New Jersey 07071

Kareem Adeem
Asst. Director Dept of Water and Sewer
City of Newark
239 Central Avenue
Newark, NJ 07103

Frank Pestana
Executive Director
North Bergen MUA
6200 Tonnelle Avenue
North Bergen, NJ 07047

Manny Ojeda
Director of Public Works
City of Paterson
111 Broadway, 4th Floor
Paterson, NJ 07505

Frank Pestana
Licensed Operator
East Newark Borough
34 Sherman Avenue East
Newark, NJ 07029

A.4 TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

A.5 INTRODUCTION AND BACKGROUND

The PVSC provides wastewater treatment service to 48 municipalities within Bergen, Hudson, Essex, Union and Passaic counties in the PVSC Treatment District located in Northeast New Jersey. In total, PVSC services approximately 1.5 million people, 198 significant industrial users and 5,000 commercial customers. The PVSC Treatment District covers approximately 150 square miles from Newark Bay to regions of the Passaic River Basin upstream of the Great Falls in Paterson. PVSC's main interceptor sewer begins at Prospect Street in Paterson and generally follows the alignment of the Passaic River to the PVSC Water Resource Recovery Facility ("WRRF") in the City of Newark. The WRRF receives flow from three sources: the Main Interceptor Sewer, the South Side Interceptor, and the Hudson County Force Main ("HCFM").

PVSC does not own or operate any of the CSO outfalls but has assumed a lead role in coordinating the Regional LTCP Report on behalf of the Permittees within the PVSC Treatment District. However, each of the eight individual CSO Permittees and PVSC have performed an analysis and prepared their own Selection and Implementation of Alternatives Reports ("SIARs"), which have been included as **Appendices F** through **N** of this report. The extent of the PVSC Treatment District and the combined sewer areas within the study area are illustrated in **Figure A-1**.

Eight of the municipalities within the PVSC Treatment District have combined sewer systems ("CSSs") and have received authorization to discharge under their respective NJPDES Permits for combined sewer management. The eight PVSC CSO Permittees are listed below:

- City of Paterson
- City of Newark
- Town of Kearny
- Town of Harrison
- Borough of East Newark
- City of Bayonne (Bayonne Municipal Utilities Authority was dissolved in 2016 and the City of Bayonne now owns the CSS)
- Jersey City Municipal Utilities Authority ("JCMUA")
- North Bergen Municipal Utilities Authority ("NBMUA")

A general flow schematic of the PVSC Treatment District is included in **Figure A-2**.

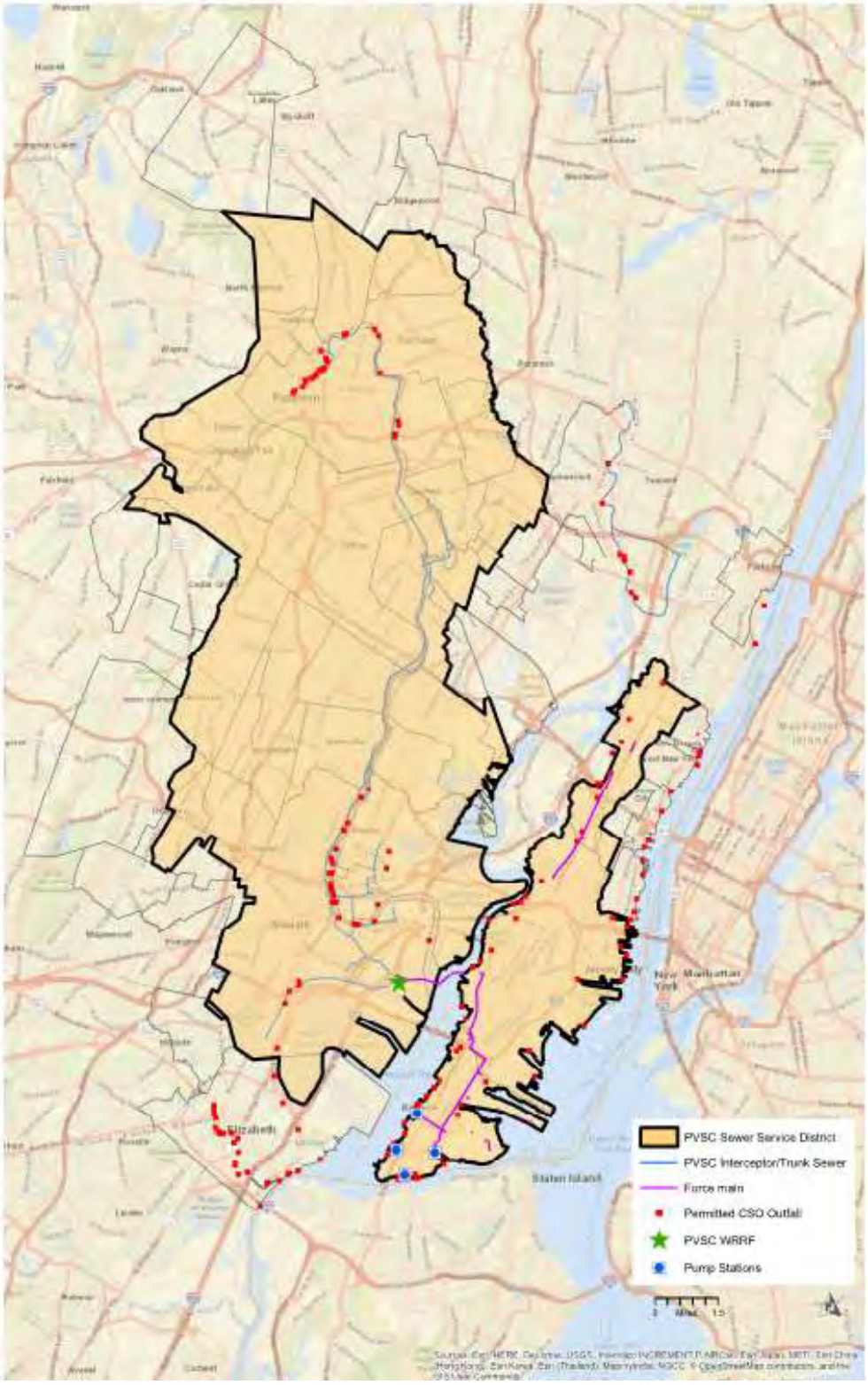


Figure A-1: The PVSC Treatment District

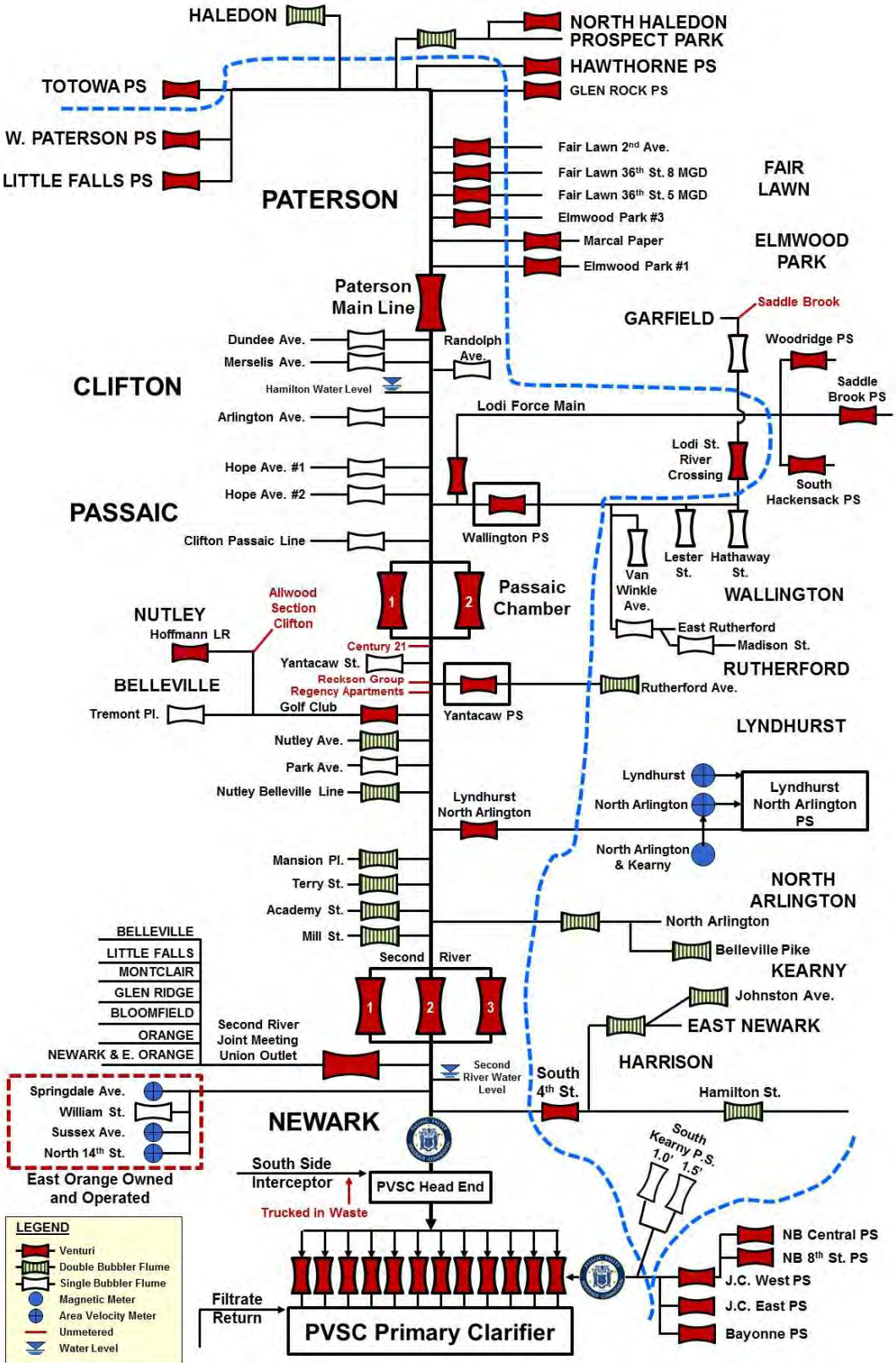


Figure A-2: The PVSC Treatment District Flow Schematic

A.6 PURPOSE OF REPORT

In accordance with the NJPDES Permits of each of the Permittees, a Final LTCP including a SIAR for each of the Permittees is required by June 1, 2020; however, due to the impacts of the SARS-CoV-2 virus Global Pandemic, the NJDEP has granted an extension for submittal of the LTCP report to October 1, 2020.

The NJPDES Permits for the PVSC Treatment District Permittees encourage collaboration among permittees within a hydraulically connected sewer system for the development of a Regional LTCP. This Regional LTCP compiles and summarizes the results of the nine individual SIARs by the Permittees in order to provide a singular, comprehensive LTCP for the PVSC Treatment District and satisfy the requirements of the NJPDES Permits.

A.7 LTCP PLANNING APPROACH

A LTCP planning approach was developed by the Permittees to ensure the individual SIARs and Regional LTCP adequately address all requirements enumerated under their NJPDES permits. The adopted LTCP Planning Approach features the following aspects, in alignment with the Permit requirements:

1. **Characterization, Monitoring, and Modeling of the CSS**
   Completed a comprehensive characterization study of the CSS including sampling, monitoring, analysis of historical data and modeling to establish baseline conditions and evaluate the efficacy of CSO control technologies selected for implementation.

   a. **Water Quality Modeling (WQM)**
      Completed the Water Quality Model (WQM) simulations to determine the impact of the CSOs on the quality of the water bodies
   b. **Hydrologic and Hydraulic (H&H) Model Development**
      Created a combined H&H model of the entire district including the preferred alternative. Ran the model and compared to individual models from each Permittee.

2. **Public Participation Process**
   Engaged and invited affected/interested public to participate, provide input, and form a Supplemental CSO Team to work with the Permittees on the LTCP development. Public participation meetings have been scheduled quarterly.

3. **Consideration of Sensitive Areas**
   A study of the Sensitive Areas within the service area and a report were submitted in accordance with the Permit CSO Reports Submittal Schedule.

4. **Evaluation of Alternatives and Maximizing Treatment at the WRRF**
   A reasonable range of CSO control alternatives were developed and evaluated and submitted individually by each Permittee as well as regionally and were submitted in accordance with the Permit CSO Reports Submittal Schedule through the Regional Development and Evaluation of Alternatives Report (DEAR). Maximizing Treatment at

the WRRF was included as part of the evaluation in observance of the Permit LTCP requirements.

5. **Cost/Performance Considerations**
   Based on the H&H and WQM results of the DEAR CSO Control Alternatives, the Permittees refined the alternatives and developed costs for each while evaluating performance considerations such as impacts to water quality and CSO volume capture (reduction) to evaluate the appropriate level of control.

Subsequent to the submittal of the DEAR, the following steps were conducted to finalize the LTCP discussed in this report:

1. **District Meetings**
   The PVSC Treatment District Permittees conducted bi-weekly meetings to further develop regional alternatives evaluated during the DEAR. The regional alternatives were moved forward for further review and evaluation.

2. **Financial Capability Assessment (FCA)**
   Developed a preliminary financial capability assessment (FCA) for each of the Permittees to determine affordability.

3. **WQM Results Validation & LTCP Expert Evaluation**
   PVSC led the development of a Pathogens Water Quality Model ("PWQM") on behalf of the NJ CSO Group to determine the impact of the CSOs on the quality of the water bodies.

   Progress of the PWQM was shared with the public and NJ CSO group at meetings, as further described in Section G. Additional workshop meetings between PVSC and their consultants, the Model Evaluation Group (MEG) and NJDEP were held to discuss the development and use of each of the models, as well as to receive feedback and input regarding the monitoring and modeling work. These meetings were held on the following dates:

   - February 5, 2016;
   - March 17, 2017;
   - September 15, 2017;
   - December 5, 2018; and
   - November 21, 2019.

   During these meetings, PVSC met with the MEG to validate the results of the WQM, submitted a report for review and comment, and met with NJDEP to review the WQM results. NJDEP comments were addressed and responded to in a December 9, 2019 memorandum, which is included in **Appendix A**.

The MEG is composed of recognized experts in hydrologic, hydraulic, hydrodynamic, and water quality monitoring and modeling, formed to provide technical review and guidance. The following individuals are part of the MEG:

- Dr. Alan Blumberg, Stevens Institute of Technology;
- Dr. Steve Chapra, Tufts University; and
- Dr. Wayne Huber, PE, D.WRE, Oregon State University, emeritus.

The MEG's stated mission was as follows:
"The Model Evaluation Group (MEG) will review all significant technical aspects of the PVSC Long Term Control Plan model development. Model development will consist of three distinct components: Landside, Hydrodynamic, and Water Quality. The goal is to ensure that these model components are technically viable for use by the engineering team in the assessment of engineering alternatives and withstand regulatory and public scrutiny. The MEG will provide guidance, where appropriate, to improve or enhance the approaches and methodologies that lead to model development. The MEG will judge, individually and jointly, the technical acceptability of the major model components. If a component is deemed unacceptable, the MEG will outline steps to improve the technical acceptability of the model components."

4. **Incorporate Feedback From LTCP Experts**
   Based on experts' feedback and coordination with the Permittees, identifying the most cost-effective regional solution and where localized solutions would have the greatest localized impact, the alternatives were further developed, H&H model re-run, and costs analyzed.

5. **Update To FCA**
   An update to the FCA was performed based on the updated alternatives costs.

6. **NJDEP Meeting To Confirm Acceptability Of Alternatives**
   Upon further development of alternatives, a meeting with NJDEP was held to determine the acceptability of alternatives in terms of CSO reduction.

7. **Mayoral Meetings To Present Alternatives**
   Alternatives determined acceptable by NJ DEP were presented to the Mayors from the treatment district for consideration of a regional agreement.

8. **Implementation Schedule**
   Upon agreement by the Permittees and the municipalities on the selected alternatives that will comprise the LTCP, an implementation schedule was developed for each of the projects selected.

9. **LTCP Finalization**
   Upon selection of the alternatives, updates to the FCA, and development of an implementation schedule, the individual SIARs and Final LTCP were completed and are presented in this report.

In accordance with each Permittees' NJPDES Permit, a Post-Construction Compliance Monitoring Program Plan and Operation and Maintenance Plan have been included in Section K and Section L of this Report, respectively.

SECTION B - REGULATORY REQUIREMENTS

B.1 INTRODUCTION

This section discusses the regulatory requirements governing the LTCP for the PVSC Treatment District Permittees. The Permittees and their associated NPDES permit numbers are listed below in **Table B-1.**

Table B-1: Permittees Covered Under this Regional Selection and Implementation of Alternatives Report

Municipality	NJPDES #
PVSC	NJ0021016
Borough of East Newark	NJ0117846
Town of Harrison	NJ0108871
Town of Kearny	NJ0111244
City of Newark	NJ0108758
City of Paterson	NJ0108880
City of Bayonne	NJ0209240
North Bergen MUA	NJ0108898
Jersey City MUA	NJ0108723

The Regional SIAR has been completed in compliance with all regulatory requirements. The regulatory requirements governing the LTCP are described in the following sections.

B.2 NJPDES PERMIT REQUIREMENTS

Under Section 402 of the CWA, all point source discharges to the waters of the United States must be permitted. USEPA Region II has delegated permitting authority in New Jersey to NJDEP. The permits are reissued on a nominal five-year cycle. All twenty-one (21) New Jersey municipalities and municipal authorities with CSSs were issued new permits in 2015 that set forth the requirement for the completion of a LTCP SIAR by June 1, 2020, currently extended to October 1, 2020 as noted in Section A.

The NJPDES permits issued to each permittee include requirements for the Permittees to cooperatively develop a CSO LTCP to reduce CSO discharges to the receiving waters.

Part IV, Section D.3.b. of the NJDPES Permit for each of the Permittees requires the completion of an approvable LTCP, to be prepared in accordance with Part IV, Sections G.1 through G.9 of the permit. Those sections are listed below for reference:

- Section G.1 Characterization, Monitoring and Modeling of the Combined Sewer System
- Section G.2 Public Participation Process
- Section G.3 Consideration of Sensitive Areas
- Section G.4 Evaluation of Alternatives

- Section G.5 Cost/Performance Considerations
- Section G.6 Operational Plan
- Section G.7 Maximizing Treatment at the Existing STP
- Section G.8 Implementation Schedule
- Section G.9 Compliance Monitoring Program (CMP)

Section G.6 through Section G.8 state that the Selection and Implementation of Alternatives must also comply with the requirements of Subsection D.3.a and Section G.10, recited below:

- Subsection D.3.a Long Term Control Plan Submittal Requirements

  "The Department encourages a single LTCP to be developed and submitted on behalf of all of the permittees in a hydraulically connected sewer system."

- Section G.10 Permittee's LTCP Responsibilities

  "Where multiple permittees own/operate different portions of a hydraulically connected CSS, the permittee is required to work cooperatively with all other permittees to ensure the LTCPs are consistent. The LTCP documents must be based on the same data, characterization, models, engineering and cost studies, and other information, where appropriate. Each permittee is required to prepare the necessary information for the portion of the hydraulically connected system that the permittee owns/operates and provide this information to the other permittees within the hydraulically connected system in a timely manner for LTCP submission.

The specific requirements for the SIAR are outlined in Sections G.2 through G.8. These requirements are identified in **Table B-2**, along with the section of this report in which those requirements are addressed.

Table B-2: Review of Requirements of the LTCP

Permit Section	Permit Requirement	Report Section
Part IV G.1.a	"The permittee, as per D.3.a and G.10, shall submit an updated characterization study that will result in a comprehensive characterization of the CSS developed through records review, monitoring, modeling and other means as appropriate to establish the existing baseline conditions, evaluate the efficacy of the CSO technology based controls, and determine the baseline conditions upon which the LTCP will be based. The permittee shall work in coordination with the combined sewer community which is hydraulically connected to this STP, for appropriate Characterization, Monitoring and Modeling of the Sewer System."	**Section C:** Existing Conditions and **Appendix A**
Part IV G.2.a	"The permittee shall submit the Public Participation Process Report to include appropriate input and participation with other hydraulically connected communities, in accordance with D.3.a and G.10."	**Section G:** Public Participation and **Appendix E**
Part IV G.3.a	"The permittee's LTCP shall give the highest priority to controlling overflows to sensitive areas, in accordance with D.3.a and G.10. Sensitive areas include designated Outstanding National Resource Waters, National Marine Sanctuaries, waters with threatened or endangered species and their habitat, waters used for primary contact recreation (including but not limited to bathing beaches), public drinking water intakes or their designated protection areas, and shellfish beds."	**Section C.5:** Sensitive Areas and **Appendix C**
Part IV G.4.a	"The permittee shall evaluate a reasonable range of CSO control alternatives, in accordance with D.3.a and G.10. that will meet the water quality-based requirements of the CWA using either the Presumption Approach or the Demonstration Approach (as described in Sections G.4.f.and G.4.g)."	**Section D:** Screening of CSO Control Technologies and **Appendix D**
Part IV G.4.b	"The permittee shall submit, as per Section D.3.b.v, the Evaluation of Alternatives Report that will enable the permittee, in consultation with the Department, the public, owners and/or operators of the entire collection system that conveys flows to the treatment works, to select the alternatives to ensure the CSO controls will meet the water quality-based requirements of the CWA, will be protective of the existing and designated uses in accordance with N.J.A.C. 7:9B, give the highest priority to controlling CSOs to sensitive areas, and address minimizing impacts from SIU discharges."	**Section E:** Evaluation of Alternatives and **Appendix D**
Part IV G.5.a	"The permittee shall submit in accordance with the submittal requirements at Sections D.3.a. and D.3.b.v., the cost/performance considerations that demonstrate the relationships among proposed	**Section H:** Selection of Recommended LTCP

Permit Section	Permit Requirement	Report Section
	control alternatives that correspond to those required in accordance with Section G.4. This shall include an analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. If the permittee chooses to pursue the "Presumption Approach" of 'no more than an average of four discharge events per year', the permittee is not required to conduct this analysis for the other number of events (i.e. 0, 7, 10, 20). This analysis, often known as "knee of the curve", shall be among the considerations used to help guide selection of controls."	
Part IV G.6.a	"Upon Departmental approval of the final LTCP and throughout implementation of the approved LTCP as appropriate, the permittee shall modify the O&M Program and Manual in accordance with D.3.a and G.10, to address the final LTCP CSO control facilities and operating strategies, including but not limited to, maintaining Green Infrastructure, staffing and budgeting, I/I, and emergency plans."	Post Final LTCP Approval
Part IV G.7.a	"The LTCP shall include the maximization of the removal of pollutants during and after each precipitation event at the STP, in accordance with D.3.a and G.10, ensuring that such flows receive treatment to the greatest extent practicable utilizing existing tankage for storage, while still meeting all permit limits."	**Section J:** Recommended Long Term Control Plan and **Appendix F**
Part IV G.7.b	"The permittee shall incorporate the receiving STP's plan for maximizing flow and treatment at the STP."	**Section J**: Recommended Long Term Control Plan
Part IV G.8.a	"The permittee shall submit a construction and financing schedule in accordance with D.3.a and G.10, for implementation of Department approved LTCP CSO controls. Such schedules may be phased based on the relative importance of the adverse impacts upon water quality standards and designated uses, the permittee's financial capability, and other water quality related infrastructure improvements, including those related to stormwater improvements that would be connected to CSO control measures."	**Section J** Recommended Long Term Control Plan
Part IV G.8.b	"Upon Departmental approval of the LTCP, the permittee shall begin implementation of the LTCP in accordance with the schedule contained therein."	**Section J** Recommended Long Term Control Plan

Permit Section	Permit Requirement	Report Section
Part IV G.8.c	"In accordance with Section D.3.b.vi., the permittee shall submit an implementation schedule, including yearly milestones."	**Section J** Recommended Long Term Control Plan
Part IV G.8.c.i	"The permittee shall consider adequately addressing areas of sewage overflows, including to basements, streets and other public and private areas."	**Section H:** Selection of Recommended Long Term Control Plan
Part IV G.8.c.ii	"The permittee shall consider CSO overflows that discharge to sensitive areas as the highest priority."	**Section C:** Existing Conditions
Part IV G.8.c.iii	"The permittee shall consider use impairment of the receiving water."	**Section C:** Existing Conditions
Part IV G.8.c.iv	"The permittee shall consider the permittee's financial capability including, but not limited to, consideration of the factors: median household income, total annual wastewater and CSO control costs per household as a percent of median household income, overall net debt as a percent of full market property value, property tax revenues as a percent of full market property value, property tax collection rate, unemployment, and bond rating."	**Section I**: Financial Capability
Part IV G.8.c.v	"The permittee shall consider grant and loan availability."	**Section I**: Financial Capability
Part IV G.8.c.vi	"The permittee shall consider previous and current residential, commercial, and industrial sewer user fees and rate structures."	**Section I**: Financial Capability
Part IV G.8.c.vii	"The permittee shall consider other viable funding mechanisms and sources of financing."	**Section I**: Financial Capability
Part IV G.8.c.viii	"The permittee shall consider Resources necessary to design, construct and/or implement other water related infrastructure improvements as part of an Asset Management Plan as per Part IV.F.1"	**Section L**: Revision of Operation and Maintenance Plans

B.2.1 Nine Minimum Controls

Under their NJPDES permits, Permittees are required to implement and document implementation of the nine minimum controls ("NMCs"). The NMC are CSO controls developed by the EPA that require minimal cost and construction time. The NMC consists of the following:

1. Proper operation and regular maintenance
2. Maximizing the use of the collection system for storage where feasible
3. Review and modification of the Industrial Pretreatment Program to minimize CSO impacts
4. Maximization of flow to the wastewater treatment plant
5. Prohibition of CSOs during dry weather
6. Control of solids and floatables (addressed by NJDEP's requirement of screening or other facilities in earlier permit cycles);

7. Pollution prevention
8. Public notification
9. Monitoring CSO impacts and controls

The Permittees submitted their NMC programs under a previous permit cycle. The LTCP has been developed to be consistent with the NMCs. CSO control technologies already in place, scheduled to be implemented, or mandated by the NMC were removed from consideration in the LTCP during the DEAR screening process.

B.3 USEPA'S CSO POLICY

USEPA's CSO Policy (the "CSO Policy") was issued in April of 1994 (59 FR 18688 - 18698) to elaborate on the 1989 National CSO Control Strategy and to expedite compliance with the requirements of the Clean Water Act ("CWA"). The CSO Policy provided guidance to municipal Permittees with CSOs, to the state agencies issuing National Pollution Discharge Elimination System permits (e.g., NJDEP and NJPDES permits) and to state and interstate water quality standards authorities (e.g., the Interstate Environmental Commission). The CSO Policy establishes a framework for the coordination, planning, selection, and implementation of CSO controls required for permittee compliance with the CWA.

The CSO Policy also states that "In addition to considering sensitive areas, the long-term control plan should adopt either the Presumption Approach or the Demonstration Approach." In accordance with the CSO Policy, and the conditions of the permit, the 85% volume capture condition of the Presumption Approach was adopted by the municipalities. The Presumption and Demonstration approach, including the process for selecting the approach, are discussed in further detail in Section H of this report."

B.4 LOCAL AGREEMENTS

The 40 separate sanitary sewer communities and the eight CSO Permittees have contracts with PVSC for the treatment and disposal of wastewater for each of their communities. These CSO Permittees convey wastewater through their own local sewerage systems to the PVSC interceptors or the HCFM. The interceptor and HCFM then convey the wastewater to the PVSC WRRF for treatment and disposal. PVSC charges each community as a wholesale customer based on their current rate structure.

B.5 NEED FOR REGIONAL APPROACH

Although the CSO Permittees own and maintain independent yet hydraulically connected sections of the CSS within the PVSC Treatment District, they have acknowledged the need for a regional approach. The PVSC CSO communities have collaborated and worked cooperatively to provide consistency in the development, selection, and implementation of their respective LTCPs and Regional LTCP alternatives per the requirements of their NJPDES permits, as enumerated in Section B.2.

The following outlines the owner/operators of the CSSs and control facilities of the CSO Permittees:

City of Bayonne
Owner/Operator of CSS: City of Bayonne
Owner of Outfalls: City of Bayonne
Operator of Regulators: City of Bayonne

Borough of East Newark
Owner/Operator of CSS: East Newark Township
Owner of Outfalls: East Newark
Operator of Regulator: PVSC

Town of Harrison
Owner/Operator of CSS: Town of Harrison
Owner of Outfalls: Town of Harrison
Operator of Regulators: PVSC

Jersey City MUA
Owner/Operator of CSS: Jersey City MUA
Owner of Outfalls: Jersey City MUA
Operator of Regulators: Jersey City MUA

Town of Kearny
Owner/Operator of CSS: Town of Kearny
Owner of Outfalls: Town of Kearny
Operator of Regulators: PVSC

City of Newark
Owner/Operator of CSS: City of Newark
Owner of Outfalls: City of Newark
Operator of Regulators: City of Newark and PVSC

North Bergen MUA
Owner of CSS: North Bergen Township
Operator of CSS: North Bergen MUA
Owner of Outfalls: North Bergen MUA
Operator of Regulators: North Bergen MUA

City of Paterson
Owner/Operator of CSS: City of Paterson
Owner of Outfalls: City of Paterson
Operator of Regulators: City of Paterson and PVSC

SECTION C - EXISTING CONDITIONS

C.1 PVSC WASTEWATER RESOURCE RECOVERY FACILITY

PVSC owns and operates one of the nation's largest wastewater treatment facilities located in Newark, NJ on a 162-acre plant site. The PVSC WRRF is permitted for an annual average design treatment flow of 330 MGD. During wet weather, PVCS exceeds the annual average design flow and treats up to 400 MGD. Wet weather flows over 400 MGD are currently not feasible due to the current treatment capacity at the final clarifiers. **Figure C-1** provides a site aerial of the PVSC WRRF.

Figure C-1: PVSC Water Resources Recovery Facility

Solids treatment at the WRRF takes primary sludge from the primary clarifiers and waste sludge from the aeration tanks and transports them to gravity sludge thickeners. Thickened sludge then enters the thickening centrifuges to reduce its liquid volume. A wet-air oxidation process, Zimpro, conditions the sludge for dewatering before it is further reduced in volume in decant tanks. Sludge enters the final processing steps in filter presses and storage in cake silos prior to beneficial use.

C.2 PVSC TREATMENT DISTRICT AREA

The PVSC Treatment District is comprised of combined and separate sewer areas that contribute flow to the PVSC WRRF. The combined sewer areas include several different municipalities who own and operate the CSSs and the combined sewer outfalls located within their jurisdiction. Separate sewer areas comprise the majority of the drainage area but only contributes approximately 40 percent of the flow to the PVSC WRRF. **Figure C-2** shows the municipalities and the type of sewer network they operate.

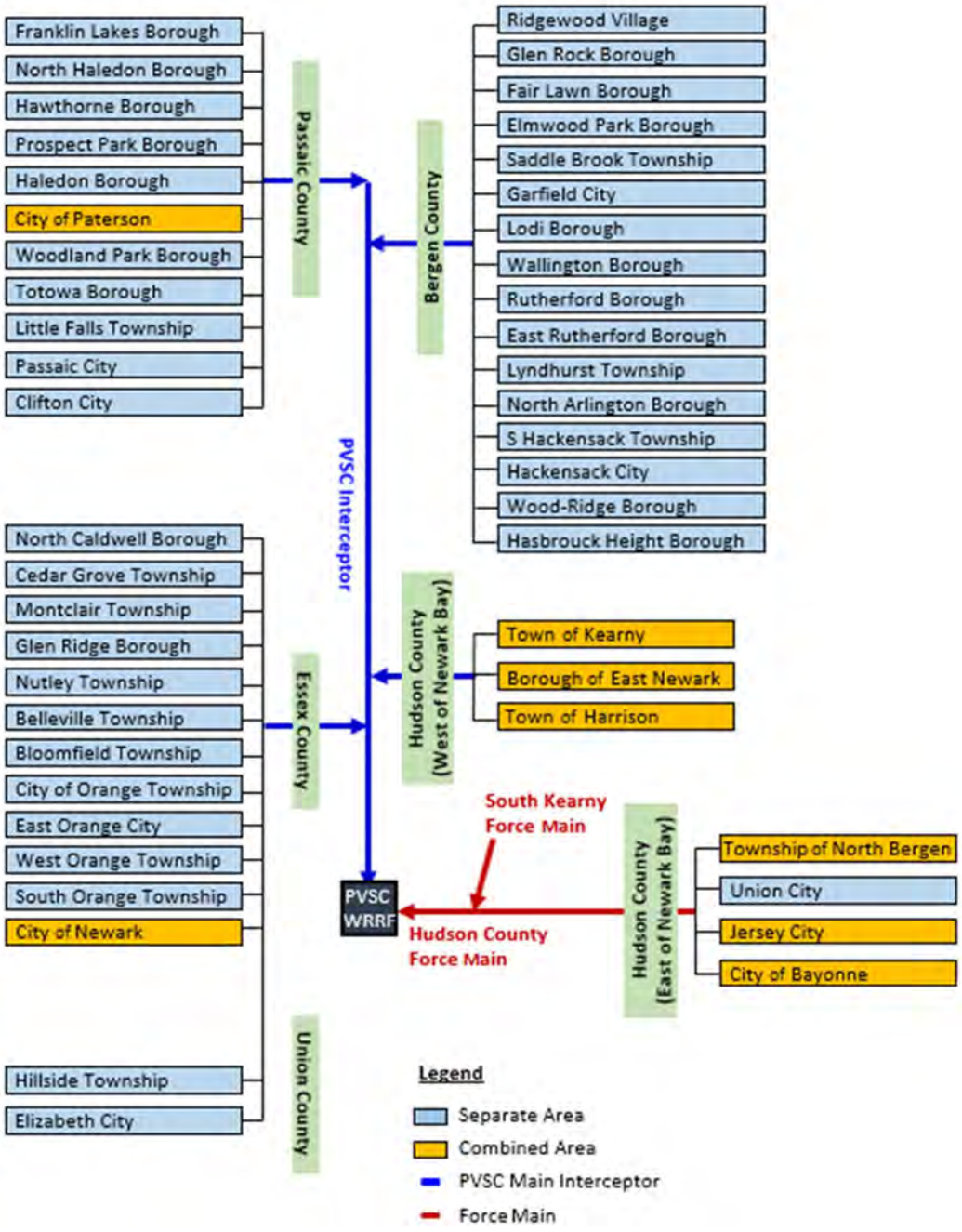


Figure C-2: PVSC Member Municipalities

C.2.1 Combined Sewer Service Area

Combined sewers serve eight of the municipalities within the PVSC Treatment District and collect surface runoff from the combined sewer service area. The total combined area is approximately 22,099 acres and makes up approximately 26 percent of the Total Combined Sewer Service Area. The eight municipalities, their service area acreage and the number of CSO outfalls are listed in **Table C-1** below. All eight municipalities are authorized to discharge under their respective NJPDES Permits for Combined Sewer Management. PVSC does not own or

operate any combined sewer outfalls. PVSC owns and operates CSO Facilities such as regulators, and netting facilities but the combined sewer outfalls are owned by other Permittees.

Table C-1: Combined and Separate Sewer Service Area Municipalities

Municipality/Sewer Authority	Contributing area (acres)		Total Contributing Area (acres) [1]	Number of CSOs Located within Service Area
	Combined Sewer	Separate Storm Sewer		
City of Bayonne	1,706	36	1,742	28
Borough of East Newark	62	0	62	1
Town of Harrison[2]	423	354	771	6
Jersey City MUA[3]	5,365	66	5,365	21
Town of Kearny	1,243	2,763	4,006	5
City of Newark	7,153	2,883	10,036	18
North Bergen MUA[4]	1,552	39	1,591	9
City of Paterson	4,595	600	5,195	23
Subtotal	**22,099**	**6,675**	**28,774**	**111**
40 Separate Sanitary Municipalities	--	55,214	55,214	--
Total	**22,099**	**61,889**	**83,988**	**111**

Note:

1. The total acreage in the table above includes only the subcatchment areas in the model that contribute flow to the PVSC WRRF. The acreage does not include rivers, creeks or unsewered areas within a municipality.
2. Harrison's NJPDES permit initially included 7 outfalls. NJDEP issued Harrison a minor modification NJPDES permit action on June 25, 2018 to remove Dey Street outfall 004A.
3. Jersey City provided details of this information separately as part of its System Characterization Report.
4. NBMUA (Woodcliff) and Guttenberg provided this information separately as part of its System Characterization Report.

The combined sewer municipalities on the east side of Newark Bay include the Cities of Jersey City and Bayonne, and the Township of North Bergen. These municipalities deliver their combined sewage through the HCFM into the PVSC primary clarifiers at the PVSC WRRF. Two of the combined sewer municipalities, the City of Bayonne and Jersey City MUA, own their own CSSs, interceptors, CSO control facilities, and pumping stations. Bayonne and Jersey City jointly own and operate the force main used to transport wastewater from the CSO area east of the Newark Bay in Hudson County, to the primary clarifiers at the PVSC WRRF in Newark. The North Bergen MUA owns and operates the CSO outfalls, but does not own the CSS, which

is owned by the Township of North Bergen. The North Bergen MUA discharges flow to the Jersey City Westside Interceptor and ultimately connects to PVSC through the Hudson County Force Main. PVSC does not own or operate any of the regulators and outfalls which service the CSO area east of Newark Bay. Jersey City MUA is included in the above description, however it submitted its own System Characterization report separately.

The other five municipalities with CSSs are located on the west side of Newark Bay include the Borough of East Newark, the Towns of Harrison and Kearny, and the Cities of Newark and Paterson. These municipalities all own and operate their CSS and are permitted by the NJDEP to discharge CSOs. All of these municipalities contribute to the PVSC Main Interceptor. A portion of the CSSs are tributaries to CSO control facilities owned and/or operated by the individual municipalities and a portion of the CSO control facilities are owned and/or operated by PVSC. PVSC owns and operates 45 of the regulator chambers in these communities that control the sewer flow to the PVSC trunk system.

These combined sewer municipalities collectively own and operate a total of 111 CSO outfalls in PVSC's Treatment District, which ultimately discharge to the waterbodies shown in **Figure** C-3**.**

City of Bayonne

The City of Bayonne is located in Hudson County and has an approximate population of 63,024 (2010 US Census Bureau). The City is located on a peninsula within the New Jersey - New York Metropolitan Area surrounded by Jersey City to the North, Newark Bay to the west, Kill Van Kull Channel to the south, and the Upper New York Bay, which separates it from the Borough of Manhattan, to the east. The City consist of a land area of approximately 3,200 acres of which approximately 1,742 acres are serviced by the combined sewer system.

The industrial section on the East side at Constable Hook is serviced primarily by a separate sewer system. Wastewater flows from the City of Bayonne, the Town of Kearny and Jersey City are conveyed to PVSC by a force main owned partially by PVSC and jointly by the City of Bayonne and the Jersey City MUA. The flow from the force main enters directly into the primary treatment facility at the PVSC WRRF. Under the current service agreement, wastewater flows from the City of Bayonne are restricted to an average daily flow of 11 MGD and a Peak flow of 17.6 MGD. The City of Bayonne entered into a forty (40) year agreement with United Water, now SUEZ, for operations and maintenance of the City's water and wastewater collection and transport facilities in December 2012. The Bayonne MUA was dissolved in 2016 as a result of this new agreement with SUEZ.

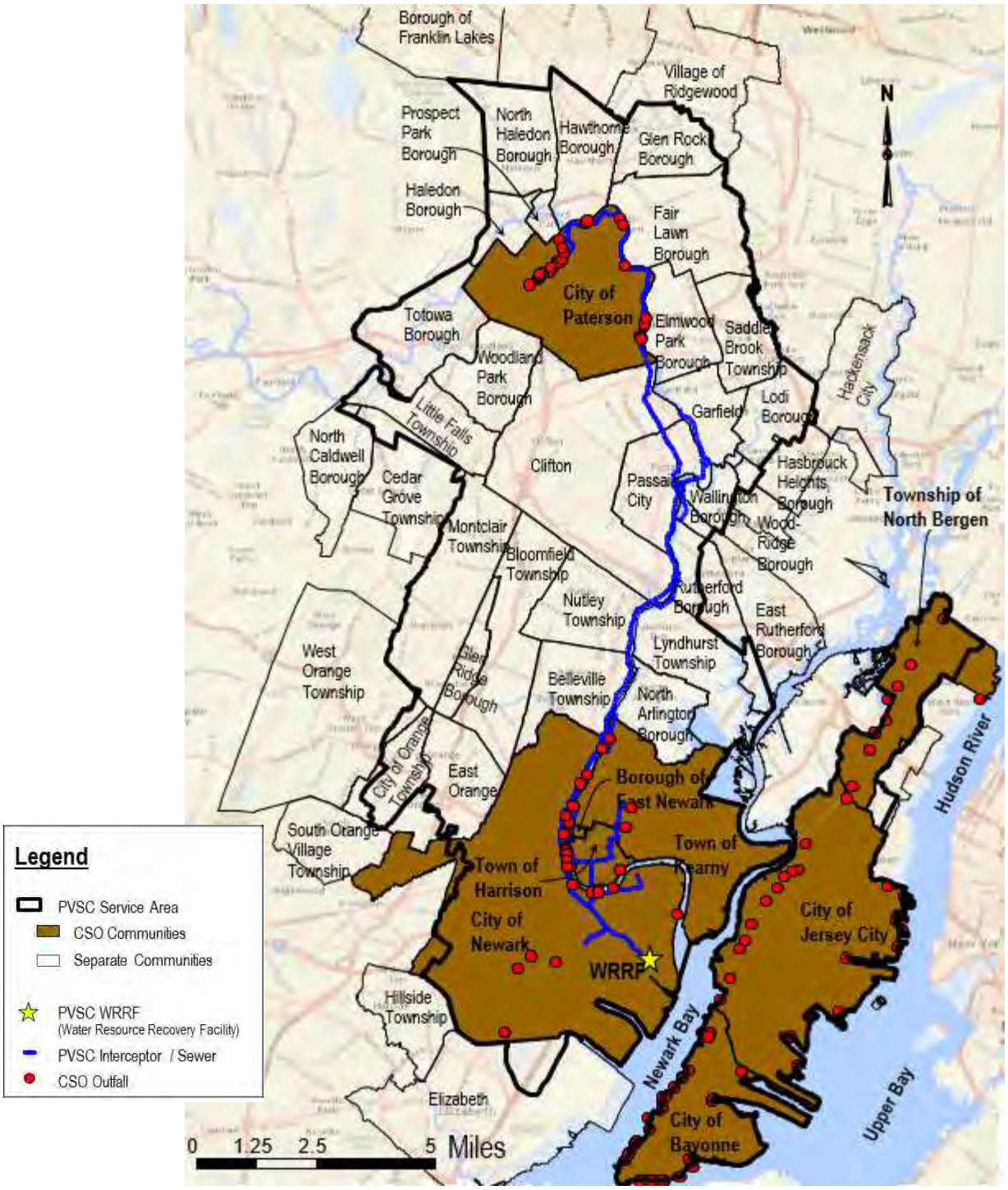


Figure C-3: PVSC Treatment District with CSO Outfall Location

Township of North Bergen

The Township of North Bergen is located in Hudson County and has an approximate population of 60,773 (2010 US Census Bureau). The Township.is located between the Hackensack and Hudson Rivers, and is bordered by Ridgefield, Cliffside Park, Secaucus, Guttenberg, Union City and Jersey City. The total area of the Township is approximately 2,060-acres, where approximately 1,130 acres is serviced by the CSS and the balance is serviced by separate systems for sanitary and storm flows.

North Bergen consists of two combined sewer areas, the Central and Woodcliff areas. North Bergen Township owns and operates the manholes and sewer systems in both of these areas. The North Bergen Municipal Utilities Authority (NBMUA) owns and operates the regulators, interceptors, outfalls, CSO facilities, and the Woodcliff STP under two separate NJPDES permits: NBMUA and NBMUA (Woodcliff). The largest combined sewer area is located in the central and western portions of the Township of North Bergen. The combined sewage in the Central/ Western section of North Bergen Township is conveyed via a pump station and force main to the Jersey City MUA where the flow is then pumped to PVSC's WRRF via the Hudson County force main. The second combined sewer area is generally located on the northeast side of North Bergen, to the east of Bergenline Avenue, and is connected to the NBMUA's Woodcliff STP. The Woodcliff STP service area is separate from the PVSC service area and is covered in a separate System Characterization Report (see **Appendix A**).

Borough of East Newark

East Newark is located in the western section of Hudson County and has an approximate population of 2,406 (2010 US Census Bureau). The Borough is bounded by the Passaic River and Newark to the west, the Town of Harrison on the southeast and the Town of Kearny on the northeast. The Borough encompasses approximately 72.5-acres and its land use is varied. East Newark mainly consists of high density residential and industrial areas primarily located along the Passaic River.

Town of Harrison

The Town of Harrison is located in Hudson County and has an approximate population of 13,620 (2010 US Census Bureau). The Town is bounded by the Town of Kearny and the Borough of East Newark to the north and the Passaic River to the south. Harrison comprises an area of approximately 1.3 square miles.

Town of Kearny

The Town of Kearny is located in the northwest corner of Hudson County and has an approximate population of 40,684 (2010 US Census Bureau). Kearny is bounded by the Hackensack River and Jersey City on the east, East Newark and Harrison on the south, the Passaic River and Belleville on the west, and North Arlington on the north. The total area of Kearny is approximately 10.19 square miles, of which 9.14 sq. mi. is land area and 1.05 sq. mi is water area.

City of Newark

The City of Newark is located in Essex County and has an approximate population of 277,140 (2010 US Census Bureau). The City is situated to the west of the Passaic River and Newark Bay, and to the north of the Peripheral Ditch which flows into the Elizabeth Channel of Newark Bay. The City covers an area of approximately 24 square miles and presently owns and maintains approximately 298 miles of sanitary and combined sewers. The City is mostly served by the Passaic Valley Sewerage Commission with approximately 5% of the city served by the Joint Meeting of Union and Essex Counties.

City of Paterson

The City of Paterson is located within Passaic County and has an approximate population of 146,199 (2010 US Census Bureau). The City is bounded on the west by the Boroughs of West Paterson and Totowa, on the north by the Passaic River and the Boroughs of Haledon and Prospect Park, on the east by the Passaic River and the Boroughs of Elmwood Park and Fairlawn, and the south by the City of Clifton. The City consists of approximately 5,290 acres.

C.2.2 Separate Sewer Service Area

In addition to the municipalities with combined systems, separately sewered municipalities convey their flow to the Main Interceptor Sewer through 13 branch intercepting sewers and various direct sewer connections. Forty of the 48 municipalities in the service area have separate sewer systems and, therefore, do not own or operate any CSOs. In all but one municipality with a separate sewer system, sewage discharges to the PVSC Main Interceptor and is conveyed to the PVSC WRRF. Union City's sewage flow is conveyed through the Hudson County Force Main and is discharged upstream of the primary clarifiers at the PVSC WRRF. See **Table C-1** above for details regarding separate and combined sewer area.

The following Passaic County towns and boroughs listed in **Table C-2** below contribute separate sewage flow to the PVSC WRRF through the Main Interceptor.

Table C-2: Passaic County Municipalities with Separate Sewer Systems

Passaic County (Towns and Boroughs)	
Franklin Lakes	Woodland Park
North Haledon	Totowa
Hawthorne	Townships of Little Falls
Prospect Park	Cities of Passaic
Haledon	Clifton City

The following towns, boroughs and cities listed in **Table C-3** are located in Bergen County with separate sewage networks are generally located east of the Passaic River and contribute separate sewage flow into the PVSC Main Interceptor.

Table C-3: Bergen County Municipalities with Separate Sewer Systems

Bergen County (Towns, Boroughs, and Cities)	
Ridgewood Village	North Arlington
Glen Rock	Wood Ridge
Fair Lawn	Hasbrouck Heights
Elmwood Park	Saddle Brook
Lodi	Lyndhurst
Wallington	South Hackensack
Rutherford	Hackensack
East Rutherford	Garfield

Table C-4 lists the Essex County towns, boroughs and cities which are located towards the south end of the PVSC Main Interceptor and contribute separate sewage flow to the PVSC WRRF via the Main Interceptor.

Table C-4: Essex County Municipalities with Separate Sewer Systems

Essex County (Towns, Boroughs, and Cities)	
Montclair	West Orange
Nutley	South Orange
Belleville	City of East Orange
Bloomfield	Glen Ridge Borough
City of Orange	North Caldwell
Cedar Grove	

The township and city listed in **Table C-5** are in Union County and are located towards the south end of the PVSC Main Interceptor. They contribute separate sewage flow to the PVSC WRRF via the Main Interceptor.

Table C-5: Union County Municipalities with Separate Sewer Systems

Union County (Township and City)	
Hillside Township	Elizabeth City

Union City listed in **Table C-6** is the only separate sewerage municipality located in Hudson County and contributes flow directly to the WRRF through the Hudson County Forcemain.

Table C-6: Hudson County Municipalities with Separate Sewer Systems

Union County (Township and City)	
Union City	

Most CSO Communities have both separate sewer sections and combined sewer areas. The contributing separate sanitary sewer system area for each CSO community is shown in **Table C-1.** A portion of the City of Bayonne includes a separate sewer system, which serves a small industrial area. Sewage is conveyed separately in the area between Pulaski Street and Constable Hook along the Hudson River and is discharged directly to the Eastern Interceptor Sewer. All wastewater within the City of Bayonne flows to the City of Bayonne Oak Street Pumping Station, which transports wastewater to the PVSC WRRF.

C.2.3 Existing CSO Controls and Programs

The PVSC Treatment District has implemented various CSO control and programs that are currently operating to reduce pollution of the waterways. The existing CSO controls and programs for each of the Permittees are described below.

PVSC

Ten regulators in Newark have been retrofitted and equipped with motorized sluice gates, which are remotely controlled from the plant via a telemetered control signal. PVSC operates the ten Newark sluice gates with radio transmission through Phoenix contact and Elpro™ transmitters back to PVSC's SCADA system. The gates can be utilized during rain events to prevent overloading the WRRF. The appropriate gates may be controlled to bypass the combined sewer from the regulator to the Passaic River.

City of Newark

The City of Newark has 16 CSO floatables control facilities, 12 netting facilities and four screening facilities. The South Side Interceptor has a gate that can be manually closed in the event of an emergency situation, causing a diversion of the entire flow to the Newark Airport Peripheral Ditch.

Borough of East Newark

The Borough of East Newark owns and operates 1 CSO floatables control facility to prevent introduction of solids and floatables to the waterways.

Town of Harrison

The Town of Harrison owns and operates 6 CSO floatables control facilities. Harrison formerly owned and operated an additional CSO floatables control facility on outfall 004A. This drainage area has been separated and on June 25, 2018 NJDEP issued Harrison a minor modification NJPDES permit action to remove Dey Street outfall 004A from the permit.

Town of Kearny

The Town of Kearny owns and operates five CSO floatables control facilities to prevent introduction of solids and floatables to the waterways.

City of Paterson

The City of Paterson has 23 CSO outfalls and one discharge currently under appeal to be re-added to the permit. Nineteen of the 23 outfalls have floatables control facilities installed upstream of the point of discharge.

City of Bayonne

The City of Bayonne owns and operates 17 CSO floatables control facilities and 17 discharge points originating at regulator chambers to the interceptor sewers. In addition to the CSO points originating at regulators to the interceptor, the City had constructed cross connections to provide hydraulic relief to the CSS. The cross connections consist of elevated overflow pipes between manholes that allow for diversion of excess wastewater flow from the combined sewer system to the storm sewer system and ultimately to the receiving waters. Each of the cross connections were retrofitted with static screens to provide control of floatables. Overall, the sewer system contains 37 floatables control facilities tributary to 13 CSO discharge pipes. During construction of the solids/floatables control facilities, several of the outfalls were combined to reduce the number of individual facilities from the total number of 28 CSO outfalls.

North Bergen MUA

The North Bergen MUA has eight netting facilities and one bar screen in the Central Service Area. Each CSO outfall receives flows from only one regulator.

Jersey City MUA

JCMUA owns and operates 20 netting facilities and one mechanical screening facility in the JCMUA's system. The netting facilities consist of nets and static screens that capture solids and floatables that would otherwise enter the receiving waters. These facilities are inspected on a regular basis, and solids and floatables are removed and disposed.

C.3 SYSTEM CHARACTERIZATION

C.3.1 System Characterization Work Plan for the LTCP

The System Characterization Work Plan for the LTCP was submitted as part of the System Characterization and Landside Modeling Program Quality Assurance Project Plan (QAPP) I and System Characterization and Landside Modeling Program QAPP II. The QAPPs describe work plans for data generation and acquisition, assessment and oversight, data validation and usability, and collections system modeling.

The System Characterization Work Plan I was submitted to the NJDEP on behalf of PVSC, Borough of East Newark, Town of Harrison, Town of Kearny, City of Newark, and City of Paterson on December 29, 2015. The NJDEP provided comments on February 17, 2016, and it was ultimately approved by the NJDEP on October 12, 2016.

The System Characterization Work Plan II was submitted to the NJDEP on behalf of Bayonne MUA and North Bergen MUA on December 28, 2015. The NJDEP provided comments on February 16, 2016, and it was approved by the NJDEP on October 12, 2016.

See **Appendix Q** for the approved System Characterization Work Plans.

C.3.2 System Characterization Report

The objective of the System Characterization Report (SCR) is to provide NJDEP, PVSC, and the Permittees with a comprehensive and empirical understanding of the physical nature and hydraulic performance of their respective sewerage systems for use in optimizing the

performance of the current systems and in the development of CSO control alternatives. The SCR incorporated the results of the QAPPs for the System Characterization and Landside Modeling Program, a summary of the Baseline Monitoring and Modeling Plan program, and the System Characterization mapping of the combined and separate sewer areas within the PVSC Treatment District. The SCR was submitted to the NJDEP on behalf of the Permittees on June 29, 2018. The NJDEP provided comments on October 9, 2018, and ultimately approved the SCR on April 12, 2019. The SCR can be found in **Appendix A**.

This System Characterization Report has been developed to include PVSC and seven of the CSO municipalities per agreement with each municipality. Jersey City MUA submitted their own System Characterization Report.

The SCR documents detail a thorough understanding of the Permittees' respective sewerage systems, the systems' responses to precipitation events of varying duration and intensity, the characteristics of system overflow events, and water quality issues associated with CSOs emanating from the systems. The latest revision of the SCR provides a more comprehensive summary of the system characterization. An overview of the organization and contents of the SCR are provided in **Table C-7.**

C.3.3 Receiving Waters Characterization

Characteristics of the receiving waters include description of the receiving waters designated use, shoreline characteristics, identification of the waters on the impaired waters of New Jersey and a summary of the sensitive areas, if any, within the receiving water. The USEPA CSO Control Policy Guideline requires that highest priority is given to CSOs that discharge to sensitive areas.

Major receiving waters impacted from PVSC service area combined sewer overflows include the Passaic River, Hackensack River, Newark Bay, Upper New York Bay, Hudson River, Kill Van Kull, Raritan River and Raritan Bay, as well as their tributaries. The NJDEP has categorized these receiving waters into Watershed Management Areas (WMA) 1 through 20 and refers to these designations in the 303(d) list of impaired water.

CSO receiving waters are waterbodies that either a CSO discharges into or receive flow from tributaries with CSOs. The receiving waters include the combined sewer service area of the PVSC Treatment District and expands from this service area to include all receiving and adjacent downstream waters that may be potentially affected by CSOs from the various combined sewer service areas of the NJ CSO Group. PVSC Treatment District receiving waters include the Passaic River, Hudson River, Newark Bay, Upper New York Bay, Hackensack River, Kill Van Kull, as well as their tributaries. All of the CSO outfalls and the waterbodies into which they discharge are listed in **Table C-8**.

Table C-7: System Characterization Report Contents and Organization

Section		Topics Covered
A	Introduction and Background	Documents the problem definition, background, project description, summary and table of contents.
B	Regulatory Requirements	Describes the scope, purpose and regulatory context of the System Characterization Report.
C	Overview of Wastewater Facilities and Service Area	Characterizes the service area comprising the PVSC combined sewered municipalities that are the subject of this system characterization report and current wastewater treatment facilities within the service area.
D	Characteristics of the Combined Sewer System	Characterizes the municipal collection sewers, sewer mains, interceptors and appurtenances such as pump stations, existing CSO control facilities, regulator structures, and CSO outfalls.
E	Collection of Precipitation and Sewer Flow Monitoring	Documents the precipitation and flow monitoring programs, data analyses, integration of wastewater treatment plant operational data, data validation and QA/QC and presents the results of the analyses.
F	Characteristics of the Receiving Waters	Describes the watersheds, physical characteristics, and hydrodynamics of the receiving streams. Also describes the designated uses and current water quality compliance (e.g. 303(d) listings) and achievement of designated use status.
G	Collection of Water Quality Data	Documents the regulatory requirements for water quality data collection, historic water quality data collection, the water quality monitoring program and related QAPP and receiving water quality results.
H	Typical Hydrologic Period	Documents the requirements for and selection of the typical year and summarizes the hydrologic characteristics of the typical year.
I	Hydrologic and Hydraulic Modeling	Documents the development and scope of the H&H model used in this system characterization and to be used in the development of CSO control alternatives. The documentation includes model inputs, sensitivity analyses, model calibration and validation and modeling results.
J	References	
K	Abbreviations	

Table C-8: CSO Outfalls and Their Receiving Waters

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0109240	Bayonne	001A	B-001A (E. 15th St.)	Kill Van Kull
NJ0109240	Bayonne	002A	B-002A (5th St.)	Kill Van Kull
NJ0109240	Bayonne	003A	B-003A (1st St.)	Kill Van Kull
NJ0109240	Bayonne	004A	B-004A (Lord Ave.)	Kill Van Kull
NJ0109240	Bayonne	006A	B-006A (E. 30th St.)	Upper NY Bay
NJ0109240	Bayonne	007A	B-007A (E. 34th St.)	Upper NY Bay
NJ0109240	Bayonne	008A	B-008A (E. 5th St.)	Kill Van Kull
NJ0109240	Bayonne	009A	B-009A (Broadway)	Kill Van Kull
NJ0109240	Bayonne	010A	B-010A (Ave. C)	Kill Van Kull
NJ0109240	Bayonne	011A	B-011A (W. 3rd St.)	Newark Bay
NJ0109240	Bayonne	012A	B-012A (W. 5th St.)	Newark Bay
NJ0109240	Bayonne	013A	B-013A (Edwards Ct.)	Newark Bay
NJ0109240	Bayonne	014A	B-014A (W. 16th St.)	Newark Bay
NJ0109240	Bayonne	015A	B-015A (W. 22nd St.)	Newark Bay
NJ0109240	Bayonne	016A	B-016A (W. 24th St.)	Newark Bay
NJ0109240	Bayonne	017A	B-017A (W. 25th St.)	Newark Bay
NJ0109240	Bayonne	018A	B-018A (W. 30th St.)	Newark Bay
NJ0109240	Bayonne	019A	B-019A (Lincoln Pkwy)	Newark Bay
NJ0109240	Bayonne	020A	B-020A (W. 59th St.)	Newark Bay
NJ0109240	Bayonne	021A	B-021A (E. 50th St.)	Upper NY Bay
NJ0109240	Bayonne	022A	B-022A (Zabriskie Ave.)	Newark Bay

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0109240	Bayonne	024A	B-024A (Humphrey's Ave.)	Kill Van Kull
NJ0109240	Bayonne	026A	B-026A (Veteran's Park)	Newark Bay
NJ0109240	Bayonne	028A	B-028A (Lincoln Pkwy)	Newark Bay
NJ0109240	Bayonne	029A	B-029A (W. 37th St.)	Newark Bay
NJ0109240	Bayonne	030A	B-030A (W. 54th St.)	Newark Bay
NJ0109240	Bayonne	034A	B-034A (Bayview Ct.)	Newark Bay
NJ0109240	Bayonne	037A	B-037A (Trask Ave.)	Kill Van Kull
NJ0117846	East Newark	001A	E-001A (Central Ave.)	Passaic River
NJ0108871	Harrison Town	001A	H-001A (Hamilton Ave.)	Passaic River
NJ0108871	Harrison Town	002A	H-002A (Cleveland Ave.)	Passaic River
NJ0108871	Harrison Town	003A	H-003A (Harrison Ave.)	Passaic River
NJ0108871	Harrison Town	005A	H-005A (Middlesex St.)	Passaic River
NJ0108871	Harrison Town	006A	H-006A (Bergen St.)	Passaic River
NJ0108871	Harrison Town	007A	H-007A (Worthington Ave.)	Passaic River
NJ0108723	Jersey City MUA	001A	RW-1 (Secaucus Rd.)	Penhorn Creek
NJ0108723	Jersey City MUA	002A	RW-2 (Manhattan Ave.)	Penhorn Creek
NJ0108723	Jersey City MUA	003A	RW-3 (St. Paul's Ave.)	Hackensack River
NJ0108723	Jersey City MUA	004A	RW-4 (Van Wrinkle Ave.)	Hackensack River
NJ0108723	Jersey City MUA	005A	RW-5 (Broadway)	Hackensack River
NJ0108723	Jersey City MUA	006A	RW-6 (Sip Ave.)	Hackensack River
NJ0108723	Jersey City MUA	007A	RW-7 (Duncan Ave.)	Hackensack River
NJ0108723	Jersey City MUA	008A	RW-8 (Clendenny Ave.)	Hackensack River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108723	Jersey City MUA	009A	RW-9 (Claremont Ave.)	Hackensack River
NJ0108723	Jersey City MUA	010A	RW-10 (Fisk St.)	Hackensack River
NJ0108723	Jersey City MUA	011A	RW-11/12 (North Danforth Ave.) RW-12 (South Danforth Ave.)	Newark Bay
NJ0108723	Jersey City MUA	013A	RW-13 (Mina Dr.)	Newark Bay
NJ0108723	Jersey City MUA	014A	RE-1 (Brown Place)	Hudson River
NJ0108723	Jersey City MUA	015A	RE-2 (Richard St.)	Hudson River
NJ0108723	Jersey City MUA	016A	RE-3/4 (Claremont and Carteret)	Hudson River
NJ0108723	Jersey City MUA	018A	RE-5/6 (Mill Creek and Pine)	Hudson River
NJ0108723	Jersey City MUA	020A	RE-10 (Grand St.) RE-11 (York St.)	Hudson River
NJ0108723	Jersey City MUA	025A	RE-15 (Second St.)	Hudson River
NJ0108723	Jersey City MUA	026A	RE-16 (South Sixth St.), RE-17 (North Sixth St.)	Hudson River
NJ0108723	Jersey City MUA	028A	RE-18 (Fourteenth St.)	Hudson River
NJ0108723	Jersey City MUA	029A	RE-19 (Eighteenth St.)	Hudson River
NJ0111244	Kearny Town	001A	K-001A (Stewart Ave.)	Passaic River
NJ0111244	Kearny Town	004A	K-004A (Nairne Ave.)	Passaic River
NJ0111244	Kearny Town	006A	K-006A (Johnston Ave.)	Passaic River
NJ0111244	Kearny Town	007A	K-007A (Ivy St.)	Frank's Creek
NJ0111244	Kearny Town	010A	K-010A (Duke St.)	Frank's Creek
NJ0108758	Newark City	002A	N-002A (Verona Ave.)	Passaic River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108758	Newark City	003A	N-003A (Delavan Ave.)	Passaic River
NJ0108758	Newark City	004A	N-004A/004A (Herbert)	Passaic River
NJ0108758	Newark City	005A	N-005A (Herbert Pl.)	Passaic River
NJ0108758	Newark City	008A	N-008A (Fourth Ave.)	Passaic River
NJ0108758	Newark City	009A	N-009A (Clay St.)	Passaic River
NJ0108758	Newark City	010A	N-010A (Clay St.)	Passaic River
NJ0108758	Newark City	014A	N-014A (Saybrook)	Passaic River
NJ0108758	Newark City	015A	N-015A (City Dock)	Passaic River
NJ0108758	Newark City	016A	N-016A (Jackson St.)	Passaic River
NJ0108758	Newark City	017A	N-017A (Polk St.)	Passaic River
NJ0108758	Newark City	018A	N-018A (Freeman St.)	Passaic River
NJ0108758	Newark City	022A	N-022A (Roanoke Ave.)	Passaic River
NJ0108758	Newark City	023A	N-023A (Adams St.)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	025A	N-025A (Peddie St.)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	026A	N-026A (Queen St.)	Queen Ditch
NJ0108758	Newark City	027A/029A	N-027A/029A (Waverly)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	030A	N-030A (Ave. A)	Peripheral Ditch / Elizabeth Channel
NJ0108898	North Bergen MUA	003A	NB-003A (W. 91st St.)	Bellmans Creek
NJ0108898	North Bergen MUA	005A	NB-005A (W. 69th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	006A	NB-006A (W. 60th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	007A	NB-007A (51st St.)	Cromakill Creek
NJ0108898	North Bergen MUA	008A	NB-008A (43rd St.)	Cromakill Creek

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108898	North Bergen MUA	009A	NB-009A (Paterson Plank Rd.)	Cromakill Creek
NJ0108898	North Bergen MUA	010A	NB-010A (29th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	011A	NB-011A (11th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	014A	NB-014A (Paterson Plank Rd.)	Cromakill Creek
NJ0108880	Paterson City	001A	P-001A (Curtis Pl.)	Passaic River
NJ0108880	Paterson City	003A	P-003A (W. Broadway)	Passaic River
NJ0108880	Paterson City	005A	P-005A (Bridge St.)	Passaic River
NJ0108880	Paterson City	006A	P-006A (Montgomery St.)	Passaic River
NJ0108880	Paterson City	007A	P-007A (Straight St.)	Passaic River
NJ0108880	Paterson City	010A	P-010A (Warren St.)	Passaic River
NJ0108880	Paterson City	013A	P-013A (E. Eleventh St.)	Passaic River
NJ0108880	Paterson City	014A	P-014A (Fourth Ave.)	Passaic River
NJ0108880	Paterson City	015A	P-015A (S.U.M. Park)	Passaic River
NJ0108880	Paterson City	016A	P-016A (Northwest St.)	Passaic River
NJ0108880	Paterson City	017A	P-017A (Arch St.)	Passaic River
NJ0108880	Paterson City	021A	P-021A (Bergen St.)	Passaic River
NJ0108880	Paterson City	022A	P-022A (Short St.)	Passaic River
NJ0108880	Paterson City	023A	P-023A (Second Ave.)	Passaic River
NJ0108880	Paterson City	024A	P-024A (Third Ave.)	Passaic River
NJ0108880	Paterson City	025A	P-025A (East 33rd Ave.)	Passaic River
NJ0108880	Paterson City	026A	P-026A (East 20th Ave.)	Passaic River
NJ0108880	Paterson City	027A	P-027A (Market St.)	Passaic River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108880	Paterson City	029A	P-029A (River St.)	Passaic River
NJ0108880	Paterson City	030A	P-030A (19th Ave.)	Passaic River
NJ0108880	Paterson City	031A	P-031A (Interstate 80)	Passaic River
NJ0108880	Paterson City	032A	P-032A (Hudson St.)	Passaic River
NJ0108880	Paterson City	033A	P-033A (River St.)	Passaic River

The receiving waters and their tributaries belong to drainage basins that are impacted by CSO discharges. Drainage basins, or watersheds, are areas that are separated by drainage divides and within a watershed, all surface water drains to a single outlet such as a river. The impacted watersheds within the PVSC Treatment District are listed in **Table C-9.** The watersheds are also shown with the QAPP Part 1 and Part 2 areas from the "System Characterization and Landside Modeling Program Quality Assurance Project Plan (QAPP)," which have been previously approved by NJDEP areas in **Figure C-4**.

Table C-9: Watersheds Affected by CSO Discharges

Watershed Name	Area (sq mi)
Hudson River	5
Passaic River Lower (Saddle to Pompton)	46
Hackensack River (below and including Hirschfeld Brook)	19
Passaic River Lower (Newark Bay to Saddle)	52
Elizabeth River	2
Newark Bay / Kill Van Kull / Upper NY Bay	25

C.3.4 Baseline Compliance Monitoring Program

Section D.3.c of the NJPDES Permit for each Permittee requires submittal of an approvable Baseline Compliance Monitoring Program (BCMP) Work Plan to the NJDEP 6 months from the effective date of the permit. The QAPPs for the BCMP and Receiving Water Quality Modeling were submitted separately from the Sewer System Characterization Work Plan QAPP described in **Section C.3.1**.

The BCMP (**Appendix R**) was developed to serve all of the North Jersey CSO Permittees and designed to generate sufficient data to establish existing ambient water quality conditions for pathogens in the CSO receiving waters and to update, calibrate and validate a pathogen water

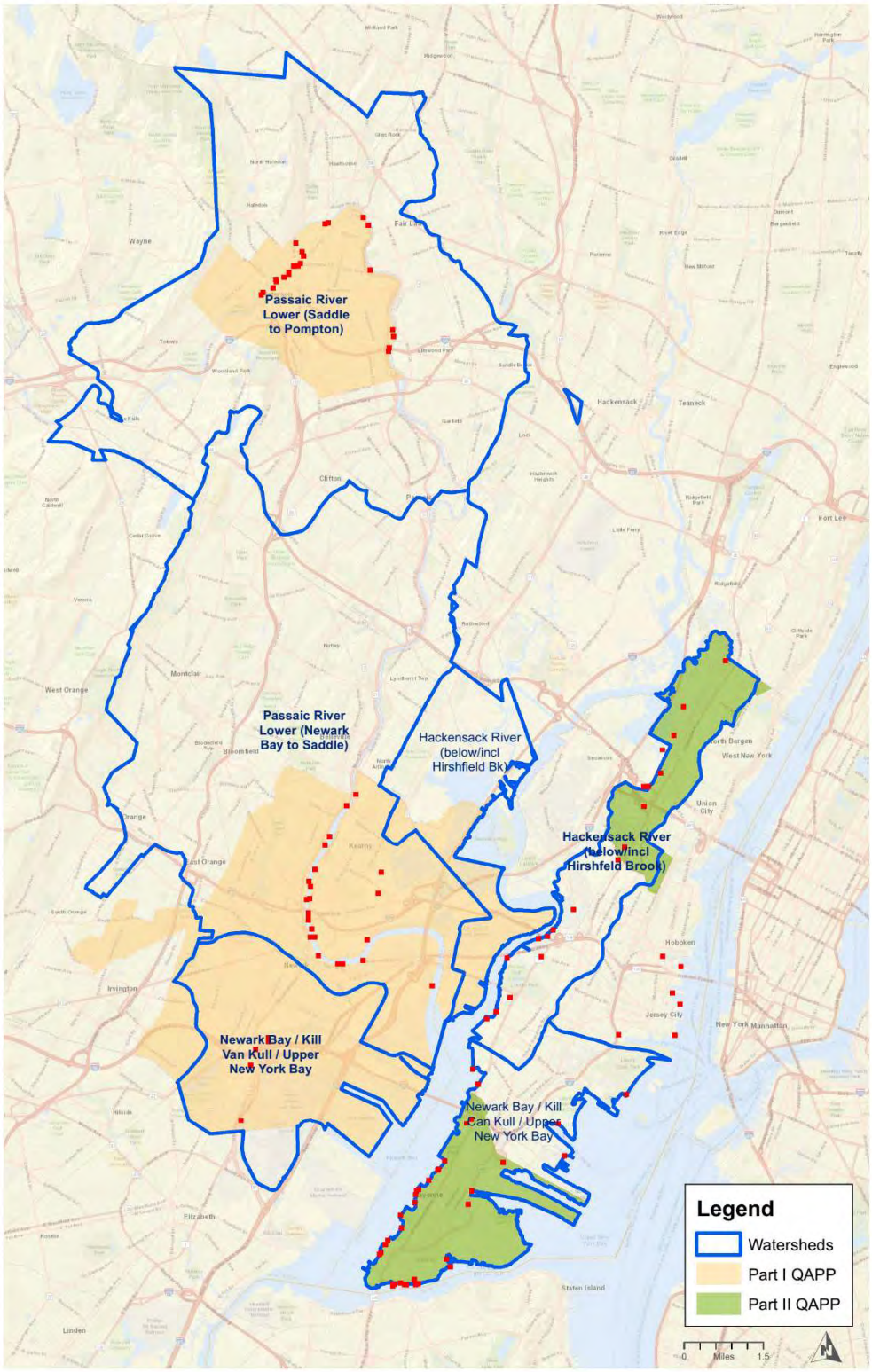


Figure C-4: PVSC Treatment District Watersheds

quality model of the receiving water bodies. The resulting model was used to support the development of CSO LTCPs by the PVSC and participating members of the NJ CSO Group. A review indicated that the data collected under the BCMP is sufficient for the intended goal of calibrating the water quality model to be used for PVSC and NJCSO communities' LTCPs.

C.4 TYPICAL HYDROLOGIC YEAR

The year 2004 was selected as the recommended typical hydrologic year for the PVSC CSO communities' LTCP. The selection of the typical hydrologic year was based on the historical records in the past 46 years from 1970 through 2015 as detailed in the SCR in **Appendix A** of this report. The Typical Year analysis that was performed accounted for climate change based on the increased precipitation trend over this 46 year period. In order to be more conservative, the typical year was selected from years with an annual precipitation depth greater than the average value.

Among the qualified periods, the year 2004 ranked first in the parameters described in **Table C-10** and contains a wide range of storms and antecedent conditions. Additionally, year 2004 has close to an average CSO volume and event number based on the hydrologic and hydraulic model results. A summary of the parameters and the percent difference is shown below in **Table C-10**.

Table C-10: Summary of the Recommended Typical Hydrologic Year - 2004

Parameters	2004
Annual Precipitation*	48.37 in (4.5% greater than average 46.27)
Number of Events >=0.2" Rainfall Depth	54 (5% greater than average 51.2)
Number of Events >=0.1" Rainfall Depth	73 (11% greater than average 66)
5th Largest Storm Volume	1.63 in (5% less than average 1.70)
Rainfall Volume for 85% Capture	1.18 in (12% less than average 1.35)
Back-to-Back Storm Events	12 (14% greater than average 10.5)
Max Peak Intensity of 5th Largest Storm & Smaller	0.99 in/hr (9.5% greater than average 0.90)
Extreme Storm	1 Year Storm (2) 2 Year Storm (1)
Average Rainfall Duration	10.3 hr (4.8% less than average 10.8)
Average Rainfall Intensity	0.084 in/hr (3.8% greater than average 0.081)

Note: *Includes snowfall

C.5 SENSITIVE AREAS

The USEPA's CSO Control Policy "expects a Permittee's long-term CSO control plan to give the highest priority to controlling overflows to sensitive areas" (Section II.C.3).

In compliance with this condition, PVSC prepared a Sensitive Areas Report on behalf of the Permittees. The study involved a comprehensive review of online databases, direct observations and correspondence with regulatory agencies and local environmental organizations to identify

potential sensitive areas within the PVSC Treatment District and in the associated receiving waters.

The results of the study are summarized below:

- Zero Outstanding National Resource Waters were located within the Service Area.
- Zero National Marine Sanctuaries were located within the Service Area.
- Zero* known critical habitats for an endangered species were located in the Service Area.
- Zero waters designated for primary contact were located within the Service Area.
- Zero operating commercial shellfish harvesters were located within the Service Area.
- Zero* drinking water intakes were located in the Service Area.

**T*here are multiple locations where endangered or threatened species have been identified near permitted CSOs, but no certainty of a critical habitat existing at these locations. As such, there have been no sensitive areas determined as a result from waters with threatened and endangered species within their habits.*

For details of the Sensitive Area Study refer to the System Characterization Report (**Appendix A**) and the Consideration of Sensitive Areas Report (**Appendix C**).

SECTION D - SCREENING OF CSO CONTROL TECHNOLOGIES

In order to determine the appropriate combined sewer overflow control technologies, a review of CSO technologies was completed in the Development and Evaluation of Alternatives Report (DEAR) to determine those technologies that have the greatest potential to meet the requirements of the NJPDES Permit for the Municipalities.

This screening of technologies did not consider cost or the cost effectiveness and was only intended to exclude CSO control technologies not technically or physically appropriate for the PVSC Treatment District. The screening of CSO control technologies was also presented to the public at a PVSC Regional Supplemental CSO Team Meeting. Public input received on the screening of CSO control technologies was reviewed and considered in this evaluation. The results of this screening brought several CSO control technologies forward for consideration in the development of the LTCP. These control technologies are further discussed in Section E of this report, and further details on the screening process are provided in **Appendix D**.

D.1 EVALUATION METHODOLOGY

Each CSO control technology evaluated in this section was assigned a value based on its effectiveness at achieving the primary goals defined above. The categories used to assign goal effectiveness are as follows:

- High: These CSO control technologies are highly effective and are among the best technologies to achieve primary CSO control goals. For this reason, these technologies are highly likely to be considered for further evaluation.
- Medium: These CSO control technologies are moderately effective at achieving the primary CSO control goals, but are not considered among the most effective technologies to achieve those goals. These technologies may or may not be considered for further evaluation.
- Low: These CSO control technologies are projected to have a minor impact on achieving the primary CSO control goals. These technologies will need other positive attributes to support achieving CSO control measures to be considered for further evaluation.
- None: The CSO control technology will have no impact or a negative impact on the primary CSO control goals. It is unlikely that these technologies will be considered for further evaluation.

A CSO technology that is highly effective in one or all evaluation factors was likely to be recommended for further investigation. A CSO technology that did not reach a “medium” effectiveness in meeting CSO control goals was not likely to be recommended for further evaluation.

Additionally, the positive impacts that each of the technologies could have on the community beyond achieving the primary goals described above were evaluated. The community benefits were identified using as a reference the New Jersey DEP Division of Water Quality’s report entitled “Evaluating Green Infrastructure: A Combined Sewer Overflow Control Alternative for Long Term Control Plans,” and the New Jersey Green Infrastructure Municipal Toolkit website. Public input received on the screenings of technologies also requested that community benefits were considered. As such, community benefits were incorporated in the evaluation methodology

and were identified to include aesthetic improvements, improvements to water quality, reduction of flooding potential, and alignment with sustainable community principles, among others.

CSO control technologies were recommended for further evaluation based on multiple factors:

- The first factor was the goal-effectiveness value that generally quantifies the effectiveness a technology would have towards achieving a CSO control goal. These goal-effectiveness values are described above.
- The second factor depended upon the CSO control technology requiring further evaluation pursuant to the NJPDES Permit. The permit identifies certain technologies that must be evaluated further before approval.
- The third factor in determining whether a technology would be evaluated further was the current or future implementation and operation of that technology. If the technology is currently in place, will be implemented, or is mandated by the Nine Minimum Controls, then further evaluation was not required.
- The fourth and final factor was the feasibility of implementation, particularly in terms of land/infrastructure ownership.

The community benefits identified for each technology also played an important role in determining whether implementation of the technology would be beneficial and recommended to be moved forward for further analysis.

CSO technologies found to be highly effective in one or all evaluation factors were likely to be recommended for further investigation. A CSO technology that would not achieve a "medium" effectiveness for water quality goals would not be expected to be recommended for further evaluation. This screening methodology was presented to the public at the October 2018 PVSC Regional Supplemental CSO Meeting. Input was requested from the public and the public feedback was considered in this evaluation.

D.2 SCREENING OF CONTROL TECHNOLOGIES

Templates of the screening tables used by the two municipalities for screening of the CSO control technologies are presented as **Table D-1**, **Table D-2**, and **Table D-3**. **Table D-1** presents the source control technologies, **Table D-2** presents the collection system technologies, and **Table D-3** presents the storage and treatment technologies.

Screening tables with the last two columns filled out by each municipality are presented in the individual DEAR for each Permittee, appended to the Regional DEAR, which is included as **Appendix D.** The CSO control technologies summarized in the individual DEARs present assigned values based on their effectiveness at reaching primary CSO control goals. CSO Control technologies recommended for further evaluation are recorded in these summary tables for each Permittee.

Table D-1 Source Control Technologies Screening Table

Source Control Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Stormwater Management	Street/Parking Lot Storage (Catch Basin Control)	Low	Low	▪ Reduced surface flooding	Flow restrictions to the CSS can cause flooding in lots, yards and buildings; potential for freezing in lots; low operational cost. Effective at reducing peak flows during wet weather events but can cause dangerous conditions for the public if pedestrian areas freeze during flooding.	No		
	Catch Basin Modification (for Floatables Control)	Low	None	▪ Water quality improvements ▪ Reduced surface flooding	Requires periodic catch basin cleaning; requires suitable catch basin configuration; potential for street flooding and increased maintenance efforts. Reduces debris and floatables that can cause operational problems with the mechanical regulators.	No		
	Catch Basin Modification (Leaching)	Low	Low	▪ Water quality improvements ▪ Reduced surface flooding	Can be installed in new developments or used as replacements for existing catch basins. Require similar maintenance as traditional catch basins. Leaching catch basins have minor effects on the primary CSO control goals.	No		
Public Education and Outreach	Water Conservation	None	Low	▪ Reduced surface flooding ▪ Align with goals for a sustainable community	Water purveyor is responsible for the water system and all related programs in the respective City. However, water conservation is a common topic for public education programs. Water conservation can reduce CSO discharge volume but would have little impact on peak flows.	Yes		
	Catch Basin Stenciling	None	None	▪ Align with goals for a sustainable community	Inexpensive; easy to implement; public education. Is only as effective as the public's input and understanding of the message. Public outreach programs would have a more effective result.	Yes		
	Community Cleanup Programs	None	None	▪ Water quality improvements ▪ Align with goals for a sustainable community	Inexpensive; sense of community ownership; educational BMP; aesthetic enhancement. Community cleanups are inexpensive and build ownership in the city.	Yes		
	Public Outreach Programs	Low	None	▪ Align with goals for a sustainable community	Public education program is ongoing. Permittee should continue its public education program as control measures demonstrate implementation of the NMC.	Yes		
	FOG Program	Low	None	▪ Water quality improvements ▪ Improves collection system efficiency	Requires communication with business owners; Permittee may not have enforcement authority. Reduces buildup and maintains flow capacity. Only as effective as business owner cooperation.	Yes		
	Garbage Disposal Restriction	Low	None	▪ Water quality improvements	Permittee may not be responsible for Garbage Disposal. This requires an increased allocation of resources for enforcement while providing very little reduction to wet weather CSO events.	Yes		
	Pet Waste Management	Medium	None	▪ Water quality improvements	Low cost of implementation and little to no maintenance. This is a low-cost technology that can significantly reduce bacteria loading in wet weather CSO's.	Yes		
	Lawn and Garden Maintenance	Low	Low	▪ Water quality improvements	Requires communication with business and homeowners. Guidelines are already established per USEPA. Educating the public on proper lawn and garden treatment protocols developed by USEPA will reduce waterway contamination. Since this information is already available to the public it is unlikely to have a significant effect on improving water quality.	Yes		
	Hazardous Waste Collection	Low	None	▪ Water quality improvements	The N.J.A.C. prohibits the discharge of hazardous waste to the collection system.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Ordinance Enforcement	Construction Site Erosion & Sediment Control	None	None	▪ Water quality improvements	In building code; reduces sediment and silt loads to waterways; reduces clogging of catch basins; little O&M required; contractor or owner pays for erosion control. A Soil Erosion & Sediment Control Plan Application or 14-day notification (if Permittee covered under permit-by-rule) will be required by NJDEP per the N.J.A.C.	Yes		
	Illegal Dumping Control	Low	None	▪ Water quality improvements ▪ Aesthetic benefits	Enforcement of current law requires large number of code enforcement personnel; recycling sites maintained. Local ordinances already in place can be used as needed to address illegal dumping complaints.	Yes		
	Pet Waste Control	Medium	None	▪ Water quality improvements ▪ Reduced surface flooding	Requires resources to enforce pet waste ordinances. Public education and outreach are a more efficient use of resources, but this may also provide an alternative to reducing bacterial loads.	Yes		
	Litter Control	None	None	▪ Property value uplift ▪ Water quality improvements ▪ Reduced surface flooding	Aesthetic enhancement; labor intensive; City function. Litter control provides an aesthetic and water quality enhancement. It will require city resources to enforce. Public education and outreach are a more efficient use of resources.	Yes		
	Illicit Connection Control	Low	Low	▪ Water quality improvements ▪ Align with goals for sustainable community	Site specific; more applicable to separate sanitary system; new storm sewers may be required; interaction with homeowners required. The primary goal of the LTCP is to meet the NJPDES Permit requirements relative to POCs. Illicit connection control is not particularly effective at any of these goals and is not recommended for further evaluation unless separate sewers are in place.	Yes		
Good Housekeeping	Street Sweeping/Flushing	Low	None	▪ Reduced surface flooding	Labor intensive; specialized equipment; doesn't address flow or bacteria; City function. Street sweeping and flushing primarily addresses floatables entering the CSS while offering an aesthetic improvement.	Yes		
	Leaf Collection	Low	None	▪ Reduced surface flooding ▪ Aesthetic benefits	Requires additional seasonal labor. Leaf collection maximizes flow capacity and removes nutrients from the collection system.	Yes		
	Recycling Programs	None	None	▪ Align with goals for sustainable community	Most Cities have an ongoing recycling program.	Yes		
	Storage/Loading/Unloading Areas	None	None	▪ Water quality improvements	Requires industrial & commercial facilities designate and use specific areas for loading/unloading operations. There may be few major commercial or industrial users upstream of CSO regulators.	Yes		
	Industrial Spill Control	Low	None	▪ Protect surface waters ▪ Protect public health	PVSC has established a pretreatment program for industrial users subject to the Federal Categorical Pretreatment Standards 40 CFR 403.1.	Yes		
Green Infrastructure Buildings	Green Roofs	None	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Adds modest cost to new construction; not applicable to all retrofits; low operational resource demand; will require the Permittee or private owners to implement; requires regular cleaning of gutters & pipes; upkeep of roof vegetation. Portions of Cities have densely populated areas, but this technology is limited to rooftops. Can be difficult to require on private properties.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals: Bacteria Reduction	Primary Goals: Volume Reduction	Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
Green Infrastructure Buildings	Blue Roofs	None	Medium	▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Adds modest cost to new construction; not applicable to all retrofits; low operational resource demand; will require the Permittees or private owners to implement; requires regular cleaning of gutters & pipes; upkeep of roof debris. Portions of the Cities have densely populated areas, but this technology is limited to rooftops. Can be difficult to require on private properties.	Yes		
	Rainwater Harvesting	None	Medium	▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community ▪ Water saving	Simple to install and operate; low operational resource demand; will require the Permittees or private owners to implement; requires regular cleaning of gutters & pipes. Portions of the Cities have densely populated areas, but this technology is limited to capturing rooftop drainage. Capture is limited to available storage, which can vary on rainwater use. Can be difficult to require on private properties.	Yes		
Green Infrastructure Impervious Areas	Permeable Pavements	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Not durable and clogs in winter; oil and grease will clog; significant O&M requirements with vacuuming and replacing deteriorated surfaces; can be very effective in parking lots, lanes and sidewalks. Maintenance requirements could be reduced if located in low-traffic areas and can utilize underground infiltration beds or detention tanks to increase storage.	Yes		
	Planter Boxes	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Site specific; good BMP; minimal vegetation & mulch O&M requirements with regular overflow and underdrain cleaning; effective at containing, infiltrating and evapotranspiring runoff in developed areas. Flexible and can be implemented even on a small-scale to any high-priority drainage areas. Underground infiltration beds or detention tanks can be utilized to increase storage.	Yes		
Green Infrastructure Pervious Areas	Bioswales	Low	Low	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs	Site specific; good BMP; minimal vegetation & mulch O&M requirements; not as flexible or infiltrate as much stormwater as planter boxes. Technology requires open space and is primarily a surface conveyance technology with additional storage & infiltration benefits. Can be modified with check dams to slow water flow. Limited open space in most Cities means land can be utilized in more effective ways with the existing infrastructure.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals: Bacteria Reduction	Primary Goals: Volume Reduction	Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
				▪ Passive and active recreational improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Community aesthetic improvements ▪ Reduced crime ▪ Align with goals for a sustainable community ▪ Increased pedestrian safety through curb retrofits				
	Free-Form Rain Gardens	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Passive and active recreational improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Community aesthetic improvements ▪ Reduced crime ▪ Align with goals for a sustainable community	Site specific; good BMP; minimal vegetation & mulch O&M requirements with regular overflow and underdrain cleaning; effective at containing, infiltrating and evapotranspiring diverted runoff. Rain Gardens are flexible and can be modified to fit into the previous areas. Underground infiltration beds or detention tanks can be utilized to increase storage.	Yes		

Table D-2: Collection System Technologies Screening Table

Collection System Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Operation and Maintenance (O&M)	I/I Reduction	Low	Medium	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires labor intensive work; changes to the conveyance system require temporary pumping measures; repairs on private property required by homeowners. Reduces the volume of flow and frequency; Provides additional capacity for future growth; House laterals account for 1/2 the sewer system length and significant sources of I/I in the sanitary sewer.	Yes		
	Advanced System Inspection & Maintenance	Low	Low	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires additional resources towards regular inspection and maintenance work. Inspection and maintenance programs can provide detailed information about the condition and future performance of infrastructure. Offers relatively small advances towards goals of the LTCP.	Yes		
	Combined Sewer Flushing	Low	Low	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires inspection after every flush; no changes to the existing conveyance system needed; requires flushing water source. Ongoing: CSO Operational Plan; maximizes existing collection system; reduces first flush effect.	Yes		
	Catch Basin Cleaning	Low	None	▪ Water quality improvements ▪ Reduced surface flooding	Labor intensive; requires specialized equipment. Catch Basin Cleaning reduces litter and floatables but will have no effect on flow and little effect on bacteria and BOD levels.	Yes		
Combined Sewer Separation	Roof Leader Disconnection	Low	Low	▪ Reduced basement sewage flooding	Site specific; Includes area drains and roof leaders; new storm sewers may be required; requires home and business owner participation. The Cities are densely populated, and disconnected roof leaders have limited options for discharge to pervious space. Disconnection may be coupled with other GI technologies but is not considered an effective standalone option.	Yes		
	Sump Pump Disconnection	Low	Low	▪ Reduced basement sewage flooding	Site specific; more applicable to separate sanitary system; new storm sewers may be required; interaction with homeowners required. The Cities are densely populated, and disconnected sump pumps have limited options for discharge to pervious space. Disconnection may be coupled with other GI technologies but is not considered an effective standalone option.	Yes		
	Combined Sewer Separation	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding ▪ Reduced surface flooding	Very disruptive to affected areas; requires homeowner participation; sewer asset renewal achieved at the same time; labor intensive.	No		
Combined Sewer Optimization	Additional Conveyance	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Additional conveyance can be costly and would require additional maintenance to keep new structures and pipelines operating.	No		
	Regulator Modifications	Medium	Medium	▪ Water quality improvements	Relatively easy to implement with existing regulators; mechanical controls will require O&M. May increase risk of upstream flooding. Permittees have an ongoing O&M program and system wide replacement program for CSO regulators and tide gates.	Yes		
	Outfall Consolidation/Relocation	High	High	▪ Water quality improvements ▪ Passive and active recreational improvements	Lower operational requirements; may reduce permitting/monitoring; can be used in conjunction with storage & treatment technologies. Combining and relocating outfalls may lower operating costs and CSO flows. It can also direct flow away from specific areas.	Yes		
	Real Time Control	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires periodic inspection of flow elements; highly automated system; increased potential for sewer backups. RTC is only effective if additional storage capacity is present in the system.	Yes		

Table D-3 Storage and Treatment Technologies Screening Table

Storage and Treatment Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Linear Storage	Pipeline	High	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Local jobs	Can only be implemented if in-line storage potential exists in the system; increased potential for basement flooding if not properly designed; maximizes use of existing facilities. Pipe storage for a CSS typically requires large diameter pipes to have a significant effect on reducing CSOs. This typically requires large open trenches and temporary closure of streets to install.	No		
	Tunnel	High	High	▪ Water quality improvements ▪ Reduced surface flooding	Requires small area at ground level relative to storage basins; disruptive at shaft locations; increased O&M burden.	No		
Point Storage	Tank (Above or Below Ground)	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Storage tanks typically require pumps to return wet weather flow to the system which will require additional O&M; disruptive to affected areas during construction. Several CSO outfalls have space available for tank storage. There may be existing tanks in abandoned commercial and industrial areas to be converted to hold stormwater. Tanks are an effective technology to reduce wet weather CSO's.	No		
	Industrial Discharge Detention	Low	Low	▪ Water quality improvements	Requires cooperation with industrial users; more resources devoted to enforcement; depends on IUs to maintain storage basins. IUs hold stormwater or combined sewage until wet weather flows subside; there may be commercial or industrial users upstream of CSO regulators.	Yes		
Treatment-CSO Facility	Vortex Separators	None	None	▪ Water quality improvements	Space required; challenging controls for intermittent and highly variable wet weather flows. Vortex separators would remove floatables and suspended solids when installed. It does not address volume, bacteria or BOD.	Yes		
	Screens and Trash Racks	None	None	▪ Water quality improvements	Prone to clogging; requires manual maintenance; requires suitable physical configuration; increased O&M burden. Screens and trash racks will only address floatables.	Yes		
	Netting	None	None	▪ Water quality improvements	Easy to implement; labor intensive; potential negative aesthetic impact; requires additional resources for inspection and maintenance. Netting will only address floatables.	Yes		
	Contaminant Booms	None	None	▪ Water quality improvements	Difficult to maintain requiring additional resources. Contaminant booms will only address floatables.	Yes		
	Baffles	None	None	▪ Water quality improvements	Very low maintenance; easy to install; requires proper hydraulic configuration; long lifespan. Baffles will only address floatables.	Yes		
	Disinfection & Satellite Treatment	High	None	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires additional flow stabilizing measures; requires additional resources for maintenance; requires additional system analysis. Disinfection is an effective control to reduce bacteria and BOD in CSO's.	Yes		
	High Rate Physical/Chemical Treatment (High Rate Clarification Process - ActiFlo)	None	None	▪ Water quality improvements	Challenging controls for intermittent and highly variable wet weather flows; smaller footprint than conventional methods. This technology primarily focuses on TSS & BOD removal but does not help reduce the bacteria or CSO discharge volume.	Yes		
	High Rate Physical (Fuzzy Filters)	None	None	▪ Water quality improvements	Relatively low O&M requirements; smaller footprint than traditional filtration methods. This technology primarily focuses on TSS removal but does not help reduce the bacteria or CSO discharge volume.	Yes		

Storage and Treatment Technologies								
Technology Group	**Practice**	**Primary Goals**		**Community Benefits**	**Implementation & Operation Factors**	**Consider Combining w/ Other Technologies**	**Being Implemented**	**Recommendation for Alternatives Evaluation**
		Bacteria Reduction	**Volume Reduction**					
Treatment-WRRF	Additional Treatment Capacity	High	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding	May require additional space; increased O&M burden.	No		
	Wet Weather Blending	Low	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding	Requires upgrading the capacity of influent pumping, primary treatment and disinfection processes; increased O&M burden. Wet weather blending does not address bacteria reduction, as it is a secondary treatment bypass for the POTW. Permittee must demonstrate there are no feasible alternatives to the diversion for this to be implemented.	Yes		
Treatment-Industrial	Industrial Pretreatment Program	Low	Low	▪ Water quality improvements ▪ Align with goals for a sustainable community	Requires cooperation with Industrial User's; more resources devoted to enforcement; depends on IU's to maintain treatment standards. May require Permits.	Yes		

SECTION E - EVALUATION OF ALTERNATIVES

E.1 INTRODUCTION

This section summarizes the alternatives developed and evaluated as part of the Regional DEAR submitted in June 2019, revised in November 2019, and approved by NJDEP in January 2020. The Regional DEAR describes the development of preliminary CSO control alternatives applicable to the Permittees in the PVSC Treatment District, the approaches selected to perform the evaluations, and the factors used to evaluate each of the alternatives.

As part of the DEAR evaluation, four alternatives were developed and evaluated regionally, as per requirement of the PVSC NJPDES Permit No. NJ0021016 (hereon referred to as "the Permit") Combined Sewer Management (CSM) Part IV.D.1.c.

Appendix D includes the Regional DEAR and PVSC DEAR for additional detail.

E.2 DEVELOPMENT OF ALTERNATIVES

In accordance with the NJPDES Permit and as defined by the USEPA's National CSO Policy and the New Jersey Administrative Code, a reasonable range of CSO control alternatives must be evaluated to meet the water quality-based requirements of the CWA. For the purpose of the evaluation of alternatives, various CSO control technologies were evaluated for varying levels of control, including 0, 4, 8, 12, and 20 CSO events per year, as well as 85% capture by volume.

Each of the CSO Permittees evaluated Municipal Alternatives as part of their development of alternatives utilizing the CSO control technologies that were identified as feasible. These Municipal Alternatives constitute an approach that was evaluated if each municipality were to achieve the LTCP objectives within their own municipal boundary (in lieu of a Regional Alternative). Additional details regarding these Municipal Alternatives can be found in the individual DEARs located in Appendices A through I of **Appendix D**.

In addition to the Municipal Alternatives, four regional alternatives were also developed using the CSO control technologies identified as feasible for implementation by the Permittees in each of their DEARs, and as required as part of the Permit in Part IV.G.4.e. Control technologies used for alternatives include: green infrastructure, regulator modifications, storage tanks, tunnels, baseflow reduction, water conservation, increased wastewater conveyance to PVSC for treatment, maximizing pump station and force main capacities, parallel interceptor, bypass line, satellite treatment, and sewer separation. A more detailed discussion of these four regional alternatives that were evaluated is included in Subsection E.3 of this report.

Evaluation factors for the CSO control alternatives are detailed by the Permittees in each of their DEARs and include siting, institutional issues, implementability concerns, public input, performance considerations, and cost.

E.3 REGIONAL ALTERNAIVES

The regional alternatives developed in the Regional DEAR are detailed below and summarized in **Table E-1**.

Table E-1: Regional Alternatives

Alternative	Description
No. 1	Most cost-effective alternatives for each Permittee
No. 2	Regional Tunnel
No. 3	Parallel Interceptor + Plant Bypass (720 MGD) + Jersey City Pipe (146 MGD HCFM) + Local
No. 4	Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Jersey City Pipe (146 MGD HCFM) + Tunnels

Regional Alternative 1 incorporates the most cost-effective alternative for each Permittee to meet the yearly CSO frequencies and 85% capture, as described in their individual DEARs. The following summarizes the alternatives found to be the most cost effective or the most capable of achieving major performance objectives, either alone or in combination with other alternatives:

- City of Bayonne: Sewer separation, PAA disinfection with potential solids treatment, offline storage with increased conveyance of wet-weather flows to PVSC for treatment, and GI.
- Borough of East Newark: 5% conversion of impervious area to GI, partial sewer separation followed by storage tanks or high rate filtration with PAA disinfection.
- Town of Harrison: consolidated tank storage, 2.5% conversion of impervious area to GI
- Jersey City MUA: a combination of inflow/infiltration removal, partial sewer separation, green infrastructure, and grouped storage tanks
- Town of Kearny: complete sewer separation, partial sewer separation, high rate filtration with PAA disinfection
- City of Newark: PAA disinfection with pretreatment (level of pretreatment based on treatability studies), gate delay and disinfection at NE022
- North Bergen MUA: high rate filtration with PAA disinfection
- City of Paterson: Partial Sewer Separation, GI, PAA disinfection with potential primary treatment based on pilot project results, storage tanks and tunnels

Alternative 2 was created as a regional approach to improve capture and treatment using three regional tunnels to meet the yearly CSO frequencies and 85% capture scenario. Regional Alternative 2 includes three regional tunnels that can serve the region. PVSC's Evaluation of Alternatives Report provided the basis for two of the tunnels, with an additional tunnel (NJ440 Tunnel) and cost-effective alternatives identified in Regional Alternative 1 to serve the HCFM communities. Regional Alternative 2 was evaluated to meet each of the yearly CSO event frequencies and for 85% CSO volume capture for the PVSC interceptor communities and the west side of the HCFM communities. The regional tunnels would include the Paterson Citywide Tunnel, McCarter Highway Tunnel, and the NJ440 Tunnel, as shown in **Figure E-1** below. It is noted that dedicated surface level piping leading to the drop shafts and microtunneling to connect the drop shafts to McCarter Highway Tunnel would be needed in Harrison, East Newark, and Kearny. Alternative technologies identified by Jersey City and Bayonne in Regional Alternative 1 were evaluated for the 12 CSO outfalls not connected to the NJ440 Tunnel.

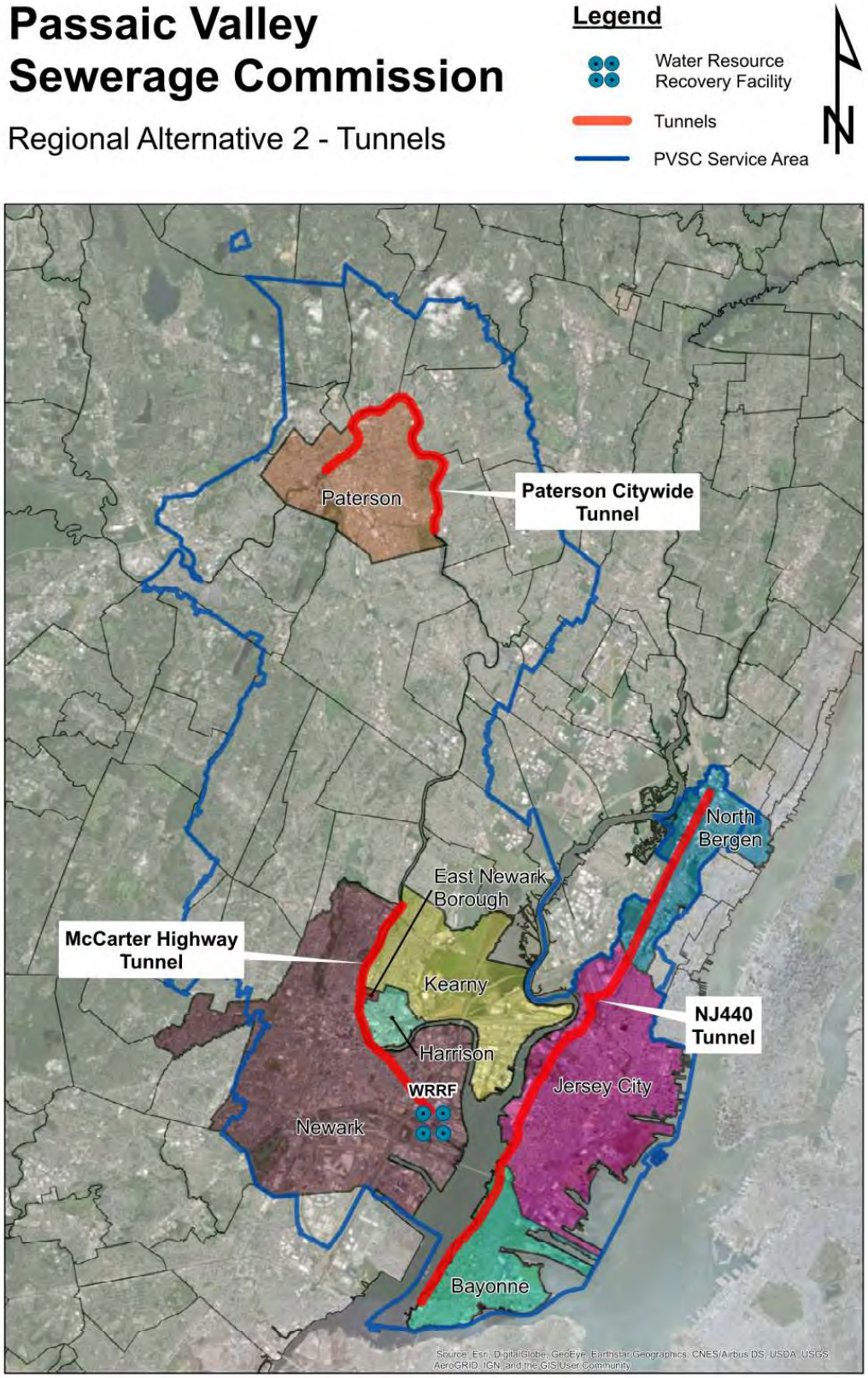


Figure E-1: Map of Regional Tunnel Locations

These technologies would be complimentary toward the NJ440 Tunnel so that every CSO outfall in the PVSC service area would meet the proposed levels of control. Regional Alternative 3 consist of a combination of Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Hudson County Force Main Pump Expansion (146 MGD HCFM). Regional Alternative 3 aims to reduce CSO frequency by increasing storage and flow capacities using multiple CSO control technologies. The alternative was evaluated to meet the 85% CSO volume capture scenario only, as the level of controls cannot be adjusted for the individual technologies (i.e. implementation of the CSO control technologies is binary - they are either implemented or they are not with no intermediate levels of control).

Finally, Alternative 4, which is a combination of Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Hudson County Force Main Pump Expansion (146 MGD HCFM) + Tunnels, was evaluated to meet the yearly CSO frequencies and 85% capture scenario. Regional Alternative 4 is the same as Alternative 7.a that was evaluated by PVSC in their DEAR with the addition of the NJ440 Tunnel and other alternative technologies for the remaining CSO outfalls in the HCFM communities. This alternative combines all technologies used in Regional Alternative 2 and Regional Alternative 3. Regional Alternative 4 was evaluated to meet each of the yearly CSO event frequencies and for 85% CSO volume capture. This alternative aims to reduce CSO frequency by increasing storage and flow capacities using multiple regional CSO control technologies.

Details of the regional alternatives are noted in the Regional DEAR (**Appendix D).**

SECTION F - POLLUTANT LOADS AND PREDICTED WATER QUALITY

F.1 INTRODUCTION

This section describes the models used to evaluate the hydraulic and water quality impact of the CSO control technologies on the receiving waters.

F.2 HYDROLOGIC AND HYDRAULIC MODEL

F.2.1 H&H Model Methodology

As part of the collaborative approach to the LTCP, the PVSC CSO communities elected to integrate their existing, disparate models into one comprehensive regional model on a common software platform. This integrated PVSC LTCP model includes all the service area that convey their sewage flow to the PVSC WRRF. It was used for the purpose of evaluating CSO control alternatives and the development of a holistic CSO LTCP for all the combined municipalities in the PVSC sewer service area.

Detailed disparate modeling information including communities, Permittees, STP, and modeling software are summarized in **Table F-1.**

Table F-1: PVSC WRRF Model Summary

	Model	Community	Permittee	Software	County
1	PVSC Interceptor Model	City of Paterson	Paterson City	InfoWorks CS	Passaic
		City of Newark	Newark City		Essex
		Town of Kearny	Town of Kearny		Hudson
		Borough of East Newark	East Newark Borough		Hudson
		Town of Harrison	Harrison Town		Hudson
2	Bayonne Model	City of Bayonne	City of Bayonne	InfoWorks CS	Hudson
3 & 4	North Bergen Model (PVSC)	Township of North Bergen	North Bergen MUA	PC-SWMM (2 models)	Hudson
5	Jersey City	City of Jersey City	Jersey City MUA	PC-SWMM	Hudson

F.2.2 Regional Model Integration

The LTCP PVSC Treatment District H&H model was developed by integrating the five pre-LTCP models in **Table F-1 (**the PVSC Interceptor model, the Bayonne model, the two North Bergen models, and the Jersey City model) into a regional PVSC model in InfoWorks ICM v9.0. The model was then expanded to include all 40 municipalities with separate sewer service area that contribute flows to the PVSC WRRF.

F.2.3 H&H Model of Regional Alternatives Baseline Summary

The calibrated regional model was simulated for the selected typical year of 2004 for evaluating the collection system performance under the existing conditions. The estimated percent capture for the typical year is approximately 69%. The percent capture is presented below in **Table F-2.**

Table F-2: Typical Year Percent Capture

	PVSC WRRF
Total CSO Volume (MG)	4,563
% Capture	69%

Note: Each one of the eight municipalities further refined their baseline models after the submission of their SCR. The flow and CSO values reported in the SIAR reflect the most up-to-date results.

The results from this regional model were used as the baseline for comparison in evaluating the CSO Control Alternatives.

F.3 WATER QUALITY MODEL

The Pathogens Water Quality Model (PWQM) was developed, calibrated, and validated to provide support for the development of LTCPs for the NJ CSO Group. Prior to the development of the PWQM, a PWQM QAPP was prepared and approved by NJDEP on February 7, 2017, which is included in **Appendix S**. The PWQM is based on an existing hydrodynamic model of the NY-NJ harbor complex that has been calibrated, validated, and peer-reviewed (Blumberg et al., 1999). The underlying source code for the hydrodynamic model portion of PWQM is the Estuarine, Coastal and Ocean Model with Sediment Transport (ECOMSED). The model domain also includes portions of New York Harbor and Raritan Bay as necessary to avoid boundary effects that would contaminate the model results in the region of interest. The hydrodynamic model portion of PWQM included freshwater inputs provided by H&H models developed for northern NJ and New York City, and USGS river gages. Meteorological forcings were based on NOAA's North American Regional Reanalysis (NARR) Dataset. Temperature and salinity boundary conditions were based on climatological data from World Ocean Atlas 2013 (WOA2013, https://www.nodc.noaa.gov/OC5/woa13/), published by NOAA. Details on the assignment of water elevation boundaries are provided in the Calibration and Validation of the Pathogen Water Quality Model (PWQM) report in **Appendix O.**

For the LTCP, the following state-variables were modeled with the water quality model portion of PWQM:

1. Salinity
2. Conservative Tracer
3. E. Coli
4. Fecal Coliform
5. Enterococcus

Salinity provides a check that the hydrodynamic model and water quality model are interfacing properly. The conservative tracer can be used to determine dilution. The three fecal indicator bacteria (FIB) were chosen because each one is used for a water quality criterion in the study area. Aside from these state-variables, other primary inputs to the water quality model include

CSOs, stormwater, WWTP/STP/WRRF, rivers/boundary conditions, dry-weather loads, and other sources. Loads were developed for three periods: calibration, validation, and baseline.

The calibration period for the PWQM is the calendar year 2016, the period when the majority of the baseline compliance monitoring was performed. The validation period is the calendar year 2017, when additional baseline compliance monitoring occurred. The year of 2004 represents a "typical" rainfall year based on precipitation data from Newark Liberty International Airport and was used to establish Baseline Conditions. For details on the PWQM refer to the Calibration and Validation of the Pathogen Water Quality Model (PWQM) report in **Appendix O**.

F.3.1 WQM Methodology

The water quality model source code underlying the water quality modeling portion of the PWQM is Row Column AESOP (RCA). RCA originates from the Water Analysis Simulation Program (WASP) developed by Hydroscience in the 1970's. RCA code has been used to develop numerous models inside and outside of the NY-NJ Harbor system.

There are 182 NJ CSO outfalls assigned in the model. As part of the CSO LTCP process, hydrologic and hydraulic (H&H or landside) models of the northern NJ communities' CSSs were upgraded and integrated for use in the sewer system characterizations. An InfoWorks stormwater model covering the separated portion on the NJ side of the NY-NJ Harbor system was developed to calculate flows and runoff from the separated areas of northern NJ that flow into the CSO affected waterbodies. The model included the area from the New York border south to the Raritan River. The model included 73 subcatchments corresponding to National Hydrography Dataset boundaries shown in **Figure F-1**.

There were two key assumptions used in the development of the PWQM. The first is that using maximum likelihood estimators (MLE) concentrations for bacteria sources adequately accounts for the total loading of bacteria. The sources of bacteria include CSOs, stormwater, rivers, STPs and other sources including illicit connections and domestic/wild animals. A second key assumption for both the hydrodynamic model and the water quality model, is that the landside models accurately calculate the flow and sanitary fraction discharged from the CSOs.

F.3.1.1 Baseline Attainment

Baseline conditions are based on the use of a "typical" rainfall condition. As previously stated in Section C.4, analysis of precipitation records indicated that 2004 rainfall conditions at Newark Liberty International Airport most closely reflected typical year conditions. River flow was used in the analysis to choose the typical year, so river flow and water elevations for 2004 are part of the baseline condition.

Additionally, to create a consistent baseline, the InfoWorks models were set up using "existing" 2015 infrastructure. New NJPDES permits were issued in 2015, so any infrastructure upgrades after this date are considered part of the LTCP.

Finally, baseline conditions assume that the non-CSO sources of bacteria to the NY-NJ harbor system remain unmitigated. As a result, the approach to developing the stormwater, river, and

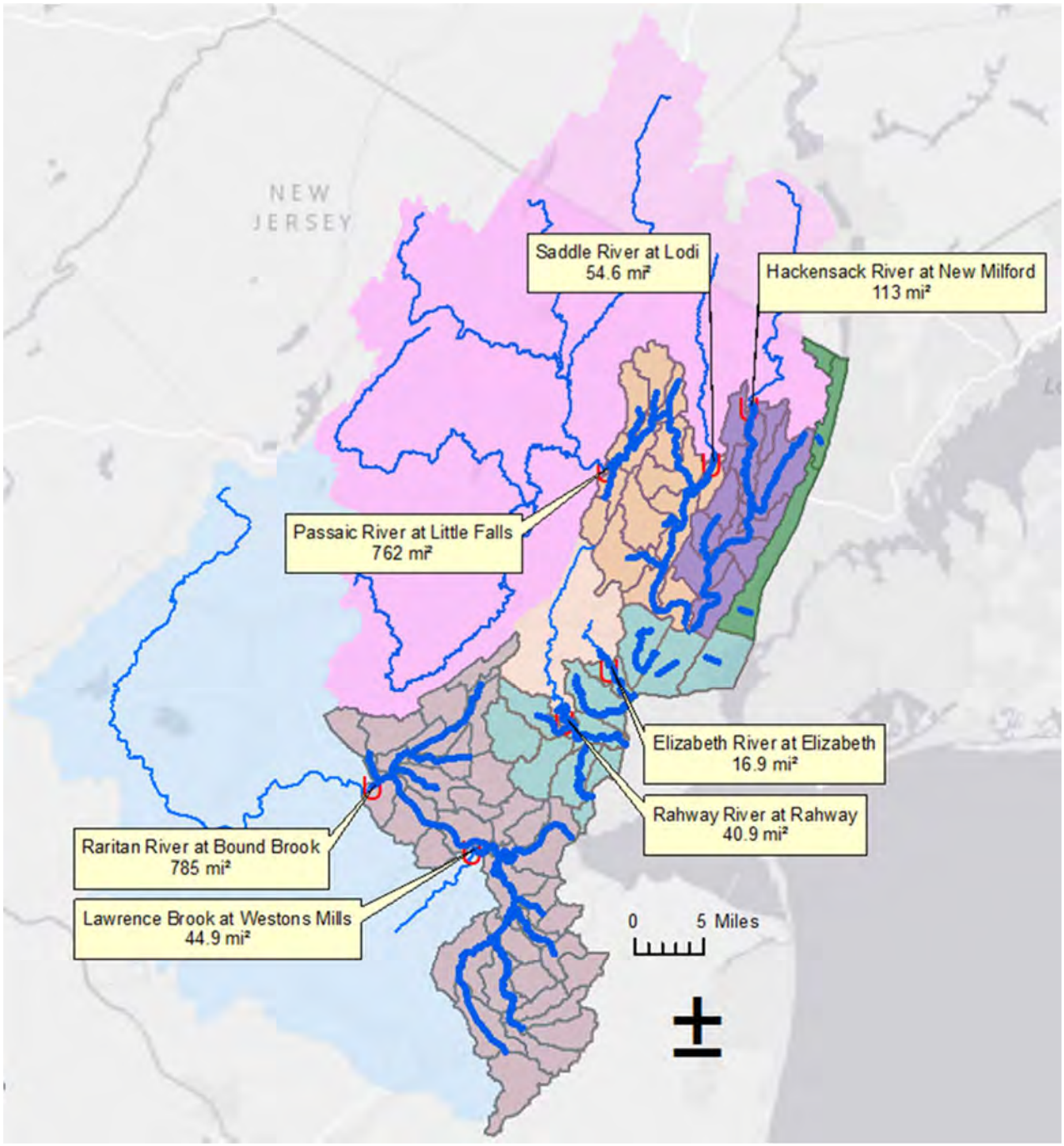


Figure F-1: Stormwater/Runoff Model Coverage Area

dry-weather loads remained the same and no efforts were made to reduce bacteria loads from the other sources.

F.3.1.2 Component Analysis

Components are defined as the various source categories of pollutants to the receiving water. A component analysis can quantify the impacts of the source categories (either geographical, type, or both) to assess which are most influential in affecting water quality for a particular time or location. This analysis is helpful to establish the level of load control to target during LTCP development.

The PWQM was applied to simulate eight component source categories to assess the impacts of these sources on water quality. The following source categories were evaluated: CSO, stormwater and runoff, the Hudson River, other rivers, NJ STPs, NY/CT STPs, dry-weather loads, and sources from New York City. For the component analysis each source component category was modeled separately to assess each component's contribution to the receiving water bacteria concentrations. The component analysis provides information as to the importance of the various pollution sources in locations throughout the model domain.

In general, the component analysis shows that different categories dominate the bacteria loading in the various portoins of the project area. In some cases, CSOs are a significant contributor to the bacteria concentrations, but these locations are often areas where the 30-day geometric mean criterion is not exceeded, or exceedances occur due to contributions from other sources.

F.3.1.3 Projection Analysis

The use of a 100% CSO Control scenario is part of a "gap analysis." 100% CSO control is the maximum level of control that can be attained for CSOs and results in the maximum possible improvement in water quality conditions due to CSO control during the typical hydrologic year. CSOs could still theoretically occur when there are storms that generate peak flows in excess of those experienced during the typical year.

If CSOs were the primary reason for non-attainment of water quality criteria, then some level of CSO control between baseline conditions and 100% control could conceivably result in attainment of the criteria. This level of CSO control would close the gap between attainment and non-attainment of water quality criteria. In many cases, other sources of bacteria, such as stormwater, are large enough that even 100% CSO control is not enough to meet criteria. In this case the 100% CSO Control scenario shows the highest level of water quality that can be achieved by CSO control only, and additional control scenarios can be analyzed that can be incorporated into a cost-benefit analysis.

The 100% CSO Control scenario was run for the receiving waters with results organized by the classification of the surface water as established under the Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B. NJDEP classifies freshwaters as FW1 waters (not subject to any man-made wastewater discharges) and FW2 waters (all other freshwaters except Pinelands waters). Saline waters are classified as saline estuarine (SE) and saline coastal (SC). SE waters are further classified as SE1, SE2, and SE3 waters based on their ability to support recreation, shellfish harvesting and warm water fish species.

The results of 100% CSO Control scenario for FW2 (FW2/SE2), SE1, SE2, and SE3 indicate that FW2 and FW2/SE2 generally have poor attainment of the criteria, and that CSO control will not improve attainment of the criteria in most cases. SE1 waterbodies showed mixed results with some areas having poor attainment and others having high attainment. SE2 and SE3 waters generally fully attain the water quality criteria for bacteria. The full details of the modeling results can be found in the Calibration and Validation of the PWQM for the Passaic Valley Sewerage Commission in **Appendix O**.

F.4 CSO OVERFLOW PREDICTIONS

In addition to the baseline conditions, the H&H model was used to simulate the CSO volume and frequency for each of the control alternatives. The results of these simulations were used to evaluate the performance of each alternative as further described under Section H.4.2.

SECTION G - PUBLIC PARTICIPATION

The Public Participation Process Report outlines the public participation process and the associated activities. The goals for the program are to foster public awareness and to facilitate public involvement in the decision-making process to develop and select the final LTCP. The Public Participation Process Report was submitted to the NJDEP on behalf of the Permittees on June 25, 2018. The NJDEP provided comments on December 14, 2018, and the report was revised on January 25, 2019. It was approved by the NJDEP on March 29, 2019. The Public Participation Process Report can be found in **Appendix E**.

G.1 INTRODUCTION

The Public Participation Process Report outlines the public participation program and the associated activities. The goals for the program are to foster public awareness and to facilitate public involvement in the decision-making process to develop and select the final LTCP. The Public Participation Process Report was submitted to the NJDEP on behalf of the Permittees on June 25, 2018. The NJDEP provided comments on December 14, 2018, and the report was revised on January 25, 2019. It was approved by the NJDEP on March 29, 2019. The Public Participation Process Report can be found in **Appendix E**.

G.2 PUBLIC INPUT FOR SELECTION OF ALTERNATIVES

G.2.1 PVSC Sewerage District Supplemental CSO Team

The Supplemental CSO Team is an important part of the LTCP development process. The overall goal of the Supplemental CSO Team is to "work as an informal work group as a liaison between the general public and the decision makers for the permittee" as required by NJPDES Permit Part IV.G.2.C.

Since the submission and approval of The Public Participation Report, some new members have joined the Supplemental CSO Team and others have requested to no longer participate. A current listing of the members of the Supplemental CSO Team and the organizations to which they belong as of the writing of this report are listed in **Table G-1**.

Table G-1: Members of the Supplemental CSO Team (alphabetically by organization)

Name	Representing
Dan Smerda	Bayonne Water Guardians
Lisha Smerda	Bayonne Water Guardians
Nancy Kontos	Bunker Hill Special Improvement District
Ruben Gomenz	City of Paterson Economic Development
Sheri Ferreira	Greater Paterson Chamber of Commerce
Captain Bill Sheehan	Hackensack Riverkeeper
Janet Castro	Hudson Regional Health Commission/Township of North Bergen
Drew Curtis	Ironbound Community Corporation
Alison Cucco	Jersey City Environmental Commission

Name	Representing
Jorge Santos	Newark Community Economic Development Corporation
Nicole Miller	Newark DIG
Robin Dougherty	Newark Greater Conservancy/Newark Business Partnership
Betty Boros	New Jersey Business & Industrial Association
Tom Stampe	North Bergen Green Team
Michele Langa	NY/NJ Baykeeper
Harvey Morginstin	Passaic River Boat Club & Passaic River Superfund CAG
Laurie Howard	Passaic River Coalition
Ben Delisle	Passaic River Rowing Association
Sue Levine	Paterson Smart
Christopher Obropta, Ph.D.	Rutgers University
Leslie Brunell	Stevens Institute of Technology
Pat Hester-Fearon	Town of Kearny
Christopher Vasquez	Town of Kearny
Christopher Pianese	Township of North Bergen

Supplemental CSO Team Public Meetings that were held after the submission of the Public Participation Report are presented in **Table G-2**:

Table G-2: Dates and Locations of Supplemental CSO Team Public Meetings

Meeting Number	Date	Location	City
1	October 5, 2016	Harrison Elks Lodge	Harrison
2	January 10, 2017	Bayonne Public Library	Bayonne
3	April 11, 2017	The Hamilton Club at Passaic County Community College	Paterson
4	July 11, 2017	Newark City Hall	Newark
5	October 16, 2017	PVSC WRRF	Newark
6	January 9, 2018	North Bergen Municipal Building	North Bergen
7	April 17, 2018	Jersey City Council Chambers	Jersey City
8	July 31, 2018	Kearny Town Hall	Kearny
9	October 16, 2018	PVSC WRRF	Newark
10	January 22, 2019	East Newark Senior Citizen Center	East Newark
11	March 7, 2019	North Jersey Transportation Planning Authority Conference Room	Newark

Meeting Number	Date	Location	City
12	May 28 2019	Bayonne Washington School	Bayonne
13	July 31, 2019	The Ironbound Early Learn Center	Kearny
14	January 9, 2020	Harrison High School	Harrison
15	June 17, 2020	Virtual Meeting Facilitated through Microsoft Teams	Online
16	September 2, 2020	Virtual Meeting Facilitated through Microsoft Teams	Online

Error! Reference source not found. lists a summary of the topics presented at meetings 1 through 16, as well as discussion items, concerns, and/or comments raised by the Supplemental CSO Team members and/or the public.

Table G-3: Supplemental CSO Team Public Meetings 1 through 16

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
1	23 (11)	• Introduction to the Permittees • Passaic Valley Sewerage Commission Service Area • Supplemental CSO Team Roster • Overview of Separate and Combined Sewer Systems • Regulatory Background • Program progress to Date • Branding of LTCP Program • Next Steps • Questions and Final Discussion	• Supplemental CSO Team should set some ground rules for the group and establish what it expects from PVSC and the project team and create accountability on both sides • Suggested the creation of a clear definition of the relationship between the Supplemental CSO team, PVSC and the consultants • For the alternatives analysis Supplemental CSO Team input is expected to be weighed against a cost-benefit analysis. • Suggested the creation of a guide for community engagement • All meeting documents were requested to be sent to the Supplemental CSO Team in advance so that the team has time to review • Team requested to be updated on the water quality model at future meetings
2	44 (13)	• Introduction • Supplemental CSO Team Roster • Overview the SharePoint Site • Recap of the October 5, 2016	• Discussion about why the flow monitoring lasted for a 12-week period and adequacy of rain events to calibrate the water quality model

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		Supplemental CSO Meeting • History of Combined Sewers in the Passaic Valley Sewerage Commission District • NJDEP – New Jersey CSO Permits • Permit Responsibilities • Highlights from CSO LTCPs from Elsewhere in the U.S. • Status Update on the PVSC District LTCP • Branding of LTCP Program	• Concern about inspections of sewer interceptors • Discussed the reporting requirements for Permittees in terms of Nine Minimum Control compliance • It was confirmed that population growth is a factor in the model and LTCP • Sewer separation can be costly. • Concern that warning signs for CSOs aren't visible enough • Discussion about Supplemental Team's input on deliverables • Concern about how alternatives analysis will be discussed with the community at large • Discussion about how payment for sewer usage and improvements is distributed within the PVSC communities • Branding and logo was discussed
3	29 (12)	• Introduction and Recap • Branding Update • Project Schedule • Green Infrastructure (GI) for CSO Control • Supplemental CSO Team Member Presentations • Paterson SMART	• Discussion about the most effective methods of GI • Concern that public outreach is the most important part of GI. Consulting with the public would hopefully help implementation issues • GI can create jobs and build a relationship between the general public and the government • Brainstorming best uses for porous pavement • Discussion of GI costs and permit requirements
4	43 (13)	• Introduction and Recap • NJ CSO Permit Overview (NJDEP) • Water Quality Standards (NJDEP) Hydrologic and Hydraulic Models	• Discussion about the flow monitoring that was completed for use in the model • The model was discussed. • Discussion regarding the details of PVSC's plant outfall • The Team requested a tour of the PVSC WRRF
5	40 (14)	• PVSC Plant Tour • Introduction and Recap • Introduction to Alternative Analysis • Stimulating Green Infrastructure	• PVSC plant tour was provided • Discussion about the pros and cons of the presumption and demonstration approaches • Questions about how funding

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		on Private Property Bayonne CSO Treatment Demonstration Project	for GI is gathered and managed • Discussion about end-of-pipe treatment technologies such as peracetic acid
6	34 (11)	• Introduction and Recap • LTCP Deliverables due to NJDEP on July 1, 2018 • Cost estimate of the LTCP • Update on the activities performed by the Project Team • Passaic Valley Regional Planning & Design Studio presentation by Rutgers University • PVSC and Rutgers Green Infrastructure Municipal Outreach and Technical Assistance Program	• SCSO Team requested time to review all deliverables and give input before they are submitted to NJDEP • The cost opinions will be included in the LTCP submission. All eight of the CSO communities will be included in the cost opinions • Discussion about the different types of public outreach materials, whether they provide more general or region-specific information and in which languages they are available
7	48 (13)	• Introduction and Recap • Water Quality Monitoring Program Overview • Overview of Reports to be submitted to NJDEP on July 1, 2018 • Timeline for Submittals and Supplemental CSO Team Input • NJDEP Guidance Document for Evaluating Green Infrastructure Social Media for Clean Waterways, Healthy Neighborhoods	• Discussion of contaminant and contamination source identification • Discussion of sampling methodology including weather patterns, specific contaminants, sampling locations, and saline and fresh water body sampling • Discussion regarding the model calibration, the contaminants being modeled, and the accuracy of the model • SCSO team recommended adding Arabic translations to the public outreach materials • Discussion about the effect the GI pilot studies will have on stormwater volume
8	25 (11)	• Introduction and Recap • Project Status Update • July 1st Report Submittals • Evaluation of Alternatives • City of Newark Evaluation of Green Infrastructure for CSO Control • Questions and Final Discussion	• Discussed the project status and the timeline • Reviewed the goals of the Evaluation of Alternatives • Discussed green infrastructure
9	29 (9)	• Introduction and Recap • Timeline for Evaluation of Alternatives • Preliminary Screenings of Technologies • CSO Bypass Alternative	• Discussed Green Infrastructure Alternatives • Reviewed which outfalls would be impacted by various alternatives • Discussed WRRF improvements

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		• No Feasible Alternatives Analysis • Jersey City MUA Evaluation of Alternatives for CSO Control • Questions and Discussion	• The City of Newark is conducting ten community-wide meetings until May 2019
10	34 (10)	• Introduction and Recap • Timeline for Evaluation of Alternatives • Preliminary Screenings of Technologies • Reducing CSOs Using a Surface Channel System (Stevens Institute of Technology Research Presentation) • Facilities Inventory and Condition Assessment Program • Green Infrastructure • Harrison Evaluation of Alternatives • Questions and Discussion	• Discussed community benefits of alternatives and how those community benefits are noted in the screenings of technologies matrix • Discussed maintenance, water quality improvements, impacts to traffic flow during construction, and construction materials of surface level drainage systems. • The group discussed eventually including a cost analysis for alternatives
11	26 (8)	• Introduction and Background • Overview of CSO Control Technologies • Evaluation of Alternatives Status Updates • Questions and Discussion	• Discussed Clean Waterways Healthy Neighborhoods • Reviewed CSO basics • Discussed Regulatory Background • Reviewed the Long Term Control Plan Requirements • Reviewed the current project status and schedule
12	56 (15)	• Introduction and Recap • Harrison Alternatives Analysis • Newark Alternatives Analysis • Presentation and Survey • Questions and Discussion	• Discussed maintenance costs • Comparison of benefits of surface piping versus green infrastructure. • Discussed community engagement in Harrison (Harrison Tide) • Discussion of Peracetic Acid (PAA) Disinfection
13	26 (5)	• Update on the July 1, 2019 submittal of the Development and Evaluation of Alternatives Report • Summary of Alternatives to be further developed • Discuss Public Comments on Development and Evaluation of Alternatives Report • Breakout Groups • Discuss next steps for development of Selection and Implementation of Alternatives	• Discussed the DEAR • Discussed the further development of the Summary of Alternatives • Discussed public comments on the DEAR • Group discussions were facilitated for each municipality • Reviewed the next steps for the development of the SIAR

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		Report • Questions and Discussion	
14	47 (11)	• Introduction and Recap • Water Quality Model Results • Microbial Source Tracking Study • Review of Public Comments ad Responses for DEAR • Discuss Next Steps for Development of Selection and Implementation of Alternatives Report • Questions and Discussion	• Discussed the results of the water quality model • Presented and discussed the Microbial Source Tracking Study • Discussion of the comments received on the DEAR and the responses to comment • Reviewed the next steps for the development of the SIAR
15	64 (16*)	• Introduction to Virtual Room and online tools to access information • Project Status and Schedule • Current Alternative Options, Municipal vs. Regional • Performance Summary of Municipal and Regional Alternatives • Cost Summary of Municipal and Regional Alternatives • Next Steps: SIAR • Coordination across Municipalities	• Positive feedback provided by the public on the virtual/online delivery. • Coordination and agreement on cost allocation across municipalities for implementation of the Regional Alternative is a concern • Cost of improvements • Location of the regional interceptor • Implementation of the projects in the municipal alternatives despite selection of the Regional Alternative.
16	44 (11*)	• Introduction and Recap • Project Status and Schedule • Municipal and Regional Alternatives (Recap) • Performance Summary of Alternatives (Recap) • Cost Summary • Next steps • Questions and Discussion • Breakout Sessions	• Municipalities' Regional Alternative decision • Impact of CSO control technologies on flooding • Cost of improvements and township resources • Would like to provide more input on areas and types of Green Infrastructure • Impacts of storage tanks on surrounding developments • Wanted SCSO events to continue in the future • Interested in reviewing the LTCP as soon as possible

*This meeting was virtual and had no sign-in sheet. These are the self-identified members of the Supplemental CSO Team present

Public input received during the development of this LTCP requested more direct communication with each of the individual Permittees. To incorporate this public input, breakout groups were incorporated into various Supplemental CSO Team Meetings. These breakout groups were facilitated by the individual Permittees to allow direct communication between the Permittees and the public relative to the evaluation of alternatives. The latest example of these breakout groups was during Supplemental CSO Team Meeting No. 16 in which 7 individual virtual breakout rooms were developed to allow members of the public to provide direct input and ask questions to the Permittees.

Additionally, a contact list for each Permittee (name, telephone number, and email address) was distributed to any member of the public included on the public distribution list for this project. This contact list was also posted to the home page of the Clean Waterways, Healthy Neighborhoods website (www.njcleanwaterways.com).

In addition to the Supplemental CSO Team Public Meetings, the following Draft Reports were provided to the members of the Supplemental CSO Team for review and comment:

- Service Area System Characterization Report;
- Public Participation Report;
- Identification of Sensitive Areas Report;
- Compliance Monitoring Program Report; and
- Regional and Permittee Development and Evaluation of Alternatives Reports

All Supplemental CSO Team Meetings are open to the public and are advertised in advance. During each Supplemental CSO Team Meeting, the Supplemental CSO Team Members and all members of the public are updated on further LTCP development and are encouraged to provide input on such milestones, including the Long Term Control Plan.

G.2.2 Local Newark Supplemental CSO Teams

In addition to participating in the Supplemental CSO Team Meetings held by the PVSC Sewerage District Supplemental CSO Team, Newark and Bayonne assembled their own local Supplemental CSO Teams. These municipal SCSO Teams met and conducted additional meetings throughout the development of the LTCP independent of the activities listed in Sections G-2 and G-3.

G.2.3 NJ CSO Group Meetings

The NJ CSO Group was originally formed to work cooperatively to fulfill the requirements of the last CSO General Permit. NJ CSO Group Permittees and their NJPDES Permit Numbers are listed in The Public Participation Report.

Meetings with the NJ CSO Group were, in general, on a quarterly basis. NJ CSO Group Meetings that were held are listed in **Table G-4:**

Table G-4: NJ CSO Group Meeting Dates

Date		
August 7, 2013	October 19, 2015	September 6, 2018
February 20, 2014	April 6, 2017	February 27, 2019
March 7, 2014	October 16, 2017	September 5, 2019
July 1, 2014	February 2, 2017	November 21, 2019
October 8, 2014	February 20, 2018	February 20, 2020
January 15, 2015	April 5, 2018	August 20, 2020
June 29, 2015	May 3, 2018	

The various topics that were discussed at the above meetings are provided in The Public Participation Report.

G.2.4 PVSC CSO Sewer District and NBMUA-Woodcliff Permittees Meetings

NJPDES Permittees located within the PVSC Treatment District and NBMUA-Woodcliff Service Area hold near monthly meeting to assist in collaboration, CSO compliance, and sharing of public information and/or input. The Permittees that participated in these meetings are provided in The Public Participation Report. Permittee Meetings that were held are listed in **Table G-5:**

Table G-5: PVSC Treatment District and NBMUA-Woodcliff Permittees Meeting Dates

Date		
July 5, 2018	July 18, 2019	April 16, 2020
August 2, 2018	August 1, 2019	May 7, 2020
October 16, 2018	September 19, 2019	May 21, 2020
November 1, 2018	October 3, 2019	June 4, 2020
January 22, 2019	October 17, 2019	June 18, 2020
February 7, 2019	November 7, 2019	July 16, 2020
March 7, 2019	December 5, 2019	August 6, 2020
April 18, 2019	January 9, 2020	August 20, 2020
May 2, 2019	February 6, 2020	September 3, 2020
May 31, 2019	February 20, 2020	September 17, 2020
June 20, 2019	April 2, 2020	

The various topics that were discussed at the above meetings are provided in The Public Participation Report.

G.2.5 Individual Permittee Meetings

Multiple meetings were held between PVSC and individual Permittees to discuss specific concerns unique to the Permittees. Meetings were held on as a needed basis.

G.2.6 Other Opportunities for Public Input

Other opportunities for public participation include municipal action teams, ad hoc stakeholder meetings, Model Evaluation Group meetings, municipal council meetings, collaboration with Rutgers University and Stevens Institute of Technology, the Rain Barrel Program, green infrastructure pilot projects, JCMUA partnerships and initiatives, City of Newark partnerships and initiatives, public outreach to separate sewer system communities, PVSC WRRF plant tours, public information, City of Newark CSO Brochure, the social media plan, various LTCP flyers, and public comments on the draft SIAR. Details regarding all other public participation activities conducted under the LTCP are provided in the Public Participation Report, which is included as **Appendix E**, and have continued subsequent to the date of The Public Participation Report**.**

G.2.7 Public Comments on Draft LTCP

G.2.7.1 Opportunities for Public Comment on Draft LTCP

Many forums and opportunities have been made available for public comment. An overview of the major opportunities is summarized in The Public Participation Report.

The majority of comments received thus far on the SIAR have been verbal comments at public meetings. Comments and responses at Supplemental CSO Team Public Meetings are tracked in meeting minutes. The other public comments received have been through social media (commenting, liking, or sharing tweets and Facebook posts), which drive individuals to the website. No questions or comments have been received from the website contact form.

The number and types of comments received on the Draft SIAR will continue to be tracked and documented. Draft LTCP plans were discussed at SCSO Team Meetings No. 15 and No. 16, providing the Supplemental CSO teams an opportunity for review and feedback. 25 text comments from the virtual chat feature and 3 verbal comments were received during the meeting, and an additional 11 text comments were received after the meeting was adjourned. All comments provided during the meeting were verbally addressed.

Comments were grouped by type and subject matter and addressed jointly in a commentary type response. The goal of this approach was to produce a commentary that is both readable and comprehensive. Groups of comments are as follows and are summarized in the Public Participation Report in **Appendix E**:

- Nine Minimum Controls;
- Alternatives Evaluation;
- Separation;

- Low Impact Development Source Control, Pollution Prevention;
- PVSC Wastewater Treatment Plant;
- CSO Location;
- Flooding;
- Implementability;
- Tunneling;
- Regulatory Compliance;
- Public Participation;
- Financial Capability;
- Schedule;
- Water Quality Standards Requirements; and
- Miscellaneous Comments.

G.3 FUTURE PUBLIC PARTICIPATION

PVSC and each of the CSO Permittees are committed to active public participation and consultation during the planning, design and construction of CSO control projects. Future public participation will be designed to educate the public about the status of the program; progress in implementing the program; to inform neighborhood residents and businesses before, during, and after construction; and to report on progress in reducing CSOs and improving water quality as a result of the program on an as-needed basis as determined necessary by the Permittee.

SECTION H - SELECTION OF RECOMMENDED LTCP

H.1 INTRODUCTION

The NJPDES Permits require each municipality to be "responsible for submitting a LTCP for their CSO facilities that addresses all nine elements in Part IV.G". The nine elements are listed below:

1. Characterization, Monitoring, and Modeling of the Combined Sewer System
2. Public Participation Process
3. Consideration of Sensitive Area
4. Evaluation of Alternatives
5. Cost/Performance Considerations
6. Operational Plan
7. Maximizing Treatment at the existing STP
8. Implementation Schedule
9. Compliance Monitoring Program

Although the nine Permittees are responsible for their own LTCPs, they worked cooperatively to coordinate their selected alternatives in developing a Regional LTCP approach.

H.2 LTCP SELECTION PROCESS

The nine Permittees followed the same criteria during the selection process of their recommended alternatives for the final LTCP, including the steps listed in Section A.7 of this report. All Permittees evaluated alternatives on monetary and non-monetary factors including impact on CSO overflows and impact on receiving water quality. This section describes the overall selection process used to select the LTCP.

H.3 APPROACH SELECTION

Part IV, Section G.4.c of each Permittee's NJDPES Permit states:

> *"The Permittee shall select either Demonstration or Presumption Approach for each group of hydraulically connected CSOs and identify each CSO group and its individual discharge locations."*

The two approaches are defined, analyzed, and compared in the following subsections.

H.3.1 Presumption Approach from USEPA's CSO Policy

Subsection II.C.4.a of the USEPA's CSO Policy (Presumption Approach) states that:

> *"A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas...These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect [water quality standards]."*

Under the Presumption Approach, CSO controls proposed in the LTCP are presumed to protect water quality in the receiving water bodies if the CSS achieves any of the following three (3) criteria:

i. *"No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified below; or*

ii. *The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or*

iii. *The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort, for the volumes that would be eliminated or captured for treatment under the paragraph ii above."*

"Minimum treatment," as noted in Item "i" above, is defined in Subsection II.C.4.a of the CSO Control Policy as:

- *"Primary Clarification (Removal of floatables and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification.);*
- *Solids and floatables disposal; and*
- *Disinfection of effluent, if necessary, to meet [water quality standards], protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary."*

H.3.2 Demonstration Approach from USEPA's CSO Policy

Subsection II.C.4.b of the USEPA's CSO Policy (Demonstration Approach) states that:

> *"A permittee may demonstrate that a selected control program, though not meeting the criteria specified in II.C.4.a. above is adequate to meet the water quality-based requirements of the CWA."*

Under the Demonstration Approach, the municipality would be required to successfully demonstrate compliance with each of the following criteria from the CSO Policy:

I. *"The planned control program is adequate to meet [water quality standards] and protect designated uses, unless [water quality standards] or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;*

II. *The CSO discharges remaining after implementation of the proposed control program will not preclude the attainment of [water quality standards] or the*

receiving waters' designated uses or contribution to their impairment. Where [water quality standards] are not met in part because of natural background conditions or pollution sources other than CSO discharges, a total maximum daily load, including a waste load allocation and a load allocation or other means should be used to apportion pollutant loads;

III. *The planned control program will provide the maximum pollution reduction benefits reasonably attainable; and*

IV. *The planned control program is designed to allow cost effective expansion or cost effective retrofitting if additional controls are determined to be necessary to meet [water quality standards] or designated uses."*

H.3.3 USEPA's Guidance for Long-Term Control Plan Requirements

The USEPA's CSO Guidance for Long-Term Control Plan (or CSO Guidance Document) states that the Demonstration Approach and the Presumption Approach are the two general approaches to attainment of water quality standards (WQS), and that these two approaches provide municipalities with targets for CSO controls that achieve compliance with the CWA, particularly the protection of designated uses.

Section 1.3 of the CSO Guidance Document states:

"Permittees should develop long-term control plans (LTCPs) for controlling CSOs. A permittee may use one of two approaches: 1) demonstrate that its plan is adequate to meet the water quality-based requirements of the CWA ("demonstration approach"), or 2) implement a minimum level of treatment (e.g., primary clarification of at least 85 percent of the collected combined sewage flows) that is presumed to meet the water quality-based requirements of the CWA, unless data indicate otherwise ("presumption approach")."

Section 2.6.2.1 states that:

"Under the [CSO Policy], a municipality should develop an LTCP that adopts either the demonstration or the presumption approach to attainment of WQS. The demonstration approach is based on adequately demonstrating that the selected CSOs will provide for the attainment of WQS, including designated uses in the receiving water. The presumption approach does not explicitly call for analysis of receiving water impacts. The presumption approach usually involves at least screening-level models of receiving water impacts, however, because the approach will not apply if the NPDES permitting authority determines that the LTCP will not result in attainment of CWA requirements."

H.3.3.1 Presumption Approach from USEPA's CSO Guidance for LTCP

For the Presumption Approach, Section 3.2.1 of the USEPA's CSO Guidance Document states that:

> *"If the data collected by a community do not provide "...a clear picture of the level of CSO controls necessary to protect WQS", the presumption approach may be considered. Use of the presumption approach is contingent, however, on the municipality presenting sufficient data to the NPDES permitting authority to allow the agency to make a reasonable judgment that WQS will probably be met with a control plan that meets one of the three presumption criteria."*

Furthermore, the CSO Guidance Document states:

> *"Use of the presumption approach does not release municipalities from the overall requirement that WQS be attained. If data collected during system characterization suggest that use of the presumption approach cannot be reasonably expected to result in attainment of WQS, the municipality should be required to use the demonstration approach instead. Furthermore, if implementation of the presumption approach does not result in attainment of WQS, additional controls beyond those already implemented might be required."*

H.3.3.2 Demonstration Approach from USEPA's CSO Guidance for LTCP

For the Demonstration Approach, Section 3.2.1 of the USEPA's CSO Guidance Document states that:

> *"Generally, if sufficient data are available to demonstrate that the proposed plan would result in an appropriate level of CSO control, then the demonstration approach will be selected. The demonstration approach is particularly appropriate where attainment of WQS cannot be achieved through CSO control alone, due to the impacts of non-CSO sources of pollution. In such cases, an appropriate level of CSO control cannot be dictated directly by existing WQS but must be defined based on water quality data, system performance modeling, and economic factors."*

The Demonstration Approach is consistent with the total maximum daily load (TMDL) development approach and may be used in the TMDL process where the WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs. Section 3.2.1.1 of the CSO Guidance Document states:

> *"The demonstration approach encourages the development of total maximum daily loads and/or the use of a watershed approach throughout the LTCP process. In conducting the existing baseline water quality assessments as part of the system characterization, for example, the specific pollutants causing nonattainment of WQS, including existing or designated uses, would be identified, and then the sources of these pollutants could be identified and loads apportioned and quantified."*

H.3.4 NJPDES Permit Approach Selection

Part IV, Section G.4.a of the Permittees' NJDPES Permit states:

> *"The permittee shall evaluate a reasonable range of CSO control alternatives…that will meet the water-quality based requirements of the CWA using either the Presumption Approach or the Demonstration Approach (as described in Sections G.4.f. and G.4.g)."*

The descriptions of both approaches in the Permit are identical to those found in the USEPA's CSO Policy detailed in Sections H.3.1 and H.3.2 of this report.

H.3.5 Comparison of the Two Approaches

Table H-1 summarizes the major differences between the Presumption Approach and the Demonstration Approach.

Table H-1: Comparison of the Presumption Approach and Demonstration Approach

Item	Presumption Approach	Demonstration Approach
Criteria	• Meet one of three criteria and compliance is **presumed**: 1) No more than an average of 4-6 overflow events per year; 2) 85% capture (by volume) 3) Elimination or removal of the mass of pollutants, identified as causing water quality impairment.	• Number of CSO events, flow or pollutant loading limited by a proposed CSO system Waste Load Allocation which will not preclude the attainment of Water Quality Standards (WQS). • Relies on data collection and model simulation to **demonstrate** that the proposed LTCP results in meeting the current WQS and designated uses.
Monitoring Data Collection	• Flow metering of the collection system and/or water quality sampling of CSOs.	• Flow metering of the collection system and water quality sampling of CSOs and receiving water bodies.
Modeling	• Combined sewer system (CSS) hydrologic and hydraulic (H&H) model.	• CSS H&H Model and Receiving Water Quality Model(s).
Pollutant Sources Evaluated	• Only CSOs.	• The contributing pollutant sources in the watershed including urban stormwater, agricultural (if any), wildlife, etc.

The Demonstration Approach takes a holistic watershed based approach to understand the pollutant sources and their relative contributions, so that appropriate level of controls can be cost-effectively applied to each pollutant source instead of focusing on just the CSOs. The Demonstration Approach can help to understand where the current CSO program is in terms of meeting the WQS and demonstrate the impact of future WQS changes on the CSO controls. Under the Demonstration Approach, the Permittee must document that their CSO control program is adequate to meet the water quality-based requirements of the CWA.

Use of the Presumption Approach for a particular water body is allowed when approved by the NJDEP that the specific presumption(s) to be used in a particular water body are reasonable pursuant to Section II.C.4.a of the CSO Policy.

Certain tasks must be completed regardless if the Presumption or Demonstration Approach is used, such as system characterization, sewer and GIS mapping, and the evaluation of alternatives. However, the study phase for the Demonstration Approach also requires water quality sampling and water quality modeling of the receiving waters. These tasks have been previously completed and the Reports and/or submittals that document the findings of each of these tasks have been submitted to the NJDEP in accordance with the NJPDES Permits.

H.3.6 PVSC Treatment District Hydraulically Connected Groups

Table H-2 summarizes the NJPDES, Permittee name, CSO numbers, and receiving water body.

Table H-2: Summary of CSO Discharge Locations

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0109240	Bayonne	001A	Kill Van Kull
NJ0109240	Bayonne	002A	Kill Van Kull
NJ0109240	Bayonne	003A	Kill Van Kull
NJ0109240	Bayonne	004A	Kill Van Kull
NJ0109240	Bayonne	006A	Upper NY Bay
NJ0109240	Bayonne	007A	Upper NY Bay
NJ0109240	Bayonne	008A	Kill Van Kull
NJ0109240	Bayonne	009A	Kill Van Kull
NJ0109240	Bayonne	010A	Kill Van Kull
NJ0109240	Bayonne	011A	Newark Bay
NJ0109240	Bayonne	012A	Newark Bay
NJ0109240	Bayonne	013A	Newark Bay
NJ0109240	Bayonne	014A	Newark Bay
NJ0109240	Bayonne	015A	Newark Bay
NJ0109240	Bayonne	016A	Newark Bay
NJ0109240	Bayonne	017A	Newark Bay
NJ0109240	Bayonne	018A	Newark Bay
NJ0109240	Bayonne	019A	Newark Bay
NJ0109240	Bayonne	020A	Newark Bay
NJ0109240	Bayonne	021A	Upper NY Bay
NJ0109240	Bayonne	022A	Newark Bay
NJ0109240	Bayonne	024A	Kill Van Kull
NJ0109240	Bayonne	026A	Newark Bay
NJ0109240	Bayonne	028A	Newark Bay
NJ0109240	Bayonne	029A	Newark Bay
NJ0109240	Bayonne	030A	Newark Bay
NJ0109240	Bayonne	034A	Newark Bay
NJ0109240	Bayonne	037A	Kill Van Kull
NJ0117846	East Newark	001A	Passaic River

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0108871	Harrison	001A	Passaic River
NJ0108871	Harrison	002A	Passaic River
NJ0108871	Harrison	003A	Passaic River
NJ0108871	Harrison	005A	Passaic River
NJ0108871	Harrison	006A	Passaic River
NJ0108871	Harrison	007A	Passaic River
NJ0111244	Kearny	001A	Passaic River
NJ0111244	Kearny	004A	Passaic River
NJ0111244	Kearny	006A	Passaic River
NJ0111244	Kearny	007A	Frank's Creek
NJ0111244	Kearny	010A	Frank's Creek
NJ0108758	Newark	002A	Passaic River
NJ0108758	Newark	003A	Passaic River
NJ0108758	Newark	004A	Passaic River
NJ0108758	Newark	005A	Passaic River
NJ0108758	Newark	008A	Passaic River
NJ0108758	Newark	009A	Passaic River
NJ0108758	Newark	010A	Passaic River
NJ0108758	Newark	014A	Passaic River
NJ0108758	Newark	015A	Passaic River
NJ0108758	Newark	016A	Passaic River
NJ0108758	Newark	017A	Passaic River
NJ0108758	Newark	018A	Passaic River
NJ0108758	Newark	022A	Passaic River
NJ0108758	Newark	023A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	025A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	026A	Queen Ditch
NJ0108758	Newark	027A/029A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	030A	Peripheral Ditch / Elizabeth Channel
NJ0108723	Jersey City MUA	001A	Penhorn Creek
NJ0108723	Jersey City MUA	002A	Penhorn Creek
NJ0108723	Jersey City MUA	003A	Hackensack River
NJ0108723	Jersey City MUA	004A	Hackensack River
NJ0108723	Jersey City MUA	005A	Hackensack River
NJ0108723	Jersey City MUA	006A	Hackensack River
NJ0108723	Jersey City MUA	007A	Hackensack River
NJ0108723	Jersey City MUA	008A	Hackensack River
NJ0108723	Jersey City MUA	009A	Hackensack River
NJ0108723	Jersey City MUA	010A	Hackensack River
NJ0108723	Jersey City MUA	011A	Newark Bay
NJ0108723	Jersey City MUA	013A	Newark Bay

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0108723	Jersey City MUA	014A	Hudson River
NJ0108723	Jersey City MUA	015A	Hudson River
NJ0108723	Jersey City MUA	016A	Hudson River
NJ0108723	Jersey City MUA	018A	Hudson River
NJ0108723	Jersey City MUA	020A	Hudson River
NJ0108723	Jersey City MUA	025A	Hudson River
NJ0108723	Jersey City MUA	026A	Hudson River
NJ0108723	Jersey City MUA	028A	Hudson River
NJ0108723	Jersey City MUA	029A	Hudson River
NJ0108898	North Bergen MUA	003A	Bellmans Creek
NJ0108898	North Bergen MUA	005A	Cromakill Creek
NJ0108898	North Bergen MUA	006A	Cromakill Creek
NJ0108898	North Bergen MUA	007A	Cromakill Creek
NJ0108898	North Bergen MUA	008A	Cromakill Creek
NJ0108898	North Bergen MUA	009A	Cromakill Creek
NJ0108898	North Bergen MUA	010A	Cromakill Creek
NJ0108898	North Bergen MUA	011A	Cromakill Creek
NJ0108898	North Bergen MUA	014A	Cromakill Creek
NJ0108880	Paterson	001A	Passaic River
NJ0108880	Paterson	003A	Passaic River
NJ0108880	Paterson	005A	Passaic River
NJ0108880	Paterson	006A	Passaic River
NJ0108880	Paterson	007A	Passaic River
NJ0108880	Paterson	010A	Passaic River
NJ0108880	Paterson	013A	Passaic River
NJ0108880	Paterson	014A	Passaic River
NJ0108880	Paterson	015A	Passaic River
NJ0108880	Paterson	016A	Passaic River
NJ0108880	Paterson	017A	Passaic River
NJ0108880	Paterson	021A	Passaic River
NJ0108880	Paterson	022A	Passaic River
NJ0108880	Paterson	023A	Passaic River
NJ0108880	Paterson	024A	Passaic River
NJ0108880	Paterson	025A	Passaic River
NJ0108880	Paterson	026A	Passaic River
NJ0108880	Paterson	027A	Passaic River
NJ0108880	Paterson	029A	Passaic River
NJ0108880	Paterson	030A	Passaic River
NJ0108880	Paterson	031A	Passaic River
NJ0108880	Paterson	032A	Passaic River
NJ0108880	Paterson	033A	Passaic River

H.3.7 Selected Approach and CSO Discharge Locations

In consideration of the complexity in characterizing the impacts of natural background conditions and CSO and non-CSO pollutant sources from other parties on the ability to achieve water quality standards and support designated uses, PVSC and the Permittees have elected to adopt criteria ii of the Presumption Approach in the formation of their local LTCP. The NJPDES permit defines criteria ii as follows:

> *ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a hydraulically connected system-wide annual average basis.*

Presumption Approach criteria ii provides a metric (85% capture) that simplifies the LTCP development process by eliminating the need to analyze the impacts of outside pollutant sources, as required under the Demonstration Approach, to achieve NJPDES Permit compliance. This approach allows the Permittees to primarily focus on the performance of their collection and treatment facilities by applying nationally accepted industry practices in support of each phase of developing this LTCP.

H.4 SELECTION OF ALTERNATIVES

H.4.1 Description

This section details the factors, both monetary and non-monetary, and procedures that went into the selection process carried out to identify the recommended alternative(s) for inclusion in the Regional LTCP.

H.4.2 Remaining Overflows

The primary criteria for evaluation of alternatives is the technology's effectiveness in reducing the volume and frequency of overflow events. At a minimum, the selected alternatives must be capable of meeting the 85% capture rate required under the Presumption Approach. The effectiveness of different alternatives CSO reduction was evaluated using the LTCP PVSC Treatment District H&H model described in Section F.

Technologies that do not impact the volume or frequency were not excluded, as they may lead to other benefits for the municipalities including, but not limited to, the ability to meet water quality standards or hydraulic benefits to the overall CSS system. This considers adequately addressing areas of sewage overflows, including to basements, streets and other public and private areas.

H.4.3 Ability to Meet Water Quality Standards

Based upon the findings of previous studies and reports submitted and approved by NJDEP (including the System Characterization Report, the Receiving Water Quality Modeling Report, the Baseline Compliance Monitoring Program Report, and the Pathogen Water Quality Modeling Report, among others), the CSO discharges are not precluding the attainment of water quality standards in any of the receiving waters PVSC or its member communities discharge to under baseline conditions.

H.4.4 Non-Monetary Factors

There are several non-monetary factors that were considered in selecting the elements of the Regional LTCP. These factors include siting, institutional issues, implementation, and public input. A brief description of these factors is included below. For a detailed description refer to the PVSC Regional DEAR which is included as **Appendix D.**

Siting of CSO Control Facilities

Identifying an appropriate site for the alternatives is an important consideration when determining the feasibility of the alternative. Siting is unique to each Permittee and is further discussed in the DEAR and individual SIARs which are included as **Appendices F-N**.

Institutional Issues

PVSC does not own any of the CSO outfalls in the CSS. The outfalls are owned by the City of Paterson, City of Newark, Township of Kearny, Town of Harrison, Borough of East Newark, City of Bayonne, Jersey City MUA, and North Bergen MUA, who have received authorization to discharge under their respective NJPDES Permits for Combined Sewer Management.

As a result, implementation of the Regional Alternative is contingent on commitment by PVSC and the eight other Permittees. Each party has factors, monetary and non-monetary, unique to them that affects their selection process. Given these circumstances, PVSC and Permittees developed both a Regional Alternative and individual LTCPs for their geographic boundaries in the event that the Regional Alternative is no longer viable for any reason; the potential for monetary constraints in the event that one or multiple Permittees opt-out is one such possibility.

Implementability

Implementability and technical issues for the Regional Alternative identified in this LTCP was evaluated based on criteria from the EPA CSO Guidance for Long-Term Control Plan document.

Public Input

Public input is a significant factor in the development of the LTCP and was continuously solicited technologies through the implementation of the LTCP Public Participation Plan (PPP), as described in Section G. For instance, throughout the LTCP process it was clear that the public desired a plan that would include green infrastructure. The use of green infrastructure provides the community with several benefits including increased green space, reduction of heat island effect and the potential for green jobs.

H.4.5 Cost Opinion

The cost and performance analysis was prepared in accordance with Passaic Valley Sewerage Commissioners CSO Long Term Control Plan Updated Technical Guidance Manual (January 2018). All present worth costs include the costs for capital costs, land costs, and O&M costs over a 20-year period or life of the project. All capital costs include an additional 25% for contingencies, 20% for engineering costs and 15% for contractor overhead and profit. A discount rate of 2.75% and a 20-year life cycle was assumed for present value calculations. The total present worth (TPW) cost is calculated as the sum of the capital cost, land cost, and the O&M costs multiplied by a 15.227 PW factor based on the discount rate and 20-year life cycle

estimated years. All costs have been adjusted for present day worth using the ENR construction indices. The cost estimates were used to determine the most cost-effective alternative. Cost-effectiveness was the leading monetary factor.

Table H-3 summarizes the CSO control technologies to be implemented under the Regional Alternative CSO LTCP, for those Permittees that have selected the Regional Alternative. The CSO control technologies to be implemented under the Municipal Alternative, for those Permittees that have selected the Municipal Alternative, are shown in each Permittee's individual SIARs. Implementation of the Regional plan, or Regional Alternative, is subject to cost allocation agreements across the various Permittees. Should regional implementation not be feasible due to a cost allocation agreement not being achieved within a specified time frame, each Permittee will implement the LTCP delineated in the individual SIARs, and referred to as the Municipal Alternative, upon NJDEP approval.

Table H-3 below shows the summary of costs for the Regional alternative of the LTCP.

Table H-3: Summary of Costs for the Regional Alternative

Permittee	Technology	Quantity	Units	CC [1] ($M)	O&M[2] ($M)	LCC[3] ($M)
Bayonne	Green Infrastructure Phases 1, 2 & 3	40	AC	15.6	0.09	17.0
Bayonne	Storage Tank at BA001/002	10.5	MG	131.6	0.19	134.5
Bayonne	Storage Tank at BA007	3.2	MG	47.5	0.11	49.2
Bayonne	Storage Tank at BA021	2.0	MG	32.2	0.09	33.6
Bayonne	OSPS Improvements to 27.8 MGD	10.2	MGD	12.0	0.60	21.1
Bayonne	Forcemain Capacity Increase	6,019	LF	23	0.06	23.9
Bayonne Subtotal				***261.9***	***1.14***	***279.4***
East Newark	Sewer Separation	13.0	Acres	3.9	0.00	3.9
East Newark	Sewer Separation	7.0	Acres	2.1	0.000	2.1
East Newark Subtotal				***6.0***	***0.00***	***6.0***
Harrison	Green Infrastructure Program	N/A	N/A	0.8	0.03	1.2
Harrison	PSS at 004 (3.3 ac completed) and 005 (87.1 ac; 37.6 ac completed, 49.5 ac remaining)	49.5	Acres	15.3	0.00	15.3
Harrison Subtotal (in addition to $11M already invested in sewer separation)				***16.1***	***0.03***	***16.5***
Jersey City	Sewer Rehabilitation and I/I Elimination	87890	LF	36.8	0.00	36.8
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	28.9	Acres	10.8	0.00	10.8
Jersey City	Green Infrastructure to Control 7% of Impervious Area	188	Acres	92.1	0.42	98.5
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	6.2	MG	104.8	0.15	107.1
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	7.1	MG	116.7	0.16	119.2
Jersey City Subtotal				***361.2***	***0.74***	***372.4***

Permittee	Technology	Quantity	Units	CC [1] ($M)	O&M[2] ($M)	LCC[3] ($M)
Kearny	Sewer Separation at Outfall KE010	34.0	Acres	10.2	0.00	10.2
Kearny	Sewer Separation at KE006	199.0	Acres	59.7	0.00	59.7
Kearny Subtotal				***69.9***	***0.00***	***69.9***
Newark	Regulator Modifications on Main Interceptor	N/A	N/A	0.0	0.00	0.0
Newark	Increasing Flow from South Interceptor	N/A	N/A	0.4	0.00	0.4
Newark	Green Infrastructure	212.7	Acres	90.2	0.48	97.5
Newark	Water Conservation Program	N/A	N/A	1.5	0.00	1.5
Newark Subtotal				***92.1***	***0.48***	***99.4***
North Bergen	Storage Tank at NB003	5.0	MG	26.5	0.20	29.6
North Bergen	Closure of outfall NB014	N/A	N/A	0.1	0.00	0.1
North Bergen	Green infrastructure	1.0	Acres	0.4	0.05	1.2
North Bergen Subtotal				***27.0***	***0.25***	***30.8***
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres	N/A	N/A	N/A
Paterson	Planned Sewer Separation for PT023	29.8	Acres	8.9	0.0	8.9
Paterson	19th Ave. Relief Sewer for PT030	7,706	LF	49.9	0.00	49.9
Paterson	2.5% Impervious Area Green Infrastructure	75.0	Acres	29.3	0.17	31.8
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025	2.1	MG	33.7	0.10	35.2
Paterson Subtotal				***121.8***	***0.26***	***125.8***
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	720	MGD	45.2	0.64	54.9
All	Parallel Interceptor to Main Interceptor	29,296	LF	219.0	0.00	219.0
Regional Facilities Subtotal				***264.2***	***0.64***	***273.9***
Total				**1,220**	**3.54**	**1,274**

[1] Capital Cost.
[2] Operation and Maintenance.
[3] Life Cycle Cost. Through financial capability assessment, each Permittee will adjust the LCC accordingly. This is a preliminary cost projection based on a 20-year implementation schedule. This will be adjusted pending the changes to each Permittee's implementation schedule.

H.5 DESCRIPTION OF RECOMMENDED LTCP

Since the submission of the Regional DEAR, PVSC and the eight other Permittees have conducted several meetings to discuss and decide upon two options for the recommended LTCP. The first is the Municipal Alternative, where each Permittee independently implements CSO control technologies to achieve no less than 85% capture by volume of wet weather flow within their geographic boundary's combined sewer system. Secondly, there is the Regional Alternative where the 85% capture criterion is achieved across the PVSC combined sewer system as a combined effort of all the Permittees. Not all Permittees will reach 85% capture individually in the Regional Alternative, but the combination of CSO control technologies used across the hydraulically connected communities within the PVSC Treatment District will meet

this criterion. This Regional Alternative primarily utilizes a major improvement: the construction of a parallel interceptor to the main interceptor. This parallel interceptor would allow the proposed secondary bypass at the PVSC WRRF to increase wet weather flow treatment capacity to 720 MGD. These improvements will then be coupled with local CSO control technologies in order to constitute the entire Regional Alternative.

The SIARs developed by each of the Permittees (included as Appendices to this LTCP) discuss the Municipal Alternative to be implemented by each Permittee independently from the other CSO Communities, and if the Municipal Alternative is selected by the individual Permittee (in lieu of the Regional Alternative). This report discusses selection of a Regional Alternative to be implemented throughout the PVSC Treatment District, and the adjustments of the CSO control technologies proposed in these SIARs. This section highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

The LTCP recommendations are based upon information and evaluations performed during the earlier phases of the planning process, including the characterization of the receiving waters, hydraulic and water quality modeling, screening of CSO control technologies, and development and evaluation of alternatives, public participation, and the nine minimum controls. Following completion of these permit requirements, the selection and implementation of alternatives for regional implementation took place and is further discussed in this section.

Table H-4 summarizes the alternative (either the Municipal Alternative or the Regional Alternative) that each Permittee has selected. For those Permittees that have selected the Regional Alternative, those Permittees are committing to working towards a negotiated cost allocation/sharing Agreement for the Regional Alternative prior to beginning the implementation of the Regional Alternative. If these cost allocation/sharing negotiations are not successful, each of these Permittees would then implement the Municipal Alternative as discussed in each of the Permittees' individual Selection and Implementation of Alternatives Reports included in **Appendices F-N**. Any Permittee selecting the Regional Alternative may instead choose to implement their Municipal Alternative at any time during the negotiations.

Table H-4: Permittee Alternative Selection

Permittee	NJPDES #	Selected Alternative
Bayonne	NJ0109240	Regional
East Newark	NJ0117846	Regional
Harrison	NJ0108871	Regional
JCMUA	NJ0108723	Regional
Kearny	NJ0111244	Municipal
Newark	NJ0108758	Regional
NBMUA	NJ0108898	Regional
Paterson	NJ0108880	Regional

Table H-5 highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

The two alternatives that most resemble Alternatives 1 (Municipal) and 3 (Regional) submitted in the Regional DEAR, noted in **Section E.3** above, have been coined Alternatives 1b (Municipal) and 3b (Regional) after iterative analysis of different alternatives with the Permittees. Detailed descriptions of each of the CSO control technologies evaluated in the Municipal and Regional Alternatives can be found in the respective Permittee SIARs (**Appendices F through N**). **Table H-6** compares the alternatives put forth in the Regional DEAR report and those agreed upon by the Permittees for the final LTCP.

Table H-5: Regional Alternatives Versus Municipal Alternatives

Permittee	Technology	Municipal Alternative	Regional Alternative
Bayonne	Green Infrastructure Phases 1, 2 & 3	✓	✓
Bayonne	Storage tank at BA001/BA002	✓	✓
Bayonne	Storage tank at BA007	✓	✓
Bayonne	Storage tank at BA010	✓	
Bayonne	Storage Tank at BA014	✓	
Bayonne	Storage Tank at BA015	✓	
Bayonne	Storage Tank at BA017	✓	
Bayonne	Storage Tank at BA021	✓	✓
Bayonne	OSPS Improvements to 27.8 MGD	✓	✓
Bayonne	FM Upgrade (replace existing force main with 36" Pipe)	✓	✓
East Newark	Thread Mill Sewer Separation (13 ac)	✓	✓
East Newark	Water Front Sewer Separation (7 ac)	✓	✓
Harrison	Green Infrastructure Program	✓	✓
Harrison	Sewer Separation at 004 (3.3ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 ac remaining)	✓	✓
Jersey City	Sewer Rehabilitation and I/I Elimination	✓	✓
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	✓	✓
Jersey City	Green Infrastructure to Control 7% of Impervious Area	✓	✓
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	✓	✓
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	✓	✓
Jersey City	Hackensack River Treatment Shaft - JC006, JC007, JC008, JC009, JC010	✓	
Jersey City	Newark Bay Treatment Shaft - JC011, JC013	✓	
Jersey City	North Hudson Treatment Shaft - JC028, JC029	✓	
Kearny	Sewer Separation at KE010	✓	
Kearny	Sewer Separation at KE006	✓	
Newark	Storage Tank at NE022	✓	
Newark	Storage Tank at NE009 & NE010	✓	
Newark	Storage Tank at NE014	✓	

Permittee	Technology	Municipal Alternative	Regional Alternative
Newark	Regulator Modifications on Main Interceptor	✓	✓
Newark	Green Infrastructure	✓	✓
Newark	Increasing flow from South Interceptor		✓
Newark	Water Conservation Program	✓	✓
North Bergen	Storage Tank at NB003	✓	✓
North Bergen	Storage Tank at NB008	✓	
North Bergen	Closure of outfall NB014	✓	✓
North Bergen	Green Infrastructure	✓	✓
Paterson	Sewer Separation Projects Completed Since 2006	✓	✓
Paterson	Planned Sewer Separation for PT023	✓	✓
Paterson	19th Ave. Relief Sewer for PT030	✓	✓
Paterson	2.5% Green Infrastructure	✓	✓
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	✓	✓
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	✓	✓
All	Parallel Interceptor to Main Interceptor		✓

Table H-6: Alternatives Presented in the Regional DEAR and Final Alternatives for the LTCP

Alternative	Description
Municipal Alternative (No. 1b)	Alternatives that achieve 85% wet weather capture within each municipality
Regional Alternative (No. 3b)	Parallel Interceptor + WRRF Secondary Bypass to 720 MGD + Local technologies

The percent capture and volume reduction information for each permittee for the Regional and Municipal Alternatives is presented in Error! Reference source not found.. Error! Reference source not found.These baseline capture rates for each Permittee and the improvements in capture for the Municipal and Regional Alternatives were presented in Supplemental CSO Group Meeting No. 16 on September 2nd, 2020:

Table H-7: Percent Capture and Volume Reduction for each Permittee for the Regional and Municipal Alternatives

Municipality	Baseline		Municipal Alternative		Regional Alternative	
	Annual CSO (MG)	% Capture	Annual CSO (MG)	% Capture	Annual CSO (MG)	% Capture
Bayonne	747	49%	205	86%	319	78%
East Newark	17	77%	11	85%	11	85%
Harrison	47	82%	38	85%	38	85%
Jersey City	1557	72%	550	88%	1145	78%
Kearny	255	75%	99	85%	99	85%
Newark	1319	77%	686	88%	174	96%
North Bergen	274	77%	176	86%	186	85%
Paterson	353	82%	283	85%	283	85%
Totals – System Wide CSO / Percent Capture	**4,569**	**69%**	**2,048**	**86%**	**2,255**	**85%**

Note: Each one of the eight municipalities further refined their baseline models after the submission of their SCR. The flow and CSO values reported in the SIAR reflect the most up-to-date results.

SECTION I - FINANCIAL CAPABILITY

I.1 Introduction

This section of the report quantifies the projected affordability impacts of the proposed long term CSO controls for the:

- City of Bayonne
- East Newark Township
- Town of Harrison
- Jersey City
- Town of Kearny
- City of Newark;
- North Bergen Township; and
- City of Paterson.

These municipalities are members of the Clean Waters, Healthy Neighborhoods initiative. The initiative is a collaboration of the entities who own and operate combined sewer systems within the PVSC service areas.

This analysis focuses on the Municipal Control Alternatives that the eight municipalities have identified in their respective Selection and Implementation Reports.

While a regional alternative would result in lowered overall costs for the control of CSOs within the PVSC service area, the basis of this allocation remains under discussion as of the writing of this report. Under this approach both the costs of the regional facilities such as a relief interceptor and the resultant savings would be allocated amongst the PVSC municipalities with combined sewer systems. As the basis of this allocation remains under discussion as of the writing of this SIAR, this document focuses on implementation of the Municipal Control Alternative. Should the Permittees come to agreement on the cost allocation for the Regional Control Plan, the FCA will be revisited to reassess the affordability and schedule for implementation of the LTCP.

This section is excerpted from individual memoranda prepared by PVSC for these municipalities. The memoranda are incorporated as **Appendix P** of this Regional LTCP.

I.2 Methodology

I.2.1 USEPA's Two Step Process

The Financial Capability assessment is a two-step process including Affordability which evaluates the impact of the CSO control program on the residential ratepayers and Financial Capability which examines a Permittee's ability to finance the program. Affordability is measured in terms of the Residential Indicator (RI) which is the percentage of median household income (MHI) spent on wastewater services. Total wastewater services exceeding 2.0% (1% for

communities with a "weak" Financial Capability Indicator score) of the median household income are considered to impose a high burden by USEPA. The financial capability analysis uses metrics similar to the municipal bond rating agencies.

I.2.2 Dynamic FCA Modeling Approach

EPA's November 24, 2014 memorandum encourages the use of a time-based ("dynamic" model per the memo) model to supplement the snapshot approach. PVSC has developed time-based models for each municipality that calculate annual costs and revenue requirements based on assumed program costs, schedules and economic variables such as interest and inflation rates. The residential indicator is calculated for each year based upon the costs per typical residential users which changes annually based on the annual system revenue requirements.

I.2.3 Evolving Analytical Framework

USEPA encourages the use of additional information and metrics to more accurately capture the impacts of the proposed CSO controls on the Permittee and its residents. Therefore, this FCA includes information on the impacts of future costs among lower income residents and within the context of local costs of living.

Detailed discussion of the FCA for the PVSC service area and Permittees and a detailed analysis of the FCAs can be found in the FCA Memoranda specifically written for the eight municipalities are attached as part of Appendix P of the Regional LTCP.

I.3 Current Baseline Conditions

I.3.1 Current Affordability Assessments

The starting point for the affordability assessment was an estimation of annual wastewater costs for the typical single family residential wastewater user in each municipality. Due to varying municipal schedules for setting rates, 2019 was used as the base year. The estimated annual costs are shown on

Table I-1. Also shown are the current (2019 unless noted) Residential Indicators which are the percentages of the municipality's MHI and the estimated MHIs.

Table I-1: Estimated Baseline Wastewater Costs per Typical Single Family Residential User (2019 unless noted)

	Municipality	User Charge	From Taxes	Total	MHI	RI
1	Bayonne (2020)	$659	$42	$701	$59,000	1.2%
2	East Newark	$436	$0	$436	$61,400	0.7%
3	Harrison	$210	$185	$395	$63,600	0.6%
4	Jersey City	$482	$0	$482	$65,300	0.7%
5	Kearny	$0	$499	$499	$64,400	0.8%

Municipality		User Charge	From Taxes	Total	MHI	RI
6	Newark	$340	$0	$340	$35,600	1.0%
7	North Bergen	$431	$126	$557	$59,600	0.9%
8	Paterson	$290	$170	$460	$40,000	1.1%

The estimated 2019 costs per single family residential user are based on the following:

- Typical residential potable water usage is 4,500 gallons monthly;
- Where applicable, collection sewer system costs that are paid for by the municipalities through their general (property tax based) funds are estimated based upon the average assessed valuation for a single family home per municipal budget materials submitted to the New Jersey Department of Community Services and the ratio of sewer system costs in the municipal budgets to the overall tax-funded municipal budgets.
- Median household incomes were based on the 2013 – 2017 US Census National Community Survey, inflated to 2019 using individual income growth rates calculated from the 2000 Census and the 2015 (mid-point of the 2013-2017 survey).

By definition, whatever the residential indicator is in a given municipality, the costs as a percentage of household will be more for half of the households.

The total Census households are broken out by income brackets on **Table I-2** below, along with the respective current Residential Indicators by income bracket. The RI for each bracket was calculated from the mid-point income within the bracket.

Table I-2: Analysis of the Current Residential Indicator

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number*	Number*	Number*	Number*	Number*	Number*	Number*	Number*
Less than $10,000	$5,000	14.0%	8.7%	7.9%	8.3%	10.0%	6.8%	10.6%	9.2%
		2,189	28	330	8,818	671	14,841	1,887	6,379
$10,000 to $14,999	$12,500	5.6%	3.5%	3.2%	3.3%	4.0%	2.7%	4.2%	3.7%
		1,061	44	186	5,377	381	7,790	1,050	3,445
$15,000 to $24,999	$20,000	3.5%	2.2%	2.0%	2.1%	2.5%	1.7%	2.6%	2.3%
		2,403	56	434	9,457	1,230	13,900	2,117	6,340
$25,000 to $34,999	$30,000	2.3%	1.5%	1.3%	1.4%	1.7%	1.1%	1.8%	1.5%
		2,410	86	493	7,901	962	11,283	2,004	5,096
$35,000 to $49,999	$42,500	1.7%	1.0%	0.9%	1.0%	1.2%	0.8%	1.2%	1.1%
		3,046	133	820	10,331	2,011	13,618	2,623	6,526

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number*	Number*	Number*	Number*	Number*	Number*	Number*	Number*
$50,000 to $74,999	$62,500	1.1%	0.7%	0.6%	0.7%	0.8%	0.5%	0.8%	0.7%
		4,496	156	1,238	14,468	2,720	14,743	4,171	6,335
$75,000 to $99,999	$87,500	0.48%	0.5%	0.5%	0.5%	0.6%	0.4%	0.6%	0.5%
		2,826	104	621	10,216	1,810	7,855	2,859	4,307
$100,000 to $149,999	$125,000	0.6%	0.4%	0.3%	0.3%	0.4%	0.3%	0.4%	0.4%
		3,302	140	822	15,064	2,196	7,600	3,290	3,723
$150,000 to $199,999	$175,000	0.4%	0.3%	0.2%	0.2%	0.3%	0.2%	0.3%	0.3%
		2,011	53	381	7,961	1,025	2,136	1,007	837
$200,000 or more	>$200,000	0.4%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.2%
		1,469	30	297	10,456	467	1,550	924	798

* Number of Census households per income bracket.

- PVSC has developed a time-based model that calculates annual costs and revenue requirements based on assumed program costs, schedules and economic variables such as interest and inflation rates. The residential indicator is calculated for each year based upon the costs per typical residential users which changes annually based on the annual system revenue requirements.

- The estimated inflationary impacts on wastewater costs per typical single family residential user without additional CSO control costs are shown on **Table I-3**. The costs are projected to the first year after the full implementation of the respective Municipal Control Alternatives. For example, if the scheduled completion of all capital expenditures required to implement a Municipal Control Alternative is 2040, the affordability test year would be 2041. For all municipalities, annual operation and maintenance (O&M) costs are projected to increase at a rate of 3.9% annually based on the 2017 NACWA survey of wastewater utilities.[I-1]

Table I-3: Projected Residential Indicator without Additional CSO Control Costs

Municipality	Metric	Baseline (2019 unless noted)	Test Year	Test Year Cost per Typical Residential Wastewater (With Inflation)
Bayonne (2020)	RI	1.2%	2051	2.2%
	Annual $	$701		$2,296
East Newark	RI	0.7%	2031	0.8%

I-1 2017 Financial Survey – Opportunities and Challenges in Clean Water Utility Management July 2018; National Association of Clean Water Agencies (NACWA)

Municipality	Metric	Baseline (2019 unless noted)	Test Year	Test Year Cost per Typical Residential Wastewater (With Inflation)
	Annual $	$436		$595
Harrison	RI	0.6%	2041	1.0%
	Annual $	$395		$1,008
Jersey City	RI	0.7%	2051	0.9%
	Annual $	$482		$1,082
Kearny	RI	0.8%	2051	1.1%
	Annual $	$499		$1,258
Newark	RI	1.0%	2031	1.2%
	Annual $	$340		$476
North Bergen	RI	0.9%	2041	1.3%
	Annual $	$557		$1,231
Paterson	RI	1.1%	2061	1.5%
	Annual $	$460		$1,257

I.3.2 Current Financial Capability Assessments

The second part of the financial capability assessment - calculation of the financial capability indicator for the Permittee - includes six items that fall into three general categories of debt, socioeconomic, and financial management indicators. The six items are:

- Bond rating
- Total net debt as a percentage of full market real estate value
- Unemployment rate
- Median household income
- Property tax revenues as a percentage of full market property value
- Property tax revenue collection rate

Each item is given a score of three, two, or one, corresponding to ratings of strong, mid-range, or weak, according to EPA-suggested standards. The overall financial capability indicator is then derived by taking a simple average of the ratings. This value is then entered into the financial capability matrix to be compared with the residential indicator for an overall capability assessment. The Financial Capability scores for the municipalities are shown on **Table I-4**.

.

Table I-4: Financial Capability Indicator Benchmarks

Municipality	Bond Rating	Net Debt	Unem-ployment Rate	MHI	Property Tax as % Market Value	Property Tax Collection Rate	Combined
	Value	Value	Value	Value	Value	Value	Value
	Score	Score	Score	Score	Score	Score	Score
Bayonne	2	1	3	2	2	3	2.2
	Mid-Range	Weak	Strong	Mid-Range	Mid-Range	Strong	Mid-Range
East Newark	NA	3	3	2	2	2	2.4
	NA	Strong	Strong	Mid-Range	Mid-Range	Mid-Range	Mid-Range
Harrison	2	2	1	2	2	3	2.0
	Mid-Range	Mid-Range	Weak	Mid-Range	Mid-Range	Strong	Mid-Range
Jersey City	3	2	2	2	2	1	2.0
	Strong	Mid-Range	Mid-Range	Mid-Range	Mid-Range	Weak	Mid-Range
Kearny	2	3	1	2	2	2	2.0
	Mid-Range	Strong	Weak	Mid-Range	Mid-Range	Mid-Range	Mid-Range
Newark	2	3	1	1	2	3	2.0
	Mid-Range	Strong	Weak	Weak	Mid-Range	Strong	Mid-Range
North Bergen	3	3	1	2	2	3	2.3
	Strong	Strong	Weak	Mid-Range	Mid-Range	Strong	Mid-Range
Paterson	2	3	1	2	2	1	1.8
	Mid-Range	Strong	Weak	Mid-Range	Mid-Range	Weak	Mid-Range

The derivations of these scores are presented in the detailed FCA memorandum presented in **Appendix P** of this PVSC Regional LTCP. As each of the financial indicators are generally based upon publicly available data from 2019 or earlier, this analysis does not reflect the current and lingering impacts of the COVID -19 pandemic and should be revisited upon memorializing the LTCP implementation schedule in the municipalities' and MUA's next NJPDES Permits.

I.4 Other Economic & Demographic Factors

In addition to following EPA guidelines for completion of the financial capability assessment matrix, a discussion of socioeconomic trends among the municipalities is essential to the consideration of scheduling and compliance levels with CSO guidelines.

I.4.1 Cost of Living Factors

General Cost of Living

Specific cost of living comparisons with national averages are not available for each municipality. However, the cost of living for the Cities of Elizabeth and Newark is approximately 30% higher than the national average.[I-2] Proxy "effective MHI" values reflecting the impact of the higher cost living have been estimated and are presented in **Table I-5**. Included on **Table I-5** are "effective MHIs" calculated for this evaluation which represent the ratio of the differences between the municipal MHIs and the national MHI and the municipal cost of living and the national average cost of living (which is 100%). For example, if a municipality has a MHI that is 110% of the national average and a cost of living that is 20% higher than the national average, the effective MHI would be about 92% which is calculated as follows:

MHI @ 95% / Cost of Living @ 1.20 = 91.67% Effective MHI.

This is not an official EPA metric but reinforces the impacts of the high costs of living in the PVSC service area which is not reflected in the basic EPA residential indicator calculation.

Table I-5: Cost of Living and "Effective" MHI

	Municipality	Cost of Living .v. National Average	MHI .v. National Average	"Effective" MHI
1	Bayonne	130%	99%	76%
2	East Newark	130%	103%	78%
3	Harrison	130%	106%	81%
4	Jersey City	130%	109%	84%
5	Kearny	130%	110%	85%
6	Newark	130%	60%	46%
7	North Bergen	130%	99%	76%
8	Paterson	130%	63%	48%

Housing Costs

Housing costs in the PVSC municipalities are substantially higher than the national average[I-3]. The Residential Indicator is a national screening parameter and does not account for localized factors which erode the effective household income. Based upon a 2017 study[I-4] by the National Low Income Housing Coalition, the fair market value of a two bedroom apartment in the counties in which the PVSC municipalities are located is presented in **Table I-6** along with the percentages of median household incomes that this represents.

I-2 http://www.infloplease.com/business/economy/cost of living - index.us-cities html

I-3 Using the Newark – Elizabeth cost of living indices.

I-4 Out of Reach 2017 – The High Cost of Housing National Low Income Housing Coalition.

Table I-6: Housing Costs Using Monthly Rents as a % of MHI

Municipality		Monthly Rent for 2 Bedroom Apartment	MHI (2017)	Rent as % of MHI
1	Bayonne	$1,519	$56,700	32%
2	East Newark	$1,519	$59,300	31%
3	Harrison	$1,519	$61,170	30%
4	Jersey City	$1,519	$62,700	29%
5	Kearny	$1,519	$63,300	29%
6	Newark	$1,288	$34,800	44%
7	North Bergen	$1,519	$57,300	32%
8	Paterson	$1,557	$36,100	52%

Local Tax Burdens

Average property tax levies for the average assessed valuations for single family homes in the municipalities have been calculated and are compared with a national average local property tax levy of $3,500 for a similarly priced home. Moreover, as housing prices are higher in the New York – Newark metropolitan area than nationally, houses costing well over the national median value of $193,500 are purchased by families of modest incomes. These data are shown on **Table I-7Table I-7**.

Table I-7: Average Property Tax Burden Compared to National Averages – Single Family Home

Municipality		Average Tax Levy (municipal + School, etc.)	National Average Levy
1	Bayonne	$9,800	$3,500
2	East Newark	$10,900	
3	Harrison	$11,000	
4	Jersey City	$7,200	
5	Kearny	$10,200	
6	Newark	$6,000	
7	North Bergen	$7,700	
8	Paterson	$7,700	

The high housing costs and tax burdens facing households in the PVSC municipalities reduces their effective household income. Consequently, measuring the household burden imposed by wastewater costs as a percentage of the median household income may underestimate the

financial burden of the projected wastewater costs per household. As was noted in an analysis of the impacts of CSO controls in the Boston region:

> *"The greater are the costs of other necessities as a share of MHI, the greater will be the economic burden associated with sewer charges equal to a given percent of MHI."*[I-5]

I.4.2 Poverty Factors

Poverty Rate

Circa 2017 poverty rates for the municipalities are provided in **Table I-8**. These can be compared to the United States poverty rate of 14.6%.

Table I-8: Poverty Rates

	Municipality	Municipal	United States
1	Bayonne	15.7%	14.6%
2	East Newark	13.0%	
3	Harrison	16.2%	
4	Jersey City	18.7%	
5	Kearny	11.7%	
6	Newark	28.3%	
7	North Bergen	15.8%	
8	Paterson	29.0%	

New Jersey Department of Community Affairs Municipal Revitalization Index

New Jersey's Municipal Renewal Index[I-6] measures the social, economic, physical and financial conditions of the 565 municipalities within New Jersey. The MRI is compiled by the NJ Department of Community Affairs and is used in the distribution of needs-based funding. Six primary along with four secondary criteria are used:

Primary Criteria

- Children on TANF (Temporary Assistance for Needy Families) per 1,000 persons
- Unemployment Rate
- Poverty Rate
- High school diploma or higher

[I-5] Assessment of the Economic Impact of Additional Combined Sewer Overflow Controls in the Massachusetts Water Resource Authority Service Area (page 13) prepared by Robert N. Stavins, Genia Long, and Judson Jaffee. Analysis Group Incorporated, August 2004.

[I-6] Measuring Distress in New Jersey: the 2017 Municipal Revitalization Index Office of Policy and Regulatory Affairs, New Jersey Department of Community Affairs.

- Median Household Income
- Percent of households receiving SNAP (food stamps)

Secondary Criteria

- Ten-year rate of change in population
- Non-seasonal housing vacancy rate
- Equalized three year effective property tax rate
- Equalized property valuation per capita

The 2017 state-wide MRI rankings for the combined sewered municipalities within the PVSC service area are shown on **Table I-9**.

Table I-9: Municipal Renewal Index for the PVSC Combined Sewered Municipalities

Municipality	2017 Municipal Revitalization Index			Percentile of Least Resourced Municipalities
	MRI Score	MRI Distress Score	MRI Rank	
Bayonne	-4.56	40.2	82	15%
East Newark	-5.71	43.4	65	12%
Harrison	-4.49	40.0	87	15%
Jersey City	-5.80	43.7	64	11%
Kearny	-3.67	37.7	106	19%
Newark	-16.53	73.5	12	2%
North Bergen	-4.65	40.5	80	14%
Paterson	-19.43	81.6	8	1%

I.5 Future Conditions

I.5.1 Impacts of the Selected CSO Control Strategies

The projected future capital costs for the Municipal Control Alternatives on the part of the eight PVSC combined sewered municipalities are shown on **Table I-10**. As noted above, the development of potential intermunicipal allocation of costs for the Regional Control Alternative are underway and the financial capability analyses can be re-evaluated to reflect the regional approach at a later date.

Table I-10: Remaining Capital Costs for Implementing the Municipal Control Alternatives

Municipal Permittee		Schedule		Capital Costs (current $ in millions)
		End Year	Years	
1	Bayonne (depending on capacity available from PVSC)	2050	30	$363.3
2	East Newark	2030	10	$6.0
3	Harrison	2040	20	$16
4	Jersey City	2050	30	$658
5	Kearny	2050	30	$70
6	Newark	2030	10	$449
7	North Bergen	2040	20	$36
8	Paterson	2060	40	$122
			Total	$1,720

The various projects comprising costs for the Municipal Control Alternatives are summarized in the individual Financial Capability Assessment memoranda provided as Appendix P to this report and are detailed in the individual municipalities' Selection and Implementation of Alternatives Reports. Also shown are the currently anticipated implementation periods per the respective municipalities SIARs. It is assumed that the Long Term Control Plans will be approved by NJDEP during 2021, triggering the implementation period per the updated NJPDES discharge permits which will be negotiated and finalized during 2021.

It should be noted that the $1.72 billion total shown below does not include costs incurred to date that are already included in the municipalities' respective rate bases such as the $20 million for the expansion of North Bergen MUA's Woodcliff Sewage Treatment Plant, which is underway, and the Town of Harrison's $11 million investment in sewer separation.

Implementation of the $1.72 billion Municipal Control Alternative results in projected annual costs per typical single family user for the eight PVSC municipalities as shown on **Table I-11**.

Table I-11: Projected Impacts of Implementing the Municipal Control Options

Municipal Permittee	Current Typical Residential		RI Based on Cost / Schedule*			Test Year	Projected MHI	Projected Typical Residential Annual Cost*	
	R.I.	Annual Cost	Uninflated	Inflated	EPA Burden (inflated)			Uninflated	Inflated
Bayonne	1.2%	$701	2.2% To 2.4%	3.5% To 3.6%	High To High	2051	$105,500	$1,222 To $1,336	$3,642 To $3,825
East Newark	0.7%	$436	1.5%	1.6%	Medium	2031	$75,400	$901	$1,191
Harrison	0.6%	$395	1.2%	1.5%	Medium	2041	$98,400	$754	$1460
Jersey City	0.7%	$482	1.1%	1.3%	Medium	2051	$123,300	$703	$1,652
Kearny	0.8%	$499	1.3%	2.0%	High	2051	$111,100	$848	$2,189
Newark	1.0%	$340	1.5%	1.8%	Medium	2031	$40,700	$515	$723
North Bergen	0.9%	$557	1.2%	1.4%	Medium	2041	$92,300	$701	$1,280
Paterson	1.1%	$460	1.6%	2.0%	High	2061	$84,200	$633	$1,683

Assuming inflation, Bayonne, Kearny and Paterson have projected residential indicators triggering the USEPA "high burden" criterion. Without inflation, no municipalities would be projected to have a residential indicator over 2.0% upon completion of the Municipal Control Alternatives. While excluding inflation obviates the need for long term projections of inflation, income growth and interest rates; assuming no inflation is equally fraught. The necessary ambiguity and unpredictability of future economic conditions beyond the municipalities' control provides a strong argument as to the need for adaptive management to be incorporated into what will ultimately be enforceable implementation schedules. Moreover, the Residential Indicator is a crude metric in that it uses a single income data point, the median household income for the entire municipality. As detailed in the following sub-section, annual wastewater costs that result in a "moderate" impact on households at or near the median household income can impose severe impacts on low income households.

This limitation is one of the drivers behind the April 2019 affordability framework proposed by the National Association of Clean Water Agencies and other national organizations.[7] The key recommendations focus on the impacts of water and wastewater investment decisions on the lowest median household income quintile (lowest 20 percent). On September 15, 2020 USEPA issued draft revisions to its circa 1997 affordability / financial capability guidance titled "EPA Proposes 2020 Financial Capability Assessment for Water Services in Disadvantaged Communities" which incorporate the concepts in the 2019 Framework for long term CSO control compliance scheduling.

[7] Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector April 2019. Prepared for the American Water Works Association, National Association of Clean Water Agencies, and the Water Environment Federation.

PVSC and the municipalities are aware of these pending changes to EPA's guidance on Financial Capability Assessment (FCA). This new guidance is still under review and not yet final, but it is recognized that it may impact the FCA and in turn the LTCP implementation schedule presented in this report. If the final guidance prompts changes to the FCA and the implementation schedule, these elements of this LTCP may be modified and resubmitted to NJDEP for review and approval.

I.5.2 Affordability Impacts by Household Income Brackets

As noted in the context of baseline residential indicators, when the residential indicator (RI) is at X% for the median household income, it is greater than X% for half of the households. The total Census households are broken out by income brackets on **Table I-12** below, along with the respective current RI by income bracket. The RI for each bracket was calculated from the mid-point income within the bracket.

Table I-12: Impacts of the Municipal Control Alternative by Income Brackets

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households
At Municipal MHI		3.6%	1.6%	1.5%	1.3%	2.0%	1.8%	1.4%	2.0%
Less than $10,000	$5,000	42.6%	19.4%	18.9%	17.5%	25.4%	12.7%	1,887	16.0%
		2189	28	330	8,818	671	14,841	16.5%	6,379
$10,000 to $14,999	$12,500	17.1%	7.8%	7.6%	7.0%	10.2%	5.1%	1,050	6.4%
		1061	44	186	5,377	381	7,790	6.6%	3,445
$15,000 to $24,999	$20,000	10.7%	4.9%	4.7%	4.4%	6.3%	3.2%	2,117	4.0%
		2403	56	434	9,457	1,230	13,900	4.1%	6,340
$25,000 to $34,999	$30,000	7.1%	3.2%	3.1%	2.9%	4.2%	2.1%	2,004	2.7%
		2410	86	493	7,901	962	11,283	2.8%	5,096
$35,000 to $49,999	$42,500	5.0%	2.3%	2.2%	2.1%	3.0%	1.5%	2,623	1.9%
		3046	133	820	10,331	2,011	13,618	1.9%	6,526
$50,000 to $74,999	$62,500	3.4%	1.6%	1.5%	1.4%	2.0%	1.0%	4,171	1.3%
		4496	156	1,238	14,468	2,720	14,743	1.3%	6,335
$75,000 to $99,999	$87,500	2.4%	1.1%	1.1%	1.0%	1.5%	0.7%	2,859	0.9%
		2826	104	621	10,216	1,810	7,855	0.9%	4,307
$100,000 to $149,999	$125,000	1.74%	0.8%	0.8%	0.7%	1.0%	0.5%	3,290	0.6%
		3302	140	822	15,064	2,196	7,600	0.7%	3,723
$150,000 to $199,999	$175,000	1.2%	0.6%	0.5%	0.5%	0.7%	0.4%	1,007	0.5%
		2011	53	381	7,961	1,025	2,136	0.5%	837
$200,000 or more	>$200,000	1.1%	0.5%	0.5%	0.4%	0.6%	0.3%	924	0.4%
		1,469	30	297	10,456	467	1,550	0.4%	798

I.5.3 Financial Capability Matrix

The final step in the USEPA financial capability assessment is to combine the affordability burden score which is intended to assess the impacts of the CSO controls on the rate payers with the financial capability score which is intended to assess the impacts of the CSO controls on the Permittee municipality's ability to finance the controls. The affordability and financial capability scores are brought together on **Table I-13** in what USEPA calls the "Financial Capability Matrix"

Table I-13: The Financial Capability Matrix

Permittee Financial Capability Indicators Score		Residential Indicator		
		Low (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0%)
(Socioeconomic, Debt and Financial Indicators)	Weak (Below 1.5)	*Medium Burden*	*High Burden*	*High Burden*
	Mid-Range (Between 1.5 and 2.5)	*Low Burden*	*Medium Burden*	*High Burden*
			- East Newark - Harrison - Jersey City - Newark - North Bergen	- Bayonne - Kearny - Paterson
	Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

I.5.4 Potential Impacts of the COVID-19 Pandemic on Affordability

The projections and conclusions concerning the affordability of the CSO control program proposed in this Regional LTCP by the eight combined sewered municipalities and their respective financial capabilities to finance their Municipal Control Alternative are premised on the baseline financial conditions of the municipalities as well as the economic conditions in New Jersey and the United States generally at the time that work on this LTCP commenced. While the impacts of the pandemic on the long-term affordability of the CSO LTCP are obviously still unknown, it is reasonable to expect that there will be impacts, and potentially significant impacts. There are several dimensions to these potential impacts, including both potentially reduced utility revenues, and potentially reduced household incomes.

Potential Wastewater Utility Revenue Impacts

This Financial Capability Assessment cannot reflect the currently unknowable impacts on wastewater utility revenues stemming from the national economic upheaval resulting from the

COVID-19 pandemic. It is however extremely likely that the PVSC municipalities and municipal wastewater utilities in general across the United States will face significant and potentially permanent declines in revenues from households unable to pay their water and sewer bills and the sudden decline in industrial and commercial demands for potable water and wastewater treatment.

On March 20, 2020 the National Association of Clean Water Agencies (NACWA) issued a press release stating that:

> ***"NACWA conservatively estimates the impact to clean water utilities nationwide of lost revenues due to coronavirus at $12.5 Billion.*** *This is a low-end estimate, assuming an average loss of revenue of 20% which is well within the range of what individual utilities are already projecting. Some utilities are anticipating closer to a 30% or 40% loss in revenue. This estimate is based on the substantial historical utility financial data NACWA has on file through its Financial Survey and recent reports from NACWA members on the decrease in usage they are observing in their systems over the last few weeks."*[I-8]

The impact of a 20% to 40% revenue loss, along with increased costs that have been and will continue to be experienced by water and wastewater utilities such as overtime and the writing off of customer accounts receivable could have a profound impact on the affordability of the proposed CSO controls and the municipalities' abilities to finance them.

Most of the costs of a municipal wastewater system are relatively fixed within broad operating ranges. Debt service and other capital costs are fixed once incurred. Some operating costs are somewhat variable with wastewater flows, e.g. chemical and electrical power usage but this variability is lessened by the reality that inflow, infiltration and stormwater flow in a combined system are not affected by billed water consumption. Labor costs are not directly variable, e.g. a twenty percent reduction in billed flow would not result in a need for twenty percent less labor. Maintenance costs might go down somewhat as equipment operating times may be reduced. As costs do not decline proportionately to billed flow, it can be expected that user charge rates must be raised to generate sufficient revenue to sustain current operations. The relationship between changes in costs and revenues and the resultant changes in user charge rates is complex and has not yet been fully analyzed. At this point it can be assumed that user rate increases may be necessary to simply maintain current operations, and these rate increases will likely erode the financial capabilities of the municipalities to fund the CSO LTCP.

[I-8] NACWA press release: Coronavirus Impacting Clean Water Agencies; Local Utilities and Ratepayers Need Assistance March 20, 2020

Potential Median Household Income Impacts

The impacts of the pandemic on median household incomes in the PVSC municipalities cannot be determined at this point. However, historical analogies may provide some useful, albeit disturbing, context but are not presented as predictive:

- U.S. median household income fell by 6.2% from $53,000 in 2007 to $49,000 in 2010. In New Jersey, the MHI decreased by around 4.0% for the same period.[I-9]
- The U.S. unemployment rates rose from 5.0% in December of 2007 to 9.9% in December of 2009.[I-10]
- Data on impacts of the Great Depression on median household income are not available. As a proxy, the personal income per capita data are available. For 1929 this was $700. By 1933 this figure bottomed out at $376, a decline of 46%. Unemployment for the same period rose from around 3.0% to 25%.[I-11]

While a quantifiable assessment of the impact of the pandemic on median household income is not feasible at this time, reduction in base year MHI can be expected. This will further exacerbate the impacts of the revenue reductions described above on LTCP affordability, as higher base user charge rates will absorb an increased portion of lower MHI.

Implications for the Long Term CSO Control Program

PVSC and the eight combined sewered municipalities anticipate that the financial implications of the COVID-19 pandemic will be discussed with NJDEP during the review of the SIARs and as the 2021 – 2025 NJPDES permit is developed.

Given the current and likely continuing uncertainties as to the New Jersey and national economic conditions, PVSC and the combined sewered municipalities will be reticent to commit to long term capital expenditures for CSO controls without the incorporation of adaptive management provisions, including provisions to revise and reschedule the long term CSO controls proposed in this LTCP based on emergent economic conditions beyond their control. These provisions could include scheduling the implementation of specific CSO control measures to occur during the five year NJPDES permit cycles. A revised affordability assessment should be performed during review of the next NJPDES permit to identify controls that are financially feasible during that next permit period.

I.5.5 Implementation Feasibility Implications

With the exceptions of Bayonne, Kearny, and Paterson, the affordability analysis detailed above has documented that the capital costs for the proposed Municipal Control Alternatives along with related operation and maintenance costs would result in a Residential Indicator within the EPA "medium burden" criterion.

Notwithstanding the 1997 EPA guidance, the reality of the poverty rates, low effective household incomes compared to the rest of New Jersey and nationally and the high costs of

---

I-9 Source: Fact Sheet: Income and Poverty Across the States, 2010 Joint Economic Committee, United States Congress, Senator Robert P. Casey, Jr. Chairman.

I-10 Source: Bureau of Labor Statistics data series LNS1400000

I-11 Source: Federal Reserve Economic Data (FRED) data series: A792RC0A052NBEA

living in the eight municipalities argue strongly that the EPA metric understates the impacts of the CSO control costs on the residents of the eight municipalities and that they are likely to remain financially distressed due to structural economic factors beyond their direct control. Therefore, their abilities to afford and finance future CSO control facilities are restricted.

SECTION J - IMPLEMENTATION OF THE RECOMMENDED LONG TERM CONTROL PLAN

J.1 INTRODUCTION

The conclusion reached from the selection of the Recommended LTCP (Section H) was a selected plan for the completion of implementing the CSO control technologies as capital projects in an affordable manner. The purpose of this section is to discuss the overall execution of the LTCP, including the financial capabilities of the PVSC Treatment District Permittees and the impact of the selected plan to determine how and when the Permittees will be able to implement the chosen control technologies.

J.2 REGIONAL ALTERNATIVE AGREEMENT

With the exception of the Town of Kearny, the PVSC Treatment District Permittees have stated a preference for the Regional Alternative selected in Section H.5 as the Regional LTCP. The Town of Kearny has selected the Municipal Alternative as defined in their individual SIAR included in **Appendix K**. Although the Permittees agree on the technologies to be used in the LTCP, an agreement for a Regional Alternative to be implemented is not final. A separate group consisting of legal and technical representatives from the Permittees have already begun to collaborate on reaching an agreement on cost allocation, responsibilities, schedule and other factors impacting the implementation of the Regional Alternative. This process is expected to take an additional 6 months or more after LTCP submittal. Should the Permittees fail to reach agreements on the implementation of the Regional Alternative, the plan will default to the Municipal Alternatives presented in each Permittees' respective SIAR. It is important to note that the proposed 6-month schedule for negotiations does not equate to an extension of time before implementation needs to begin. There are many projects that can be initiated while negotiations are finalized, including Green Infrastructure, separation and I/I reduction projects, which can be broken into smaller design contracts and phased in a way that allows progress on implementation while negotiations are underway. Additionally, design of projects common to both the Regional and Municipal plans can proceed as needed to meet schedule milestones for projects planned in the first 5-year permit cycle.

J.3 IMPLEMENTATION COST OPINION

As discussed in Section H and summarized in Table H-3, the total capital cost associated with the Recommended Regional Alternative is $1,220 million, with an annual O&M cost projected at $3.55 million and total Life Cycle Cost of $1,274 million. The specific cost allocation of these costs by municipality will need to be finalized during negotiations between participating Permittees. As discussed previously, the total costs borne by each municipality will be less than or equal to the Municipal Alternative for each Permittee as the capital cost for the Recommended Regional Alternative is approximately $500 million lower than the total cost for the Municipal Alternative. The negotiations between participating Permittees on how to allocate these cost savings and regional plan facilities is ongoing.

J.4 FINANCIAL IMPACTS

The financial impacts and Financial Capability Assessment associated with the Recommended Regional Plan for each Permittee cannot be finalized until the cost allocation negotiations associated with this plan are completed as this will dictate the share of the total $1,175 million

capital cost each municipality will pay. PVSC is not a municipality involved in the negotiations, but is providing the WRRF Secondary Bypass, so this cost excludes the $45 million for the bypass. It can be stated that the financial impacts of the Regional Plan will be less than or equal to that presented for the Municipal Plan for each Permittee given the significant cost savings available. The Financial Capability Assessment for each Permittee under the Municipal Plan is presented in the individual SIARs for each municipality appended to this report.

J.5 IMPLEMENTATION SCHEDULE

Table J-1 presents the proposed schedule and associated capital cost opinion for implementation of the Recommended Regional CSO LTCP. This schedule assumes that a regional cost-sharing approach is negotiated by the participating municipalities. The implementation schedule for those Permittees that have selected the Municipal Alternative is included in the individual SIAR of that respective Permittee. In addition to the capital improvements presented in **Table** J-1**,** it is anticipated that negotiations for regional cost sharing between participating Permittees will span a 6-month period. The negotiations are not expected to affect the overall implementation schedule for the program as design and implementation of projects common to both the Regional and Municipal Plans can proceed while negotiations are underway.

J.6 BASIS FOR LTCP DEVELOPMENT AND IMPLEMENTATION SCHEDULE

The LTCP development and implementation schedule is based on the construction schedule for each project, and the financing schedule for the overall LTCP. The schedule of projects proposed within each municipality is based on that proposed by each respective municipality in their Municipal Plan SIAR for that particular project. The exception to this is the pump station and force main upgrade proposed by Bayonne, which is not part of their Municipal plan. These pump station and force main improvements are proposed in the first 10 years of the program given their ability to convey more flow to the PVSC WRRF. The Regional Plan allows municipalities to reduce capital improvements within their municipal boundaries due to the benefit provided by the Parallel Interceptor and WRRF bypass. Therefore, some projects from the Municipal Plan are common to both the Municipal Plan and the Regional Plan, while others are reduced in size or eliminated. Given the projected benefit of the Parallel Interceptor in terms of maximizing conveyance to the WRRF and use of the secondary bypass providing total wet weather treatment capacity of 720 mgd, this project is scheduled for completion in the first 15 years of the program, including design in the first five-year permit cycle and construction in the second and third cycles. The extent and complexity of this project along with construction impacts poses challenges to compressing this schedule beyond that proposed.

J.7 CSO REDUCTION VERSUS TIME

The approximate CSO reduction improvements completed over each 5-year permit cycle is presented in **Figure J-1**. These improvements will provide a significant CSO reduction that is front loaded over the first 5 to 15 years. The greatest CSO reduction of any individual project is achieved through the construction of the PVSC WRRF secondary bypass, which will be completed by 2026. This project, combined with pump station and force main improvements in Bayonne and storage, separation, GI and I/I reduction projects in various communities is projected to reduce CSO by approximately 1.2 billion gallons (BG) by 2026. An additional

Table J-1: Implementation Schedule of Regional Alternative with 5-year Permit Cycles

Permittee	Technology	Quantity/Size	Units	Updated CC Total	Annual O&M Cost Total	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060
				CC ($M)	O&M ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)
Bayonne	Storage Tank at BA001, 002	10.5	MG	131.6	0.19					26.3	105.3		
Bayonne	Storage Tank at BA007	3.2	MG	47.5	0.11			15.7	31.8				
Bayonne	Storage Tank at BA021	2.0	MG	32.2	0.09				16.1	16.1			
Bayonne	Green Infrastructure Phases 1, 2 & 3	40	Acres	15.6	0.09	2.6	2.6	2.6	2.6	2.6	2.6		
Bayonne	Oak St. Pump Station Improvements to 27.8 MGD	27.8	MGD	12.0	0.60	12.0							
Bayonne	FM Upgrade (6,019 ft of pipe increased to 36" Pipe)	6019	LF	23.0	0.06	23.0							
Bayonne Subtotal				***261.9***	***1.14***	***37.6***	***2.6***	***18.3***	***50.5***	***45.0***	***107.9***	***0.0***	***0.0***
East Newark	Sewer Separation	13.0	Acres	3.9	0.00	1.0	2.9						
East Newark	Sewer Separation	7.0	Acres	2.1	0.00	2.1							
East Newark Subtotal				***6.0***	***0.00***	***3.1***	***2.9***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Harrison	GI Program	$750,000	N/A	0.8	0.03	0.4	0.4						
Harrison	PSS at 004 (3.3ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 remaining)	49.5	Acres	15.3	0.00			1.5	13.8				
Harrison Subtotal				***16.1***	***0.03***	***0.4***	***0.4***	***1.5***	***13.8***	***0.0***	***0.0***	***0.0***	***0.0***
Jersey City	Sewer Rehabilitation and I/I Elimination	87890	LF	36.8	0.00	36.8							
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	28.9	Acres	10.8	0.00	10.8							
Jersey City	Green Infrastructure to Control 7% of Impervious Area	188	Acres	92.1	0.42	23.0	23.0	23.0	23.0				
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	6.2	MG	104.8	0.15			52.4	52.4				
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	7.1	MG	116.7	0.16				58.4	58.4			
Jersey City Subtotal				***361.2***	***0.73***	***70.6***	***23.0***	***75.4***	***133.8***	***58.4***	***0.0***	***0.0***	***0.0***
Newark	Regulator Modifications on Main Interceptor	N/A	N/A	0.0	0.00	0.0							
Newark	Increasing Flow from South Interceptor (Peddie St. Regulator Modifications)	N/A	N/A	0.4	0.00				0.4				
Newark	Green Infrastructure	212.67	Acres	90.2	0.48	36.0	52.4	1.8					
Newark	Water Conservation	N/A	N/A	1.5	0.00	0.4	0.4	0.4	0.4				

Permittee	Technology	Quantity/Size	Units	Updated CC Total	Annual O&M Cost Total	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060
				CC ($M)	O&M ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)
Newark Subtotal				***92.1***	***0.48***	***36.4***	***52.8***	***2.2***	***0.8***	***0.0***	***0.0***	***0.0***	***0.0***
North Bergen	Storage Tank at NB003	5.0	MG	26.5	0.20	26.5							
North Bergen	Closure of Outfall NB014	N/A	N/A	0.1	0.00		0.1						
North Bergen	Green infrastructure	1.0	Acres	0.4	0.05		0.4						
	North Bergen Subtotal			***27.0***	***0.25***	***26.5***	***0.5***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres	N/A	N/A								
Paterson	Planned Sewer Separation for PT023	29.8	Acres	8.9	0.00	8.9							
Paterson	19th Ave. Relief Sewer for PT030	7705.6	LF	49.9	0.00				49.9				
Paterson	2.5% Green Infrastructure	75.0	Acres	29.3	0.17	2.0	3.9	3.9		5.9	5.9		7.8
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	2.1	MG	33.7	0.10							33.7	
Paterson Subtotal				***121.8***	***0.27***	***10.9***	***3.9***	***3.9***	***49.9***	***5.9***	***5.9***	***33.7***	***7.8***
PVSC	PVSC WRRF Secondary Bypass to 720 MGD	720	MGD	45.2	0.64	36.2	9.0						
PVSC Subtotal				**45.2**	**0.64**	**36.2**	**9.0**						
All	Parallel Interceptor to Main Interceptor	29296	LF	219	0	21.9	98.6	98.6					
Regional Facilities Subtotal				***219***	***0.00***	***21.9***	***98.6***	***98.6***					
Total				**1150.2**	**3.54**	**243.5**	**193.7**	**199.9**	**248.7**	**109.2**	**113.7**	**33.7**	**7.8**

nearly 400 MG of CSO is estimated to be reduced by the end of the third permit cycle with the construction of the parallel interceptor and as storage, GI, separation and I/I reduction projects continue. A total reduction of approximately 1.7 BG is projected to be achieved by the end of the first 20 years of the program, exceeding 80% capture. An additional 620 MG of CSO will be reduced by the end of the total 40-year program in 2060 for a total reduction of 2.3 BG and 85% capture.

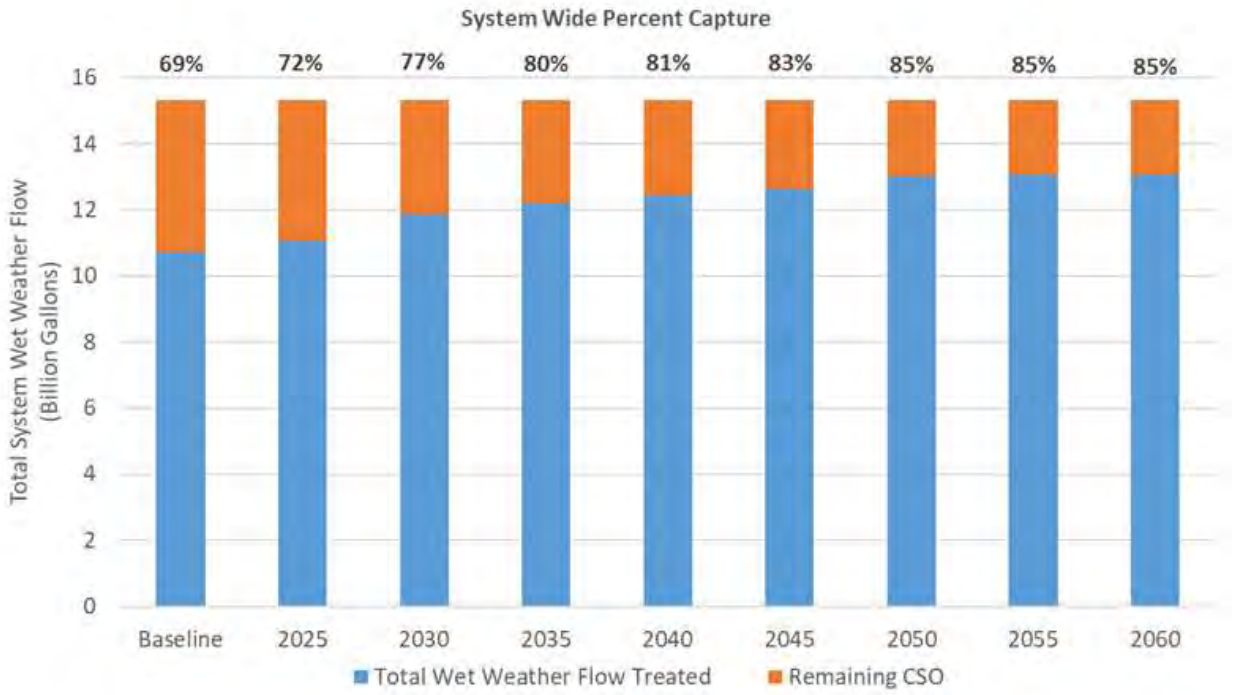


Figure J-1: Approximate System Wide CSO Reduction Improvements Completed Over Each 5-year Permit Cycle

J.8 PERFORMANCE CRITERIA

Upon completion of the CSO projects described in Subsection J.2, post-construction monitoring will be performed to evaluate the incremental reduction in overflow rates and volumes as CSO Control facilities are placed into operation. For the selected Presumption Approach, the National CSO Policy and the NJPDES Permit requires an 85% wet weather capture on an annual system wide basis for the Typical Year. Wet weather capture will be determined on a system wide basis using an updated H&H model that will be calibrated using post construction monitoring data and evaluated over the Typical Year, which has been previously approved by the NJDEP. This is the performance criteria that will be used for the LTCP capital projects.

SECTION K - POST-CONSTRUCTION COMPLIANCE MONITORING PLAN

K.1 INTRODUCTION

PVSC and the Permittees are required Under Section G.9 of their NJDPES permits to develop a Compliance Monitoring Plan (CMP) that is "adequate to: verify baseline and existing conditions, the effectiveness of CSO controls, compliance with water quality standards, and protection of designated uses. This CMP shall be conducted before, during and after implementation of the LTCP and shall include a work plan to be approved by the Department that details the monitoring."

The portion of the CMP conducted after implementation of the LTCP is specifically referred to as the Post Construction Compliance Monitoring Plan (PCCMP) and is the focus of this section. The monitoring plan proposed in this section satisfies the requirements of the Permittees' NJDPES permits and is consistent with and informed by National CSO Control Policy and USEPA's *CSO Post Construction Compliance Monitoring Guidance*, May 2012. The main elements of the PCCMP include the following:

- A process to determine whether the CSO control measures are meeting the Performance Criteria established in Subsection J.8.
- A monitoring schedule, regulator monitoring locations, receiving water sampling locations, and rain gauge locations.
- The approach for analysis of the PCCMP data for assessing the performance of CSO control measures and for reporting progress to regulatory agencies and the general public.
- A Public Notification System to notify the public of the occurrence of Combined Sewer Overflows for each receiving water body.

K.2 OVERVIEW OF APPROACH

Post-construction monitoring is a requirement of the NJPDES Permit and the approach provided herein has been developed for the purposes of providing enough data to evaluate the effectiveness of the CSO control measures constructed during the implementation of the LTCP. The evaluation of the control measures will be based on the Performance Criteria established in Subsection J.8 and further discussed in this Section and will be used to verify that PVSC and the Permittees are in compliance with their respective NJPDES Permits. The general scope of the PCCMP will include the implementation of a rainfall and hydraulic monitoring program, as well as a detailed analysis and evaluation of the CSO control measures' efficacy. The PCCMP has been developed for the PVSC Treatment District and the remaining CSO discharges to the receiving water bodies. The program will be conducted during the LTCP implementation to corroborate that the completed CSO control measures are performing effectively, while providing sufficient data to identify and remedy underperforming control measures.

As mentioned in Section F of this report, results of the 100% control conditions during the typical rainfall year (2004) for the receiving yielded mixed results and indicate that CSO control will not improve attainment of the criteria for pathogens. Post construction monitoring will serve its role in demonstrating that CSOs will be reduced to the levels predicted in the recommended plan based on the typical year conditions to meet the CWA requirements. Pathogen loads, contributed by the remaining CSOs, based on post construction monitoring will

be compared to non-CSO loads to the receiving waters estimated in the LTCP (or Baseline Compliance Monitoring Report previously approved by NJDEP). Any reductions in non-CSO loads as a result of then-current water quality compliance requirements in the receiving waters will also be considered. This information, as developed and made available during post construction monitoring, will be used to assess CSO compliance with the current NJPDES Permit and WQS.

As rainfall varies substantially from year to year and from storm to storm, it will require normalizing rainfall to the typical year to assess performance. The same is true for receiving water monitoring where the variables include other pollutant sources that are also driven by wet weather conditions. For these reasons and in accordance with the CSO Policy, the LTCP is based on "typical year" conditions (2004 precipitation at Newark Liberty International Airport).

PVSC and the Permittees will evaluate the performance of the control measures through use of the H&H model. The model output will be compared with actual CSO flow data for the post-construction monitoring period to determine whether recalibration of the H&H model is needed. Once the H&H model has been determined to be adequately calibrated, a continuous simulation of the Typical Year (2004) will be run to compare the remaining CSO discharge volume to baseline conditions and determine whether the CSO control measures have achieved the Performance Criteria.

For the purposes of addressing the NJPDES Permit PCCMP ambient monitoring requirements, PVSC and the Permittees plan to utilize water quality sampling data collected by the existing NJ/NY Harbor Dischargers Group sampling program to supplement the findings of the collection system modeling and to support the water quality modeling efforts, to be performed upon the implementation of all CSO control measures to verify that the remaining CSOs are not precluding the attainment of water quality standards for pathogens. For purposes of defining the implementation of all CSO control measures, implementation of all CSO Control measures is defined as the implementation of all projects within NBMUA, Guttenberg, and all NJ CSO Group Permittees

K.3 EXISTING DATA SOURCES

A temporary flow monitoring program was conducted from April 2016 to August 2016, installing eighteen flow meters in the PVSC sewer system. This existing data will be utilized, as needed, as part of the PCCMP.

K.4 PERFORMANCE CRITERIA AND COMPLIANCE ASSESSMENT

The Performance Criteria developed in Subsection J.8 were based on a percentage of total volume entering the CSS that is "captured" for treatment at the WRRF, as part of the Presumption Approach. Upon full implementation of the CSO control measures of the LTCP, the Performance Criteria will be a minimum of 85% capture by volume of the system-wide wet weather volume for treatment at the WRRF based on the Typical Year (2004). The minimum 85% capture by volume meets the requirements of the Presumption Approach, and this minimum capture amount may increase based on the selected CSO control measures detailed in Section J. Actual overflow volume will vary from one year to another after full implementation of the CSO control measures, based on real-life precipitation conditions. Recognizing the hydraulics of the

combined sewer system and the interconnection between CSO regulators, CSO control measures that do not achieve the performance criteria as a result of other controls that have yet to be completed will not be fully evaluated until all CSO control measures are constructed.

K.5 POST-CONSTRUCTION COMPLIANCE MONITORING DATA COLLECTION

Temporary flow meters will be installed at select locations within the PVSC Treatment District. **Table K-1** summarizes the type, location, ownership, and, frequency of the flow meters, and rain gauges to be implemented.

Table K-1: Proposed Post-Construction Compliance Monitoring Plan

Monitoring Type	Municipality	Meter Identification	Location	Frequency
Flow Monitoring	The number of flow meters, location and schedule for installation will be determined upon approval of the respective LTCPs and associated implementation schedules for each permittee participating in the PVSC Regional Alternative.			Monitor for 6-month period every 5 years*
Rainfall Monitoring	North Bergen and Guttenberg	Newark Airport and/or Local Rain Gauge	Existing Rain Gauge at Newark Airport and/or Local Rain Gauge	Monitor for 1-year period every 5 years*
Ambient In-Stream Monitoring	North Bergen and Guttenberg	NJ/NY Harbor Dischargers Group Sampling Locations	NJ/NY Harbor Dischargers Group Sampling Locations (at current time)	Based on NJ/NY Harbor Dischargers Group Frequency (at current time)

* While it is anticipated that flow and rainfall monitoring may occur approximately every 5 years, the frequency of monitoring will be dependent upon the implementation of projects that are to be evaluated for effectiveness.

K.6 PERFORMANCE ASSESSMENT

To demonstrate compliance under the Presumption Approach, PVSC and the Permittees will continue to update and calibrate the H&H model after the implementation of CSO control measures and post-construction monitoring phase data has been collected. The model will be used to simulate CSS performance in the PVSC Treatment District collection system and to demonstrate compliance with the performance criteria identified in Subsection K.4, a minimum of 85% capture by volume of the system-wide wet weather volume during the Typical Year (2004). An H&H model will also be used to assess the performance of green infrastructure control measures. PVSC and the Permittees will submit a series of milestone reports to the NJDEP detailing the implementation and performance of CSO control measures. An Adaptive Management Plan shall be developed in the event that CSO control measures exceed or do not meet the Performance Criteria. The Performance Assessment approach, reporting, and adaptive management plan are outlined in the following subsections.

K.6.1 APPROACH

PVSC and the Permittees will evaluate the performance of the CSO control measures through the use of its H&H model. The following steps will be used to determine compliance with the Performance Criteria:

1. Collect flow monitoring and rainfall data during post-construction monitoring period of each phase of CSO control measures. Perform QA/QC on the data.

2. If needed, once every five years, update the H&H model to include all completed CSO control measures and any other modifications to the CSS since the H&H model was calibrated for this LTCP.

3. Recalibrate and/or validate the updated H&H model, if needed, using the flow and rainfall data collected during the 12-month post-construction monitoring period.

4. Perform continuous simulation using the updated H&H model for the typical year (2004) and calculate percent capture for verification of compliance with milestone CSO reductions towards the 85% capture requirements of the Presumption Approach.

K.6.2 ADAPTIVE MANAGEMENT PLAN

PVSC and the Permittees are confident that the CSO control measures implemented prior to the final 2060 post construction monitoring period will meet the 85% wet weather capture percentage Performance Criteria based on the simulation of the Typical Year (2004). However, should the post construction monitoring suggest the CSO control measures exceed the performance criteria or do not perform as anticipated, performance factors and deficiencies responsible for this exceedance or shortfall will be identified. Modified, reduced, or additional control measures will then be implemented to allow PVSC and the Permittees to meet the 85% Performance Criteria. An Adaptive Management Plan shall be developed that details this analysis, including the implementation plan and schedule of the additional controls. This Adaptive Management Plan will include any adaptive management modifications based on Post-Construction Monitoring and evaluation. The Adaptive Management Plan shall be submitted to NJDEP as part of each Post Construction Compliance Monitoring Plan (PCCMP) Report for each of the 5-year monitoring periods. Generally, these 5-year reports are meant to coincide with the renewal of each NJPDES Permit, such that any required adaptive actions could then be included in the NJPDES Permit renewal, as applicable. The Adaptive Management Plan, if needed based on the performance of the implemented CSO control measures, will be included in the PCCMP, as further described in Subsection K.6.3.

PVSC and the Permittees will consider multiple adaptive management actions for over-performing or under-performing CSO control measures, including eliminating or reducing the size of proposed facilities, revising technologies, or constructing additional grey infrastructure (i.e. storage) or green infrastructure (i.e. bio retention).

Additionally, the financial impacts of the recent COVID-19 Pandemic are yet to be fully realized and may not be fully realized for several years. These financial impacts may be due to several factors, which could be caused by a decrease in revenue or an impact on collection rates, among

other items. PVSC and the Permittees will continue to monitor these potential financial impacts and will include any negative impacts to their financial capability within the Adaptive Management Plan, which may include the need for a longer implementation schedule in order to reduce the financial burden as a result of lost revenue, a reduction in collection rates, or other financial factors.

Upon review and approval of the Adaptive Management Plan by the NJDEP, PVSC and the Permittees shall implement those measures in accordance with the schedule set forth in the Adaptive Management Plan.

K.6.3 REPORTING

The PCCMP will evaluate whether the CSO control measures are achieving the Performance Criteria and assess CSO capture volumes of remaining PVSC Treatment District CSO discharges to the receiving waters. The progress and evaluation of the CSO control measure implementation will be reported to the NJDEP, and to the public through a series of reports, namely the PCCMP Reports, which will include any necessary adaptive management. PVSC and the Permittees will also continue to submit the monthly Discharge Monitoring Reports (DMRs) as required by their respective NJPDES Permits.

The PCCMP Reports shall provide the following information:

- A statement setting forth the deadlines and other terms that PVSC and the Permittees were required to meet since the last Reporting Period;
- A general description of work completed within the prior period, and a projection of work to be completed within the succeeding period;
- A summary of principal contacts with NJDEP during the reporting period relating to CSOs or implementation of the LTCP;
- NJPDES permit violations;
- A summary of all flow and hydraulic monitoring data collected by PVSC and the Permittees during the five-year reporting period;
- A description of the CSO control measures completed within the five-year reporting period and a projection of CSO control measure work to be performed during the next five-year period; and,
- An evaluation of the effectiveness of the CSO control measures constructed to date, including proposed adjustments to the components of the recommended plan (adaptive management), if needed, and as outlined in Subsection K.6.2.

PVSC and the Permittees shall submit a PCCMP Report to the NJDEP at the end of each NJPDES Permit cycle (in 5-year increments). The final PCCMP Report will be submitted to the NJDEP for their review and approval within 1-year after the last LTCP project has been implemented (currently scheduled for 2060). The purpose of the Final PCCMP Report shall be to evaluate and document the system-wide performance of PVSC and the Permittees' fully implemented LTCP CSO control measures. The report shall include an assessment of whether the control measures are meeting the Performance Criteria and complying with water-quality

based CWA requirements and PVSC and the Permittees respective NJPDES permits, including the following information:

- A complete Post-Construction Compliance Monitoring Period data summary and analysis;
- A reporting of all of the CSO control measures that have been constructed, implemented, and that are in operation;
- An evaluation of the system-wide CSO control measure performance, and whether the controls meet the Performance Criteria;
- A description of any adaptive management actions that need to be implemented to meet the Performance Criteria where they are not being achieved or to manage affordability in the case where the Performance Criteria are being exceeded.

K.7 FUTURE REGULATORY REQUIREMENTS

Given the impacts of upstream loading, it is recommended that any future regulatory effort to further reduce bacteria loadings to the receiving streams be assigned to the background and non-CSO contributors.

K.8 PUBLIC NOTIFICATION

In order to advise the public of overflows, the existing notification system will continue to be utilized. This system notifies the public of the occurrence of CSOs based on rainfall monitoring near the representative CSO outfalls. The notification system can be accessed using the following link: https://njcso.hdrgateway.com/.

SECTION L - REVISION OF OPERATION AND MAINTENANCE PLANS

L.1 INTRODUCTION

This section summaries the current O&M programs for each Permittee and how the program will be updated to reflect the LTCP. This section also describes how responsibilities for O&M of the proposed CSO technologies will be dispersed between Permittees.

Under their respective NJPDES permits, the Permittees are required to develop and implement a comprehensive Operation and Maintenance (O&M) program for appropriate and consistent operation of their CSS facilities. In compliance with this requirement, the Permittees have developed O&M's which are reviewed and updated as needed annually. In addition to these annual reviews, the Permittees are required to update the O&M's as the changes proposed under the LTCP are implemented.

Part IV, Combined Sewer Management, Section G.6.a. of the permit states:

> *"Upon Department approval of the final LTCP and throughout implementation of the approved LTCP as appropriate, the permittee shall modify the O&M Program and Manual in accordance with D.3.a and G.10, to address the final LTCP CSO control facilities and operating strategies including but not limited to maintain Green Infrastructure, staffing and budgeting, I/I, and emergency plans."*

Fulfillment of this requirement will be addressed upon approval of the Regional LTCP by NJDEP, and throughout the implementation process as needed. The following summarizes the municipalities' current O&M programs and how they will be updated as the CSO control measures are implemented.

L.2 CURRENT OPERATION AND MAINTENANCE PLAN

All PVSC CSO Permittees have updated O&M plans and are in compliance with all permit requirements as indicated in their quarterly progress reports submitted to NJDEP.

L.3 OPERATION AND MAINTENANCE PROGRAM UPDATES FOR CSO CONTROL MEASURES

As required by their NJPDES permits, the Permittees will update their current O&M manuals to include any new facilities which are a part of the approved LTCP. Updates to the O&M manuals will include a description of the equipment and features of the new facilities, operating instructions, maintenance guides, and safety considerations.

The updates to the O&M Programs will begin upon placing the CSO Control Measures into operation, and will follow a two-step process:

1. Proposed Operation and Maintenance Manual Updates - The municipalities will modify their O&M Manual to address the final LTCP CSO control facilities and operating strategies, after placing the recommended controls into operation.

2. Integrated Operation and Maintenance Manual – Once approved by NJDEP, the municipalities will incorporate the proposed updates into the current O&M Manuals, described in the preceding section.

L.4 STAFFING NEEDS

In developing the LTCP, the Permittees have made preliminary estimates of O&M costs, which include staffing. The exact number of staff, and the specific staff responsibilities and qualifications will be determined during the implementation of the LTCP and reviewed by the Permittees as part of their annual budget process.

SECTION M - REFERENCES

Blumberg, A.F., L.A. Khan, and J.P. St. John, 1999. Three dimensional hydrodynamic model of New York Harbor. J. Hyd. Engr., ASCE. 125(8), 799-816.

Interstate Environmental Commission. (2018, April 2). *IEC Regulations*. Retrieved from Interstate Environmental Commission: http://www.iec-nynjct.org/wq.regulations.htm

New Jersey Administrative Code (NJAC) -7:9B Surface Water Quality Standards, October 2016. https://www.nj.gov/dep/rules/rules/njac7_9b.pdf

New Jersey Department of Environmental Protection. (2017). *2014 New Jersey Integrated Water Quality Assessment Report: Appendix B: Final 303(d) List of Water Quality Limited Waters with Sublist 5 Subpart and Priority Ranking for TMDL Development*. Division of Water Monitoring and Standards, Bureau of Environmental Analysis, Restoration and Standards.

New Jersey Department of Environmental Protection. (NJDEP). *Evaluating Green Infrastructure: A Combined Sewer Overflow Control Alternative for Long Term Control Plans.* January 2018. https://www.nj.gov/dep/dwq/pdf/CSO_Guidance_Evaluating_Green_Infrastructure_A_CSO_Control_Alternative_for_LTCPs.pdf

United States Environmental Protection Agency (USEPA) - Federal Water Pollution Control Act, November 2002. https://www.epa.gov/sites/production/files/2017-08/documents/federal-water-pollution-control-act-508full.pdf

United States Environmental Protection Agency (USEPA) - EPA Combined Sewer Overflow (CSO) Control Policy, April 1994. https://www.epa.gov/sites/production/files/2015-10/documents/owm0111.pdf

United States Environmental Protection Agency (USEPA) - EPA CSO Guidance for LTCP, September 1995. http://water.epa.gov/polwaste/npdes/cso/upload/owm0272.pdf

United States Environmental Protection Agency (USEPA) - EPA CSO Post Construction Compilance Monitoring Guidance, May, 2012. https://www.epa.gov/sites/production/files/2015-10/documents/final_cso_pccm_guidance.pdf

United States Environmental Protection Agency (USEPA) - Federal Water Pollution Control Act, November 2002. https://www.epa.gov/sites/production/files/2017-08/documents/federal-water-pollution-control-act-508full.pdf

United States Environmental Protection Agency (USEPA) – Financial Capability Assessment Framework for Municipal Clean Water Act Requirements Memorandum, November 24, 2014. https://www.epa.gov/sites/production/files/2015-10/documents/municipal_fca_framework_0.pdf

SECTION N - ABBREVIATIONS

AACE:	Association for the Advancement of Cost Engineering
BA:	Bayonne
BG:	Billion Gallons
BMP:	Best Management Practices
BOD:	Biochemical Oxygen Demand
CC:	Capital Cost
CMP:	Compliance Monitoring Program
CSO:	Combined Sewer Overflow
CSS:	Combined Sewer System
CWA:	Clean Water Act
EDP:	Effective Date of the Permit
EN:	East Newark
EPA:	Environmental Protection Agency
FOG:	Fats, Oils, and Grease
FW2-NT:	Fresh Water Non Trout
GI:	Green Infrastructure
GIS:	Geographic Information System
GM:	Geometric Mean
GRDs:	Grease Removal Devices
HA:	Harrison Town
HCFM:	Hudson County Force Main
HDD:	Horizontal Directional Drilling
H&H:	Hydrologic and Hydraulic
IDDE:	Illicit Discharge Detection and Elimination
IEC:	Interstate Environmental Commission
I/I:	Inflow and Infiltration
JC:	Jersey City
JCMUA:	Jersey City Municipal Utilities Authority
KEA:	Kearny Town
LCC:	Life Cycle Cost
LTCP:	Long Term Control Plan
MEG:	Model Evaluation Group
MG:	Million Gallons
MGD:	Million Gallons per Day
MUA:	Municipal Utilities Authority
NACWA:	National Association of Clean Water Agencies
NJAC:	New Jersey Administrative Code
NB:	North Bergen
NBMUA:	North Bergen Municipal Utilities Authority
NE:	Newark
NJDEP:	New Jersey Department of Environmental Protection
NJPDES:	New Jersey Pollutant Discharge Elimination System
NRCS:	Natural Resources Conservation Service
O&M:	Operation and Maintenance

PAA:	Peracetic Acid
PAT:	Paterson
PCCMP:	Post Construction Compliance Monitoring Plan
POC:	Pollutants of Concern
POTW:	Publicly Owned Treatment Works
PPP:	Public Participation Plan
PVSC:	Passaic Valley Sewerage Commission
PWQM:	Pathogens Water Quality Model
QAPP:	Quality Assurance Project Plan
RI:	Residential Indicator
SCR:	System Characterization Report
SC:	Saline Coastal
SE:	Saline Estuarine
STP:	Sewage Treatment Plant
SWQS:	Surface Water Quality Standards
RCA:	Row Column AESOP
TMDL:	Total Maximum Daily Load
TPW:	Total Present Worth
TSS:	Total Suspended Solids
USEPA:	United States Environmental Protection Agency
WASP:	Water Analysis Simulation Program
WMA:	Watershed Management Areas
WWF:	Wet Weather Flow
WWRF:	Water Resources Recovery Facility

Exhibit 12

State of New Jersey

PHILIP D. MURPHY
Governor

TAHESHA L. WAY
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION

AIR, ENERGY AND MATERIALS SUSTAINABILITY
Division of Air Quality and Radiation Protection
Bureau of Stationary Sources
401 E. State Street, 2nd floor, P.O. Box 420, Mail Code 401-02
Trenton, NJ 08625-0420

SHAWN M. LATOURETTE
Commissioner

Air Pollution Control Operating Permit
Administrative Amendment

Permit Activity Number: BOP240001 **Program Interest Number: 08857**

Mailing Address	Plant Location
ADAM SENSENIG ASSET MANAGER NEWARK ENERGY CENTER 955 DELANCY ST Newark, NJ 07105	NEWARK ENERGY CENTER 955 Delancy St Newark Essex County

Initial Operating Permit Approval Date: **November 1, 2012**

Operating Permit Approval Date: **May 8, 2024**

Operating Permit Expiration Date: **October 31, 2022 (Operating Under Application Shield)**

AUTHORITY AND APPLICABILITY

The New Jersey Department of Environmental Protection (Department) approves and issues this Air Pollution Control Operating Permit under the authority of Chapter 106, P.L. 1967 (N.J.S.A. 26:2C-9.2). This permit is issued in accordance with the air pollution control permit provisions promulgated at Title V of the Federal Clean Air Act, 40 CFR 70, Air Pollution Control Act codified at N.J.S.A. 26:2C and New Jersey State regulations promulgated at N.J.A.C. 7:27-22.

The Department approves this operating permit based on the evaluation of the certified information provided in the permit application that all equipment and air pollution control devices regulated in this permit comply with all applicable State and Federal regulations. The facility shall be operated in accordance with the conditions of this permit. This operating permit supersedes any previous Air Pollution Control Operating Permits issued to this facility by the Department including any general operating permits, renewals, significant modifications, minor modifications, seven-day notice changes or administrative amendments to the permit.

Changes made through this permit activity are provided in the Reason for Application.

PERMIT SHIELD

Equipment at the facility referenced by this modification **is not covered by** the permit shield, pursuant to the provisions of N.J.A.C. 7:27-22.17.

COMPLIANCE SCHEDULES

This operating permit does not include compliance schedules as part of the approved compliance plan.

COMPLIANCE CERTIFICATIONS AND DEVIATION REPORTS

The permittee shall submit to the Department and to United States Environmental Protection Agency (US EPA) periodic compliance certifications, in accordance with N.J.A.C. 7:27-22.19. **The annual compliance certification** is due to the Department and EPA within 60 days after the end of each calendar year during which this permit was in effect. **Semi-annual deviation reports** relating to compliance testing and monitoring are due to the Department within 30 days after the end of the semi-annual period. The schedule and additional details for these submittals are available in Subject Item - FC, of the Facility Specific Requirements of this permit.

ACCESSING PERMITS

The facility's current approved operating permit and any previously issued permits (e.g. superseded, expired, or terminated) are available for download in PDF format at: https://dep.nj.gov/boss. After accessing the website, click on "Approved Operating Permits" listed under "Reports" and then type in the Program Interest (PI) Number as instructed on the screen. If needed, the RADIUS file for your permit, containing Facility Specific Requirements (Compliance Plan), Inventories and Compliance Schedules can be obtained by contacting the Helpline number given below. RADIUS software, instructions, and help are available at the Department's website at https://dep.nj.gov/boss.

HELPLINE

The Operating Permit Helpline is available for any questions at (609) 633-8248 from 9:00 AM to 4:00 PM Monday to Friday.

RENEWING YOUR OPERATING PERMIT AND APPLICATION SHIELD

The permittee is responsible for submitting a timely and administratively complete operating permit renewal application pursuant to N.J.A.C. 7:27-22.30. Only applications which are timely and administratively complete are eligible for an application shield. The details on the contents of the renewal application, submittal schedule, and application shield are available in Section B - General Provisions and Authorities of this permit.

COMPLIANCE ASSURANCE MONITORING

Facilities that are subject to Compliance Assurance Monitoring (CAM), pursuant to 40 CFR 64, shall develop a CAM Plan for modified equipment as well as existing sources. The rule and guidance on how to prepare a CAM Plan can be found at EPA's website: https://www.epa.gov/air-emissions-monitoring-knowledge-base/compliance-assurance-monitoring. In addition, CAM Plans must be included as part of the permit renewal application. Facilities that do not submit a CAM Plan may have their permit applications denied, pursuant to N.J.A.C. 7:27-22.3.

ADMINISTRATIVE HEARING REQUEST

If, in your judgment, the Department is imposing any unreasonable condition of approval, you may contest the Department's decision and request an adjudicatory hearing pursuant to N.J.S.A. 52:14B-1 et seq. and N.J.A.C. 7:27-22.32(a). All requests for an adjudicatory hearing must be received in writing by the Department within 20 calendar days of the date you receive this letter. The request must contain the information specified in N.J.A.C. 7:27-1.32 and the information on the NJ04 - Administrative Hearing Request Checklist and Tracking Form available at https://dep.nj.gov/wp-content/uploads/boss/applications-and-forms/administrative-hearing-request-checklist-and-tracking-form.pdf .

If you have any questions regarding this permit approval, please call Michael Mankbadi at 609-940-5683.

Approved by:

_____

David J. Owen

Enclosure

CC: Suilin Chan, United States Environmental Protection Agency, Region 2

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

TABLE OF CONTENTS

Section A

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

POLLUTANT EMISSIONS SUMMARY

Table 1: Total emissions from all Significant Source Operations[1] at the facility.

Facility's Potential Emissions from all Significant Source Operations (tons per year)										
Source Categories	VOC (total)	NO_x	CO	SO_2	TSP (total)	PM_{10} (total)	$PM_{2.5}$ (total)	Pb	HAPs* (total)	CO_2e[2]
Emission Units Summary	34.8	138	482	19.7	67.0	101	97.5	N / A	4.99	
Batch Process Summary	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	
Group Summary	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	
Total Emissions	34.8	138	482	19.7	67.0	101	97.5	N / A	4.99	2,157,259

Table 2: Estimate of total emissions from all Insignificant Source Operations[1] and total emissions from Non-Source Fugitives at the facility.

Emissions from all Insignificant Source Operations and Non-Source Fugitive Emissions (tons per year)									
Source Categories	VOC (total)	NO_x	CO	SO_2	TSP (total)	PM_{10} (total)	$PM_{2.5}$ (total)	Pb	HAPs (total)
Insignificant Source Operations	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A
Non-Source Fugitive Emissions	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A	N / A

VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
CO: Carbon Monoxide
SO_2: Sulfur Dioxide
TSP: Total Suspended Particulates
Other: Any other air contaminant regulated under the Federal CAA
PM_{10}: Particulates under 10 microns
$PM_{2.5}$: Particulates under 2.5 microns
Pb: Lead
HAPs: Hazardous Air Pollutants
CO_2e: Carbon Dioxide equivalent
N/A: Indicates the pollutant is not emitted or is emitted below the reporting threshold specified in N.J.A.C. 7:27-22, Appendix, Table A and N.J.A.C. 7:27-17.9(a).

*Emissions of individual HAPs are provided in Table 3 on the next page.
Emissions of "Other" air contaminants are provided in Table 4 on the next page.

[1] Significant Source Operations and Insignificant Source Operations are defined at N.J.A.C. 7:27-22.1.
[2] Total CO_2e emissions for the facility.

Section A

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

POLLUTANT EMISSIONS SUMMARY

Table 3: Summary of Hazardous Air Pollutants (HAP) Emissions from Significant Source Operations [3]:

HAP	TPY
Acrolein	0.0582
Benzene	0.233
Formaldehyde	2.15
Polycyclic Organic Matter	0.0425
Toluene	2.51

Table 4: Summary of "Other" air contaminants emissions from Significant Source Operations:

Other Air Contaminant	TPY
H2SO4	10.5
Ammonia (NH3)	119
Methane	153

[3] Do not sum the values below for the purpose of establishing a total HAP potential to emit. See previous page for the allowable total HAP emissions.

Section B

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

GENERAL PROVISIONS AND AUTHORITIES

1. No permittee shall allow any air contaminant, including an air contaminant detectable by the sense of smell, to be present in the outdoor atmosphere in a quantity and duration which is, or tends to be, injurious to human health or welfare, animal or plant life or property, or which would unreasonably interfere with the enjoyment of life or property. This shall not include an air contaminant that occurs only in areas over which the permittee has exclusive use or occupancy. Requirements relative only to nuisance situations, including odors, are not considered federally enforceable. [N.J.A.C. 7:27-22.16(g)8]

2. Any deviation from operating permit requirements which results in a release of air contaminants shall be reported to the Department as follows:

   a. If the air contaminants are released in a quantity or concentration which poses a potential threat to public health, welfare or the environment or which might reasonably result in citizen complaints, the permittee shall report the release to the Department:

      i. Immediately on the Department hotline at 1-(877) 927-6337, pursuant to N.J.S.A. 26:2C-19(e); and

      ii. As part of the compliance certification required in N.J.A.C. 7:27-22.19(f). However, if the deviation is identified through source emissions testing, it shall be reported through the source emissions testing and monitoring procedures at N.J.A.C. 7:27-22.18(e)3; or

   b. If the air contaminants are released in a quantity or concentration which poses no potential threat to public health, welfare or the environment and which will not likely result in citizen complaints, the permittee shall report the release to the Department as part of the compliance certification required in N.J.A.C. 7:27-22.19(f), except for deviations identified by source emissions testing reports, which shall be reported through the procedures at N.J.A.C. 7:27-22.18(e)3; or

   c. If the air contaminants are released in a quantity or concentration which poses no potential threat to public health, welfare or the environment and which will not likely result in citizen complaints, and the permittee intends to assert the affirmative defense afforded by N.J.A.C. 7:27-22.16(l), the violation shall be reported by 5:00 PM of the second full calendar day following the occurrence, or of becoming aware of the occurrence, consistent with N.J.A.C. 7:27-22.16(l). [N.J.A.C. 7:27-22.19(g)]

3. The permittee shall comply with all conditions of the operating permit including the approved compliance plan. Any non-compliance with a permit condition constitutes a violation of the New Jersey Air Pollution Control Act N.J.S.A. 26:2C-1 et seq., or the CAA, 42 U.S.C. §7401 et seq., or both, and is grounds for enforcement action; for termination, revocation and reissuance, or for modification of the operating permit; or for denial of an application for a renewal of the operating permit. [N.J.A.C. 7:27-22.16(g)1]

4. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of its operating permit. [N.J.A.C. 7:27-22.16(g)2]

5. This operating permit may be modified, terminated, or revoked for cause by the EPA pursuant to 40 CFR 70.7(g) and revoked or reopened and modified for cause by the Department pursuant to N.J.A.C. 7:27-22.25. [N.J.A.C. 7:27-22.16(g)3]

6. The permittee shall furnish to the Department, within a reasonable time, any information that the Department may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this operating permit; or to determine compliance with the operating permit. [N.J.A.C. 7:27-22.16(g)4]

7. The filing of an application for a modification of an operating permit, or of a notice of planned changes or anticipated non-compliance, does not stay any operating permit condition. [N.J.A.C. 7:27-22.16(g)5]

8. The operating permit does not convey any property rights of any sort, or any exclusive privilege. [N.J.A.C. 7:27-22.16(g)6]

9. Upon request, the permittee shall furnish to the Department copies of records required by the operating permit to be kept. [N.J.A.C. 7:27-22.16(g)7]

10. a. For emergencies (as defined at 40 CFR 70.6(g)(1)) that result in non-compliance with any promulgated federal technology-based standard such as NSPS, NESHAPS, or MACT, a federal affirmative defense is available, pursuant to 40 CFR 70. To assert a federal affirmative defense, the permittee must use the procedures set forth in 40 CFR 70. The affirmative defense provisions described below may not be applied to any situation that caused the Facility to exceed any federally delegated regulation, including but not limited to NSPS, NESHAP, or MACT.

    b. For situations other than those covered above, an affirmative defense is available for a violation of a provision or condition of the operating permit only if:

        i. The violation occurred as a result of an equipment malfunction, an equipment startup or shutdown, or during the performance of necessary equipment maintenance; and

        ii. The affirmative defense is asserted and established as required by N.J.S.A. 26:2C-19.1 through 19.5 and any implementing rules. [N.J.A.C. 7:27-22.16(l)]

11. In the event of a challenge to any part of this operating permit, all other parts of the permit shall continue to be valid. [N.J.A.C. 7:27-22.16(f)]

12. Each owner and each operator of any facility, source operation, or activity to which this permit applies is responsible for ensuring compliance with all requirements of N.J.A.C. 7:27-22. If the owner and operator are separate persons, or if there is more than one owner or operator, each owner and each operator is jointly and severally liable for any fees due under N.J.A.C. 7:27-22, and for any penalties for violation of N.J.A.C. 7:27-22. [N.J.A.C. 7:27-22.3]

13. The permittee shall ensure that no air contaminant is emitted from any significant source operation at a rate, calculated as the potential to emit, that exceeds the applicable threshold for reporting emissions set forth in the Appendix to N.J.A.C. 7:27-22 or 7:27-17.9(a), unless emission of the air contaminant is authorized by this operating permit. [N.J.A.C. 7:27-22.3(c)]

14. Consistent with the provisions of N.J.A.C. 7:27-22.3(e), the permittee shall ensure that all requirements of this operating permit are met. In the event that there are multiple emission limitations, monitoring, recordkeeping, and/or reporting requirements for a given source operation, the facility must comply with all requirements, including the most stringent.

15. Consistent with the provisions of N.J.A.C. 7:27-22.3(s), Except as otherwise provided in this subchapter, the submittal of any information or application by a permittee including, but not limited to, an application or notice for any change to the operating permit, including any administrative amendment, any minor or significant modification, renewal, a notice of a seven-day notice change, a notice of past or anticipated noncompliance, does not stay any operating permit condition, nor relieve a permittee from the obligation to obtain other necessary permits and to comply with all applicable Federal, State, and local requirements.

16. Applicable requirements derived from an existing or terminated consent decree with EPA will not be changed without advance consultation by the Department with EPA. N.J.A.C. 7:27-22.3(uu).

17. Unless specifically exempted from permitting, temporary mobile equipment for short-term activities may be periodically used at major facilities, on site for up to 90 days if the requirements listed below, (a) through (h) are satisfied.

    a. The permittee will ensure that the temporary mobile equipment will not be installed permanently or used permanently on site.

    b. The permittee will ensure that the temporary mobile equipment will not circumvent any State or Federal rules and regulations, even for a short period of time, and the subject equipment will comply with all applicable performance standards.

    c. The permittee cannot use temporary mobile equipment unless the owner or operator of the subject equipment has obtained and maintains an approved Air Pollution Control Permit, issued pursuant to N.J.A.C. 7:27-8 or 22, prior to bringing the temporary mobile equipment to operate at the major facility.

    d. The permittee is responsible for ensuring the temporary mobile equipment's compliance with the terms and conditions specified in its approved Air Pollution Control Permit when the temporary mobile equipment operates on the property of the permittee.

    e. The permittee will ensure that temporary mobile equipment utilized for short-term activities will not operate on site for more than a total of 90 days during any calendar year.

    f. The permittee will keep on site a list of temporary mobile equipment being used at the facility with the start date, end date, and record of the emissions from all such equipment (amount and type of each air contaminant) no later than 30 days after the temporary mobile equipment completed its job in accordance with N.J.A.C. 7:27-22.19(i)3.

    g. Emissions from the temporary mobile equipment must be included in the emission netting analysis required of the permittee by N.J.A.C. 7:27-18.7. This information is maintained on site by the permittee and provided to the Department upon request in accordance with existing applicable requirements in the FC Section of its Title V permit.

    h. Where short-term activities (employing temporary mobile equipment) will reoccur on at least an annual basis, the permittee is required to include such activities (and the associated equipment) within one year of the first use, in its Title V permit through the appropriate modification procedures.

18. Consistent with the provisions of N.J.A.C. 7:27-22.9(c), the permittee shall use monitoring of operating parameters, where required by the compliance plan, as a surrogate for direct emissions testing or monitoring, to demonstrate compliance with applicable requirements.

19. The permittee is responsible for submitting timely and administratively complete operating permit applications:

    Administrative Amendments [N.J.A.C. 7:27-22.20(c)];
    Seven-Day Notice changes [N.J.A.C. 7:27-22.22(e)];
    Minor Modifications [N.J.A.C. 7:27-22.23(e)];
    Significant Modifications [N.J.A.C. 7:27-22.24(e)]; and
    Renewals [N.J.A.C. 7:27-22.30(b).

20. The operating permit renewal application consists of a RADIUS application and the application attachment available at the Department's website https://dep.nj.gov/boss/applications-and-forms/ (Attachment to the RADIUS Operating Permit Renewal Application). Both the RADIUS application and the Application Attachment, along with any other supporting documents must be submitted using the Department's Portal

at: https://njdeponline.com/. The application is considered timely if it is received at least 12 months before the expiration date of the operating permit. To be deemed administratively complete, the renewal application shall include all information required by the application form for the renewal and the information required pursuant to N.J.A.C. 7:27-22.30(d). However, consistent with N.J.A.C. 7:27-22.30(c), the permittee is encouraged to submit the renewal application at least 15 months prior to expiration of the operating permit, so that any deficiencies can be identified and addressed to ensure that the application is administratively complete by the renewal deadline. Only renewal applications which are timely and administratively complete are eligible for an application shield.

21. For all source emissions testing performed at the facility, the phrase "worst case conditions without creating an unsafe condition" used in the enclosed compliance plan is consistent with EPA's National Stack Testing Guidance, dated April 27, 2009, where all source emission testing performed at the facility shall be under the representative (normal) conditions that:

    i. Represent the range of combined process and control measure conditions under which the facility expects to operate (regardless of the frequency of the conditions); and

    ii. Are likely to most challenge the emissions control measures of the facility with regard to meeting the applicable emission standards, but without creating an unsafe condition.

22. Consistent with EPA's National Stack Testing Guidance and Technical Manual 1004, a facility may not stop an ongoing stack test because it would have failed the test unless the facility also ceases operation of the equipment in question to correct the issue. Stopping an ongoing stack test in these instances will be considered credible evidence of emissions non-compliance.

23. Each permittee shall maintain records of all source emissions testing or monitoring performed at the facility and required by the operating permit in accordance with N.J.A.C. 7:27-22.19. Records shall be maintained, for at least five years from the date of each sample, measurement, or report. Each permittee shall maintain all other records required by this operating permit for a period of five years from the date each record is made. At a minimum, source emission testing or monitoring records shall contain the information specified at N.J.A.C. 7:27-22.19(b). [N.J.A.C. 7:27-22.19(a) and N.J.A.C. 7:27-22.19(b)]

24. A Permittee may seek the approval of the Department for a delay in testing required pursuant to this permit by submitting a written request to the appropriate Regional Enforcement Office in accordance with N.J.A.C. 7:27-22.18(k). A Permittee may also seek advanced approval for a longer period for submittal of a source emissions test report required by the permit by submitting a request to the Department's Regional Enforcement Office in accordance with N.J.A.C. 7:27-22.19. [N.J.A.C. 7:27-22.18(k) and N.J.A.C. 7:27-22.19]

25. Any emission limit values in an operating permit shall be interpreted to be followed by inherent trailing zeros (0) in the decimal portion of the limit to three significant figures (e.g. a printed limit of "1 lb/hr" means a limit of "1.00 lb/hr") except for concentration limits less than 10 parts per million (ppm). For such concentration limits, the emission limit shall be interpreted to be followed by inherent trailing zeros (0) in the decimal portion of the limit to two significant figures (e.g. a printed limit of "1 ppm" means a limit of "1.0 ppm").

Section C

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

STATE-ONLY APPLICABLE REQUIREMENTS

N.J.A.C. 7:27-22.16(b)5 requires the Department to specifically designate as not being federally enforceable any permit conditions based only on applicable State requirements. The applicable State requirements to which this provision applies are listed in the table titled "State-Only Applicable Requirements."

STATE-ONLY APPLICABLE REQUIREMENTS

The following applicable requirements are not federally enforceable:

SECTION	SUBJECT ITEM	ITEM #	REF. #
B	---	1	---
B	---	10b	---
D	FC	---	3
D	FC	---	9

Section D

Facility Name: NEWARK ENERGY CENTER
Program Interest Number: 08857
Permit Activity Number: BOP240001

FACILITY SPECIFIC REQUIREMENTS AND INVENTORIES

FACILITY SPECIFIC REQUIREMENTS PAGE INDEX

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Reason for Application

Permit Being Modified

Permit Class: BOP **Number:** 230001

Description of Modifications: Administrative Ammendment BOP240001

The responsible official, fees/billing and air permitting contacts were updated.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **FC**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	General Provisions: The permittee shall comply with all applicable provisions of N.J.A.C. 7:27-1. [N.J.A.C. 7:27- 1]	None.	None.	None.
2	Control and Prohibition of Open Burning: The permittee is prohibited from open burning of rubbish, garbage, trade waste, buildings, structures, leaves, other plant life and salvage. Open burning of infested plant life or dangerous material may only be performed with a permit from the Department. [N.J.A.C. 7:27- 2]	None.	None.	Obtain an approved permit: Prior to occurrence of event (prior to open burning). [N.J.A.C. 7:27- 2]
3	Prohibition of Air Pollution: The permittee shall not emit into the outdoor atmosphere substances in quantities that result in air pollution as defined at N.J.A.C. 7:27-5.1. [N.J.A.C. 7:27- 5]	None.	None.	None.
4	Prevention and Control of Air Pollution Control Emergencies: Any person responsible for the operation of a source of air contamination set forth in Table 1 of N.J.A.C. 7:27-12 is required to prepare a written Standby Plan, consistent with good industrial practice and safe operating procedures, and be prepared for reducing the emission of air contaminants during periods of an air pollution alert, warning, or emergency. Any person who operates a source not set forth in Table 1 of N.J.A.C. 7:27-12 is not required to prepare such a plan unless requested by the Department in writing. [N.J.A.C. 7:27-12]	None.	None.	Comply with the requirement: Upon occurrence of event. Upon proclamation by the Governor of an air pollution alert, warning, or emergency, the permittee shall put the Standby Plan into effect. In addition, the permittee shall ensure that all of the applicable emission reduction objectives of N.J.A.C. 7:27-12.4, Table I, II, and III are complied with whenever there is an air pollution alert, warning, or emergency. [N.J.A.C. 7:27-12]
5	Emission Offset Rules: The permittee shall comply with all applicable provisions of Emission Offset Rules. [N.J.A.C. 7:27-18]	None.	None.	None.
6	Emission Statements: The permittee shall comply with all the applicable provisions of N.J.A.C. 7:27-21. [N.J.A.C. 7:27-21]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	Compliance Certification: The permittee shall submit an annual Compliance Certification for each applicable requirement, pursuant to N.J.A.C. 7:27-22.19(f). [N.J.A.C. 7:27-22]	None.	None.	Submit an Annual Compliance Certification: Annually to the Department and to EPA within 60 days after the end of each calendar year during which this permit was in effect. The Compliance Certification shall be certified pursuant to N.J.A.C. 7:27-1.39 by the responsible official and submitted electronically through the NJDEP online web portal. The certification should be printed for submission to EPA. The NJDEP online web portal can be accessed at: http://www.state.nj.us/dep/online/. The Compliance Certification forms and instructions for submitting to EPA are available by selecting Documents and Forms and then Periodic Compliance Certification. [N.J.A.C. 7:27-22]
8	Prevention of Air Pollution from Consumer Products and Architectural Coatings: The permittee shall comply with all applicable provisions of N.J.A.C. 7:27-24 and [N.J.A.C. 7:27-23]	None.	None.	None.
9	Any operation of equipment which causes off-property effects, including odors, or which might reasonably result in citizen's complaints shall be reported to the Department to the extent required by the Air Pollution Control Act, N.J.S.A. 26:2C-19(e). [N.J.S.A. 26: 2C-19(e)]	Other: Observation of plant operations. [N.J.S.A. 26: 2C-19(e)].	Other: Maintain a copy of all information submitted to the Department. [N.J.S.A. 26: 2C-19(e)].	Notify by phone: Upon occurrence of event. A person who causes a release of air contaminants in a quantity or concentration which poses a potential threat to public health, welfare or the environment or which might reasonably result in citizen complaints shall immediately notify the Department. Such notification shall be made by calling the Environmental Action Hotline at (877) 927-6337. [N.J.S.A. 26: 2C-19(e)]
10	Prevention of Significant Deterioration: The permittee shall comply with all applicable provisions of Prevention of Significant Deterioration (PSD). [40 CFR 52.21]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
11	The permittee shall comply with all applicable provisions of National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Asbestos, Subpart M. [40 CFR 61]	Other: Comply with 40 CFR 61.145 and 61.150 when conducting any renovation or demolition activities at the facility. [40 CFR 61].	Other: Comply with 40 CFR 61.153 when conducting any renovation or demolition activities at the facility. [40 CFR 61].	Comply with the requirement: Upon occurrence of event. The permittee shall comply with 40 CFR 61.153 when conducting any renovation or demolition activities at the facility. [40 CFR 61]
12	Protection of Stratospheric Ozone:1) If the permittee manufactures, transforms, destroys, imports, or exports a Class I or Class II substance, the permittee is subject to all the requirements as specified at 40 CFR 82, Subpart A; 2) If the permittee performs a service on motor "fleet" vehicles when this service involves an ozone depleting substance refrigerant (or regulated substance) in the motor vehicle air conditioner (MVAC), the permittee is subject to all the applicable requirements as specified at 40 CFR 82, Subpart B. 3) The permittee shall comply with the standards for labeling of products containing or manufactured with ozone depleting substances pursuant to 40 CFR 82, Subpart E. 4). The permittee shall comply with the standards for recycling and emission reductions of Class I and Class II refrigerants or a regulated substitute substance during the service, maintenance, repair, and disposal of appliances pursuant to 40 CFR 82, Subpart F, except as provided for motor vehicle air conditioners (MVACs) in Subpart B. 5) The permittee shall be allowed to switch from any ozone depleting substance to any alternative that is listed in the Significant New Alternative Program (SNAP) promulgated pursuant to 40 CFR 82, Subpart G. [40 CFR 82]	Other: Comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82].	Other: Comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82].	Comply with the requirement: Upon occurrence of event. The permittee shall comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	Deviation Reports: The permittee shall submit to the Department a certified six-month Deviation Report relating to testing and monitoring required by the operating permit. [N.J.A.C. 7:27-22.19(d)3], [N.J.A.C.7:27-22.19(e)], and [N.J.A.C. 7:27-22.19(c)]	None.	Other: The permittee shall maintain deviation reports for a period of five years from the date each report is submitted to the Department. [N.J.A.C.7:27-22.19(a)] and [N.J.A.C. 7:27-22.19(e)].	Submit a report: As per the approved schedule. The six-month deviation reports for the period from January 1 through June 30 shall be submitted by July 30 of the same calendar year, and for the period from July 1 through December 31, shall be submitted by January 30 of the following calendar year. The annual compliance certification required by N.J.A.C.7:27-22.19(f) may also be considered as your six-month Deviation Report for the period from July 1 – December 31, if submitted by January 30 of the following calendar year. The reports shall be certified pursuant to N.J.A.C. 7:27-1.39 by the responsible official and submitted electronically through the NJDEP online web portal. The NJDEP online web portal can be accessed at: http://www.state.nj.us/dep/online/ . The Compliance Certification forms are available by selecting Documents and Forms and then Periodic Compliance Certification. [N.J.A.C. 7:27-22]
14	Used Oil Combustion: No person shall combust used oil except as authorized pursuant to N.J.A.C. 7:27-20. [N.J.A.C. 7:27-20.2]	None.	None.	Comply with the requirement: Prior to occurrence of event (prior to burning used oil) either register with the Department pursuant to N.J.A.C. 7:27-20.3 or obtain a permit issued by the Department pursuant to N.J.A.C. 7:27-8 or 7:27-22, whichever is applicable. [N.J.A.C. 7:27-20.2(d)]
15	Prevention of Accidental Releases: Facilities producing, processing, handling or storing a chemical, listed in the tables of 40 CFR Part 68.130, and present in a process in a quantity greater than the listed Threshold Quantity, shall comply with all applicable provisions of 40 CFR 68. [40 CFR 68]	Other: Comply with 40 CFR 68. [40 CFR 68].	Other: Comply with 40 CFR 68. [40 CFR 68].	Other (provide description): Other. Comply with 40 CFR 68 as described in the Applicable Requirement. [40 CFR 68]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	The Department and its authorized representatives shall have the right to enter and inspect any activity subject to N.J.A.C. 7:27-22, or portion thereof, pursuant to N.J.A.C. 7:27-1.31. [N.J.A.C. 7:27-22.16(g)9]	None.	None.	None.
17	The permittee shall pay fees to the Department pursuant to N.J.A.C. 7:27. [N.J.A.C. 7:27-22.16(g)10]	None.	None.	None.
18	Each permittee shall meet all requirements of the approved source emissions testing and monitoring protocol during the term of the operating permit. Whenever the permittee makes a replacement, modification, change or repair of a certified CEMS or COMS that may significantly affect the ability of the system to accurately measure or record data, the permittee must recertify the CEMS or COMS in accordance with Section V.B. and Appendix E of Technical Manual 1005. The permittee is responsible for any downtime associated with the replacement, modification, change or repair of the CEMS or COMS. [N.J.A.C. 7:27-22.18(j)]	None.	None.	Comply with the requirement: Upon occurrence of event. The permittee is responsible for contacting the Emission Measurement Section to determine the need for recertification and/or to initiate the recertification process. [N.J.A.C. 7:27-22.18(j)]
19	Each process monitor must be operated at all times when the associated process equipment is operating except during service outage time not to exceed 24 hours per calendar quarter. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee must keep a service log to document any outage. [N.J.A.C. 7:27-22.16(o)]	None.
20	Continuous recording for process monitors must be at a sufficient frequency and resolution to be able to document compliance or non-compliance in accordance with Technical Manual 1005 for CEMS (TM1005(B)(3). [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
21	Stack testing after permit expiration: If an operating permit has expired, the conditions of the operating permit, including the requirements for stack testing during the expired permit term, remain enforceable until the operating permit is reissued. [N.J.A.C. 7:27-22.30(j)] and [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **IS1 (2) Ultra Low Sulfur Distillate (ULSD) Storage Tanks (350 gallon and 550 gallon)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Sulfur Content in Fuel <= 15 ppmw (0.0015 % by weight). Maximum allowable sulfur content in No. 2 and lighter fuel oil. NOTE: This requirement is effective on and after July 1, 2016. [N.J.A.C. 7:27- 9.2(a)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **IS3 Sulfuric Acid Storage Tank - (1) 20,000 gal tank**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The operating temperature of the tank shall not be greater than 350 degrees F. [N.J.A.C. 7:27-22.1]	None.	None.	None.
2	The vapor pressure of the liquid, excluding the vapor pressure of water, shall be less than 0.02 psia at the liquid's actual temperature or at 70 degrees F, whichever is higher. [N.J.A.C. 7:27-22.1]	None.	None.	None.
3	The tank or vessel shall have no visible emissions, exclusive of water vapor, to the outdoor atmosphere. [N.J.A.C. 7:27-22.1]	None.	None.	None.
4	The tank or vessel shall not emit any air contaminants which may cause an odor detectable outside the property boundaries of the facility. [N.J.A.C. 7:27-22.1]	None.	None.	None.
5	The tank or vessel shall not be subject to any NESHAPS, MACT, or NSPS air pollution control standards, excluding the NSPS requirements to maintain a record of the contents of the tank or vessel, the period of storage of these contents, and the maximum true vapor pressure of the liquid stored. [N.J.A.C. 7:27-22.1]	None.	None.	None.
6	The tank's or vessel's potential to emit each TXS and each HAP shall not exceed the de minimis reporting thresholds as specified in Appendix to N.J.A.C. 7:27-22. [N.J.A.C. 7:27-22.1]	None.	None.	None.
7	The percentage by weight of all HAPs collectively in the raw material stored in the tank, or mixed or blended in the vessel, shall be less than 1.0 percent. [N.J.A.C. 7:27-22.1]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	The owner or operator shall have readily available upon Department request a statement certified in accordance with N.J.A.C. 7-27-1.39, signed by the responsible official, as defined at N.J.A.C. 7:27-1.4, that: (1) specifies the contents of the tank; (2) affirms that the tank or vessel meets the above applicable requirements and (3) attests that the tank or vessel is in compliance with all other applicable State or federal air pollution requirements. [N.J.A.C. 7:27-22.1]	None.	None.	None.
9	Tank content limited to sulfuric acid. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by review of tank contents delivery records per delivery.[N.J.A.C. 7:27-22.16(o)].	Other: Recordkeeping by invoices / bills of lading once per delivery.[N.J.A.C. 7:27-22.16(o)].	None.
10	Sulfuric Acid Emissions from this storage tank must be included in the total annual sulfuric acid emissions calculations for the entire facility. The total facility-wide sulfuric acid emissions must comply with the emission cap in GR1 of the permit. [N.J.A.C. 7:27-22.16(a)]	Sulfuric acid emissions from this storage tank shall be determined each month using AP-42 calculations. A consecutive 12 month value shall be determined by adding the current months emissions to the total emissions from the previous 11 consecutive months. The consecutive 12 month value shall then be added to the total emissions from the rest of the facility to determine compliance with the facility wide emission cap in GR 1. Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

IS3 Sulfuric Acid Storage Tank - (1) 20,000 gal tank

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **GR1 Facility Wide Annual Emissions**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	NOx (Total) <= 138 tons/yr. Facility Wide Annual NOx (total) emissions from the facility shall include NOx emitted by the two turbines and duct burners, one emergency generator and one fire pump. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.2(a)] and. [40 CFR 52.21]	NOx (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
2	CO <= 482 tons/yr. Facility Wide Annual CO emissions from the facility shall include CO emitted by the two turbines and duct burners, one emergency generator and one fire pump. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
3	VOC (Total) <= 34.8 tons/yr. This limit includes Formaldehyde emissions. Facility Wide Annual VOC (total) emissions from the facility shall include VOC emitted by the two turbines and duct burners, one emergency generator and one fire pump. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.2(a)]	VOC (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. . [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	SO2 <= 19.7 tons/yr. Facility Wide Annual SO2 emissions from the facility shall include SO2 emitted by the two turbines and duct burners. Note: The SO2 emissions from emergency diesel generator and fire water pump are below reporting thresholds of 0.05 lb/hr and therefore not included in this limit. . [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
5	TSP <= 67 tons/yr. Facility Wide Annual TSP(total) emissions from the facility shall include TSP emitted by the two turbines and duct burners, one emergency generator, one fire pump and one cooling tower. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U2, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
6	PM-10 (Total) <= 101 tons/yr. Facility Wide Annual PM-10(total) emissions from the facility shall include PM-10 emitted by the two turbines and duct burners, one emergency generator, one fire pump and one cooling tower. [N.J.A.C. 7:27-22.16(a)] and . [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U2, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

GR1 Facility Wide Annual Emissions

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	PM-2.5 (Total) <= 97.5 tons/yr. Facility Wide Annual PM-2.5(total) emissions from the facility shall include PM-2.5 emitted by the two turbines and duct burners, one emergency generator, one fire pump and one cooling tower. . [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be calculated by adding the annual emissions calculated at (U1, OS Summary), (U2, OS Summary), (U3, OS Summary), and (U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
8	Ammonia <= 119 tons/yr. Facility Wide Annual Ammonia emissions from the facility shall include Ammonia emitted by the two combustion turbines and duct burners. This limit is based on steady state operation of each turbine, at ISO conditions, for the maximum permitted hr/yr. . [N.J.A.C. 7:27-22.16(a)]	Ammonia: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Ammonia: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

GR1 Facility Wide Annual Emissions

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	SO3 and H2SO4, as converted and expressed as H2SO4 <= 10.5 tons/yr. Facility Wide Annual H2SO4 emissions from the facility shall include H2SO4 emitted by the two turbines and duct burners (U1) and the sulfuric acid tank (IS3). Note: The H2SO4 emissions from emergency diesel generator and fire water pump are below reporting thresholds of 0.05 lb/hr and therefore not included in this limit. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	SO3 and H2SO4, as converted and expressed as H2SO4: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Sulfuric Acid tons/month = (0.0006 lb/MMBtu x 1020 MMBtu/MMScf x (CTGas + DBGas) MMScf/month / 2000 lbs/ton) + sulfuric acid emissions from storage tank (determined using EPA Tanks 4.0.9 software). Where: CTGas = total MMScf of gas consumed by the combustion turbines (CT) during the month, including fuel consumed during start-up and shut down. DBGas = total MMScf of gas consumed by the duct burners (DB) during the month. Sulfuric Acid emission factor of 0.0006 lb/MMBtu. [N.J.A.C. 7:27-22.16(o)]	SO3 and H2SO4, as converted and expressed as H2SO4: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

GR1 Facility Wide Annual Emissions

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	Methane <= 153 tons/yr. Facility Wide Annual Methane emissions from the facility shall include Methane emitted by the two turbines and duct burners. This limit is based on steady state operation of each turbine, at ISO conditions, for the maximum permitted hr/yr and operation of each duct burner, for the maximum permitted hr/yr. Note: The Methane emissions from emergency diesel generator and fire water pump are below reporting thresholds of 0.05 lb/hr and therefore not included in this limit. . [N.J.A.C. 7:27-22.16(a)]	Methane: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Methane: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
11	HAPs (Total) <= 4.99 tons/yr. Based on the sum of individual HAP emissions. [N.J.A.C. 7:27-22.16(a)]	HAPs (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	HAPs (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
12	Acrolein <= 0.0582 tons/yr. Facility Wide Annual Acrolein emissions from the facility shall include Acrolein emitted by the two turbines and duct burners. . [N.J.A.C. 7:27-22.16(a)]	Acrolein: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Acrolein: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

GR1 Facility Wide Annual Emissions

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	Benzene <= 0.233 tons/yr. Facility Wide Annual Benzene emissions from the facility shall include Benzene emitted by the two turbines and duct burners. [N.J.A.C. 7:27-22.16(a)]	Benzene: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Benzene: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
14	Formaldehyde <= 2.15 tons/yr. Facility Wide Annual Formaldehyde emissions from the facility shall include Formaldehyde emitted by the two turbines and duct burners. [N.J.A.C. 7:27-22.16(a)]	Formaldehyde: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Formaldehyde: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
15	Polycyclic organic matter <= 0.0425 tons/yr. Facility Wide Annual Polycyclic Organic Matter (POM) emissions from the facility shall include POM emitted by the two turbines and duct burners. [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Polycyclic organic matter: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
16	Toluene <= 2.51 tons/yr. Facility Wide Annual Toluene emissions from the facility shall include Toluene emitted by the two turbines and duct burners. [N.J.A.C. 7:27-22.16(a)]	Toluene: Monitored by calculations each month during operation. The total facility wide annual emissions shall be equal to the annual emissions calculated at (U1, OS Summary). [N.J.A.C. 7:27-22.16(o)]	Toluene: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

GR1 Facility Wide Annual Emissions

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **GR2 GHG**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Greenhouse gases as CO2e <= 2,157.259 thousand tons/yr. Facility Wide Annual Greenhouse gas (GHG) emissions from the facility, based on the annual GHG emission from all combustion equipment in the permit: (2) turbines, (2) duct burners, (1) emergency generator and (1) emergency fire pump. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Greenhouse gases as CO2e: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Monthly Facility Wide CO2e emissions = Monthly CO2e emitted by the (2) turbines and duct burners + Monthly CO2e emitted by the emergency diesel generator + Monthly CO2e emitted by the fire water pump. [N.J.A.C. 7:27-22.16(o)]	Greenhouse gases as CO2e: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	Greenhouse gases as CO2e <= 2,157.125 thousand tons/yr. Annual Greenhouse gas (GHG) emissions from two turbines and two duct burners (U1). Based on the following: Emission Factors: CO2: (40 CFR 75, Equation G-4) Methane: (AP-42, table 3.1-2a) Nitrous Oxide: (AP-42, table 1.4-2) Global Warming Potentials: (40 CFR 98, table A-1) Heat Input values: Manufacturer's data. Maximum permitted hr/yr of natural gas combustion for each turbine and each duct burner [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Greenhouse gases as CO2e: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: CO2e tons/month = (119 lb/MMBtu x 1020 MMBtu/MMScf x (CTGas + DBGas) MMScf/month / 2000 lbs/ton) + (25 x 0.0086 lb/MMBtu x 1020 MMBtu/MMScf x CTGas MMScf/month / 2000 lbs/ton) + (25 x 0.00225 lb/MMBtu x 1020 MMBtu/MMScf x DBGas MMScf/month / 2000 lbs/ton) + (298 x 0.003 lb/MMBtu x 1020 MMBtu/MMScf x CTGas MMScf/month / 2000 lbs/ton) + (298 x 0.00216 lb/MMBtu x 1020 MMBtu/MMScf x DBGas MMScf/month / 2000 lbs/ton) Where: CTGas = total MMScf of gas consumed by the (2) combustion turbines (CT) during the month, including fuel consumed during start-up and shut down. DBGas = total MMScf of gas consumed by the (2) duct burners (DB) during the month, including fuel consumed during start-up and shut down. * See "Applicable Requirement" for Emission Factors and Global Warming Potentials. [N.J.A.C. 7:27-22.16(o)]	Greenhouse gases as CO2e: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	The turbine net heat Rate at base load without Duct Burner shall be <= 7,522 Btu/kWh (HHV) at ISO conditions, based on higher heating value of the fuel. [N.J.A.C. 7:27-22.16(a)] and [40 CFR 52.21]	Monitored by calculations once initially Btu/kW-hr = X (Scf/hr) * Y (Btu/Scf) / Z (kW) Where: X = Total MMScf of gas consumed during the hour. Y = Total British thermal units per Scf of gas, based on higher heating value of gas. Z = Total kiloWatts of power output to grid. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain calculations that demonstrate compliance and make accessible to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	CO2 <= 887 lb/MW-hr (gross output) for each combustion turbine and its associated duct burner. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO2: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). lb CO2/MWh for each combustion turbine / duct burner shall be determined as follows: (1) Determine total hourly CO2 mass emissions (lbs/hr) emitted by each turbine/duct burner during each operating hour of the month, using the following equation: CO2 lb/hr = (119 lb/MMBtu x 1020 MMBtu/MMScf x (CTGas + DBGas) MMScf/hr) Where: CTGas = total MMScf of gas consumed by the combustion turbine (CT) during the hour, including fuel consumed during start-up (SU) and shut down (SD). DBGas = total MMScf of gas consumed by the duct burner (DB) during the hour, including fuel consumed during SU and SD. Natural Gas Emission Factor (lb/MMBtu): CO2 (40 CFR 75, Equation G-4) - CT and DB: 119 (2) Determine total gross electric output from the turbine/duct burner, in terms of MWh, for each operating hour of the month. (3) Add the hourly CO2 mass emissions (lb/hr) for the entire month, and add the hourly gross output (MW) for the entire month. (4) Divide the total CO2 mass emissions calculated for the entire month (lb/hr) by the total hourly gross output calculated for the entire month (MW) to determine the total lb/MWhr for that month. (5) Add the CO2 lb/MWhr emission rate for that month to the sum of the CO2 lb/MWhr emission rate for the previous 11 calendar months and divide the total by 12 to determine the 12-month rolling average. [N.J.A.C. 7:27-22.16(o)]	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	Greenhouse gases as CO2e <= 117 tons/yr. Annual Greenhouse gas (GHG) emissions from one emergency generator (U4). Based on the following: Emission Factors: CO2: (40 CFR 75, Equation G-4) Methane: (AP-42, table 3.1-4) Nitrous Oxide: (Climate Registry General Reporting Protocol (GRP) (Emission Factors by Fuel Type and Sector)) Global Warming Potentials: (40 CFR 98, table A-1) Maximum permitted heat input Maximum permitted hr/yr of diesel fuel combustion, for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Greenhouse gases as CO2e: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: CO2e tons/month = (162 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton) + (25 x 0.0081 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton) + (298 x 0.00132 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton Where: EG = total gallons of ULSD consumed by the emergency generator (EG) during the month, including fuel consumed during startup and shut down. * See "Applicable Requirement" for Emission Factors and Global Warming Potentials. [N.J.A.C. 7:27-22.16(o)]	Greenhouse gases as CO2e: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	Greenhouse gases as CO2e <= 16.8 tons/yr. Annual Greenhouse gas (GHG) emissions from one fire water pump engine (U3). Based on the following: Emission Factors: CO2: (40 CFR 75, Equation G-4) Methane: (AP-42, table 3.1-4) Nitrous Oxide: (Climate Registry General Reporting Protocol (GRP) (Emission Factors by Fuel Type and Sector)) Global Warming Potentials: (40 CFR 98, table A-1) Maximum permitted heat input Maximum permitted hr/yr of diesel fuel combustion, for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Greenhouse gases as CO2e: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: CO2e tons/month = (162 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton) + (25 x 0.0081 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton) + (298 x 0.00132 lb/MMBtu x 139,000 MMBtu/MMGal x EG MMGal/month / 2000 lbs/ton Where: EG = total gallons of ULSD consumed by the emergency generator (EG) during the month, including fuel consumed during startup and shut down. * See "Applicable Requirement" for Emission Factors and Global Warming Potentials. [N.J.A.C. 7:27-22.16(o)]	Greenhouse gases as CO2e: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **GR10 N.J.A.C. 7:27C (RGGI Requirements for CC Turbines in U1)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The owners and operators of each CO2 budget source and each CO2 budget unit at the source shall, as of the CO2 allowance transfer deadline, hold CO2 allowances in the sources's compliance account, available for compliance deductions under N.J.A.C. 7:27C-6.9, as follows: 1) In the case of an initial control period, the number of CO2 allowances held shall be no less than the amount equivalent to the total CO2 emissions for the initial control period from all CO2 budget units at the source; 2) In the case of a control period, the number of CO2 allowances held shall be no less than the total CO2 emissions for the control period from all CO2 budget units at the source, less the CO2 allowances deducted to meet the requirements of N.J.A.C 7:27C-1.4(g) with respect to the previous two interim control periods, as determined in accordance with N.J.A.C 7:27C-6 and 7:27C-8; 3) In the case of an interim control period, the number of CO2 allowances held shall be no less than the total CO2 emissions for the interim control period from all CO2 budget units at the source, multiplied by 0.50, as determined in accordance with NJAC 7:27C-6 and 7:27C-8. [N.J.A.C. 7:27C-1.4(f)]	Monitored by calculations at the approved frequency. The Department shall use the emission measurements recorded and reported in accordance with N.J.A.C. 7:27C-8 to determine the unit's compliance. Total tons for a control period shall be calculated as the sum of all recorded hourly emissions (or the tonnage equivalent of the recorded hourly emissions rates) in accordance with N.J.A.C. 7:27C-8. The Department will round total CO2 emissions to the nearest whole ton, so that any fraction of a ton equal to or greater than 0.50 tons is deemed to equal one ton and any fraction of a ton less than 0.50 tons is deemed to equal zero tons. [N.J.A.C. 7:27C- 1.4(d)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. Maintain records of all CO2 emissions from each CO2 budget unit. [N.J.A.C. 7:27C- 8]	Submit a report: On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1). The CO2 authorized account representative shall submit quarterly reports to the Bureau of Energy and Sustainability, for each calendar quarter beginning with: i. For a unit that commences commercial operation before December 17, 2018, the calendar quarter beginning January 1, 2020; or ii. For a unit commencing commercial operation on or after December 17, 2018, the calendar quarter corresponding to the earlier of the date of provisional certification or the applicable deadline for initial certification under N.J.A.C. 7:27C-8.1(d). If the calendar quarter so determined is the third or fourth quarter of 2019, reporting shall commence in the quarter beginning January 1, 2020. Quarterly reports shall be submitted in the manner specified in Subpart H of 40 CFR 75 and 40 CFR 75.64. Quarterly reports shall be submitted for each CO2 budget unit (or group of units using a common stack), and shall include all of the data and information required in Subpart G of 40 CFR 75, except for opacity, heat input, NOx and SO2 provisions. The CO2 authorized account representative shall submit, to the Bureau of Energy and Sustainability, a compliance certification in support of each quarterly report, pursuant to N.J.A.C. 7:27C-8.5(c)3. [N.J.A.C. 7:27C-8.5(c)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	CO2 Allowance Tracking System (COATS): CO2 allowances shall be held in, deducted from, or transferred among COATS accounts in accordance with N.J.A.C 7:27C-5, 6, and 7. [N.J.A.C 7:27C-1.4(i)] A CO2 allowance shall not be deducted, in order to comply with N.J.A.C. 7:27-1.4(f), for a control period that ends prior to the year for which the CO2 allowance was allocated. [N.J.A.C 7:27C-1.4(j)] A CO2 offset allowance shall not be deducted, in order to comply with N.J.A.C. 7:27-1.4(f), beyond the applicable percent limitations at N.J.A.C. 7:27C6.9(a)3. [N.J.A.C. 7:27C- 1.4(k)]	Other: The Permittee shall review any transactions recorded in its COATS account for accuracy.[N.J.A.C. 7:27-22.16(o)].	None.	Submit a report: As per the approved schedule Submit compliance certification reports pursuant to N.J.A.C 7:27C-4.1(a) and CO2 allowance transfer requests, as necessary, pursuant to N.J.A.C 7:27C-7.1(a), to the Bureau of Energy and Sustainability If information in COATS account is found to be inaccurate, notify the Bureau of Energy and Sustainability. [N.J.A.C. 7:27-22.16(o)]
3	CO2: The owners and operators of a CO2 budget source that has excess emissions in any control period or in the initial control period, or has excess interim emissions in any interim control period, shall: 1. Forfeit the CO2 allowances required for deduction under N.J.A.C. 7:27C-6.9(e); 2. Not use any CO2 offset allowances to cover any part of such excess emissions; and 3. Pay any fine, penalty, or assessment or comply with any other remedy imposed under N.J.A.C. 7:27C-6.9(f). [N.J.A.C. 7:27C- 1.4(n)]	Other: The Permittee shall review any transactions recorded in its COATS account for accuracy.[N.J.A.C. 7:27-22.16(o)].	None.	Submit notification: Upon occurrence of event. If information in COATS account is found to be inaccurate, notify the Bureau of Energy and Sustainability. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	CO2: Account certificate of representation and supporting documents. [N.J.A.C. 7:27C-1.4(o)1]	None.	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owners and operators of the CO2 budget source and each CO2 budget unit at the source shall keep on site at the source the account certificate of representation for the CO2 authorized account representative for the CO2 budget source and each CO2 budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with N.J.A.C. 7:27C-2.4. These documents shall be retained on site at the source until such documents are superseded by a newly submitted account certificate of representation changing the CO2 authorized account representative. [N.J.A.C. 7:27C- 1.4(o)1]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	CO2: Copies of Documents & Reports [N.J.A.C. 7:27C- 1.4(o)]	None.	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event The owners and operators of the CO2 budget source and each CO2 budget unit at the source shall keep on site at the source each of the following documents for a period of 10 years from the date the document is created. The Department may at any time prior to the end of the 10-year period extend the 10-year period in writing, if it determines that retention of the documents beyond the 10-year period is necessary to determine compliance with the requirements of N.J.A.C. 7:27C: - All emissions monitoring information, in accordance with N.J.A.C. 7:27C-8 and 40 CFR 75.57; - Copies of all reports, compliance certifications, and other submissions, and all records made or required under the CO2 Budget Trading Program; and - Copies of all documents used to complete an application for a new or modified operating permit that incorporates the requirements of the CO2 Budget Trading Program and any other submission under the CO2 Budget Trading Program or to demonstrate compliance with the requirements of the CO2 Budget Trading Program. [N.J.A.C 7:27C-1.4(o)2, [N.J.A.C 7:27C-1.4(o)3 and. [N.J.A.C. 7:27C-1.4(o)4]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	CO2: Compliance Certification Report: [N.J.A.C. 7:27C-1.4(p)] and [N.J.A.C. 7:27C- 4.1]	None.	None.	Submit a report: As per the approved schedule. For each control period, including the initial control period, in which a CO2 budget source is subject to the CO2 requirements of N.J.A.C 7:27C-1.4, the CO2 authorized account representative shall submit, to the Bureau of Energy and Sustainability, by March 1 following each relevant three-calendar-year control period, the compliance certification report that includes the following elements listed in N.J.A.C. 7:27C-4.1(b): 1. Identification of the CO2 budget source and each CO2 budget unit at the source; 2. At the CO2 authorized account representative's option, the serial numbers of the CO2 allowances that are to be deducted from the CO2 budget source's compliance account under N.J.A.C. 7:27C-6.9 for the control period, including the serial numbers of any CO2 offset allowances that are to be deducted subject to the limitations of N.J.A.C. 7:27C-6.9(a)3; and 3. The compliance certification: In the compliance certification report, the CO2 authorized account representative shall certify whether the CO2 budget source and each CO2 budget unit at the source for which the compliance certification is submitted was operated, during the calendar years covered by the report, in compliance with the requirements of the CO2 Budget Trading Program, based on reasonable inquiry of those persons with primary responsibility for operating the CO2 budget source and the CO2 budget units at the source in compliance with the CO2 Budget Trading Program. [N.J.A.C. 7:27C-4.1(b)] and. [N.J.A.C. 7:27C- 4.1]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	CO2: The owner or operator of each CO2 budget unit shall install all monitoring systems necessary to monitor CO2 mass emissions in accordance with 40 CFR Part 75, except for equation G-1 of Appendix G, which shall not be used to determine CO2 emissions. Compliance with this paragraph may require systems to monitor CO2 concentration, stack gas flow rate, O2 concentration, heat input, and fuel flow rate [N.J.A.C. 7:27C- 8.1(c)1]	Other: The owner or operator of a CO2 budget unit shall meet the monitoring system certification and other requirements of N.J.A.C. 7:27C-8.1(c) and shall quality-assure the data from the monitoring systems in accordance with the schedule prescribed in N.J.A.C. 7:27C-8.1(d)(1) for a CO2 budget unit that commenced commercial operation before December 17, 2018, N.J.A.C. 7:27C-8.1(d)(2) for a CO2 budget unit that commenced commercial operation on or after December 17, 2018 or N.J.A.C. 7:27C-8.1(d)(3) for a CO2 budget unit for which construction of a new stack or flue installation is completed after the applicable deadlines at N.J.A.C. 7:27C-8.1(d)(1) and (2). [N.J.A.C 7:27C-8.1(c)2], [N.J.A.C 7:27C-8.1(c)3] and [N.J.A.C 7:27C-8.1(d)] The owner or operator shall ensure, for each continuous emissions monitoring system (including the automated data acquisition and handling system) the successful completion of all of the initial certification testing required under 40 CFR 75.20 by the applicable deadlines listed above. In addition, whenever the owner or operator installs a monitoring system in order to meet the requirements of N.J.A.C. 7:27C-8 in a location where no such monitoring system was previously installed, initial certification in accordance with 40 CFR 75.20 is required.[N.J.A.C. 7:27C- 8.2(d)].	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. The owner or operator of a CO2 budget unit shall record the data from the monitoring systems in accordance with the schedule prescribed in N.J.A.C. 7:27C-8.1(d)(1) for a CO2 budget unit that commenced commercial operation before December 17, 2018, N.J.A.C. 7:27C-8.1(d)(2) for a CO2 budget unit that commenced commercial operation on or after December 17, 2018 or N.J.A.C. 7:27C-8.1(d)(3) for a CO2 budget unit for which construction of a new stack or flue installation is completed after the applicable deadlines at N.J.A.C. 7:27C-8.1(d)(1) and (2). [N.J.A.C 7:27C-8.1(c)3] and. [N.J.A.C. 7:27C-8.1(d)]	Submit a report: As per the approved schedule. The owner or operator of a CO2 budget unit shall report the data from the monitoring systems in accordance with the schedule prescribed in N.J.A.C. 7:27C-8.1(d)(1) for a CO2 budget unit that commenced commercial operation before December 17, 2018, N.J.A.C. 7:27C-8.1(d)(2) for a CO2 budget unit that commenced commercial operation on or after December 17, 2018 or N.J.A.C. 7:27C-8.1(d)(3) for a CO2 budget unit for which construction of a new stack or flue installation is completed after the applicable deadlines at N.J.A.C. 7:27C-8.1(d)(1) and (2). [N.J.A.C 7:27C-8.1(c)3] and. [N.J.A.C. 7:27C- 8.1(d)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	CO2: The owner or operator of a CO2 budget unit that commenced commercial operation before December 17, 2018 and did not certify all monitoring systems required under N.J.A.C. 7:27C8.1(c) by June 11, 2019; or a CO2 budget unit that commenced commercial operation on or after December 17, 2018 and did not certify all monitoring systems required under N.J.A.C. 7:27C8.1(c) by June 11, 2019 or the earlier of 90 unit operating days or 180 calendar days after the date on which the unit commenced commercial operation; or a CO2 budget unit for which construction of a new stack or flue installation is completed after the above deadline and did not certify all monitoring systems required under N.J.A.C. 7:27C8.1(c) by the earlier of 90 unit operating days or 180 calendar days after the date on which emissions first exited the new stack or flue and entered the atmosphere; shall, for each such monitoring system, determine, record and report, the necessary data as specified. [N.J.A.C. 7:27C- 8.1(e)]	Other: The owner or operator shall, for each monitoring system, determine maximum (or, as appropriate, minimum) potential values for CO2 concentration, CO2 emissions rate, stack gas moisture content, fuel flow rate, heat input, and any other parameter required to determine CO2 mass emissions in accordance with 40 CFR 75.31(b)(2) or (c)(3) and section 2.4 of Appendix D of 40 CFR Part 75, as applicable.[N.J.A.C. 7:27C-8.1(e)].	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. The owner or operator shall, for each monitoring system, record maximum (or, as appropriate, minimum) potential values for CO2 concentration, CO2 emissions rate, stack gas moisture content, fuel flow rate, heat input, and any other parameter required to determine CO2 mass emissions in accordance with 40 CFR 75.31(b)(2) or (c)(3) and section 2.4 of Appendix D of 40 CFR Part 75, as applicable. [N.J.A.C. 7:27C- 8.1(e)]	Submit a report: As per the approved schedule. The owner or operator shall, for each monitoring system, report maximum (or, as appropriate, minimum) potential values for CO2 concentration, CO2 emissions rate, stack gas moisture content, fuel flow rate, heat input, and any other parameter required to determine CO2 mass emissions in accordance with 40 CFR 75.31(b)(2) or (c)(3) and section 2.4 of Appendix D of 40 CFR Part 75, as applicable. [N.J.A.C. 7:27C-8.1(e)]
9	No owner or operator of a CO2 budget unit shall use any alternative monitoring system, alternative reference method, or any other alternative for the required continuous emissions monitoring system without having obtained prior written approval in accordance with N.J.A.C. 7:27C-8.6. [N.J.A.C. 7:27C-8.1(j)1]	None.	None.	Obtain approval: Upon occurrence of event. The CO2 authorized account representative of a CO2 budget unit may submit a petition to the Administrator under 40 CFR 75.66, and to the Department requesting approval to apply an alternative to any requirement of 40 CFR Part 75 or to a requirement concerning any additional CEMS required under the common stack provisions of 40 CFR 75.72 or a CO2 concentration CEMS used under 40 CFR 75.71(a)(2). [N.J.A.C. 7:27C-8.6]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	CO2: The owner or operator of a CO2 budget unit shall comply with the initial certification and recertification procedures set forth at N.J.A.C. 7:27C-8.2(d) through (r) for a continuous emissions monitoring system and an excepted monitoring system under Appendix D of 40 CFR Part 75, except as provided in N.J.A.C. 7:27C-8.2(a). The owner or operator of a CO2 budget unit that qualifies to use the low mass emissions excepted monitoring methodology in 40 CFR 75.19 or that qualifies to use an alternative monitoring system under Subpart E of 40 CFR Part 75 shall comply with the initial certification and recertification procedures set forth at N.J.A.C. 7:27C-8.2(q) or (r), respectively. [N.J.A.C. 7:27C- 8.2(c)]	None.	None.	Submit notification: Upon occurrence of event. The CO2 authorized account representative shall submit to the Department, EPA Region 2 office and the Administrator a written notice of the dates of certification in accordance with N.J.A.C. 7:27C-8.4. [N.J.A.C. 7:27C-8.2(h)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
11	CO2: . The owner or operator shall recertify a monitoring system in accordance in 40 CFR 75.20(b) whenever the owner or operator makes the replacement, modification, or changes described in N.J.A.C. 7:27C-8.2(f). [N.J.A.C. 7:27C-8.2(f)] A provisionally certified monitor may be used under the CO2 Budget Trading Program for a period not to exceed 120 days after the Department receives the complete certification application for the monitoring system, or component thereof, under N.J.A.C.7:27C-8.2(h). [N.J.A.C. 7:27C-8.2(j)] Whenever any monitoring system fails to meet the quality assurance and quality control requirements or data validation requirements of 40 CFR Part 75, data shall be substituted using the applicable procedures in Subpart D or Appendix C, of 40 CFR Part 75. [N.J.A.C. 7:27C- 8.3(a)]	Other: The owner or operator of a CO2 budget unit shall submit a monitoring plan in the manner prescribed in 40 CFR 75.62, either electronically or hardcopy. If electronic, no later than 21 days prior to the initial certification tests; at the time of each certification or recertification application submission; and (prior to or concurrent with) the submittal of the electronic quarterly report for a reporting quarter where an update of the electronic monitoring plan information is required. If hardcopy, no later than 21 days prior to the initial certification test; with any certification or recertification application, if a hardcopy monitoring plan change is associated with the certification or recertification event; and within 30 days of any other event with which a hardcopy monitoring plan change is associated, pursuant to 40 CFR 75.53(b). Electronic submittal of all monitoring plan information, including hardcopy portions, is permissible provided that a paper copy of the hardcopy portions can be furnished upon request.[N.J.A.C. 7:27C- 8.5(b)].	None.	Submit documentation of compliance: As per the approved schedule. The CO2 authorized account representative shall submit a certification or recertification application to the Department for each monitoring system within 45 days after completing all CO2 monitoring system initial certification or recertification tests required under N.J.A.C. 7:27C-8.2 including the information required under 40 CFR 75.53(g) and (h) and 75.63. . [N.J.A.C. 7:27C- 8.2(e)]
12	The CO2 authorized account representative of a CO2 budget unit that co-fires eligible biomass as a compliance mechanism under N.J.A.C. 7:27C shall report the information as provided in N.J.A.C. 7:27C-8.7 to the Department for each calendar quarter. [N.J.A.C. 7:27C- 8.7(a)]	None.	None.	Submit a report: Every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1). [N.J.A.C. 7:27C-8.7]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	Net electric output and net thermal output. [N.J.A.C. 7:27C- 8.8(a)]	Other: The output monitoring plan shall include: - a diagram of the electrical and/or steam system, - a description of each output monitoring system, - a detailed description of all quality assurance and quality control activities, and - documentation supporting any output value(s) to be used as a missing data value should there be periods of invalid output data. [N.J.A.C. 7:27C-8.8(g)] Ongoing quality assurance and quality control (QA/QC) activities shall be performed in order to maintain the output system in accordance with N.J.A.C. 7:27C-8.8(i).[N.J.A.C. 7:27C- 8.8].	Other: The owner or operator of a CO2 budget source shall retain data used to monitor, determine, or calculate net electrical output and net thermal output for 10 years.[N.J.A.C. 7:27C-8.8(j)].	Submit a report: Annually. The CO2 authorized account representative shall submit annual output reports electronically to the Department, pursuant to N.J.A.C. 7:27C-8.8(b) through (j), by the March 1 following the immediately preceding calendar year. These reports shall also be submitted, upon Department request, in hardcopy. The annual output report shall include unit level megawatt-hours and all useful steam output; and shall include a certification from the CO2 authorized account representative pursuant to N.J.A.C. 7:27C-8.8(k). [N.J.A.C. 7:27C-8.8(a)] and. [N.J.A.C. 7:27C- 8.8(k)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **GR11 N.J.A.C. 7:27F (PACT Requirements for CC Turbines in U1)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	CO2 <= 1,700 lb/MW-hr. From June 1, 2024 thru May 31, 2027, any existing electrical generating unit (EGU) with a nameplate capacity equal to or greater than 25 MWe shall emit no more than 1,700 pounds of CO2 per MWh gross energy output. Compliance is demonstrated when the CO2 emission rate, determined using procedures in 40 CFR 60.5540(a)(1) through (7), for the initial and each subsequent 12-operating-month rolling average compliance period, is less than or equal to the applicable CO2 emission standard (above). [N.J.A.C. 7:27F-2.5(d)1]	CO2: Monitored by calculations each month during operation, based on a 12-operating-month rolling average. The owner or operator shall use the compliance demonstration procedures at 40 CFR 60.5540 that pertain to EGUs with an output -based emission limit for CO2 by using the procedures in 40 CFR 60.5540(a)(1) through (7) to calculate the CO2 mass emissions. The hourly CO2 mass emissions must be calculated from the fuel use, according to 60.5535(c)(1) through (3) and the generating load must be measured in accordance with 60.5535(d). The calculations shall only be performed for "valid operating hours", as defined in 40 CFR 60.5540(a)(1). [N.J.A.C. 7:27F-2.6(c)]	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator must comply with the recordkeeping requirements at 40 CFR 60.5560 that pertain to EGUs with an output -based emission limit for CO2 by maintaining records of the information used to demonstrate compliance as specified in 40 CFR 60.7(b) and (f) and 40 CFR 60.5560, in a form suitable and readily available for expeditious review. [N.J.A.C. 7:27F-2.6(d)]	None.
2	CO2 <= 1,300 lb/MW-hr. From June 1, 2027 thru May 31, 2035, any existing electrical generating unit (EGU) with a nameplate capacity equal to or greater than 25 MWe shall emit no more than 1,300 pounds of CO2 per MWh gross energy output. Compliance is demonstrated when the CO2 emission rate, determined using procedures in 40 CFR 60.5540(a)(1) through (7), for the initial and each subsequent 12-operating-month rolling average compliance period, is less than or equal to the applicable CO2 emission standard (above). [N.J.A.C. 7:27F-2.5(d)2]	CO2: Monitored by calculations each month during operation, based on a 12-operating-month rolling average. The owner or operator shall use the compliance demonstration procedures at 40 CFR 60.5540 that pertain to EGUs with an output -based emission limit for CO2 by using the procedures in 40 CFR 60.5540(a)(1) through (7) to calculate the CO2 mass emissions. The hourly CO2 mass emissions must be calculated from the fuel use, according to 60.5535(c)(1) through (3) and the generating load must be measured in accordance with 60.5535(d). The calculations shall only be performed for "valid operating hours", as defined in 40 CFR 60.5540(a)(1). [N.J.A.C. 7:27F-2.6(c)]	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator must comply with the recordkeeping requirements at 40 CFR 60.5560 that pertain to EGUs with an output -based emission limit for CO2 by maintaining records of the information used to demonstrate compliance as specified in 40 CFR 60.7(b) and (f) and 40 CFR 60.5560, in a form suitable and readily available for expeditious review. [N.J.A.C. 7:27F-2.6(d)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	CO2 <= 1,000 lb/MW-hr. On and after June 1, 2035, any existing electrical generating unit (EGU) with a nameplate capacity equal to or greater than 25 MWe shall emit no more than 1,000 pounds of CO2 per MWh gross energy output. Compliance is demonstrated when the CO2 emission rate, determined using procedures in 40 CFR 60.5540(a)(1) through (7), for the initial and each subsequent 12-operating-month rolling average compliance period, is less than or equal to the applicable CO2 emission standard (above). [N.J.A.C. 7:27F-2.5(d)3]	CO2: Monitored by calculations each month during operation, based on a 12-operating-month rolling average. The owner or operator shall use the compliance demonstration procedures at 40 CFR 60.5540 that pertain to EGUs with an output -based emission limit for CO2 by using the procedures in 40 CFR 60.5540(a)(1) through (7) to calculate the CO2 mass emissions. The hourly CO2 mass emissions must be calculated from the fuel use, according to 60.5535(c)(1) through (3) and the generating load must be measured in accordance with 60.5535(d). The calculations shall only be performed for "valid operating hours", as defined in 40 CFR 60.5540(a)(1). [N.J.A.C. 7:27F-2.6(c)]	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator must comply with the recordkeeping requirements at 40 CFR 60.5560 that pertain to EGUs with an output -based emission limit for CO2 by maintaining records of the information used to demonstrate compliance as specified in 40 CFR 60.7(b) and (f) and 40 CFR 60.5560, in a form suitable and readily available for expeditious review. [N.J.A.C. 7:27F-2.6(d)]	None.
4	CO2 Mass Emissions: The owner or operator shall use the compliance demonstration procedures at 40 CFR 60.5540 that pertain to EGUs with an output -based emission limit for CO2. Calculations of the hourly CO2 (tons/h) and EGU operating times must be done in accordance with 40 CFR 60.5535(c)(1) through (3). Pursuant to 40 CFR 60.5535(c), the owner or operator must implement the applicable procedures in appendix D to 40 CFR 75 to determine hourly EGU heat input rates (MMBtu/h), based on hourly measurements of fuel flow rate and periodic determinations of the gross calorific value (GCV) of each fuel combusted. For each measured hourly heat input rate, use equation G-4 in appendix G to 40 CFR 75 to calculate the hourly CO2 mass emission rate (tons/h). [N.J.A.C. 7:27F-2.6(c)]	Monitored by fuel flow/firing rate instrument continuously, based on a 1 hour block average. [N.J.A.C. 7:27F-2.6(c)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. The owner or operator must comply with the recordkeeping requirements at 40 CFR 60.5560 that pertain to EGUs with an output - based emission limit for CO2. The hourly CO2 (tons/h) and EGU (or stack) operating times used to calculate CO2 mass emissions are required to be recorded under 40 CFR 75.57(e). These data must be used to calculate the hourly CO2 mass emissions. [N.J.A.C. 7:27F-2.6(d)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	Electrical Output: The owner or operator shall use the compliance demonstration procedures at 40 CFR 60.5540 that pertain to EGUs with an output - based emission limit for CO2. Pursuant to 40 CFR 60.5535 (d), the owner or operator must install, calibrate, maintain, and operate a sufficient number of watt meters to continuously measure and record the hourly gross electric output. These measurements must be performed using 0.2 class electricity metering instrumentation and calibration procedures as specified under ANSI Standards No. C12.20. [N.J.A.C. 7:27F-2.6(c)]	Other: Monitored by watt meter continuously (See Applicable Requirement). Consistent with 40 CFR 60.5535(e) and 40 CFR 60.5520, if two or more affected EGUs serve a common electric generator, the owner or operator must apportion the combined hourly gross or net energy output to the individual affected EGUs according to the fraction of the total steam load contributed by each EGU. Alternatively, if the EGUs are identical, the owner or operator may apportion the combined hourly gross or net electric load to the individual EGUs according to the fraction of the total heat input contributed by each EGU.[N.J.A.C. 7:27F-2.6(c)].	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. The owner or operator must comply with the recordkeeping requirements at 40 CFR 60.5560 that pertain to EGUs with an output -based emission limit for CO2 by maintaining records of the information used to demonstrate compliance as specified in 40 CFR 60.7(b) and (f) and 40 CFR 60.5560, in a form suitable and readily available for expeditious review. [N.J.A.C. 7:27F-2.6(d)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Subject Item: **CD101 Selective Catalytic Reduction for Turbine 1, CD201 Selective Catalytic Reduction for Turbine 2**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The Selective Catalytic Reduction system shall be used to reduce Nitrogen Oxides (NOx) resulting from combustion in the turbine, at the recommended manufacturer's operating flue gas flowrate range, such that NOx (Total) emissions as established for the turbines in this permit are met. The minimum NOx control efficiency shall be 90% (design value). [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by documentation of construction.[N.J.A.C. 7:27-22.16(o)].	Other: The permittee shall maintain SCR system manufacturer's documentation, as built performance guarantee, specifications, operation and maintenance manual on-site.[N.J.A.C. 7:27-22.16(o)].	None.
2	The SCR shall be operated and reagent shall be injected at all times that the turbine is operating, except during periods of start-up and shutdown, as defined in this permit. [N.J.A.C. 7:27-22.16(a)]	Monitored by hour/time monitor continuously. The permittee shall continuously monitor the time and duration of any operation of the combustion turbine and the SCR system. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. The permittee shall continuously record the time and duration of any operation of the combustion turbine and the SCR system. [N.J.A.C. 7:27-22.16(o)]	None.
3	Temperature upstream of SCR >= 400 degrees Fahrenheit, except during startups or shutdowns, as defined in this permit. [N.J.A.C. 7:27-22.16(a)]	Monitored by temperature instrument continuously, based on a 1 hour block average. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
4	The SCR catalyst shall be maintained and replaced in accordance with the recommendations and schedules of the manufacturer, based on NOx emission levels indicated through CEMS and stack testing. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by documentation of maintenance and catalyst replacement upon occurence of event.[N.J.A.C. 7:27-22.16(o)].	Other: Record keeping by mannual logging of parameter or storing data in computer system. The permittee shall maintain the catalyst maintenance and replacement records on-site.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Subject Item: **CD102 CO Oxidation Catalyst for Turbine 1, CD202 CO Oxidation Catalyst for Turbine 2**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	The Catalytic Oxidizers shall be used to destroy carbon monoxide (CO) and volatile organic compounds (VOC) resulting from the combustion of fuel in the turbine at the recommended manufacturer's operating flue gas flowrate range such that CO and VOC (total) emission limits, as established in this permit, are met. The minimum CO destruction efficiency shall be 90% (design value) except during startup or shutdown, as defined in this permit. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by document of construction.[N.J.A.C. 7:27-22.16(o)].	Other: The permittee shall maintain Catalytic Oxidizer system manufacturer's documentation, as built performance guarantee, specifications, and operation & maintenance manual (O&M) on-site.[N.J.A.C. 7:27-22.16(o)].	None.
2	The Catalytic Oxidizers shall be in place at all times that the turbine is operating except during start-up and shutdown, as defined in this permit. [N.J.A.C. 7:27-22.16(a)]	Other: Ensure that the Catalytic Oxidizer (catalyst) is in place at all times.[N.J.A.C. 7:27-22.16(o)].	None.	None.
3	Temperature at Exit of Catalyst >= 350 and Temperature at Exit of Catalyst <= 800 degrees F , except during periods of turbine startup/shutdown, as defined in this permit. Applicable to the Catalytic Oxidizers. [N.J.A.C. 7:27-22.16(a)]	Temperature at Exit of Catalyst: Monitored by temperature instrument continuously, based on a 1 hour block average. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Temperature at Exit of Catalyst: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
4	The Catalytic Oxidizer array(s) shall be maintained and replaced in accordance with the recommendations and schedules of the manufacturer, based on usage rate and CO emission levels, indicated through CEMS and stack testing. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by documentation of maintenance and catalyst replacement upon occurence of event.[N.J.A.C. 7:27-22.16(o)].	Other: Record keeping by mannual logging of parameter or storing data in computer system. The permittee shall maintain the catalyst maintenance and replacement records on-site.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Summary of Applicable Federal Regulations: 40 CFR 52 PSD 40 CFR 60 Subpart A (Turbines) 40 CFR 60 Subpart KKKK (Turbines) 40 CFR 72 - Phase II Acid Rain 40 CFR 97 - CSAPR [None]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	RENEWAL STACK TESTING SUMMARY: The permittee shall conduct a stack test at least 18 months prior to the expiration of the inital or renewed operating permit using an approved protocol to demonstrate compliance with emission limits for NOx, CO, VOC, SO2, TSP, PM-10 and PM-2.5 as specified in the compliance plan for OS1, OS2, OS3 and OS4. The permittee shall provide EMS with the turbine load performance curve with the protocol. The duct burner shall be in operation during stack testing of OS3 and OS4. Testing must be conducted at worst-case permitted operating conditions with regard to meeting the applicable emission standards, but without creating an unsafe condition. The permittee may propose, in the stack test protocol, to use CEMS data to satisfy the stack testing requirements, for NOx and/or CO, with EMS approval. In order for EMS to approve using CEMS data at the time of the stack test, the CEMS must be certified and be in compliance with all daily, quarterly and annual quality assurance requirements. The CEMS shall monitor and record emissions in units identical to those required by the applicable stack testing conditions of this permit. CEMS data, if allowed by this permit, shall be taken at the same worst case conditions as described above. [N.J.A.C. 7:27-22.16(a)]	Other: Monitoring as required under the applicable operating scenario(s). PERMITTEES OPERATING AFTER EXPIRATION DATE OF THE OPERATING PERMIT SHALL FOLLOW THE STACK TESTING SCHEDULE SPECIFIED IN THE REF.# LINE ITEM BELOW. In accordance with N.J.A.C 7:27-19.15(a)2, any NOx testing conducted pursuant to this section shall be conducted concurrently with CO testing. The applicable NOx emission limits in N.J.A.C 7:27-19 will not be considered to have been met unless the concurrent CO testing demonstrates compliance with the CO limit in N.J.A.C 7:27-16.9 or any other permit limit for CO, whichever is more stringent, is also met.[N.J.A.C. 7:27-22.16(o)].	Other: Recordkeeping as required under the applicable operating scenario(s).[N.J.A.C. 7:27-22.16(o)].	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. Submit a stack test protocol to the Emission Measurement Section (EMS) at Mail Code: 09-01, PO Box 420, Trenton, NJ 08625 at least 30 months prior to the expiration of the approved operating permit. The protocol and test report must be prepared and submitted on a CD using the Electronic Reporting Tool (ERT), unless another format is approved by EMS. The ERT program can be downloaded at: http://www.epa.gov/ttnchie1/ert. Within 30 days of protocol approval or no less than 60 days prior to the testing deadline, whichever is later, the permittee must contact EMS at 609-984-3443 to schedule a mutually acceptable test date. A full stack test report must be submitted to EMS and a certified summary test report must be submitted to the Regional Enforcement Office within 45 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. [N.J.A.C. 7:27-22.18(e)] and. [N.J.A.C. 7:27-22.18(h)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	STACK TESTING SCHEDULE FOR EXPIRED PERMIT: The permittee shall conduct a stack test no later than 42 months after the date of expiration of the operating permit using an approved protocol to demonstrate compliance with emission limits for for NOx, CO, VOC, SO2, TSP, PM-10 and PM-2.5 as specified in the compliance plan for OS1, OS2, OS3 and OS4. The permittee shall provide EMS with the turbine load performance curve with the protocol. The duct burner shall be in operation during stack testing of OS3 and OS4. Testing must be conducted at worst-case permitted operating conditions with regard to meeting the applicable emission standards, but without creating an unsafe condition. The permittee may propose, in the stack test protocol, to use CEMS data to satisfy the stack testing requirements, for NOx and/or CO, with EMS approval. In order for EMS to approve using CEMS data at the time of the stack test, the CEMS must be certified and be in compliance with all daily, quarterly and annual quality assurance requirements. The CEMS shall monitor and record emissions in units identical to those required by the applicable stack testing conditions of this permit. CEMS data, if allowed by this permit, shall be taken at the same worst case conditions as described above. [N.J.A.C. 7:27-22.16(a)]	Other: Monitoring as required under the applicable operating scenario(s). [N.J.A.C. 7:27-22.16(o)].	Other: Recordkeeping as required under the applicable operating scenario(s). [N.J.A.C. 7:27-22.16(o)].	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. If an operating permit has expired, the permittee shall submit a stack test protocol to the Emission Measurement Section (EMS) at Mail Code: 09-01, PO Box 420, Trenton, NJ 08625 no later than 30 months after the date of expiration of the operating permit. The protocol and test report must be prepared and submitted on a CD using the Electronic Reporting Tool (ERT), unless another format is approved by EMS. The ERT program can be downloaded at: https://www.epa.gov/chief. Within 30 days of protocol approval or no less than 60 days prior to the testing deadline, whichever is later, the permittee must contact EMS at 609-984-3443 to schedule a mutually acceptable test date. A full stack test report must be submitted to EMS and a certified summary test report must be submitted to the Regional Enforcement Office within 45 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. [N.J.A.C. 7:27-22.18(e)] and . [N.J.A.C. 7:27-22.18(h)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	CONTINUOUS EMISSION MONITORING: (NOx, CO) Install and operate Continuous Emission Monitoring System (CEMS) and conduct Performance Specification Test (PST) in accordance with the NJDEP Technical Manual 1005, to demonstrate compliance with emission limits for NOx and CO as specified in the compliance plan for OS Summary, OS1, OS2, OS3, OS4, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12. [N.J.A.C. 7:27-22.16(a)]	Other: Monitoring as required under the applicable operating scenario(s). [N.J.A.C. 7:27-22.16(o)].	Other: Recordkeeping as required under the applicable operating scenario(s). [N.J.A.C. 7:27-22.16(o)].	CEMS/COMS - Submit equipment protocol, submit a PST protocol, conduct PST and submit results: As per the approved schedule . [N.J.A.C. 7:27-22.18(g)]
5	The Permittee shall request approval from the Department's Emission Measurement Section (EMS) to allow continued use of the existing CEMS when a change to the units of measurement is made to a permit limit. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain readily accessible records of the Permittee's written request to EMS, and the response from EMS . [N.J.A.C. 7:27-22.16(o)].	Comply with the requirement: Upon occurrence of event submit a written request to the EMS within 30 days from the date of the approved operating permit to determine whether a full CEMS recertification is required, whether the change can follow the procedures for data recording and storage equipment upgrades found in the Department's Technical Manual 1005 Section IV.B.3(f), or if continued use of the existing CEMS is allowed. [N.J.A.C. 7:27-22]
6	The owner or operator shall develop a QA/QC plan for each CEMS/COMS required by this permit prepared in accordance with the NJDEP Technical Manual 1005 posted on the AQPP webpage at http://www.state.nj.us/dep/aqpp. [N.J.A.C. 7:27-22.16(a)]	Other: The QA/QC coordinator shall be responsible for reviewing the QA/QC plan on an annual basis. [N.J.A.C. 7:27-22.16(o)].	Other: Maintain readily accessible records of the QA/QC plan including QA data and quarterly reports. [N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	CONTINUOUS PROCESS MONITORING: (Ammonia) Install and Operate Continuous Ammonia Monitoring System, in accordance with the NJDEP Technical Manual 1005, to demonstrate compliance with emission limits for Ammonia as specified in the compliance plan for OS Summary, OS1, OS2, OS3 and OS4. [N.J.A.C. 7:27-22.16(a)]	Other: Monitoring as required under the applicable operating scenario(s).[N.J.A.C. 7:27-22.16(o)].	Other: Recordkeeping as required under the applicable operating scenario(s).[N.J.A.C. 7:27-22.16(0)].	Submit an equipment protocol: As per the approved schedule. The Permittee shall submit an equipment protocol to the Department in accordance with the NJDEP Technical Manual 1005 for review and approval. [N.J.A.C. 7:27-22.16(o)]
8	Turbines: The owner or operator of a stationary combustion turbine that has a maximum gross heat input rate of 25 million BTU per hour or more and associated duct burner (if a duct burner is installed) shall ensure that the combustion process is adjusted in accordance with the manufacturer's recommended procedures and maintenance schedules for those sources. [N.J.A.C 7:27-22.16(g)], [N.J.A.C. 7:27-19.16(g)], [N.J.A.C. 7:27-16.9(f)] and [N.J.A.C. 7:27-19.5(e)]	Other: Monitored by continuous emission monitoring (CEMS) or by periodic emission monitoring upon performing combustion adjustment. If not using a certified CEMS, monitoring shall be performed in accordance with the specific procedures for combustion adjustment monitoring specified in NJDEP Technical Manual 1005. [N.J.A.C. 7:27-19.16(g)].	Recordkeeping by data acquisition system (DAS) / electronic data storage upon performing combustion adjustment or by manual logging of parameter or storing data in a computer data system. The permittee shall record the following information for each adjustment in a log book or computer data system: 1. The date and times the adjustment began and ended; 2. The name, title, and affiliation of the person who performed the procedure and adjustment; 3. The type of procedure and maintenance performed; 4. The concentration of NOx, CO, and O2 measured before and after the adjustment was made; and 5. The type and amount of fuel use over the 12 months prior to the adjustment. The records shall be kept for a minimum of 5 years and be readily accessible to the Department upon request. . [N.J.A.C. 7:27-19.16(h)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	Turbines: An exceedance of an emission limit that occurs during an adjustment of the combustion process under N.J.A.C. 7:27-19.16(g) is not a violation of this subchapter if it occurs as a result of the adjustment. After the combustion adjustment has been completed, the maximum emission rate of any contaminant shall not exceed the maximum allowable emission rate applicable under this subchapter or under an operating permit issued pursuant to N.J.A.C. 7:27-22 or an applicable certificate issued pursuant to N.J.A.C. 7:27-8. [N.J.A.C. 7:27-19.16(f)]	None.	None.	None.
10	Sulfur Content in Fuel <= 0.0042 gr/dscf in natural gas. [N.J.A.C. 7:27-22.16(a)]	Sulfur Content in Fuel: Monitored by fuel sampling (e.g. gas) each month during operation, based on a consecutive 12 month period (rolling 1 month basis). Fuel sampling and analysis may be done either by the permittee or by the natural gas supplier. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by certified lab analysis results each month during operation. Maintain monthly certified lab analysis results and make them accessible to the Department upon request. [N.J.A.C. 7:27-22.16(o)]	None.
11	Natural Gas Usage <= 39,411 MMft^3 per 365 consecutive day period, rolling one day basis. This fuel limit applies to the combined operation of (2) combustion turbines and (2) duct burners. Based on operation, at maximum permitted heat input, of each turbine and each duct burner for the maximum permitted hr/yr. [N.J.A.C. 7:27-22.16(a)]	Natural Gas Usage: Monitored by fuel flow/firing rate instrument continuously, based on a consecutive 365 day period (rolling 1 day basis). The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Natural Gas Usage: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
12	Hours of Operation While Firing Natural Gas <= 8,500 hr/yr (for each turbine). [N.J.A.C. 7:27-22.16(a)]	Hours of Operation While Firing Natural Gas: Monitored by hour/time monitor continuously, based on a consecutive 12 month period (rolling 1 month basis). The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation While Firing Natural Gas: Recordkeeping by manual logging of parameter or storing data in a computer data system daily. [N.J.A.C. 7:27-22.16(o)]	None.
13	Hours of Operation While Firing Natural Gas <= 1,800 hr/yr (for each duct burner). [N.J.A.C. 7:27-22.16(a)]	Hours of Operation While Firing Natural Gas: Monitored by hour/time monitor continuously, based on a consecutive 12 month period (rolling 1 month basis). The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation While Firing Natural Gas: Recordkeeping by manual logging of parameter or storing data in a computer data system daily. [N.J.A.C. 7:27-22.16(o)]	None.
14	The permittee shall operate and maintain Dry Low NOx Burners, as per manufacturer's requirements, at all times, including periods of start-up and shut down, as defined in this permit. [N.J.A.C. 7:27-22.16(a)]	Other: Ensure that the Dry Low NOx Burner is operated and maintained in accordance with the manufacturer's requirements at all times.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The permittee shall record all maintenance performed on the Dry Low NOx Burner. Records shall include: 1. The date and time that the maintenance was performed. 2. The name, title and affiliation of the person who performed the maintenance. 3. The type of procedure and maintenance performed. The permittee shall maintain Dry Low NOx Burner manufacturer's specifications, and operation and maintenance manual (OM&M) on-site. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
15	NOx (Total) <= 137 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.2(a)] and. [40 CFR 52.21]	NOx (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: NOx tons/month = [(Total NOx emitted during the month by two combustion turbines / duct burners operating simultaneously (tons / month) measured by CEMs system)] + [(Total NOx emitted during the month by two combustion turbines operating without duct burner (tons / month) measured by CEMs system)]. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
16	CO <= 481 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: Co tons/month = [(Total CO emitted during the month by two combustion turbines / duct burners operating simultaneously (tons / month) measured by CEMs system)] + [(Total CO emitted during the month by two combustion turbines operating without duct burner (tons / month) measured by CEMs system)]. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
17	VOC (Total) <= 34.6 tons/yr. This limit includes Formaldehyde emissions. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.2(a)]	VOC (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated, for each turbine/duct burner separately, as follows: VOC tons/month = {{(1020 MMBtu/MMscf) x [(X1 lbs/MMBtu x Y1 MMscf/month) + (X2 lbs/MMBtu x Y2 MMscf/month)]} + [(42.4 lb/hr x ZC hr/month) + (25.3 lb/hr x ZW hr/month) + (27.1 lb/hr x ZH hr/month) + (14 lb/hr x ZSD hr/month)]} / 2000 lbs/ton (See Recordkeeping Requirement for definition of variables). [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. Definition of variables in VOC compliance equation (see Monitoring Requirement) X1 = the average lb/MMBtu emission rate, for each turbine with duct burner on, determined by the most recent stack test X2 = the average lb/MMBtu emission rate, for each turbine with duct burner off, determined by the most recent stack test (X1 and X2 shall be the average of all valid stack test runs) Y1 = the monthly MMscf of gas consumed by the turbine with duct burner on Y2 = the monthly MMscf of gas consumed by the turbine with duct burner off (Y1 and Y2 shall not include fuel consumption during start-up and shut down) ZC = the total hours, during the month, that the turbine operated in cold start-up mode ZW = the total hours, during the month, that the turbine operated in warm start-up mode ZH = the total hours, during the month, that the turbine operated in hot start-up mode ZSD = the total hours, during the month, that the turbine operated in shut down mode (All variables shall be determined separately for each piece of equipment) . [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
18	SO2 <= 19.7 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. *Based on the maximum rolling 12 month average value of sulfur content in Transco's natural gas measured during 2010 - 2011monthly samples (0.3775 grains/100dscf). [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated, for each turbine/duct burner separately, as follows: SO2 tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] / 2000 lbs/ton Where: X1 = the lb/MMBtu emission rate, for each turbine with duct burner on, based on the most recent monthly natural gas sulfur test X2 = the lb/MMBtu emission rate, for each turbine with duct burner off, based on the most recent monthly natural gas sulfur test Y1 = the monthly MMscf of gas consumed by the turbine with duct burner on Y2 = the monthly MMscf of gas consumed by the turbine with duct burner off (Y1and Y2 shall include fuel consumption during start-up and shut down) (X1, X2, Y1 and Y2 shall be determined for each turbine separately). [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	TSP <= 57.3 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated, for each turbine/duct burner separately, as follows: TSP tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] / 2000 lbs/ton Where: X1 = the average lb/MMBtu emission rate, for each turbine with duct burner on, determined by the most recent stack test X2 = the average lb/MMBtu emission rate, for each turbine with duct burner off, determined by the most recent stack test (X1 and X2 shall be the average of all valid stack test runs) Y1 = the monthly MMscf of gas consumed by the turbine with duct burner on Y2 = the monthly MMscf of gas consumed by the turbine with duct burner off (Y1 and Y2 shall include fuel consumption during start-up and shut down) (X1, X2, Y1 and Y2 shall be determined for each turbine separately). [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
20	PM-10 (Total) <= 95.4 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated, for each turbine/duct burner separately, as follows: PM-10 tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] / 2000 lbs/ton Where: X1 = the average lb/MMBtu emission rate, for each turbine with duct burner on, determined by the most recent stack test X2 = the average lb/MMBtu emission rate, for each turbine with duct burner off, determined by the most recent stack test (X1 and X2 shall be the average of all valid stack test runs) Y1 = the monthly MMscf of gas consumed by the turbine with duct burner on Y2 = the monthly MMscf of gas consumed by the turbine with duct burner off (Y1 and Y2 shall include fuel consumption during start-up and shut down) (X1, X2, Y1 and Y2 shall be determined for each turbine separately). [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
21	PM-2.5 (Total) <= 95.4 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated, for each turbine/duct burner separately, as follows: PM-2.5 tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] / 2000 lbs/ton Where: X1 = the average lb/MMBtu emission rate, for each turbine with duct burner on, determined by the most recent stack test X2 = the average lb/MMBtu emission rate, for each turbine with duct burner off, determined by the most recent stack test (X1 and X2 shall be the average of all valid stack test runs) Y1 = the monthly MMscf of gas consumed by the turbine with duct burner on Y2 = the monthly MMscf of gas consumed by the turbine with duct burner off (Y1 and Y2 shall include fuel consumption during start-up and shut down) (X1, X2, Y1 and Y2 shall be determined for each turbine separately). [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
22	Ammonia <= 119 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Ammonia: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: Ammonia tons/month = [(Total Ammonia emitted during the month by two combustion turbines / duct burners operating simultaneously (tons / month) measured by continuous process monitoring system)] + [(Total Ammonia emitted during the month by two combustion turbines operating without duct burner (tons / month) measured by continuous process monitoring system)]. [N.J.A.C. 7:27-22.16(o)]	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
23	SO3 and H2SO4, as converted and expressed as H2SO4 <= 10.5 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	SO3 and H2SO4, as converted and expressed as H2SO4: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: Sulfuric Acid tons/month = (0.0006 lb/MMBtu x 1020 MMBtu/MMScf x (CTGas + DBGas) MMScf/month / 2000 lbs/ton) Where: CTGas = total MMScf of gas consumed by the combustion turbines (CT) during the month, including fuel consumed during start-up and shut down. DBGas = total MMScf of gas consumed by the duct burners (DB) during the month. Sulfuric Acid emission factor of 0.0006 lb/MMBtu. [N.J.A.C. 7:27-22.16(o)]	SO3 and H2SO4, as converted and expressed as H2SO4: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
24	CO2 <= 2,137.306 thousand tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. Based on the following: CO2 Emission Factor: (40 CFR 75, Equation G-4) Heat Input values: Based on manufacturer's data. Maximum permitted hours of natural gas combustion for each turbine and each duct burner [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO2: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: CO2 tons/month = (119 lb/MMBtu x 1020 MMBtu/MMScf x (CTGas + DBGas) MMScf/month / 2000 lbs/ton) Where: CTGas = total MMScf of gas consumed by the combustion turbines (CT) during the month, including fuel consumed during start-up and shut down. DBGas = total MMScf of gas consumed by the duct burners (DB) during the month. CO2 emission factor of 119 lb/MMBtu (from 40 CFR 75, equation G-4). [N.J.A.C. 7:27-22.16(o)]	CO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
25	Methane <= 153 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. Based on the following: CH4 Emission Factor: Turbine: (AP-42, Table 3.1-2a) Duct Burner: (AP-42, Table 1.4-2) Heat Input values: Based on manufacturer's data. Maximum permitted hours of natural gas combustion for each turbine and each duct burner. [N.J.A.C. 7:27-22.16(a)]	Methane: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: Methane tons/month = [(18.3 lbs/hr turbine/db emission rate) x (total hours of operation during the month for two combustion turbines / duct burners operating simultaneously) / (2000 lb/ton)] + [(17.9 lbs/hr turbine emission rate) x (total hours of operation during the month for two combustion turbines without duct burners) / (2000 lb/ton)]. [N.J.A.C. 7:27-22.16(o)]	Methane: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
26	HAPs (Total) <= 4.99 tons/yr. Based on the sum of individual HAP emissions. [N.J.A.C. 7:27-22.16(a)]	HAPs (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Total HAPs tons/month = Sum of the Total HAPs tons/month for each individual HAP. [N.J.A.C. 7:27-22.16(o)]	HAPs (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-21.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
27	Acrolein <= 0.0582 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Acrolein: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Acrolein tons/month = [[[(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf/month) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf/month)] x (1- CE)] + (0.0105 lb/hr x Z1 hr/month) + (0.0224 lb/hr x Z2 hr/month) + (0.0540 lb/hr x Z3 hr/month)] Where: X1 = the lb/MMBtu emission rate (from AP-42) for Turbines. X2 = the lb/MMBtu emission rate (from AP-42) for Duct Burners. Y1 = the monthly MMscf of gas consumed by the Turbines, excluding consumption during start-up but including consumption during shut down. Y2 = the monthly MMscf of gas consumed by the Duct Burners. CE = Control Eficiency of CO Catalyst = 50 Z1 = total monthly hours of "Hot Startup" operation. Z2 = total monthly hours of "Warm Startup" operation. Z3 = total monthly hours of "Cold Startup" operation. [N.J.A.C. 7:27-22.16(o)]	Acrolein: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
28	Benzene <= 0.233 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Benzene: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Benzene tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] Where: X1 = the lb/MMBtu emission rate (from AP-42) for Turbines. X2 = the lb/MMBtu emission rate (from AP-42) for Duct Burners. Y1 = the monthly MMscf of gas consumed by the Turbines, including consumption during start-up and shut down. Y2 = the monthly MMscf of gas consumed by the Duct Burners. [N.J.A.C. 7:27-22.16(o)]	Benzene: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
29	Formaldehyde <= 2.15 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Formaldehyde: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Formaldehyde tons/month = [[(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf/month) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf/month)] + (0.395 lb/hr x Z1 hr/month) + (0.840 lb/hr x Z2 hr/month) + (2.02 lb/hr x Z3 hr/month)] Where: X1 = the lb/MMBtu emission rate [(from CARB - CATEF database for natural gas fired turbines with SCR and /or CO catalyst) for Turbines. X2 = the lb/MMBtu emission rate (from AP-42) for Duct Burners. Y1 = the monthly MMscf of gas consumed by the Turbines, excluding consumption during start-up but including consumption during shut down. Y2 = the monthly MMscf of gas consumed by the Duct Burners. Z1 = total monthly hours of "Hot Startup" operation. Z2 = total monthly hours of "Warm Startup" operation. Z3 = total monthly hours of "Cold Startup" operation. [N.J.A.C. 7:27-22.16(o)]	Formaldehyde: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
30	Polycyclic organic matter <= 0.0425 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Polycyclic Organic Matter tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] Where: X1 = the lb/MMBtu emission rate (from AP-42) for Turbines. X2 = the lb/MMBtu emission rate (from AP-42) for Duct Burners. Y1 = the monthly MMscf of gas consumed by the Turbines, including consumption during start-up and shut down. Y2 = the monthly MMscf of gas consumed by the Duct Burners. [N.J.A.C. 7:27-22.16(o)]	Polycyclic organic matter: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
31	Toluene <= 2.51 tons/yr. This emission limit applies to the combined operation of (2) combustion turbines and (2) duct burners. [N.J.A.C. 7:27-22.16(a)]	Toluene: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceeding 11 months; monthly emissions shall be calculated as follows: Toluene tons/month = [(X1 lbs/MMBtu x 1020 MMBtu/MMscf x Y1 MMscf) + (X2 lbs/MMBtu x 1020 MMBtu/MMscf x Y2 MMscf)] Where: X1 = the lb/MMBtu emission rate (from AP-42) for Turbines. X2 = the lb/MMBtu emission rate (from AP-42) for Duct Burners. Y1 = the monthly MMscf of gas consumed by the Turbines, including consumption during start-up and shut down. Y2 = the monthly MMscf of gas consumed by the Duct Burners. [N.J.A.C. 7:27-22.16(o)]	Toluene: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Record monthly and annual emissions. [N.J.A.C. 7:27-22.16(o)]	None.
32	All requests, reports, applications, submittals, and other communications to the Administrator pursuant to Part 60 shall be submitted in duplicate to the Regional Office of US Environmental Protection Agency. Submit information to: Director, Division of Enforcement & Compliance Assistance, US EPA, Region 2, 290 Broadway, New York, NY 10007-1866. [40 CFR 60.4(a)]	None.	None.	Submit a report: As per the approved schedule to EPA Region 2 as required by 40 CFR 60. [40 CFR 60.4(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
33	Copies of all information submitted to EPA pursuant to 40 CFR Part 60, must also be submitted to the appropriate Regional Enforcement Office of NJDEP. [40 CFR 60.4(b)]	None.	None.	Submit a report: As per the approved schedule to the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60. Submit to: Northern Regional Office New Jersey Department of Environmental Protection 7 Ridgedale Avenue Cedar Knolls, NJ 07927 . [40 CFR 60.4(b)]
34	The owner or operator subject to the provisions of 40 CFR Part 60 shall furnish the Administrator written notification or, if acceptable to both the Administrator and the owner or operator of a source, electronic notification, of the date of construction or reconstruction of an affected facility as defined under 40 CFR Part 60 Subpart A. Notification shall be postmarked no later than 30 days after such date. [40 CFR 60.7(a)(1)]	None.	None.	Submit notification: Upon occurrence of event to EPA Region 2 and the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60.7 [40 CFR 60.7(a)(1)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
35	The owner or operator subject to the provisions of 40 CFR Part 60 shall furnish the Administrator written notification or, if acceptable to both the Administrator and the owner or operator of a source, electronic notification, of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change is specifically exempted under an applicable subpart or in section 60.14(e). The notification shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of facility before and after the change and the expected completion date of the change. Notification shall be postmarked within 60 days or as soon as practicable before any change is commenced. The Administrator may request additional relevant information subsequent to this notice. [40 CFR 60.7(a)(4)]	None.	None.	Submit notification: Upon occurrence of event to EPA Region 2 and the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60.7 [40 CFR 60.7(a)(4)]
36	The owner or operator shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility, any malfunction of air pollution control equipment or any periods during which continuous monitoring system or monitoring device is inoperative. [40 CFR 60.7(b)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The records should be kept in a permanent form suitable for inspections. [40 CFR 60.7(b)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): Semi-annually beginning on the 30th day of the 6th month following initial performance tests. The report shall contain the information required in 40 CFR 60.7(b) and be postmarked by the 30th day following the end of each six-month period. The report shall be submitted to the EPA Region 2 Administrator and the appropriate Regional Enforcement Office of NJDEP and be in the format specified at 40 CFR Part 60.7(c) and 40 CFR Part 60.7(d). [40 CFR 60.7(c)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
37	Each owner or operator required to install a continuous monitoring device shall submit an excess emissions and monitoring systems performance report (excess emissions are defined in applicable subparts) and/or a summary report form (see section 60.7(d)) to the Administrator semiannually, except when: more frequent reporting is specifically required by an applicable subpart; or the Administrator, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. All reports shall be postmarked by the 30th day following the end of each six-month period. [40 CFR 60.7(c)]	None.	Other: Written reports of excess emissions shall include the following information: (1) The magnitude of excess emissions computed in accordance with section 60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period and excess emissions. The process operating time during the reporting period. (2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted. (3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments. (4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report. [40 CFR 60.7(c)].	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): Semi-annually beginning on the 30th day of the 6th month following initial performance tests. The report shall be postmarked by the 30th day following the end of each six-month period. The report shall be submitted to the EPA Region 2 Administrator and the appropriate Regional Enforcement Office of NJDEP and be in the format specified at 40 CFR Part 60.7(c) and 40 CFR Part 60.7(d). [40 CFR 60.7(c)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
38	The owner or operator shall maintain a file, suitable for inspection, of all monitoring measurements as indicated in Recordkeeping Requirement column. [40 CFR 60.7(f)]	None.	Other: The file shall include all measurements (including continuous monitoring system, monitoring device, and performance testing measurements), all continuous monitoring system performance evaluations, all continuous monitoring system or monitoring device calibration checks, all adjustments/maintenance performed on these systems or devices, and all other information required by 40 CFR Part 60 recorded in a permanent form suitable for inspection. The file shall be retained for at least two years following the dates of the record, except as prescribed in 40 CFR 60.7(f)(1) through (3). Sources subject to 40 CFR 70, are required to retain records of all required monitoring data and support information for a period of at least 5 years from the date of the monitoring sample, measurement, report, or application, per 40 CFR 70.6(a)(3)(ii)(B). [40 CFR 60.7(f)].	None.
39	Compliance with NSPS standards specified in this permit, other than opacity standards, shall be determined only by performance tests established by 40 CFR 60.8, unless otherwise specified in NSPS. [40 CFR 60.11(a)]	None.	None.	None.
40	The NSPS opacity standard shall apply at all times except during periods of startup, shutdown, malfunctions and as otherwise specified in the applicable standard. [40 CFR 60.11(c)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
41	At all times, including periods of start-up, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operation and maintenance procedures, and inspection of the source. [40 CFR 60.11(d)]	None.	None.	None.
42	No owner or operator subject to NSPS standards in Part 60, shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere. [40 CFR 60.12]	None.	None.	None.
43	All continuous emission monitoring systems and monitoring devices shall be installed and operational prior to conducting performance tests specified under 40 CFR Part 60.8. The owner or operator shall follow manufacturer's written recommendations for installation, operation and calibration of the device. [40 CFR 60.13(b)]	During any performance test required under 40 CFR Part 60.8 or within 30 days thereafter, the owner or operator shall conduct a performance evaluation of the continuous emission monitoring system in accordance with applicable performance specification in Appendix B of 40 CFR Part 60. Monitored by other method (provide description) upon occurrence of event. [40 CFR 60.13(c)]	None.	Within 60 days of completion of the performance test, furnish the Administrator two or, upon request, more copies of the results of the performance evaluation. Submit a report: As per the approved schedule. [40 CFR 60.13(c)(2)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
44	The owner or operator shall perform zero and span adjustments daily for continuous emission monitors and continuous opacity monitors following procedures outlined in 40 CFR Part 60.13(d)1 & 2. [40 CFR 60.13(d)]	None.	Other: Maintain records in accordance with 40 CFR 60.7(f). [40 CFR 60.13(d)].	None.
45	Except for system breakdowns, repairs, calibration checks, and zero and span adjustments, all continuous monitoring systems referenced by 40 CFR 60.13(c) measuring emissions except opacity shall be in continuous operation. They shall complete a minimum of one cycle of operation (sampling, analyzing and data recording) for each successive 15-minute period. [40 CFR 60.13(e)(2)]	Other: See Applicable Requirement. [40 CFR 60.13(e)(2)].	Other: See Applicable Requirement. [40 CFR 60.13(e)(2)].	None.
46	All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions or process parameters from the affected facility are obtained. Procedures for location of continuous monitoring systems contained in the applicable Performance Specifications of Appendix B of 40 CFR Part 60 shall be used. [40 CFR 60.13(f)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
47	The owner or operator of all continuous monitoring systems (other than opacity) shall reduce all data to 1-hour averages for time periods. One-hour period is defined in 40 CFR 60.2 as any 60-minute period commencing on the hour. For a full operating hour, 1-hour averages shall be computed from at least four valid data points, i.e., one data point in each of the 15-minute quadrants of the hour. For a partial operating hour (any clock hour with less than 60 minutes of unit operation), the owner or operator shall follow all the procedures specified at 40 CFR 60.13(h)(2) to compute 1-hour averages. Data recorded during periods of continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages computed under this paragraph. The owners and operators complying with the requirements in 40 CFR 60.7(f)(1) or (2) must include any data recorded during periods of monitor breakdown or malfunction in the data averages. Either arithmetic or integrated averaging of all data may be used to calculate the hourly averages. The data may be recorded in reduced or nonreduced form (e.g., ppm pollutant and percent O2 or ng/J of pollutant). [40 CFR 60.13(h)(2)]	None.	Other: See Applicable Requirement. [40 CFR 60.13(h)].	None.
48	All excess emissions shall be converted into units of the standard using the applicable conversion procedures specified in the applicable subparts. After conversion into units of the standard, the data may be rounded to the same number of significant digits as used in the applicable subpart to specify the emission limit. [40 CFR 60.13(h)(3)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
49	Changes in time periods for submittal of information and postmark deadlines set forth in this subpart, may be made only upon approval by the Administrator and shall follow procedures outlined in 40 CFR Part 60.19. [40 CFR 60.19]	None.	None.	None.
50	NOx (Total) <= 15 ppmvd @ 15% O2 OR NOx (total)<= 0.43 lb/MW-hr of useful output. This limit applies to a turbine that has heat input at peak load greater than 850 MMBtu/hr (HHV) firing natural gas and commenced construction, modification or reconstruction after February 18, 2005. [40 CFR 60.4320(a)]	NOx (Total): Monitored by stack emission testing at the approved frequency, based on the average of three Department validated stack test runs. The owner or operator shall conduct an initial performance test as required in 40 CFR 60.8. The subsequent testing shall only be conducted if choosing to comply with 40 CFR 60.4340(a). Test methods and procedures shall be consistent with the requirements of 40 CFR 60.4400 or, if a NOx diluent CEMS is installed, consistent with 40 CFR 60.4405. The performance test must be done at any load condition within plus or minus 25 percent of 100 percent of peak load. Alternatively, the testing might be performed at the highest achievable load point, if at least 75 percent of peak load cannot be achieved in practice. For turbines with supplemental duct burner NOx measurements shall be taken after the duct burner, which has to be in operation during the performance test. [40 CFR 60.4400]	NOx (Total): Recordkeeping by stack test results at the approved frequency. [40 CFR 60.4460]	Submit a report: As per the approved schedule. The owner or operator shall submit a written report of the results of each performance test before the close of business on the 60th day following the completion of the performance test. [40 CFR 60.4375(b)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
51	NOx (Total) <= 96 ppmvd @ 15% O2 OR NOx (total)<= 4.7 lb/MW-hr of useful output. This limit applies to a turbine that has output greater than 30 MW and whether turbine operating at less than 75 percent of peak load or turbine operating at temperature less than 0 degrees F. [40 CFR 60.4320(a)]	NOx (Total): Monitored by stack emission testing at the approved frequency, based on the average of three Department validated stack test runs. The owner or operator shall conduct an initial performance test as required in 40 CFR 60.8. The subsequent testing shall only be conducted if choosing to comply with 40 CFR 60.4340(a). Test methods and procedures shall be consistent with the requirements of 40 CFR 60.4400 or, if a NOx diluent CEMS is installed, consistent with 40 CFR 60.4405. The performance test must be done at any load condition within plus or minus 25 percent of 100 percent of peak load. Alternatively, the testing might be performed at the highest achievable load point, if at least 75 percent of peak load cannot be achieved in practice. For turbines with supplemental duct burner NOx measurements shall be taken after the duct burner, which has to be in operation during the performance test. [40 CFR 60.4400]	NOx (Total): Recordkeeping by stack test results at the approved frequency. [40 CFR 60.4460]	Submit a report: As per the approved schedule. The owner or operator shall submit a written report of the results of each performance test before the close of business on the 60th day following the completion of the performance test. [40 CFR 60.4375(b)]
52	If there are two or more turbines that are connected to a single generator, each turbine must meet the NOx emission limit for the appropriate size of a turbine. [40 CFR 60.4320(b)]	None.	None.	None.
53	SO2 <= 0.06 lb/MMBTU. No owner or operator shall burn any fuel which contains total potential sulfur emissions in excess of specified limit. If the turbine simultaneously fires multiple fuels, each fuel must meet this requirement. [40 CFR 60.4330(a)(2)]	Other: The permittee shall demonstrate that the potential sulfur emissions from each type of fuel do not exceed potential sulfur emissions of 0.060 lb SO2 per MMBtu heat input using sources of information listed in 40 CFR 60.4365(a) or perform representative fuel sampling as described in 60.4365(b). [40 CFR 60.4365].	None.	Submit documentation of compliance: Once initially. The permittee shall furnish the Administrator and NJDEP a written report of the results. The permittee shall demonstrate that the potential sulfur emissions from each type of fuel do not exceed potential sulfur emissions of 0.060 lb SO2 per MMBtu heat input using sources of information listed in 40 CFR 60.4365(a) or perform representative fuel sampling as described in 60.4365(b). [40 CFR 60.8(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
54	The owner or operator shall operate and maintain the subject stationary combustion turbine, air pollution control equipment, and monitoring equipment in a manner consistent with good air pollution control practices for minimizing emissions at all times including during startup, shutdown and malfunction. [40 CFR 60.4333(a)]	None.	None.	None.
55	If the subject turbine is equipped with heat recovery unit and utilizes a common steam header with one or more combustion turbines the permittee shall determine compliance with the applicable NOx emission limits by measuring the emissions combined with the emissions from the other unit(s) utilizing the common heat recovery unit. [40 CFR 60.4333(b)(1)]	None.	None.	None.
56	To demonstrate continuous compliance with NOx limit, the owner or operator of the turbine that does not use water or steam injection may, as alternative to performing annual performance tests as described in 40 CFR 60.4340(a), install, certify, maintain, and operate a continuous emission monitoring system (CEMS) consisting of a NOx monitor and a diluent gas O2 or CO2 monitors to determine the hourly NOx emission rate in ppm or lb/MMBtu as described in 40 CFR 60.4335(b) and 60.4345. [40 CFR 60.4340(b)(1)]	Monitored by continuous emission monitoring system continuously. The continuous emission monitoring system as described in 40 CFR 60.4335(b) shall be consistent with the requirements of 40 CFR 60.4335(b) and 40 CFR 60.4345. [40 CFR 60.4345]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [40 CFR 60.4345]	None.
57	The permittee shall install and certify each NOx diluent CEMS in accordance with Performance Specifications 2 (PS2) as described in appendix B to 40 CFR 60. The 7 day calibration drift should be based on unit operating days, not calendar days. Upon the Bureau of Technical Services of NJDEP approval, Procedure 1 in appendix F to 40 CFR 60 is not required. The relative accuracy test audit (RATA) shall be performed on a lb/MMBtu basis. [40 CFR 60.4345(a)]	Monitored by continuous emission monitoring system continuously. During each full unit operating hour, both the NOx monitor and the diluent monitor must complete a minimum of one cycle of operation (Sampling, analyzing, and data recording) for each 15-minute quadrant of the hour, to validate the hour, as specified in 40 CFR 60.13(e)(2). The permittee shall follow procedure described in 40 CFR 60.4345(b) for partial unit operating hours. [40 CFR 60.4345(b)]	Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. The permittee shall develop and keep on-site a quality assurance (QA) plan for all of the continuous monitoring equipment. For NOx CEMS and fuel flow meters, the QA program and plan described in section 1 of appendix B to 40 CFR 75 may, with state approval, satisfy this requirement. [40 CFR 60.4345(e)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
58	The permittee shall install and certify a NOx diluent CEMS in accordance with appendix A to 40 CFR 75. The relative accuracy test audit (RATA) shall be performed on a lb/MMBtu basis. [40 CFR 60.4345(a)]	Monitored by continuous emission monitoring system continuously. During each full unit operating hour, both the NOx monitor and the diluent monitor must complete a minimum of one cycle of operation (Sampling, analyzing, and data recording) for each 15-minute quadrant of the hour, to validate the hour, as specified in 40 CFR 60.13(e)(2). The permittee shall follow procedure described in 40 CFR 60.4345(b) for partial unit operating hours. [40 CFR 60.4345(b)]	Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. The permittee shall develop and keep on-site a quality assurance (QA) plan for all of the continuous monitoring equipment. For NOx CEMS and fuel flow meters, the QA program and plan described in section 1 of appendix B to 40 CFR 75 may, with state approval, satisfy this requirement. [40 CFR 60.4345(e)]	None.
59	The permittee shall install, calibrate, maintain, and operate each fuel flowmeter in accordance with the manufacturer's instructions or, with NJDEP approval, in accordance with the requirements of appendix D to 40 CFR 75. [40 CFR 60.4345(c)]	Monitored by fuel flow/firing rate instrument continuously. Each fuel flowmeter shall be installed, calibrated, maintained and operated according to the manufacturer's instructions. Alternatively, with the NJDEP approval, fuel flowmeters that meet the installation, certification, and quality assurance requirements of appendix D to 40 CFR 75 are acceptable. [40 CFR 60.4345(c)]	Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. The permittee shall develop and keep on-site a quality assurance (QA) plan for all of the continuous monitoring equipment. For NOx CEMS and fuel flow meters, the QA program and plan described in section 1 of appendix B to 40 CFR 75 may, with state approval, satisfy this requirement. [40 CFR 60.4345(e)]	None.
60	The permittee shall install, calibrate, maintain, and operate each watt meter, steam flow meter, and each pressure or temperature measurement device in accordance with the manufacturer's instructions. [40 CFR 60.4345(d)]	Monitored by other method (provide description) continuously. The gross electrical output of the unit in megawatt-hours shall be monitored by watt meter (or (meters) and shall be installed, calibrated, maintained and operated according to the manufacturer's instructions. [40 CFR 60.4345(d)]	Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. The permittee shall develop and keep on-site a quality assurance (QA) plan for all of the continuous monitoring equipment. [40 CFR 60.4345(e)]	None.
61	The owner or operator may elect not to monitor the total sulfur content of the fuel combusted in the turbine if the fuel is demonstrated not to exceed potential sulfur emissions of 0.060 lb SO2/MMBtu heat input for units located in continental areas. [40 CFR 60.4365]	Other: The required demonstration that the total sulfur content of the fuel does not exceed potential sulfur emissions of 0.060 lb SO2/MMBtu shall be made using a current valid purchase contract, tariff sheet or transportation contract specifying that in continental areas the maximum total sulfur content for oil use is 0.05 weight percent (500 ppmw) and for natural gas use is 20 grains of sulfur or less per 100 standard cubic feet. [40 CFR 60.4365(a)].	Recordkeeping by fuel certification receipts at the approved frequency The owner or operator shall keep copies of valid purchase contracts, tariff sheets or transportation contracts specifying that in continental areas the maximum total sulfur content for oil use is 0.05 weight percent (500 ppmw) and for natural gas use is 20 grains of sulfur or less per 100 standard cubic feet. [40 CFR 60.4365]	Demonstrate compliance: Once initially. The owner or operator shall submit the required determination to the Administrator using the sources of information described in 40 CFR 60.4365(a) showing the maximum total sulfur content for continental areas for oil use at 0.05 weight percent or less and for natural gas at 20 grains of sulfur or less per 100 standard cubic feet or to demonstrate that fuel has potential sulfur emissions of less than 0.060 lb SO2 /MMBtu heat input. [40 CFR 60.4365(a)]

U1 2 Turbines, each with HRSG

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
62	The owner or operator shall submit reports of excess emissions and monitor downtime in accordance with 40 CFR 60.7(c) for Nitrogen oxides. Excess emissions shall be reported for all periods of unit operation, including startup, shutdown and malfunction. An excess emissions as defined in 40 CFR 60.4380(b)1 is any unit operating period in which the 4-hour (for simple cycle turbines) or 30-day rolling average NOx emission rate exceeds the applicable emission limit in 40 CFR 60.4320. A period of monitor downtime is any unit operating hour in which the data for any of the following parameters are either missing or invalid: NOx concentration, CO2 or O2 concentration, fuel flow rate, steam flow rate, steam temperature, steam pressure, or megawatts. The steam flow rate, steam temperature, and steam pressure are only required if used for compliance demonstration. [40 CFR 60.4380(b)]	Other: For the purposes of identifying excess emissions based on data from the continuous emission monitoring equipment the permittee shall follow procedures described in 40 CFR 60.4350(a), (b), (c), (e), (f), (g), and (h). If a NOx diluent CEMS meets the requirements of 40 CFR 75, the only quality assured data from the CEMS shall be used to identify excess emissions. Periods where the missing data substitution procedures in subpart D of 40 CFR 75 are applied are to be reported as monitor downtime. [40 CFR 60.4350].	None.	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): Semi-annually beginning on the 30th day of the 6th month following initial performance tests. All reports required under 40 CFR 60.7(c) must be postmarked by the 30th day following the end of each 6-moth period. [40 CFR 60.4395]
63	Acid Rain: The permittee shall comply with all of the requirements of the Phase II Acid Rain (AC) permit issued for this affected unit. [40 CFR 72]	Other: Comply with the requirements in the attached Acid Rain Permit (Appendix I).[40 CFR 72].	Other: Comply with the requirements in the attached Acid Rain Permit (Appendix I).[40 CFR 72].	Comply with the requirement: As per the approved schedule. Comply with the requirements in the attached Acid Rain Permit (Appendix I). [40 CFR 72]
64	CSAPR: The permittee shall comply with all the attached requirements of Cross-State Air Pollution Rule (CSAPR) for the CSAPR NOx Annual Trading Program, CSAPR NOx Ozone Season Trading Program, and CSAPR SO2 Group 1 Trading Program applicable to this affected unit. See CSAPR Attachment (appendix II). [40 CFR 97]	Other: See the monitoring requirements in the CSAPR Attachment (Appendix II).[40 CFR 97].	Other: See the recordkeeping requirements in the CSAPR Attachment (Appendix II).[40 CFR 97].	Other (provide description): Other See the submittal requirements in the CSAPR Attachment (Appendix II). [40 CFR 97]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**

Operating Scenario: **OS1 Combustion Turbine (CT) 1 firing natural gas at full load without supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 1, OS2 Combustion Turbine (CT) 2 firing natural gas at full load without supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 2**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 232 lb/hr. Particulate emission limit from the combustion of natural gas based on rated heat input for one turbine. [N.J.A.C. 7:27-4.2(a)]	Particulate Emissions: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
6	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
8	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(0)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
9	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.

U1 2 Turbines, each with HRSG
OS1, OS2

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
11	NOx (Total) <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
12	NOx (Total) <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	NOx (Total) <= 0.0073 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	NOx (Total) <= 0.0073 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	NOx (Total) <= 16.8 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

U1 2 Turbines, each with HRSG
OS1, OS2

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	NOx (Total) <= 16.8 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
17	CO <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
18	CO <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	CO <= 0.0044 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
20	CO <= 0.0044 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
21	CO <= 10.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
22	CO <= 10.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
23	VOC (Total) <= 1 ppmvd @ 15% O2. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
24	VOC (Total) <= 0.001 lb/MMBTU. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
25	VOC (Total) <= 2.9 lb/hr. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
26	SO2 <= 2.8 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-21.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
27	TSP <= 6.6 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
28	PM-10 (Total) <= 11 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
29	PM-10 (Total) <= 11 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each hour during operation. The permittee shall demonstrate compliance with the lb/hr emission limit each hour during turbine operation using the following calculation: PM10 (Total) = EF1 (lbs/MMBtu) * HI1 (MMBtu/hr); or PM10 (Total) = EF2 (lbs/MMBtu) * HI2 (MMBtu/hr) Where: EF1 and EF2 is the emission factor for unit 1 or unit 2; This emission factor shall be the maximum stack test result (average of 3 valid stack test runs) obtained during any valid stack test, that was performed within the previous 12 months, for the combustion turbine without the duct burner operating. HI1 and HI2 is the total heat input of the natural gas combusted, by unit 1 or unit 2, during that hour by that combustion turbine without the duct burner operating. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of lb/MMBtu emission factor and lb/hr emission rate calculated during each hour of operation. [N.J.A.C. 7:27-22.16(o)]	None.
30	PM-2.5 (Total) <= 11 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
31	PM-2.5 (Total) <= 11 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each hour during operation. The permittee shall demonstrate compliance with the lb/hr emission limit each hour during turbine operation using the following calculation: PM-2.5 (Total) = EF1 (lbs/MMBtu) * HI1 (MMBtu/hr); or PM-2.5 (Total) = EF2 (lbs/MMBtu) * HI2 (MMBtu/hr) Where: EF1 and EF2 is the emission factor for unit 1 or unit 2; This emission factor shall be the maximum stack test result (average of 3 valid stack test runs) obtained during any valid stack test, that was performed within the previous 12 months, for the combustion turbine without the duct burner operating. HI1 and HI2 is the total heat input of the natural gas combusted, by unit 1 or unit 2, during that hour by that combustion turbine without the duct burner operating. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of lb/MMBtu emission factor and lb/hr emission rate calculated during each hour of operation. [N.J.A.C. 7:27-22.16(o)]	None.
32	Ammonia <= 5 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.
33	Ammonia <= 16 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.
34	Sulfuric Acid Mist Emissions <= 1.36 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Sulfuric Acid Mist Emissions: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
35	Methane <= 20 lb/hr. Based on AP-42 emission factor (AP-42, Table 3.1-2a) and heat input established by the initial PSD permit. [N.J.A.C. 7:27-22.16(a)]	Methane: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
36	Acrolein <= 0.00678 lb/hr. Based on maximum permitted heat input, AP-42 emission factor (AP-42, Table 3.1-3) and 50% emission control by CO Catalyst. [N.J.A.C. 7:27-22.16(a)]	Acrolein: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
37	Benzene <= 0.0278 lb/hr. Based on maximum permitted heat input and AP-42 emission factor (AP-42, Table 3.1-3). [N.J.A.C. 7:27-22.16(a)]	Benzene: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
38	Formaldehyde <= 0.255 lb/hr. Based on maximum permitted heat input and emission factor from CARB - CATEF database for natural gas fired turbines with SCR and/or CO catalyst. [N.J.A.C. 7:27-22.16(a)]	Formaldehyde: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
39	Polycyclic organic matter <= 0.0051 lb/hr. Based on maximum permitted heat input and AP-42 emission factor (AP-42, Table 3.1-3). [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
40	Toluene <= 0.302 lb/hr. Based on maximum permitted heat input and AP-42 emission factor (AP-42, Table 3.1-3). [N.J.A.C. 7:27-22.16(a)]	Toluene: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**

Operating Scenario: **OS3 Combustion Turbine (CT) 1 firing natural gas at full load with supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 1, OS4 Combustion Turbine (CT) 2 firing natural gas at full load with supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 2**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 253.1 lb/hr. Particulate emission limit from the combustion of natural gas. Based on rated heat input for one turbine and one duct burner. [N.J.A.C. 7:27- 4.2(a)]	Particulate Emissions: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
6	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
8	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(0)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
9	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	Duct Burner fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.
11	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
12	Maximum Gross Heat Input <= 211 MMBTU/hr (HHV) per duct burner firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
13	NOx (Total) <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
14	NOx (Total) <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	NOx (Total) <= 0.0073 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
16	NOx (Total) <= 0.0073 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
17	NOx (Total) <= 16.5 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
18	NOx (Total) <= 16.5 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
19	CO <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
20	CO <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
21	CO <= 0.0045 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
22	CO <= 0.0045 lb/MMBTU. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
23	CO <= 10 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
24	CO <= 10 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
25	VOC (Total) <= 2 ppmvd @ 15% O2. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
26	VOC (Total) <= 0.0025 lb/MMBTU. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
27	VOC (Total) <= 5.7 lb/hr. Based on manufacturer guarantee. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
28	SO2 <= 2.5 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-21.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
29	TSP <= 7.9 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]
30	PM-10 (Total) <= 13.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
31	PM-10 (Total) <= 13.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each hour during operation. The permittee shall demonstrate compliance with the lb/hr emission limit each hour during turbine operation using the following calculation: PM10 (Total) = EF1 (lbs/MMBtu) * HI1 (MMBtu/hr); or PM10 (Total) = EF2 (lbs/MMBtu) * HI2 (MMBtu/hr) Where: EF1 and EF2 is the emission factor for unit 1 or unit 2; This emission factor shall be the maximum stack test result (average of 3 valid stack test runs) obtained during any valid stack test, that was performed within the previous 12 months, for the combustion turbine with the duct burner operating. HI1 and HI2 is the total heat input of the natural gas combusted, by unit 1 or unit 2, during that hour by that combustion turbine with the duct burner operating. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of lb/MMBtu emission factor and lb/hr emission rate calculated during each hour of operation. [N.J.A.C. 7:27-22.16(o)]	None.
32	PM-2.5 (Total) <= 13.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by stack test results prior to permit expiration date. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See "RENEWAL STACK TESTING SUMMARY" in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
33	PM-2.5 (Total) <= 13.2 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each hour during operation. The permittee shall demonstrate compliance with the lb/hr emission limit each hour during turbine operation using the following calculation: PM-2.5 (Total) = EF1 (lbs/MMBtu) * HI1 (MMBtu/hr); or PM-2.5 (Total) = EF2 (lbs/MMBtu) * HI2 (MMBtu/hr) Where: EF1 and EF2 is the emission factor for unit 1 or unit 2; This emission factor shall be the maximum stack test result (average of 3 valid stack test runs) obtained during any valid stack test, that was performed within the previous 12 months, for the combustion turbine with the duct burner operating. HI1 and HI2 is the total heat input of the natural gas combusted, by unit 1 or unit 2, during that hour by that combustion turbine with the duct burner operating. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of lb/MMBtu emission factor and lb/hr emission rate calculated during each hour of operation. [N.J.A.C. 7:27-22.16(o)]	None.
34	Ammonia <= 5 ppmvd @ 15% O2. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.
35	Ammonia <= 15 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.
36	Sulfuric Acid Mist Emissions <= 1.33 lb/hr. Based on manufacturer guarantee. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	Sulfuric Acid Mist Emissions: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
37	Methane <= 18.6 lb/hr. Based on AP-42 emission factors (AP-42, Table 3.1-2a and Table 1.4-2) and heat input established by the initial PSD permit. [N.J.A.C. 7:27-22.16(a)]	Methane: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
38	Acrolein <= 0.00608 lb/hr. Based on AP-42 emission factor for turbine (AP-42, Table 3.1-3) and 50% emission control by CO Catalyst. Heat Input value based on manufacturer's data. [N.J.A.C. 7:27-22.16(a)]	Acrolein: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
39	Benzene <= 0.0253 lb/hr. Based on AP-42 emission factors (AP-42, Table 3.1-3 and Table 1.4-3). Heat Input values based on manufacturer's data. [N.J.A.C. 7:27-22.16(a)]	Benzene: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
40	Formaldehyde <= 0.242 lb/hr. Based on emission factor from CARB - CATEF database for natural gas fired turbines with SCR and/or CO catalyst and AP-42 emission factor for duct burner (AP-42, Table 1.4-3). Heat Input values based on manufacturer's data. [N.J.A.C. 7:27-22.16(a)]	Formaldehyde: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
41	Polycyclic organic matter <= 0.00459 lb/hr. Based on AP-42 emission factors (AP-42, Table 3.1-3 and Table 1.4-3). Heat Input values based on manufacturer's data. [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
42	Toluene <= 0.271 lb/hr. Based on AP-42 emission factors (AP-42, Table 3.1-3 and Table 1.4-3). Heat Input values based on manufacturer's data. [N.J.A.C. 7:27-22.16(a)]	Toluene: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Operating Scenario: **OS5 Combustion Turbine (CT) 1 Cold start-up, OS6 Combustion Turbine (CT) 2 Cold start-up**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 232 lb/hr. Particulate emission limit from the combustion of natural gas based on rated heat input of one turbine (without duct burner operating). [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	None.	None.	None.
6	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.
8	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	Start-up Period: Start-up is defined as the period of time from initiation of combustion of fuel in the combustion turbine until it achieves steady-state operation at a load of 52.9% of maximum operating load. A Cold Start-up is defined as a start-up which occurs after the turbine has been shut down for 72 hours or more. The duration of a cold start-up shall not exceed 201 minutes. [N.J.A.C. 7:27-22.16(a)]	Start-up Period: Monitored by hour/time monitor continuously, based on an instantaneous determination. Monitor the duration of any period during which the turbine is not operated in order to determine the type of start-up that follows (cold, warm or hot). Monitor the duration of each period of start up in order to demonstrate compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	Start-up Period: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record the duration of any period during which the turbine is not operated in order to document the type of start-up that follows (cold, warm or hot). Record the duration of each period of start up in order to document compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	None.
10	Maximum number of Cold startups shall not exceed 50 in any 365 day period. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by observation upon occurrence of event, based on a consecutive 365 day period (rolling 1 day basis)[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Maintain a record of total cold start-ups, warm start-ups, hot start-ups, and shutdowns. [N.J.A.C. 7:27-22.16(o)]	None.
11	Testing of the emergency generator shall not occur at the same time as start-up or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the emergency generator is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
12	Testing of the fire pump shall not occur at the same time as startup or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the fire pump is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	NOx (Total) <= 140.6 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	CO <= 723 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	VOC (Total) <= 42.4 lb/hr per turbine during cold start-up. This limit includes Formaldehyde emissions. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	SO2 <= 2.8 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-21.16(o)].	None.
17	TSP <= 6.6 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
18	PM-10 (Total) <= 11 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
19	PM-2.5 (Total) <= 11 lb/hr per turbine during cold start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
20	Ammonia <= 10 ppmvd @ 15% O2 per turbine during cold start-up. Based on operating data. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Operating Scenario: **OS7 Combustion Turbine (CT) 1 Warm start-up, OS8 Combustion Turbine (CT) 2 Warm start-up**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 232 lb/hr. Particulate emission limit from the combustion of natural gas based on rated heat input of one turbine (without duct burner operating). [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	None.	None.	None.
6	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.
8	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	Start-up Period: Start-up is defined as the period of time from initiation of combustion of fuel in the combustion turbine until it achieves steady-state operation at a load of 52.9% of maximum operating load. A Warm Start-up is defined as a start-up which occurs after the turbine has been shut down for at least 8 hours but less than 72 hours. The duration of a warm start-up shall not exceed 95 minutes. [N.J.A.C. 7:27-22.16(a)]	Start-up Period: Monitored by hour/time monitor continuously, based on an instantaneous determination. Monitor the duration of any period during which the turbine is not operated in order to determine the type of start-up that follows (cold, warm or hot). Monitor the duration of each period of start up in order to demonstrate compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	Start-up Period: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record the duration of any period during which the turbine is not operated in order to document the type of start-up that follows (cold, warm or hot). Record the duration of each period of start up in order to document compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	None.
10	Maximum combined number of warm or hot start-ups shall not exceed 250 in any 365 day period. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by observation upon occurrence of event, based on a consecutive 365 day period (rolling 1 day basis)[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Maintain a record of total cold start-ups, warm start-ups, hot start-ups, and shutdowns. [N.J.A.C. 7:27-22.16(o)]	None.
11	Testing of the emergency generator shall not occur at the same time as start-up or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the emergency generator is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
12	Testing of the fire pump shall not occur at the same time as startup or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the fire pump is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	NOx (Total) <= 96.8 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	CO <= 437.7 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	VOC (Total) <= 25.3 lb/hr per turbine during warm start-up. This limit includes Formaldehyde emissions. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	SO2 <= 2.8 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-21.16(o)].	None.
17	TSP <= 6.6 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
18	PM-10 (Total) <= 11 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
19	PM-2.5 (Total) <= 11 lb/hr per turbine during warm start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
20	Ammonia <= 10 ppmvd @ 15% O2 per turbine during warm start-up. Based on operating data. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Operating Scenario: **OS9 Combustion Turbine (CT) 1 Hot start-up, OS10 Combustion Turbine (CT) 2 Hot start-up**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 232 lb/hr. Particulate emission limit from the combustion of natural gas based on rated heat input of one turbine (without duct burner operating). [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	None.	None.	None.
6	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.
8	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	Start-up Period: Start-up is defined as the period of time from initiation of combustion of fuel in the combustion turbine until it achieves steady-state operation at a load of 52.9% of maximum operating load. A Hot Start-up is defined as a start-up which occurs when the turbine has been shut down for less than 8 hours. The duration of a hot start-up shall not exceed 39 minutes. [N.J.A.C. 7:27-22.16(a)]	Start-up Period: Monitored by hour/time monitor continuously, based on an instantaneous determination. Monitor the duration of any period during which the turbine is not operated in order to determine the type of start-up that follows (cold, warm or hot). Monitor the duration of each period of start up in order to demonstrate compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	Start-up Period: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record the duration of any period during which the turbine is not operated in order to document the type of start-up that follows (cold, warm or hot). Record the duration of each period of start up in order to document compliance with the maximum duration for that type of start-up. [N.J.A.C. 7:27-22.16(o)]	None.
10	Maximum combined number of warm or hot start-ups shall not exceed 250 in any 365 day period. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by observation upon occurrence of event, based on a consecutive 365 day period (rolling 1 day basis)[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Maintain a record of total cold start-ups, warm / hot start-ups, and shutdowns. [N.J.A.C. 7:27-22.16(o)]	None.
11	Testing of the emergency generator shall not occur at the same time as start-up or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the emergency generator is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
12	Testing of the fire pump shall not occur at the same time as startup or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the fire pump is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	NOx (Total) <= 95.2 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	CO <= 553.2 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	VOC (Total) <= 27.1 lb/hr per turbine during hot start-up. This limit includes Formaldehyde emissions. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	SO2 <= 2.8 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-21.16(o)].	None.
17	TSP <= 6.6 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
18	PM-10 (Total) <= 11 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
19	PM-2.5 (Total) <= 11 lb/hr per turbine during hot start-up. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
20	Ammonia <= 10 ppmvd @ 15% O2 per turbine during hot start-up. Based on operating data. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 2 Turbines, each with HRSG**
Operating Scenario: **OS11 Combustion Turbine (CT) 1 Shut Down, OS12 Combustion Turbine (CT) 2 Shut Down**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary combustion turbines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Opacity <= 10 %. Smoke emissions from stationary combustion turbines no greater than 10% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
3	Particulate Emissions <= 232 lb/hr. Particulate emission limit from the combustion of natural gas based on rated heat input of one turbine (without duct burner operating). [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
4	CO <= 250 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(b)]	CO: Monitored by continuous emission monitoring system continuously, based on one calendar day. Compliance shall be based upon the average of emissions over one calendar day, not including periods of equipment downtime. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-16.23(a)1]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	VOC (Total) <= 50 ppmvd @ 15% O2. VOC RACT rule emission limit applies during all operation of the turbine. [N.J.A.C. 7:27-16.9(c)]	None.	None.	None.
6	NOx (Total) <= 0.75 lb/MW-hr (net). NOx RACT emission limit applies during all periods of natural gas combustion during which net energy output is being produced by the turbine. [N.J.A.C. 7:27-19.5(g)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a calendar day (in ozone season) or 30 day rolling (at other times) average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
7	Turbine fuel is limited to natural gas. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by invoices / bills of lading / certificate of analysis per delivery. [N.J.A.C. 7:27-22.16(o)]	None.
8	Maximum Gross Heat Input <= 2,320 MMBTU/hr (HHV) per turbine firing natural gas. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by fuel flow/firing rate instrument continuously. The permittee shall install, calibrate and maintain the monitor(s) in accordance with the manufacturer's specifications. The monitor(s) shall be ranged such that the allowable value is approximately mid-scale of the full range current/voltage output. [N.J.A.C. 7:27-22.16(o)]	Maximum Gross Heat Input: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	Shutdown Period: Shutdown is defined as the period of time from initial lowering of the combustion turbine fuel input, with the intent to cease generation of electrical power output, until the cessation of turbine operation. The duration of shut down shall not exceed 18 minutes. [N.J.A.C. 7:27-22.16(a)]	Shutdown Period: Monitored by hour/time monitor continuously, based on an instantaneous determination. Monitor the duration of each period of shut down in order to demonstrate compliance with the maximum duration of shut down. [N.J.A.C. 7:27-22.16(o)]	Shutdown Period: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record the duration of each period of shut down in order to document compliance with the maximum duration of shut down. [N.J.A.C. 7:27-22.16(o)]	None.
10	Maximum number of shut downs shall not exceed 300 in any 365 day period. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by observation upon occurrence of event, based on a consecutive 365 day period (rolling 1 day basis)[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Maintain a record of total cold start-ups, warm / hot start-ups, and shutdowns. [N.J.A.C. 7:27-22.16(o)]	None.
11	Testing of the emergency generator shall not occur at the same time as start-up or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the emergency generator is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
12	Testing of the fire pump shall not occur at the same time as startup or shut down of any turbine. [N.J.A.C. 7:27-22.16(o)]	Other: Verify that the fire pump is not being tested before commencing start-up or shut down of a combustion turbine.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	NOx (Total) <= 25 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	CO <= 546 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	CO: Monitored by continuous emission monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS EMISSION MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding calendar quarter (the calendar quarters begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal starting with the quarter in which the Performance Specification Test was conducted, for review and approval. Quarterly EEMPR reports shall include all quarterly and annual QA data. This report shall be submitted whether or not an emission exceedence has occurred. See CEMS and QA/QC requirements in OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	VOC (Total) <= 14 lb/hr per turbine during shut down. This limit includes Formaldehyde emissions. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
16	SO2 <= 2.8 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-21.16(o)].	None.
17	TSP <= 6.6 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
18	PM-10 (Total) <= 11 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
19	PM-2.5 (Total) <= 11 lb/hr per turbine during shut down. Based on manufacturer data. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain relevant emission and operation information from turbine and control equipment manufacturers and the engineering factors used to project startup emissions.[N.J.A.C. 7:27-22.16(o)].	None.
20	Ammonia <= 10 ppmvd @ 15% O2 per turbine during shut down. Based on operating data. [N.J.A.C. 7:27-22.16(a)]	Other: Monitored by continuous process monitoring system continuously, based on a 3 hour rolling average based on a 1 hour block average. See "CONTINUOUS PROCESS MONITORING" in OS Summary.[N.J.A.C. 7:27-22.16(o)].	Ammonia: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. See "CONTINUOUS PROCESS MONITORING" in OS Summary. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U2 Cooling Tower**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Summary of Applicable Federal Regulations: 40 CFR 52 PSD [None]	None.	None.	None.
2	Particulate Emissions <= 30 lb/hr based on 0.02 grains per SCF. [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
3	Opacity <= 20 % , exclusive of condensed water vapor, except for 3 minutes in any consecutive 30-minute period. [N.J.A.C. 7:27- 6.2(d)]	None.	None.	None.
4	Total Throughput <= 2,267 tons/yr. Maximum total chemical additives that can be added to the cooling tower water. Cooling water chemicals shall be limited to: - Chlorine Dioxide - 1-Hydroxyethylidene-1,1-diphosphonic aci - Potassium phosphate, dibasic - Tetrapotassium pyrophosphate - Sulfuric Acid (pH conrol) - Sodium Hypochlorite (biocide) - Alcohol (C8 - 10) ethoxylated propoxylated - Severely hydrotreated mineral oil Provided it does not result in an increase in actual emissions, does not contain any HAP and complies with all other requirements at N.J.A.C. 7:27-22.20, a chemical not already authorized by this operating permit, can be added to the above list of permitted cooling water treatment chemicals by submitting an administrative amendment to the Department. Water treatment chemicals containing hexavalent chromium shall not be added to the circulating water. [N.J.A.C. 7:27-22.16(a)]	Other: Review of process records showing each chemical added to the cooling tower water, each month during operation, based on a consecutive 12 month period (rolling 1 month basis).[N.J.A.C. 7:27-22.16(o)].	Total Throughput: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation in a permanently bound log book or readily accessible computer memory Process records shall show: - The date the chemical was added; - The name of each chemical added; and - the amount of each chemical added. Maintain a record, each month, of: - The total quantity of each chemical added to the cooling tower water during that month; and - The total quantitly of all chemicals added to the cooling tower water during the 12 month period that concludes with that month, as calculated below: Total tons/year = Total tons/month for a given month + Total tons/month for the immediately preceding 11 months. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	This source shall be equipped with high efficiency drift eliminators. The quantity of drift shall be less than 0.0005% of the circulating water flow. [N.J.A.C. 7:27-22.16(a)]	Monitored by documentation of construction once initially. [N.J.A.C. 7:27-22.16(o)]	None.	None.
6	TSP <= 9.74 tons/yr. Based on cooling tower operation for 8500 hr/yr at the permitted hourly emission rate. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: TSP (total) tons/month = 2.29 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
7	PM-10 (Total) <= 5.66 tons/yr. Based on cooling tower operation for 8500 hr/yr at the permitted hourly emission rate. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-10 (total) tons/month = 1.33 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	PM-2.5 (Total) <= 2 tons/yr. Based on cooling tower operation for 8500 hr/yr at the permitted hourly emission rate. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-2.5 (total) tons/month = 0.47 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U2 Cooling Tower**
Operating Scenario: **OS1 Cooling Tower**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Cooling tower circulation water flow rate <= 220,870 gallons per minute (gpm). [N.J.A.C. 7:27-22.16(a)]	Monitored by other method (provide description) continuously, based on 1 minute intervals. Continuously monitor the recirculation flow rate using the Distributed Control System (DCS). The DCS shall calculate and display the cooling tower circulation flow rate each minute, using the pump output rating (GPM) and the operating time. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. Record the pump operation and the calculated flow rate in the Data Historian each minute during operation. [N.J.A.C. 7:27-22.16(o)]	None.
2	Total Disolved Solids (TDS) concentration in the cooling tower circulating water =<4,150 mg/liter. [N.J.A.C. 7:27-22.16(a)]	Monitored by grab sampling each month during operation for analysis of circulating water. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. Maintain records of circulating water analysis. [N.J.A.C. 7:27-22.16(o)]	None.
3	pH: pH >=6.0 and pH<=10.5 Acceptable range for pH of the cooling tower water. If pH drops below this range, an alarm shall sound and the sulfuric acid feed shall be locked out. [N.J.A.C. 7:27-22.16(o)]	pH: Monitored by pH instrument continuously, based on an instantaneous determination. The pH of the cooling tower water shall be monitored by a continuous dual channel pH monitor with an alarm and sulfuric acid feed lock out system which are activated when the pH goes below this range. [N.J.A.C. 7:27-22.16(o)]	pH: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. Maintain a record of the pH of the cooling tower water and a record of any instance where the pH goes outside of the permitted range. [N.J.A.C. 7:27-22.16(o)]	None.
4	Oxidation Reduction Potential >= 175 and Oxidation Reduction Potential <= 600 millivolts. Acceptable range for the oxidation reduction potential of the cooling tower water. [N.J.A.C. 7:27-22.16(a)]	Oxidation Reduction Potential: Monitored by oxidation/reduction potential meter continuously, based on a 1 hour block average. The ORP of the cooling tower water shall be monitored by a continuous ORP meter with an alarm system which is activated when the ORP goes below this range. [N.J.A.C. 7:27-22.16(o)]	Oxidation Reduction Potential: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. Maintain a record of the ORP of the cooling tower water and a record of any instance where the ORP goes outside of the permitted range. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	TSP <= 2.29 lb/hr. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation : TSP (lb/hr) = 0.000501 x D x C x TDS; where: D = fraction of circulating water lost to drift = 0.0005% (based on permitted maximum drift) C = cooling tower circulating water flow rate (gal/min) = monitored by the Distributed Control System (DCS) TDS = total dissolved solids concentration in circulating water (mg/l) A sample of the circulating water will be taken once every month, at minimum, and analyzed for TDS. [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation Records shall be maintained on site for a period of five (5) years after the date of each record and made available to the representatives of the Department upon request. [N.J.A.C. 7:27-22.16(o)]	Submit a report: Annually on January 31 for the preceding calendar year. The report shall be submitted to the NJDEP Northern Regional Enforcement Office. The report must contain: 1. A log of the total dissolved solids concentration of the circulating water flow. A sample will be taken and recorded during Cooling Tower operation a minimum of every month in which the Cooling Tower operates; 2. The calculated maximum hourly particulate emissions in pounds per hour; 3. The calculated maximum cumulative particulates emissions in tons per year; and 4. Description of any maintenance procedures applied to the cooling tower. [N.J.A.C. 7:27-21.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	PM-10 (Total) <= 1.33 lb/hr. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation : PM-10 (lb/hr) = 0.000501 x D x C x TDS x A; where: D = fraction of circulating water lost to drift = 0.0005% (based on permitted maximum drift) C = cooling tower circulating water flow rate (gal/min) = monitored by the Distributed Control System (DCS) TDS = total dissolved solids concentration in circulating water (mg/l), A = PM-10 fraction = 0.5808. A sample of the circulating water will be taken once every month, at minimum, and analyzed for TDS. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation Records shall be maintained on site for a period of five (5) years after the date of each record and made available to the representatives of the Department upon request. [N.J.A.C. 7:27-22.16(o)]	Submit a report: Annually on January 31 for the preceding calendar year. The report shall be submitted to the NJDEP Northern Regional Enforcement Office. The report must contain: 1. A log of the total dissolved solids concentration of the circulating water flow. A sample will be taken and recorded during Cooling Tower operation a minimum of every month in which the Cooling Tower operates; 2. The calculated maximum hourly particulate emissions in pounds per hour; 3. The calculated maximum cumulative particulates emissions in tons per year; and 4. Description of any maintenance procedures applied to the cooling tower. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	PM-2.5 (Total) <= 0.47 lb/hr. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation : PM-2.5 (lb/hr) = 0.000501 x D x C x TDS x A; where: D = fraction of circulating water lost to drift = 0.0005% (based on permitted maximum drift) C = cooling tower circulating water flow rate (gal/min) = monitored by the Distributed Control System (DCS) TDS = total dissolved solids concentration in circulating water (mg/l), A = PM-2.5 fraction = 0.2052 A sample of the circulating water will be taken once every month, at minimum, and analyzed for TDS. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation Records shall be maintained on site for a period of five (5) years after the date of each record and made available to the representatives of the Department upon request. [N.J.A.C. 7:27-22.16(o)]	Submit a report: Annually on January 31 for the preceding calendar year. The report shall be submitted to the NJDEP Northern Regional Enforcement Office. The report must contain: 1. A log of the total dissolved solids concentration of the circulating water flow. A sample will be taken and recorded during Cooling Tower operation a minimum of every month in which the Cooling Tower operates; 2. The calculated maximum hourly particulate emissions in pounds per hour; 3. The calculated maximum cumulative particulates emissions in tons per year; and 4. Description of any maintenance procedures applied to the cooling tower. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U3 1.5 MW Emergency Generator**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Summary of Applicable Federal Regulations: 40 CFR 52 PSD 40 CFR 60 Subpart A (Emergency Generator) 40 CFR 60 Subpart IIII (Emergency Generator) [None]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	Each emergency generator shall be located at the facility and produce mechanical or thermal energy, or electrical power exclusively for use at the facility. This emergency generator shall be operated only: 1. During the performance of normal testing and maintenance procedures, as recommended in writing by the manufacturer and/or as required in writing by a Federal or State law or regulation, 2. When there is power outage or the primary source of mechanical or thermal energy fails because of an emergency, or when the power disruption resulted from construction, repair, or maintenance activity (CRM) at the facility. Operation of the emergency generator under construction, repair, or maintenance activity is limited to 30 days in any calendar year 3. When there is a voltage reduction issued by PJM and posted on the PJM internet website (www.pjm.com) under the "emergency procedures" menu. [N.J.A.C. 7:27-19.1]	Monitored by hour/time monitor continuously. In addition, the owner or operator shall monitor, once per month, the total operating time from the generator's hour meter; hours of operation for emergency use; hours of operation for testing and maintenance; hours of operation during power disruption resulted from construction, repair and maintenance activity (CRM) at the facility; and the total fuel usage calculated by the following: Fuel Usage (Gallons per month) = (Hours of operation per month) x (Maximum emergency generator fuel usage rate in gallons per hour). Hours of operation for emergency use (per month) = (The monthly total operating time from the generator's hour meter) - (The monthly total operating time for testing and maintenance) - (The monthly total operating time due to power disruption resulted from construction, repair, or maintenance activity not counting operation during the performance of normal testing and maintenance procedures). . [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Record the following information: 1. Once per month, the total operating time from the generator's hour meter, the fuel usage (gallons per month), and the monthly hours of operation for emergency use and during power disruption from CRM. Document if the emergency use was due to internal or external loss of primary source of energy, or due to a fire or flood. If internal loss at the facility, document the emergency and/or CRM that occurred, the damages to the primary source of energy and the amount of time needed for repairs. 2. For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator; and 3. If a voltage reduction is the reason for the use of the emergency generator, a copy of the voltage reduction notification from PJM or other documentation of the voltage reduction. The owner or operator of shall maintain the above records for at least 5 years after the record was made and shall make the records readily available to the Department or the EPA. [N.J.A.C. 7:27-22.16(o)] and. [N.J.A.C. 7:27-19.11]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	This emergency generator shall not be used: 1. For normal testing and maintenance on days when the Department forecasts air quality anywhere in New Jersey to be "unhealthy for sensitive groups," "unhealthy," or "very unhealthy" as defined in the EPA's Air Quality Index at http://airnow.gov/, as supplemented or amended and incorporated herein by reference, unless required in writing by a Federal or State law or regulation. Procedures for determining the air quality forecasts for New Jersey are available at the Department's air quality permitting web site at http://www.state.nj.us/dep/aqpp/aqforecast; and 2. As a source of energy or power after the primary energy or power source has become operable again after emergency or after power disruption resulted from construction, repair, or maintenance activity. Operation of the emergency generator during construction, repair, or maintenance activity shall be limited to no more than 30 days of operation per calendar year. If the primary energy or power source is under the control of the owner or operator of the emergency generator, the owner or operator shall make a reasonable, timely effort to repair the primary energy or power source. [N.J.A.C. 7:27-19.2(d)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	Hours of Operation <= 100 hr/yr for testing and maintenance. The limit on the allowable hours for testing and maintenance in accordance with the documentation from manufacturer, the vendor, or the insurance company associated with the engine. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator shall maintain on site and record the following information: For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator. [N.J.A.C. 7:27-19.11]	None.
5	The duration of a testing event is restricted to 30 minutes. [N.J.A.C. 7:27-22.16(a)]	Monitored by hour/time monitor upon occurrence of event. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
6	The emergency generator shall not be tested at the same time as the fire pump. [N.J.A.C. 7:27-22.16(a)]	Other: Verify that the fire pump is not operating before commencing emergency generator testing.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of emergency generator operation (as required under U3, OS Summary) and Periods of fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
7	Testing of the emergency generator shall not occur at the same time as start-up or shut down of any turbine. [N.J.A.C. 7:27-22.16(a)]	Other: Verify that no combustion turbine is in start-up or shut down mode before commencing emergency generator testing.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency generator operation (as required under U3, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	NOx (Total) <= 0.926 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.2(a) and. [40 CFR 52.21]	NOx (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: NOx (total) tons/month = 18.5 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
9	CO <= 0.578 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: CO (total) tons/month = 11.6 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	VOC (Total) <= 0.131 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.2(a)]	VOC (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: VOC (total) tons/month = 2.62 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
11	TSP <= 0.029 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: TSP (total) tons/month = 0.588 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
12	PM-10 (Total) <= 0.033 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-10 (total) tons/month = 0.661 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
13	PM-2.5 (Total) <= 0.033 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-2.5 (total) tons/month = 0.661 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
14	All requests, reports, applications, submittals, and other communications to the Administrator pursuant to Part 60 shall be submitted in duplicate to the Regional Office of US Environmental Protection Agency. Submit information to: Director, Division of Enforcement & Compliance Assistance, US EPA, Region 2, 290 Broadway, New York, NY 10007-1866. [40 CFR 60.4(a)]	None.	None.	Submit a report: As per the approved schedule to EPA Region 2 as required by 40 CFR 60. [40 CFR 60.4(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
15	Copies of all information submitted to EPA pursuant to 40 CFR Part 60, must also be submitted to the appropriate Regional Enforcement Office of NJDEP. [40 CFR 60.4(b)]	None.	None.	Submit a report: As per the approved schedule to the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60. [40 CFR 60.4(b)]
16	No owner or operator subject to NSPS standards in Part 60, shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere. [40 CFR 60.12]	None.	None.	None.
17	Changes in time periods for submittal of information and postmark deadlines set forth in this subpart, may be made only upon approval by the Administrator and shall follow procedures outlined in 40 CFR Part 60.19. [40 CFR 60.19]	None.	None.	None.
18	The owner or operator of a 2007 model year and later emergency generator with the displacement of >= 10 liters per cylinder and less than 30 liters per cylinder must comply with the certification emissions standards for new marine engine in 40 CFR 94.8 for the same displacement and same maximum engine power, as prescribed at 40 CFR 60.4202(e)(1) through (4) as follows: NMHC + NOx <= 4.8 g/HP-hr, CO <= 2.6 g/HP-hr, PM <= 0.15 g/HP-hr. [40 CFR 60.4205(b)]	None.	Other: The owner or operator of a 2007 model year or later engine must keep manufacturer certification showing compliance with the applicable emission standards, for the same model year and maximum engine power. [40 CFR 60.4211].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Owners and operators of stationary CI internal combustion engines must operate and maintain stationary CI ICE that achieve the emission standards as required in 40 CFR 60.4204 and 60.4205 over the entire life of the engine. [40 CFR 60.4206]	None.	Other: The owner or operator shall keep the manufacturer's emission-related written instructions over the entire life of the engine. If the manufacturer's emission-related written instructions are not followed, the owner or operator must keep the results of the performance test(s) demonstrating compliance with the applicable emission limits. [40 CFR 60.4206].	None.
20	Beginning October 1, 2007, the CI internal combustion engines subject to NSPS IIII (manufactured after April 1, 2006 or modified or reconstructed after July 11, 2005) that use diesel fuel must use diesel fuel that meets the requirements of 40 CFR 80.510(a) that contains the following per gallon standards: 500 ppm (0.05 percent) maximum sulfur content and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent. [40 CFR 60.4207(a)]	Monitored by review of fuel delivery records once per bulk fuel shipment. For each diesel delivery received, the owner or operator shall review written documentation of the delivery to ensure the maximum allowable fuel oil sulfur content and either a minimum cetane index or a maximum aromatic content is not being exceeded. Such written documentation can include, but is not limited to: bill of lading, delivery Invoice, certificate of analysis. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by invoices / bills of lading / certificate of analysis once per bulk fuel shipment. The owner or operator shall keep records of fuel showing oil sulfur content and either a minimum cetane index or a maximum aromatic content for each delivery received. All records must be maintained for a minimum of 2 years following the date of such records, per 40 CFR 60.7(f). [N.J.A.C. 7:27- 8.13(d)]	None.
21	Beginning October 1, 2010, the CI internal combustion engines with a displacement of less than 30 liters per cylinder subject to NSPS IIII (manufactured after April 1, 2006 or modified or reconstructed after July 11, 2005) that use diesel fuel must use diesel fuel that meets the requirements of 40 CFR 80.510(b) that contains the following per gallon standards: 15 ppm (0.0015 percent) maximum sulfur content and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent, except that any existing diesel fuel purchased (or otherwise obtained) prior to October 1, 2010, may be used until depleted. [40 CFR 60.4207(b)]	Monitored by review of fuel delivery records once per bulk fuel shipment. For each diesel delivery received, the owner or operator shall review written documentation of the delivery to ensure the maximum allowable fuel oil sulfur content and either a minimum cetane index or a maximum aromatic content is not being exceeded. Such written documentation can include, but is not limited to: bill of lading, delivery invoice, certificate of analysis. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by invoices / bills of lading / certificate of analysis once per bulk fuel shipment. The owner or operator shall keep records of fuel showing oil sulfur content and either a minimum cetane index or a maximum aromatic content for each delivery received. All records must be maintained for a minimum of 2 years following the date of such records per 40 CFR 60.7(f). [N.J.A.C. 7:27- 8.13(d)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
22	After December 31, 2008, owners and operators may not install stationary CI ICE (excluding fire pump engines) that do not meet the applicable requirements for 2007 model year engines, except for engines that have been modified or reconstructed, and except for engines that were removed from one existing location and reinstalled at a new location. [40 CFR 60.4208]	None.	None.	None.
23	Owners and operators of a stationary CI internal combustion engine equipped with a diesel particulate filter must install a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached. [40 CFR 60.4209(b)]	Monitored by pressure measurement device continuously. The backpressure monitor must alert the operator when the diesel particulate filter requires service. The service monitor should be mounted in a location that is clearly visible to the operator during operation. [40 CFR 60.4209(b)]	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator must keep records of any corrective action taken after the backpressure monitor has notified the owner or operator that the high backpressure limit of the engine is approached. [40 CFR 60.4214(c)]	None.
24	The owner or operator that must comply with the emission standards specified in NSPS IIII must operate and maintain the stationary CI internal combustion engine and control device, except as permitted under 40 CFR 60.4211(g), according to the manufacturer's emission-related written instructions. In addition, owners and operators may only change emission-related settings that are permitted by the manufacturer. The owner or operator must also meet the requirements of 40 CFR parts 89, 94 and/or 1068, as applicable. If the engine and control device is not installed, configured, operated, and maintained according to the manufacturer's emission-related written instructions, or emission-related settings are changed in a way that is not permitted by the manufacturer, the owner or operator must demonstrate compliance as prescribed at 40 CFR 60.4211(g)(1), (2) or (3) depending on the maximum engine power. [40 CFR 60.4211(a)]	None.	Other: The owner or operator shall keep the manufacturer's emission-related written instructions. If not complying with manufacturer's emission-related written instructions or emission-related settings, the owner or operator shall must keep a maintenance plan, records of conducted maintenance, and conduct a performance test(s), as prescribed at 40 CFR 60.4211(g). [40 CFR 60.4211].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
25	The owner or operator of a 2007 model year and later stationary CI internal combustion engine complying with the emission standards specified in 40 CFR 60.4204(b) or 40 CFR 60.4205(b), must comply by purchasing an engine certified to the emission standards in 40 CFR 60.4204(b) or 40 CFR 60.4205(b) as applicable, for the same model year and maximum engine power. The engine must be installed and configured according to the manufacturer's emission-related specifications, except as permitted in 40 CFR 60.4211(g). [40 CFR 60.4211(c)]	None.	Other: The owner or operator must keep documentation from the manufacturer, for the life of the equipment, that the engine is certified to meet the emission standards as applicable, for the same model year and maximum engine power. If the engine and control device is not installed, configured, operated, and maintained according to the manufacturer's emission-related written instructions, or emission-related settings are changed in a way that is not permitted by the manufacturer, the owner or operator must demonstrate compliance as prescribed at 40 CFR 60.4211(g)(1), (2) or (3) depending on the maximum engine power. [40 CFR 60.4211(c)].	None.
26	Emergency stationary internal combustion engines may be operated for the purpose of maintenance checks and readiness testing limited to 100 hours per year, provided that those tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Anyone may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year. [40 CFR 60.4211(f)(2)(i)]	Monitored by hour/time monitor continuously. The owner or operator of an emergency stationary internal combustion engine that does not meet the standards applicable to non-emergency engines must install a non-resettable hour meter prior to startup of the engine. [40 CFR 60.4209(a)]	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator must record the time of operation of the emergency engine and the reason the engine was in operation during that time. Starting with the model year 2011, 2012, or 2013, depending on the maximum engine power as provided in Table 5 in NSPS IIII, the owner or operator must keep records of the operation of the engine in emergency and non-emergency service that are recorded through the non-resettable hour meter if the emergency engine does not meet the standards in 40 CFR 60.4204, applicable to non-emergency engines, in the applicable model year. The emergency engine must comply with the labeling requirements in 40 CFR 60.4210(f). [40 CFR 60.4214(b)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
27	A new or reconstructed stationary RICE located at an area HAP source must meet the requirements of 40 CFR 63 by meeting the requirements of 40 CFR 60 subpart IIII, for compression ignition engines or 40 CFR 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under 40 CFR 63. [40 CFR 63.6590(c)]	Other: Comply with all applicable provisions at NSPS IIII. [40 CFR 63].	Other: Comply with all applicable provisions at NSPS IIII. [40 CFR 63].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U3 1.5 MW Emergency Generator**
Operating Scenario: **OS1 1.5 MW Emergency Generator**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary internal combustion engines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Particulate Emissions <= 6.872 lb/hr. Particulate emission limit from the combustion of ULSD based on rated heat input of emergency generator. [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
3	Sulfur Content in Fuel <= 15 ppmw (0.0015 % by weight). Maximum allowable sulfur content in No. 2 and lighter fuel oil. [N.J.A.C. 7:27-22.16(a)], and. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Emergency generator fuel limited to ultra low sulfur distillate fuel oil (ULSD) [sulfur content <= 15 ppm]. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
5	Maximum Gross Heat Input <= 14.36 MMBTU/hr (HHV). [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain documentation showing maximum heat input rating.[N.J.A.C. 7:27-22.16(o)].	None.
6	NOx (Total) <= 18.5 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1). [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1) and. [40 CFR 52.21]	NOx (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
7	CO <= 11.6 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1). [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	VOC (Total) <= 2.62 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1). This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
9	TSP <= 0.588 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1) and AP-42 distribution of particulate matter (AP-42, Table 3.4-2). [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
10	PM-10 (Total) <= 0.661 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1). [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
11	PM-2.5 (Total) <= 0.661 lb/hr. Based on emission factor for tier 2 engines (40 CFR 89.112, Table 1). [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U4 270 HP Fire Pump**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Summary of Applicable Federal Regulations: 40 CFR 52 PSD 40 CFR 60 Subpart A (Fire Pump) 40 CFR 60 Subpart IIII (Fire Pump) [None]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
2	Each emergency generator shall be located at the facility and produce mechanical or thermal energy, or electrical power exclusively for use at the facility. This emergency generator shall be operated only: 1. During the performance of normal testing and maintenance procedures, including other fire protection equipment, as recommended in writing by the fire pump or fire protection system manufacturer and/or as required in writing by a Federal or State law or regulation, 2. When there is power outage or the primary source of mechanical or thermal energy fails because of an emergency, or 3. When there is a voltage reduction issued by PJM and posted on the PJM internet website (www.pjm.com) under the "emergency procedures" menu, or 4. To provide power to pump water for fire suppression or protection, or in case of flood, even if there is no power outage and primary source of mechanical energy has not failed. [N.J.A.C. 7:27-22.16(a)] and [N.J.A.C. 7:27-19.1]	Monitored by hour/time monitor continuously. In addition, the owner or operator shall monitor, once per month, the total operating time from the generator's hour meter; hours of operation for emergency use; hours of operation for testing and maintenance; and the total fuel usage calculated by the following: Fuel Usage (Gallons per month) = (Hours of operation per month) x (Maximum emergency generator fuel usage rate in gallons per hour). Hours of operation for emergency use (per month) = (The monthly total operating time from the generator's hour meter) - (The monthly total operating time for testing or maintenance) . [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. The owner or operator shall maintain on site and record the following information: 1. Once per month, the total operating time from the generator's hour meter, the fuel usage (gallons per month) and the hours of operation for emergency use (per month). Document if the emergency use was due to internal or external loss of primary source of energy, or due to a fire or flood. If internal loss at the facility, document the emergency that occurred, the damages to the primary source of energy and the amount of time needed for repairs. 2. For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator; and 3. If a voltage reduction is the reason for the use of the emergency generator, a copy of the voltage reduction notification from PJM or other documentation of the voltage reduction. The owner or operator of an emergency generator shall maintain the above records for a period no less than 5 years after the record was made and shall make the records readily available to the Department or the EPA. [N.J.A.C. 7:27-22.16(o)] and. [N.J.A.C. 7:27-19.11]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	This emergency generator shall not be used: 1. For normal testing and maintenance on days when the Department forecasts air quality anywhere in New Jersey to be "unhealthy for sensitive groups," "unhealthy," or "very unhealthy" as defined in the EPA's Air Quality Index at http://airnow.gov/, as supplemented or amended and incorporated herein by reference, unless required in writing by a Federal or State law or regulation. Procedures for determining the air quality forecasts for New Jersey are available at the Department's air quality permitting web site at http://www.state.nj.us/dep/aqpp/aqforecast; and 2. As a source of energy or power after the primary energy or power source has become operable again after emergency or after power disruption resulted from construction, repair, or maintenance activity. Operation of the emergency generator during construction, repair, or maintenance activity shall be limited to no more than 30 days of operation per calendar year. If the primary energy or power source is under the control of the owner or operator of the emergency generator, the owner or operator shall make a reasonable, timely effort to repair the primary energy or power source. [N.J.A.C. 7:27-19.2(d)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	Hours of Operation <= 100 hr/yr for testing and maintenance. The limit on the allowable hours for testing and maintenance in accordance with the documentation from manufacturer, the vendor, or the insurance company associated with the engine. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator shall maintain on site and record the following information: For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator. [N.J.A.C. 7:27-19.11]	None.
5	The duration of a testing event is restricted to 30 minutes. [N.J.A.C. 7:27-22.16(a)]	Monitored by hour/time monitor upon occurrence of event. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of emergency fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16]	None.
6	The emergency fire pump shall not be tested at the same time as the emergency generator. [N.J.A.C. 7:27-22.16(a)]	Other: Verify that the emergency generator is not operating before commencing fire pump testing.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of emergency generator operation (as required under U3, OS Summary) and Periods of emergency fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.
7	Testing of the emergency fire pump shall not occurr as the same time as startup or shutdown of any turbine. [N.J.A.C. 7:27-22.16(a)]	Other: Verify that no combustion turbine is in start-up or shut down mode before commencing fire pump testing.[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. Maintain a record of: Periods of turbine startup and shut down (as required under U1, OS5, OS6, OS7, OS8, OS9, OS10, OS11 and OS12) and Periods of emergency fire pump operation (as required under U4, OS Summary). [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	NOx (Total) <= 0.0776 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.2(a)] and. [40 CFR 52.21]	NOx (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: NOx (total) tons/month = 1.56 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
9	CO <= 0.0777 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: CO (total) tons/month = 1.55 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
10	VOC (Total) <= 0.011 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.2(a)]	VOC (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: VOC (total) tons/month = 0.22 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
11	TSP <= 0.00395 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	TSP: Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: TSP (total) tons/month = 0.079 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
12	PM-10 (Total) <= 0.00444 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-10 (total) tons/month = 0.0887 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
13	PM-2.5 (Total) <= 0.00444 tons/yr. Based on maximum permitted hr/yr of operation for testing and maintenance. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations each month during operation, based on a consecutive 12 month period (rolling 1 month basis). The total annual emissions shall be calculated by adding the total monthly emissions for a given month to the total monthly emissions for the immediately preceding 11 months; monthly emissions shall be calculated as follows: PM-2.5 (total) tons/month = 0.0887 (lbs/hr) x monthly operating hours (hr/month) / 2000 (lbs/ton). [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. [N.J.A.C. 7:27-22.16(o)]	None.
14	All requests, reports, applications, submittals, and other communications to the Administrator pursuant to Part 60 shall be submitted in duplicate to the Regional Office of US Environmental Protection Agency. Submit information to: Director, Division of Enforcement & Compliance Assistance, US EPA, Region 2, 290 Broadway, New York, NY 10007-1866. [40 CFR 60.4(a)]	None.	None.	Submit a report: As per the approved schedule to EPA Region 2 as required by 40 CFR 60. [40 CFR 60.4(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
15	Copies of all information submitted to EPA pursuant to 40 CFR Part 60, must also be submitted to the appropriate Regional Enforcement Office of NJDEP. [40 CFR 60.4(b)]	None.	None.	Submit a report: As per the approved schedule to the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60. [40 CFR 60.4(b)]
16	No owner or operator subject to NSPS standards in Part 60, shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere. [40 CFR 60.12]	None.	None.	None.
17	Changes in time periods for submittal of information and postmark deadlines set forth in this subpart, may be made only upon approval by the Administrator and shall follow procedures outlined in 40 CFR Part 60.19. [40 CFR 60.19]	None.	None.	None.
18	The owner or operator of a fire pump engine with a displacement of less than 30 liters per cylinder must comply with the emissions standards in table 4 to NSPS IIII for the same model year and nameplate engine power as follows: NMHC + NOx <= 3.0 g/HP-hr, CO <= 2.6 g/HP-hr, PM <= 0.15 g/HP-hr. [40 CFR 60.4205(c)]	None.	Other: The owner or operator must keep documentation demonstrating compliance with the applicable emission standards, for the same model year and maximum engine power. [40 CFR 60.4211].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Owners and operators of stationary CI internal combustion engines must operate and maintain stationary CI ICE that achieve the emission standards as required in 40 CFR 60.4204 and 60.4205 over the entire life of the engine. [40 CFR 60.4206]	None.	Other: The owner or operator shall keep the manufacturer's emission-related written instructions over the entire life of the engine. If the manufacturer's emission-related written instructions are not followed, the owner or operator must keep the results of the performance test(s) demonstrating compliance with the applicable emission limits. [40 CFR 60.4206].	None.
20	Beginning October 1, 2007, the CI internal combustion engines subject to NSPS IIII that use diesel fuel must use diesel fuel that contains the following per gallon standards: 500 ppm (0.05 percent) maximum sulfur content and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent. [40 CFR 60.4207(a)]	Monitored by review of fuel delivery records once per bulk fuel shipment. For each diesel delivery received, the owner or operator shall review written documentation of the delivery to ensure the maximum allowable fuel oil sulfur content and either a minimum cetane index or a maximum aromatic content is not being exceeded. Such written documentation can include, but is not limited to: bill of lading, delivery Invoice, certificate of analysis. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by invoices / bills of lading / certificate of analysis once per bulk fuel shipment. The owner or operator shall keep records of fuel showing oil sulfur content and either a minimum cetane index or a maximum aromatic content for each delivery received. All records must be maintained for a minimum of 2 years following the date of such records per 40 CFR 60.7(f). [N.J.A.C. 7:27- 8.13(d)]	None.
21	Beginning October 1, 2010, the CI internal combustion engines with a displacement of less than 30 liters per cylinder subject to NSPS IIII that use diesel fuel must use diesel fuel that contains the following per gallon standards: 15 ppm (0.0015 percent) maximum sulfur content and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent, except that any existing diesel fuel purchased (or otherwise obtained) prior to October 1, 2010, may be used until depleted. [40 CFR 60.4207(b)]	Monitored by review of fuel delivery records once per bulk fuel shipment. For each diesel delivery received, the owner or operator shall review written documentation of the delivery to ensure the maximum allowable fuel oil sulfur content and either a minimum cetane index or a maximum aromatic content is not being exceeded. Such written documentation can include, but is not limited to: bill of lading, delivery invoice, certificate of analysis. [N.J.A.C. 7:27- 8.13(d)]	Recordkeeping by invoices / bills of lading / certificate of analysis once per bulk fuel shipment. The owner or operator shall keep records of fuel showing oil sulfur content and either a minimum cetane index or a maximum aromatic content for each delivery received. All records must be maintained for a minimum of 2 years following the date of such records per 40 CFR 60.7(f). [N.J.A.C. 7:27- 8.13(d)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
22	Owners and operators of a stationary CI internal combustion engine equipped with a diesel particulate filter must install a backpressure monitor that notifies the owner or operator when the high backpressure limit of the engine is approached. [40 CFR 60.4209(b)]	Monitored by pressure measurement device continuously. The backpressure monitor must alert the operator when the diesel particulate filter requires service. The service monitor should be mounted in a location that is clearly visible to the operator during operation. [40 CFR 60.4209(b)]	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator must keep records of any corrective action taken after the backpressure monitor has notified the owner or operator that the high backpressure limit of the engine is approached. [40 CFR 60.4214(c)]	None.
23	The owner or operator that must comply with the emission standards specified in NSPS IIII must operate and maintain the stationary CI internal combustion engine and control device, except as permitted under 40 CFR 60.4211(g), according to the manufacturer's emission-related written instructions. In addition, owners and operators may only change emission-related settings that are permitted by the manufacturer. The owner or operator must also meet the requirements of 40 CFR parts 89, 94 and/or 1068, as applicable. If the engine and control device is not installed, configured, operated, and maintained according to the manufacturer's emission-related written instructions, or emission-related settings are changed in a way that is not permitted by the manufacturer, the owner or operator must demonstrate compliance as prescribed at 40 CFR 60.4211(g)(1), (2) or (3) depending on the maximum engine power. [40 CFR 60.4211(a)]	None.	Other: The owner or operator shall keep the manufacturer's emission-related written instructions. If not complying with manufacturer's emission-related written instructions or emission-related settings, the owner or operator shall must keep a maintenance plan, records of conducted maintenance, and conduct a performance test(s), as prescribed at 40 CFR 60.4211(g). [40 CFR 60.4211].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
24	The owner or operator of a fire pump engine that was manufactured starting with or after the model year that applies to the engine power rating and a rated speed in table 3 to NSPS IIII and must comply with the emission standards in 40 CFR 60.4205(c), must comply by purchasing an engine certified to the emission standards in 40 CFR 60.4205(c), for the same model year and maximum engine power. The engine must be installed and configured according to the manufacturer's emission-related specifications, except as permitted in 40 CFR 60.4211(g). [40 CFR 60.4211(c)]	None.	Other: The owner or operator must keep documentation from the manufacturer, for the life of the equipment, that the engine is certified to meet the emission standards. If the engine and control device is not installed, configured, operated, and maintained according to the manufacturer's emission-related written instructions, or emission-related settings are changed in a way that is not permitted by the manufacturer, the owner or operator must demonstrate compliance as prescribed at 40 CFR 60.4211(g)(1), (2) or (3) depending on the maximum engine power. [40 CFR 60.4211(c)].	None.
25	Emergency stationary internal combustion engines may be operated for the purpose of maintenance checks and readiness testing limited to 100 hours per year, provided that those tests are recommended by Federal, State, or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Anyone may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year. [40 CFR 60.4211(f)(2i)]	Monitored by hour/time monitor continuously. The owner or operator of an emergency stationary internal combustion engine that does not meet the standards applicable to non-emergency engines must install a non-resettable hour meter prior to startup of the engine. [40 CFR 60.4209(a)]	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator must record the time of operation of the emergency engine and the reason the engine was in operation during that time. Starting with the model year 2011, 2012, or 2013, depending on the maximum engine power as provided in Table 5 in NSPS IIII, the owner or operator must keep records of the operation of the engine in emergency and non-emergency service that are recorded through the non-resettable hour meter if the emergency engine does not meet the standards in 40 CFR 60.4204, applicable to non-emergency engines, in the applicable model year. The emergency engine must comply with the labeling requirements in 40 CFR 60.4210(f). [40 CFR 60.4214(b)]	None.
26	A new or reconstructed stationary RICE located at an area HAP source must meet the requirements of 40 CFR 63 by meeting the requirements of 40 CFR 60 Subpart IIII, for compression ignition engines or 40 CFR 60 Subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under 40 CFR 63. [40 CFR 63.6590(c)]	Other: Comply with all applicable provisions at NSPS IIII. [40 CFR 63].	Other: Comply with all applicable provisions at NSPS IIII. [40 CFR 63].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U4 270 HP Fire Pump**
Operating Scenario: **OS1 270 HP Fire Pump**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 %. Smoke emissions from stationary internal combustion engines no greater than 20% opacity, exclusive of visible condensed water vapor, for more than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Particulate Emissions <= 1.24 lb/hr. Particulate emission limit from the combustion of ULSD based on rated heat input of emergency fire pump. [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
3	Sulfur Content in Fuel <= 15 ppmw (0.0015 % by weight). Maximum allowable sulfur content in No. 2 and lighter fuel oil. [N.J.A.C. 7:27-22.16(a)], and. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Emergency fire pump fuel limited to ultra low sulfur distillate fuel oil (ULSD) [sulfur content <= 15 ppm]. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
5	Maximum Gross Heat Input <= 2.06 MMBTU/hr (HHV). [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain documentation showing maximum heat input rating.[N.J.A.C. 7:27-22.16(o)].	None.
6	NOx (Total) <= 1.56 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4). [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7-27-18.3(b)(1)] and. [40 CFR 52.21]	NOx (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
7	CO <= 1.55 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4). [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	CO: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	VOC (Total) <= 0.22 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4). This limit includes Formaldehyde emissions. [N.J.A.C. 7:27-22.16(a)] and. [N.J.A.C. 7:27-18.3(b)1]	VOC (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
9	TSP <= 0.079 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4) and AP-42 distribution of particulate matter (AP-42, Table 3.4-2). [N.J.A.C. 7:27-22.16(a)]	TSP: Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
10	PM-10 (Total) <= 0.0887 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4). [N.J.A.C. 7:27-22.16(a)] and. [40 CFR 52.21]	PM-10 (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.
11	PM-2.5 (Total) <= 0.0887 lb/hr. Based on emission factor for post-2009 fire pump engines (40 CFR 60 Subpart IIII, Table 4). [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by calculations once initially. [N.J.A.C. 7:27-22.16(o)]	Other: Maintain initial calculations and make available to the Department upon request.[N.J.A.C. 7:27-22.16(o)].	None.

New Jersey Department of Environmental Protection
Facility Profile (General)

Facility Name (AIMS): Newark Energy Center, LLC **Facility ID (AIMS):** 08857

Street Address: 955 DELANCY ST
NEWARK, NJ 07105

Mailing Address: 955 DELANCY ST
NEWARK, NJ 07105

State Plane Coordinates:
X-Coordinate:
Y-Coordinate:
Units:
Datum:
Source Org.:
Source Type:

County: Essex
Location Description:

Industry:
Primary SIC: 4911
Secondary SIC:
NAICS: 221112

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Air Permit Information Contact

Organization: Newark Energy Center, LLC
Org. Type: Corporation
Name: Kevin Lopez
NJ EIN: 00452391369
Title: EHS Manager
Phone: (973) 287-9283 x
Mailing Address: 955 DELANCY ST
NEWARK, NJ 07105
Fax: ( ) - x
Other: ( ) - x
Type:
Email: Kevin.lopez@naes.com

Contact Type: Fees/Billing Contact

Organization: Newark Energy Center, LLC
Org. Type: Corporation
Name: Adam Sensenig
NJ EIN: 00452391369
Title: Asset Manager
Phone: (717) 341-8366 x
Mailing Address: 955 Delancy St
Newark, NJ 07105
Fax: ( ) - x
Other: ( ) - x
Type:
Email: asensenig@ppmsllc.com

Contact Type: Operator

Organization: Newark Energy Center, LLC
Org. Type: Corporation
Name: Newark Energy Center, LLC
NJ EIN: 00452391369
Title:
Phone: (973) 900-2123 x
Mailing Address: 955 DELANCY ST
Newark, NJ 07105
Fax: (973) 274-1540 x
Other: ( ) - x
Type:
Email: Ronald.Dolinski@naes.com

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: **Owner (Current Primary)**

Organization: Newark Energy Center, LLC
Org. Type: Corporation
Name: Newark Energy Center, LLC
NJ EIN: 00452391369
Title:
Phone: (717) 341-8366 x
Fax: ( ) - x
Other: ( ) - x
Type:
Email: asensenig@ppmsllc.com
Mailing Address: 955 Delancy St
Newark, NJ 07105

Contact Type: **Responsible Official**

Organization: Newark Energy Center, LLC
Org. Type: Corporation
Name: Adam Sensenig
NJ EIN: 00452391369
Title: Asset Manager
Phone: (717) 341-8366 x
Fax: ( ) - x
Other: ( ) - x
Type:
Email: asensenig@ppmsllc.com
Mailing Address: 955 Delancy St
Newark, NJ 07105

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 05/08/2024

New Jersey Department of Environmental Protection
Non-Source Fugitive Emissions

FG NJID	Description of Activity Causing Emission	Location Description	Reasonable Estimate of Emissions (tpy)								
			VOC (Total)	NOx	CO	SO	TSP (Total)	PM-10	Pb	HAPS (Total)	Other (Total)
FG1											
Total											

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Insignificant Source Emissions

IS NJID	Source/Group Description	Equipment Type	Location Description	Estimate of Emissions (tpy)								
				VOC (Total)	NOx	CO	SO	TSP	PM-10	Pb	HAPS (Total)	Other (Total)
IS1	(2) Ultra Low Sulfur Distillate (ULSD) Storage Tanks (350 gallon and 550 gallon)	Storage Vessel		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00000000	0.000
IS3	Sulfuric Acid Storage Tank - (1) 20,000 gal tank	Storage Vessel		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00000000	0.007
Total				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00000000	0.007

NEWARK ENERGY CENTER (08857) Date: 5/8/2024

BOP240001

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E1	Turbine 1	Combustion Turbine 1	Combustion Turbine			No		
E2	Tubine 2	Combustion Turbine 2	Combustion Turbine			No		
E3	HRSG 1	HRSG w/ Duct Burner 1	Duct Burner			No		
E4	HRSG 2	HRSG w/ Duct Burner 2	Duct Burner			No		
E6	Em Gen	1.5 MW Emergency Generator	Emergency Generator			No		
E7	Fire Pump	270 HP Fire Pump	Emergency Fire Pump			No		
E8	CoolingTower	Cooling Tower	Other Equipment			No		

08857 NEWARK ENERGY CENTER BOP240001 E1 (Combustion Turbine)
Print Date: 5/8/2024

Make:	GE 7FA		
Manufacturer:	GE		
Model:	7FA.05		
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	2,320.00		
Type of Turbine:	Industrial		
Type of Cycle:	Combined-Cycle	Description:	
Industrial Application:	Electrical Generato	Description:	
Power Output:	225.00	Units:	Megawatts

Is the combustion turbine using (check all that apply):

A Dry Low NOx Combustor:	☑		
Steam Injection:	☐	Steam to Fuel Ratio:	
Water Injection:	☐	Water to Fuel Ratio:	
Other:	☐	Description:	

Is the turbine Equipped with a Duct Burner?	● Yes ○ No		
Have you attached a diagram showing the location and/or the configuration of this equipment?	● Yes ○ No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	● Yes ○ No

Comments: Total Facility Generating Capacity: 705 MW Breakdown: Each CT: 225 MW, Steam Turbine: 205 MW, each Duct Burner: 25 MW

08857 NEWARK ENERGY CENTER BOP240001 E2 (Combustion Turbine)
Print Date: 5/8/2024

Make:	GE 7FA		
Manufacturer:	GE		
Model:	7FA.05		
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	2,320.00		
Type of Turbine:	Industrial		
Type of Cycle:	Combined-Cycle	Description:	
Industrial Application:	Electrical Generato	Description:	
Power Output:	225.00	Units:	Megawatts

Is the combustion turbine using (check all that apply):

A Dry Low NOx Combustor:	☑		
Steam Injection:	☐	Steam to Fuel Ratio:	
Water Injection:	☐	Water to Fuel Ratio:	
Other:	☐	Description:	

Is the turbine Equipped with a Duct Burner?	● Yes ○ No		
Have you attached a diagram showing the location and/or the configuration of this equipment?	● Yes ○ No	Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	● Yes ○ No

Comments: Total Facility Generating Capacity: 705 MW Breakdown: Each CT: 225 MW, Steam Turbine: 205 MW, each Duct Burner: 25 MW

08857 NEWARK ENERGY CENTER BOP240001 E3 (Duct Burner)
Print Date: 5/8/2024

Make:	De Jong DJC
Manufacturer:	De Jong Combustion
Model:	DJC
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	211.00
Equipment Type Description:	Supplementary-fired heat recovery steam generator (HRSG)

Have you attached a diagram showing the location and/or the configuration of this equipment?

- (●) Yes
- ( ) No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?

- (●) Yes
- ( ) No

Comments: Total Facility Generating Capacity: 705 MW Breakdown: Each CT: 225 MW, Steam Turbine: 205 MW, each Duct Burner: 25 MW

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

08857 NEWARK ENERGY CENTER BOP240001 E4 (Duct Burner)
Print Date: 5/8/2024

Make:	De Jong DJC
Manufacturer:	De Jong Combustion
Model:	DJC
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	211.00
Equipment Type Description:	Supplementary-fired heat recovery steam generator (HRSG)

Have you attached a diagram showing the location and/or the configuration of this equipment? (●) Yes ( ) No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application? (●) Yes ( ) No

Comments: Total Facility Generating Capacity: 705 MW Breakdown: Each CT: 225 MW, Steam Turbine: 205 MW, each Duct Burner: 25 MW

Include Emission Rates on the Potential to Emit Screen for each contaminant in ppmvd @ 7%O2 in addition to lbs/hr and tons/yr.

08857 NEWARK ENERGY CENTER BOP240001 E6 (Emergency Generator)
Print Date: 5/8/2024

Make:	C 27
Manufacturer:	Caterpillar
Model:	C 27
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	14.36

Will the equipment be used in excess of 500 hours per year?
- ○ Yes
- ● No

Have you attached a diagram showing the location and/or the configuration of this equipment?
- ● Yes
- ○ No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?
- ○ Yes
- ● No

Comments:

08857 NEWARK ENERGY CENTER BOP240001 E7 (Emergency Fire Pump)
Print Date: 5/8/2024

Make:	Clark Diesel
Manufacturer:	Peerless Engineering Systems
Model:	Clark Diesel Engine - JWEH-UFADF0
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	2.06
Will the equipment be used in excess of 500 hours per year?	○ Yes ● No
Have you attached a diagram showing the location and/or the configuration of this equipment?	● Yes ○ No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No
Comments:	

08857 NEWARK ENERGY CENTER BOP240001 E8 (Other Equipment)
Print Date: 5/8/2024

Make:	Marley F400 Clearsky
Manufacturer:	SPX Cooling Technologies
Model:	F4117D-6.0-12
Equipment Type:	Cooling Tower
Capacity:	5.40
Units:	other units
Description:	mega-gallons per day

Have you attached a diagram showing the location and/or the configuration of this equipment?

- (●) Yes
- ( ) No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?

- ( ) Yes
- (●) No

Comments: 12 cell cooling tower with 0.0005% drift eliminator efficiency.

NEWARK ENERGY CENTER (08857) Date: 5/8/2024

BOP240001

New Jersey Department of Environmental Protection
Control Device Inventory

CD NJID	Facility's Designation	Description	CD Type	Install Date	Grand-Fathered	Last Mod. (Since 1968)	CD Set ID
CD101	SCR 1	Selective Catalytic Reduction for Turbine 1	Selective Catalytic Reduction		No		
CD102	Ox Cat 1	CO Oxidation Catalyst for Turbine 1	Oxidizer (Catalytic)		No		
CD201	SCR 2	Selective Catalytic Reduction for Turbine 2	Selective Catalytic Reduction		No		
CD202	Ox Cat 2	CO Oxidation Catalyst for Turbine 2	Oxidizer (Catalytic)		No		

08857 NEWARK ENERGY CENTER BOP240001 CD101 (Selective Catalytic Reduction)
Print Date: 5/8/2024

Make:	DNX
Manufacturer:	Haldor Topsoe, Inc
Model:	DNX Catalyst
Minimum Temperature at Catalyst Bed (°F):	400
Maximum Temperature at Catalyst Bed (°F):	825
Minimum Temperature at Reagent Injection Point (°F):	400
Maximum Temperature at Reagent Injection Point (°F):	825
Type of Reagent:	Ammonia
Description:	
Chemical Formula of Reagent:	NH3OH
Minimum Reagent Charge Rate (gpm):	0.8
Maximum Reagent Charge Rate (gpm):	0.9
Minimum Concentration of Reagent in Solution (% Volume):	19
Minimum NOx to Reagent Mole Ratio:	
Maximum NOx to Reagent Mole Ratio:	
Maximum Anticipated Ammonia Slip (ppm):	5
Type of Catalyst:	Ceramic
Volume of Catalyst (ft^3):	
Form of Catalyst:	Ceramic Monolith Modules
Anticipated Life of Catalyst:	120
Units:	months
Have you attached a catalyst replacement schedule?	○ Yes ● No
Method of Determining Breakthrough:	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	2
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	NOx CEM
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No

08857 NEWARK ENERGY CENTER BOP240001 CD101 (Selective Catalytic Reduction)
Print Date: 5/8/2024

Comments:	The maximum concentration of ammonia in solution is 19% by weight

08857 NEWARK ENERGY CENTER BOP240001 CD102 (Oxidizer (Catalytic))
Print Date: 5/8/2024

Make:	ADCAT
Manufacturer:	Emero Chem
Model:	ADCAT
Minimum Inlet Temperature (°F):	350
Maximum Inlet Temperature (°F)	800
Minimum Outlet Temperature (°F)	350
Maximum Outlet Temperature (°F):	800
Minimum Residence Time (sec)	
Fuel Type:	Natural gas
Description:	
Maximum Rated Gross Heat Input (MMBtu/hr):	2320
Minimum Pressure Drop Across Catalyst (psi):	0.02
Maximum Pressure Drop Across Catalyst (psi):	0.05
Catalyst Material:	Platinum / Palladium / Rhodium / Alumna / Stainless Steel Monolith
Form of Catalyst:	Other
Description:	Module Carbon Steel Fram
Minimum Expected Life of Catalyst:	120
Units:	months
Volume of Catalyst (ft^3):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	2
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	CO CEM
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No
Comments:	

08857 NEWARK ENERGY CENTER BOP240001 CD201 (Selective Catalytic Reduction)
Print Date: 5/8/2024

Make:	DNX
Manufacturer:	Haldor Topsoe, Inc
Model:	DNX Catalyst
Minimum Temperature at Catalyst Bed (°F):	400
Maximum Temperature at Catalyst Bed (°F):	825
Minimum Temperature at Reagent Injection Point (°F):	400
Maximum Temperature at Reagent Injection Point (°F):	825
Type of Reagent:	Ammonia
Description:	
Chemical Formula of Reagent:	NH3OH
Minimum Reagent Charge Rate (gpm):	0.8
Maximum Reagent Charge Rate (gpm):	0.9
Minimum Concentration of Reagent in Solution (% Volume):	19
Minimum NOx to Reagent Mole Ratio:	19
Maximum NOx to Reagent Mole Ratio:	
Maximum Anticipated Ammonia Slip (ppm):	5
Type of Catalyst:	Ceramic
Volume of Catalyst (ft^3):	
Form of Catalyst:	Ceramic Monolith Modules
Anticipated Life of Catalyst:	39
Units:	months
Have you attached a catalyst replacement schedule?	○ Yes ● No
Method of Determining Breakthrough:	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	2
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	NOx CEM
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No

08857 NEWARK ENERGY CENTER BOP240001 CD201 (Selective Catalytic Reduction)
Print Date: 5/8/2024

Comments:	The maximum concentration of ammonia in solution is 19% by weight

08857 NEWARK ENERGY CENTER BOP240001 CD202 (Oxidizer (Catalytic))
Print Date: 5/8/2024

Make:	ADCAT
Manufacturer:	Emero Chem
Model:	ADCAT
Minimum Inlet Temperature (°F):	535
Maximum Inlet Temperature (°F)	800
Minimum Outlet Temperature (°F)	550
Maximum Outlet Temperature (°F):	800
Minimum Residence Time (sec)	
Fuel Type:	Natural gas
Description:	
Maximum Rated Gross Heat Input (MMBtu/hr):	2320
Minimum Pressure Drop Across Catalyst (psi):	0.02
Maximum Pressure Drop Across Catalyst (psi):	0.05
Catalyst Material:	Platinum / Palladium / Rhodium / Alumna / Stainless Steel Monolith
Form of Catalyst:	Other
Description:	Module Carbon Steel Fram
Minimum Expected Life of Catalyst:	39
Units:	months
Volume of Catalyst (ft^3):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	2
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	CO CEM
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No
Comments:	

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Emission Points Inventory

PT NJID	Facility's Designation	Description	Config.	Equiv. Diam. (in.)	Height (ft.)	Dist. to Prop. Line (ft)	Exhaust Temp. (deg. F)			Exhaust Vol. (acfm)			Discharge Direction	PT Set ID
							Avg.	Min.	Max.	Avg.	Min.	Max.		
PT1	Turbine 1	Turbine 1 and HRSG Emission Point	Round	222	252	185	181.2	161.3	300.0	1,121,050.0	0.0	1,232,750.0	Up	
PT2	Turbine 2	Turbine 2 and HRSG Emission Point	Round	222	252	185	181.2	161.3	3,000.0	1,121,050.0	0.0	1,232,750.0	Up	
PT6	Em Gen	Emergency Generator Emission Point	Round	12	50	273	948.7	948.7	948.7	11,174.0	0.0	11,174.0	Up	
PT7	Fire Pump	Fire Pump Emission Point	Round	6	50	240	826.0	826.0	826.0	1,644.0	0.0	1,644.0	Up	
PT8	CoolingTower	Cooling Tower Emission Point (diameter and flow rate are per cell)	Round	384	72	23	85.0	32.0	120.0	1,442,650.0	0.0	1,442,650.0	Up	

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 1 2 Turbine/DB 2 Turbines, each with HRSG

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	CT1	Combustion Turbine (CT) 1 firing natural gas at full load without supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 1	Normal - Steady State	E1	CD101 (P) CD102 (S)	PT1	2-01-002-01	0.0	8,760.0		0.0	1,232,750.0	161.3	187.3
OS2	CT2	Combustion Turbine (CT) 2 firing natural gas at full load without supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 2	Normal - Steady State	E2	CD201 (P) CD202 (S)	PT2	2-01-002-01	0.0	8,760.0		0.0	1,232,750.0	161.3	187.3
OS3	CT/HRSG 1	Combustion Turbine (CT) 1 firing natural gas at full load with supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 1	Normal - Steady State	E3	CD101 (P) CD102 (S)	PT1	2-01-002-01	0.0	1,800.0		0.0	1,232,750.0	161.3	187.3
OS4	CT/HRSG 2	Combustion Turbine (CT) 2 firing natural gas at full load with supplemental duct burner firing in Heat Recovery Steam Generator (HRSG) 2	Normal - Steady State	E4	CD201 (P) CD202 (S)	PT2	2-01-002-01	0.0	1,800.0		0.0	1,232,750.0	161.3	187.3
OS5	CT1 Cold SU	Combustion Turbine (CT) 1 Cold start-up	Startup	E1		PT1	2-01-002-01	0.0	167.5		0.0	1,232,750.0	161.3	187.3
OS6	CT2 Cold SU	Combustion Turbine (CT) 2 Cold start-up	Startup	E2		PT2	2-01-002-01	0.0	167.5		0.0	1,232,750.0	161.3	187.3
OS7	CT1 Warm SU	Combustion Turbine (CT) 1 Warm start-up	Startup	E1		PT1	2-01-002-01	0.0	395.0		0.0	1,232,750.0	161.3	187.3
OS8	CT2 Warm SU	Combustion Turbine (CT) 2 Warm start-up	Startup	E2		PT2	2-01-002-01	0.0	395.0		0.0	1,232,750.0	161.3	187.3

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 1 2 Turbine/DB 2 Turbines, each with HRSG

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS9	CT1 Hot SU	Combustion Turbine (CT) 1 Hot start-up	Startup	E1		PT1	2-01-002-01	0.0			0.0	1,232,750.0	161.3	187.3
OS10	CT2 Hot SU	Combustion Turbine (CT) 2 Hot start-up	Startup	E2		PT2	2-01-002-01	0.0			0.0	1,232,750.0	161.3	187.3
OS11	CT1 SD	Combustion Turbine (CT) 1 Shut Down	Shutdown	E1		PT1	2-01-002-01	0.0	90.0		0.0	1,232,750.0	161.3	187.3
OS12	CT2 SD	Combustion Turbine (CT) 2 Shut Down	Shutdown	E2		PT2	2-01-002-01	0.0	90.0		0.0	1,232,750.0	161.3	187.3

U 2 CoolingTower Cooling Tower

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	CoolingTower	Cooling Tower	Normal - Steady State	E8		PT8	3-85-001-01	0.0	8,760.0		0.0	1,442,650.0	32.0	120.0

NEWARK ENERGY CENTER (08857)
BOP240001

Date: 5/8/2024

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 3 EmGen 1.5 MW Emergency Generator

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	Em Gen	1.5 MW Emergency Generator	Normal - Steady State	E6		PT6	2-02-004-01	0.0	100.0		0.0	11,174.0	70.0	775.9

U 4 Fire Pump 270 HP Fire Pump

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	Fire Pump	270 HP Fire Pump	Normal - Steady State	E7		PT7	2-02-001-02	0.0	100.0		0.0	1,644.0	70.0	750.0

Date: 5/8/2024

New Jersey Department of Environmental Protection
Subject Item Group Inventory

Group NJID: GR1 Emissions

Members:

Type	ID	OS	Step
IS	IS3		
U	U 1	OS0 Summary	
U	U 2	OS0 Summary	
U	U 3	OS0 Summary	
U	U 4	OS0 Summary	

Formal Reason(s) for Group/Cap:

☑ Other

Other (explain): Facility Wide annual emission limits for all sources combined

Condition/Requirements that will be complied with or are no longer applicable as a result of this Group:

None

Operating Circumstances:

Facility Wide PTE

New Jersey Department of Environmental Protection
Subject Item Group Inventory

Group NJID: GR2 GHG

Members:

Type	ID	OS	Step
U	U 1	OS0 Summary	
U	U 3	OS0 Summary	
U	U 4	OS0 Summary	

Formal Reason(s) for Group/Cap:

☑ Other

Other (explain): Consolidate all GHG Requirements in one location

Condition/Requirements that will be complied with or are no longer applicable as a result of this Group:

None

Operating Circumstances:

Greenhouse Gas Requirements

New Jersey Department of Environmental Protection
Subject Item Group Inventory

Group NJID: GR10 NJAC 7:27C

Members:

Type	ID	OS	Step
E	E 1		
E	E 2		

Formal Reason(s) for Group/Cap:

☑ Other

Other (explain): RGGI Rule: N.J.A.C. 7:27C - CO2 Budget Trading Program

Condition/Requirements that will be complied with or are no longer applicable as a result of this Group:

Operating Circumstances:

New Jersey Department of Environmental Protection
Subject Item Group Inventory

Group NJID: GR11 NJAC 7:27F

Members:

Type	ID	OS	Step
E	E 1		
E	E 2		
U	U 1	OS0 Summary	

Formal Reason(s) for Group/Cap:

☑ Other

Other (explain): PACT Rule: N.J.A.C. 7:27F - Control and Prohibition of Carbon Dioxide Emissions

Condition/Requirements that will be complied with or are no longer applicable as a result of this Group:

Operating Circumstances:

Appendix I

Phase II Acid Rain Permit

Issued to: **Newark Energy Center, LLC**
955 Delancy Street
Newark, Essex County, New Jersey, 07105

Owned by: **Newark Energy Center, LLC**
955 Delancy Street
Newark, Essex County, New Jersey, 07105

Operated by: **Newark Energy Center, LLC**
955 Delancy Street
Newark, Essex County, New Jersey, 07105

ORIS Code: 58079

Effective: **November 1, 2017 through October 31, 2022 (Coincide with Operating Permit Date)**

This Acid Rain Permit is issued under the authority of Chapter 106, P.L. 1967 (N.J.S.A 26:2C-9.2) and Titles IV and V of the Clean Air Act. The owners and operators of each affected unit at this facility shall comply with all of the requirements established in this permit.

Approved by:

David J. Owen

Supervisor, Bureau of Stationary Sources

ACID RAIN PERMIT CONTENTS

1. STATEMENT OF BASIS

In accordance with N.J.S.A. 26:2C-9.2 and Titles IV and V of the Clean Air Act, the Department issues this permit pursuant to N.J.A.C 7:27 et. seq.

2. UNIT SPECIFIC REQUIREMENTS

Refer to 40 CFR 72 for specific requirements.

3. COMMENTS, NOTES, AND JUSTIFICATIONS REGARDING PERMIT DECISIONS

This facility is subject to the Operating Permit regulations promulgated at N.J.A.C. 7:27-22. Therefore, the facility must obtain an Operating Permit. The procedures for incorporating this Acid Rain permit into the Operating Permit shall be consistent with the state requirements at N.J.A.C. 7:27-22.29, the federal requirements at 40 CFR 72, and any official guidance issued by USEPA.

4. PHASE II PERMIT APPLICATION

The owners and operators shall comply with all of the standard requirements and special provisions set forth on the attached Phase II Permit Application for each affected unit.

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258
Approval expires 11/30/2012

Acid Rain Permit Application

For more information, see instructions and 40 CFR 72.30 and 72.31.

This submission is: ☐ **New** ☐ **Revised** ☒ **for ARP permit renewal**

STEP 1

Identify the facility name, State, and plant (ORIS) code.

Newark Energy Center Facility (Source) Name	NJ State	58079 Plant Code

STEP 2

Enter the unit ID# for every affected unit at the affected source in column "a."

a	b
Unit ID#	Unit Will Hold Allowances in Accordance with 40 CFR 72.9(c)(1)
U001	Yes
U002	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes
	Yes

STEP 3

Read the standard requirements.

Permit Requirements

(1) The designated representative of each affected source and each affected unit at the source shall:

(i) Submit a complete Acid Rain permit application (including a compliance plan) under 40 CFR part 72 in accordance with the deadlines specified in 40 CFR 72.30; and

(ii) Submit in a timely manner any supplemental information that the permitting authority determines is necessary in order to review an Acid Rain permit application and issue or deny an Acid Rain permit;

(2) The owners and operators of each affected source and each affected unit at the source shall:

(i) Operate the unit in compliance with a complete Acid Rain permit application or a superseding Acid Rain permit issued by the permitting authority; and

(ii) Have an Acid Rain Permit.

Monitoring Requirements

(1) The owners and operators and, to the extent applicable, designated representative of each affected source and each affected unit at the source shall comply with the monitoring requirements as provided in 40 CFR part 75.

(2) The emissions measurements recorded and reported in accordance with 40 CFR part 75 shall be used to determine compliance by the source or unit, as appropriate, with the Acid Rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides under the Acid Rain Program.

(3) The requirements of 40 CFR part 75 shall not affect the responsibility of the owners and operators to monitor emissions of other pollutants or other emissions characteristics at the unit under other applicable requirements of the Act and other provisions of the operating permit for the source.

Sulfur Dioxide Requirements

(1) The owners and operators of each source and each affected unit at the source shall:

(i) Hold allowances, as of the allowance transfer deadline, in the source's compliance account (after deductions under 40 CFR 73.34(c)), not less than the total annual emissions of sulfur dioxide for the previous calendar year from the affected units at the source; and

(ii) Comply with the applicable Acid Rain emissions limitations for sulfur dioxide.

(2) Each ton of sulfur dioxide emitted in excess of the Acid Rain emissions limitations for sulfur dioxide shall constitute a separate violation of the Act.

(3) An affected unit shall be subject to the requirements under paragraph (1) of the sulfur dioxide requirements as follows:

(i) Starting January 1, 2000, an affected unit under 40 CFR 72.6(a)(2); or

(ii) Starting on the later of January 1, 2000 or the deadline for monitor certification under 40 CFR part 75, an affected unit under 40 CFR 72.6(a)(3).

Newark Energy Center
Facility (Source) Name (from STEP 1)

Sulfur Dioxide Requirements, Cont'd.

STEP 3, Cont'd.

(4) Allowances shall be held in, deducted from, or transferred among Allowance Tracking System accounts in accordance with the Acid Rain Program.
(5) An allowance shall not be deducted in order to comply with the requirements under paragraph (1) of the sulfur dioxide requirements prior to the calendar year for which the allowance was allocated.
(6) An allowance allocated by the Administrator under the Acid Rain Program is a limited authorization to emit sulfur dioxide in accordance with the Acid Rain Program. No provision of the Acid Rain Program, the Acid Rain permit application, the Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8 and no provision of law shall be construed to limit the authority of the United States to terminate or limit such authorization.
(7) An allowance allocated by the Administrator under the Acid Rain Program does not constitute a property right.

Nitrogen Oxides Requirements

The owners and operators of the source and each affected unit at the source shall comply with the applicable Acid Rain emissions limitation for nitrogen oxides.

Excess Emissions Requirements

(1) The designated representative of an affected source that has excess emissions in any calendar year shall submit a proposed offset plan, as required under 40 CFR part 77.
(2) The owners and operators of an affected source that has excess emissions in any calendar year shall:
(i) Pay without demand the penalty required, and pay upon demand the interest on that penalty, as required by 40 CFR part 77; and
(ii) Comply with the terms of an approved offset plan, as required by 40 CFR part 77.

Recordkeeping and Reporting Requirements

(1) Unless otherwise provided, the owners and operators of the source and each affected unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Administrator or permitting authority:
(i) The certificate of representation for the designated representative for the source and each affected unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation, in accordance with 40 CFR 72.24; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission

of a new certificate of representation changing the designated representative;

STEP 3, Cont'd.

Recordkeeping and Reporting Requirements, Cont'd.

(ii) All emissions monitoring information, in accordance with 40 CFR part 75, provided that to the extent that 40 CFR part 75 provides for a 3-year period for recordkeeping, the 3-year period shall apply.
(iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the Acid Rain Program; and,
(iv) Copies of all documents used to complete an Acid Rain permit application and any other submission under the Acid Rain Program or to demonstrate compliance with the requirements of the Acid Rain Program.

(2) The designated representative of an affected source and each affected unit at the source shall submit the reports and compliance certifications required under the Acid Rain Program, including those under 40 CFR part 72 subpart I and 40 CFR part 75.

Liability

(1) Any person who knowingly violates any requirement or prohibition of the Acid Rain Program, a complete Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8, including any requirement for the payment of any penalty owed to the United States, shall be subject to enforcement pursuant to section 113(c) of the Act.
(2) Any person who knowingly makes a false, material statement in any record, submission, or report under the Acid Rain Program shall be subject to criminal enforcement pursuant to section 113(c) of the Act and 18 U.S.C. 1001.
(3) No permit revision shall excuse any violation of the requirements of the Acid Rain Program that occurs prior to the date that the revision takes effect.
(4) Each affected source and each affected unit shall meet the requirements of the Acid Rain Program.
(5) Any provision of the Acid Rain Program that applies to an affected source (including a provision applicable to the designated representative of an affected source) shall also apply to the owners and operators of such source and of the affected units at the source.
(6) Any provision of the Acid Rain Program that applies to an affected unit (including a provision applicable to the designated representative of an affected unit) shall also apply to the owners and operators of such unit.
(7) Each violation of a provision of 40 CFR parts 72, 73, 74, 75, 76, 77, and 78 by an affected source or affected unit, or by an owner or operator or designated representative of such source or unit, shall be a separate violation of the Act.

Effect on Other Authorities

No provision of the Acid Rain Program, an Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7 or 72.8 shall be construed as:
(1) Except as expressly provided in title IV of the Act, exempting or excluding the owners and operators and, to the extent applicable, the designated representative of an affected source or affected unit from compliance with

any other provision of the Act, including the provisions of title I of the Act relating

STEP 3, Cont'd.

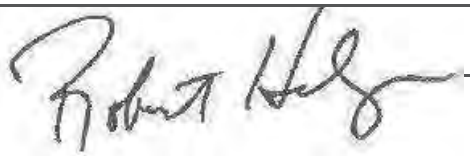
Effect on Other Authorities, Cont'd.

to applicable National Ambient Air Quality Standards or State Implementation Plans;
(2) Limiting the number of allowances a source can hold; *provided,* that the number of allowances held by the source shall not affect the source's obligation to comply with any other provisions of the Act;
(3) Requiring a change of any kind in any State law regulating electric utility rates and charges, affecting any State law regarding such State regulation, or limiting such State regulation, including any prudence review requirements under such State law;
(4) Modifying the Federal Power Act or affecting the authority of the Federal Energy Regulatory Commission under the Federal Power Act; or,
(5) Interfering with or impairing any program for competitive bidding for power supply in a State in which such program is established.

STEP 4
Read the certification statement, sign, and date.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name Robert B. Haley	
Signature 	8/19/2016 Date

Appendix II:

Cross-State Air Pollution Rule (CSAPR) Title V requirements for

- **CSAPR NOx Annual Trading Program,**
- **CSAPR NOx Ozone Season Trading Program, and**
- **CSAPR SO2 Trading Program**

Transport Rule (TR) Trading Program Title V Requirements

TR NO_X Annual Trading Program requirements (40 CFR 97.406)

(a) Designated representative requirements.

The owners and operators shall comply with the requirement to have a designated representative, and may have an alternate designated representative, in accordance with 40 CFR 97.413 through 97.418.

(b) Emissions monitoring, reporting, and recordkeeping requirements.

(1) The owners and operators, and the designated representative, of each TR NO_X Annual source and each TR NO_X Annual unit at the source shall comply with the monitoring, reporting, and recordkeeping requirements of 40 CFR 97.430 (general requirements, including installation, certification, and data accounting, compliance deadlines, reporting data, prohibitions, and long-term cold storage), 97.431 (initial monitoring system certification and recertification procedures), 97.432 (monitoring system out-of-control periods), 97.433 (notifications concerning monitoring), 97.434 (recordkeeping and reporting, including monitoring plans, certification applications, quarterly reports, and compliance certification), and 97.435 (petitions for alternatives to monitoring, recordkeeping, or reporting requirements).

(2) The emissions data determined in accordance with 40 CFR 97.430 through 97.435 shall be used to calculate allocations of TR NO_X Annual allowances under 40 CFR 97.411(a)(2) and (b) and 97.412 and to determine compliance with the TR NO_X Annual emissions limitation and assurance provisions under paragraph (c) below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.430 through 97.435 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(c) NO_X emissions requirements.

(1) TR NO_X Annual emissions limitation.

(i). As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR NO_X Annual source and each TR NO_X Annual unit at the source shall hold, in the source's compliance account, TR NO_X Annual allowances available for deduction for such control period under 40 CFR 97.424(a) in an amount not less than the tons of total NO_X emissions for such control period from all TR NO_X Annual units at the source.

(ii). If total NO_X emissions during a control period in a given year from the TR NO_X Annual units at a TR NO_X Annual source are in excess of the TR NO_X Annual emissions limitation set forth in paragraph (c)(1)(i) above, then:

(A). The owners and operators of the source and each TR NO_X Annual unit at the source shall hold the TR NO_X Annual allowances required for deduction under 40 CFR 97.424(d); and

(B). The owners and operators of the source and each TR NO_X Annual unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart AAAAA and the Clean Air Act.

(2) TR NO_X Annual assurance provisions.

(i). If total NO_X emissions during a control period in a given year from all TR NO_X Annual units at TR NO_X Annual sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the

common designated representative's share of such NO_X emissions during such control period exceeds the common designated representative's assurance level for the state and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR NO_X Annual allowances available for deduction for such control period under 40 CFR 97.425(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.425(b), of multiplying— (A) The quotient of the amount by which the common designated representative's share of such NO_X emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such NO_X emissions exceeds the respective common designated representative's assurance level; and (B) The amount by which total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the state for such control period exceed the state assurance level.

(ii). The owners and operators shall hold the TR NO_X Annual allowances required under paragraph (c)(2)(i) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(iii). Total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the State during a control period in a given year exceed the state assurance level if such total NO_X emissions exceed the sum, for such control period, of the state NO_X Annual trading budget under 40 CFR 97.410(a) and the state's variability limit under 40 CFR 97.410(b).

(iv). It shall not be a violation of 40 CFR part 97, subpart AAAAA or of the Clean Air Act if total NO_X emissions from all TR NO_X Annual units at TR NO_X Annual sources in the State during a control period exceed the state assurance level or if a common designated representative's share of total NO_X emissions from the TR NO_X Annual units at TR NO_X Annual sources in the state during a control period exceeds the common designated representative's assurance level.

(v). To the extent the owners and operators fail to hold TR NO_X Annual allowances for a control period in a given year in accordance with paragraphs (c)(2)(i) through (iii) above,

(A). The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B). Each TR NO_X Annual allowance that the owners and operators fail to hold for such control period in accordance with paragraphs (c)(2)(i) through (iii) above and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart AAAAA and the Clean Air Act.

(3) Compliance periods.

(i). A TR NO_X Annual unit shall be subject to the requirements under paragraph (c)(1) above for the control period starting on the later of January 1, 2015, or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(ii). A TR NO_X Annual unit shall be subject to the requirements under paragraph (c)(2) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(4) Vintage of allowances held for compliance.

(i). A TR NO_X Annual allowance held for compliance with the requirements under paragraph (c)(1)(i) above for a control period in a given year must be a TR NO_X Annual allowance that was allocated for such control period or a control period in a prior year.

(ii). A TR NO_X Annual allowance held for compliance with the requirements under paragraphs (c)(1)(ii)(A) and (2)(i) through (iii) above for a control period in a given year must be a TR NO_X Annual allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(5) Allowance Management System requirements. Each TR NO_X Annual allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR part 97, subpart AAAAA.

(6) Limited authorization. A TR NO_X Annual allowance is a limited authorization to emit one ton of NO_X during the control period in one year. Such authorization is limited in its use and duration as follows:

(i). Such authorization shall only be used in accordance with the TR NO_X Annual Trading Program; and

(ii). Notwithstanding any other provision of 40 CFR part 97, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(7) Property right. A TR NO_X Annual allowance does not constitute a property right.

(d) Title V permit revision requirements.

(1) No title V permit revision shall be required for any allocation, holding, deduction, or transfer of TR NO_X Annual allowances in accordance with 40 CFR part 97, subpart AAAAA.

(2) This permit incorporates the TR emissions monitoring, recordkeeping and reporting requirements pursuant to 40 CFR 97.430 through 97.435, and the requirements for a continuous emission monitoring system (pursuant to 40 CFR part 75, subparts B and H), an excepted monitoring system (pursuant to 40 CFR part 75, appendices D and E), a low mass emissions excepted monitoring methodology (pursuant to 40 CFR 75.19), and an alternative monitoring system (pursuant to 40 CFR part 75, subpart E). Therefore, the Description of TR Monitoring Provisions table for units identified in this permit may be added to, or changed, in this title V permit using minor permit modification procedures in accordance with 40 CFR 97.406(d)(2) and 70.7(e)(2)(i)(B) or 71.7(e)(1)(i)(B).

(e) Additional recordkeeping and reporting requirements.

(1) Unless otherwise provided, the owners and operators of each TR NO_X Annual source and each TR NO_X Annual unit at the source shall keep on site at the source each of the following documents (in hardcopy or electronic format) for a period of 5 years from the date the document is created. This period may be extended for cause, at any time before the end of 5 years, in writing by the Administrator.

(i). The certificate of representation under 40 CFR 97.416 for the designated representative for the source and each TR NO_X Annual unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such certificate of representation and documents are superseded because of the submission of a new certificate of representation under 40 CFR 97.416 changing the designated representative.

(ii). All emissions monitoring information, in accordance with 40 CFR part 97, subpart AAAAA.

(iii). Copies of all reports, compliance certifications, and other submissions and all records made or required under, or to demonstrate compliance with the requirements of, the TR NO_X Annual Trading Program.

(2) The designated representative of a TR NO_X Annual source and each TR NO_X Annual unit at the source shall make all submissions required under the TR NO_X Annual Trading Program, except

as provided in 40 CFR 97.418. This requirement does not change, create an exemption from, or otherwise affect the responsible official submission requirements under a title V operating permit program in 40 CFR parts 70 and 71.

(f) Liability.

(1) Any provision of the TR NO_X Annual Trading Program that applies to a TR NO_X Annual source or the designated representative of a TR NO_X Annual source shall also apply to the owners and operators of such source and of the TR NO_X Annual units at the source.

(2) Any provision of the TR NO_X Annual Trading Program that applies to a TR NO_X Annual unit or the designated representative of a TR NO_X Annual unit shall also apply to the owners and operators of such unit.

(g) Effect on other authorities.

No provision of the TR NO_X Annual Trading Program or exemption under 40 CFR 97.405 shall be construed as exempting or excluding the owners and operators, and the designated representative, of a TR NO_X Annual source or TR NO_X Annual unit from compliance with any other provision of the applicable, approved state implementation plan, a federally enforceable permit, or the Clean Air Act.

TR NO_X Ozone Season Trading Program Requirements (40 CFR 97.506)

(a) Designated representative requirements.

The owners and operators shall comply with the requirement to have a designated representative, and may have an alternate designated representative, in accordance with 40 CFR 97.513 through 97.518.

(b) Emissions monitoring, reporting, and recordkeeping requirements.

(1) The owners and operators, and the designated representative, of each TR NO_X Ozone Season source and each TR NO_X Ozone Season unit at the source shall comply with the monitoring, reporting, and recordkeeping requirements of 40 CFR 97.530 (general requirements, including installation, certification, and data accounting, compliance deadlines, reporting data, prohibitions, and long-term cold storage), 97.531 (initial monitoring system certification and recertification procedures), 97.532 (monitoring system out-of-control periods), 97.533 (notifications concerning monitoring), 97.534 (recordkeeping and reporting, including monitoring plans, certification applications, quarterly reports, and compliance certification), and 97.535 (petitions for alternatives to monitoring, recordkeeping, or reporting requirements).

(2) The emissions data determined in accordance with 40 CFR 97.530 through 97.535 shall be used to calculate allocations of TR NO_X Ozone Season allowances under 40 CFR 97.511(a)(2) and (b) and 97.512 and to determine compliance with the TR NO_X Ozone Season emissions limitation and assurance provisions under paragraph (c) below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.530 through 97.535 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(c) NO_X emissions requirements.

(1) TR NO_X Ozone Season emissions limitation.

(i). As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR NO_X Ozone Season source and each TR NO_X Ozone Season unit at the source shall hold, in the source's compliance account, TR NO_X Ozone Season allowances available for deduction for such control period under 40 CFR 97.524(a) in an amount not less than the tons of total NO_X emissions for such control period from all TR NO_X Ozone Season units at the source.

(ii). If total NO_X emissions during a control period in a given year from the TR NO_X Ozone Season units at a TR NO_X Ozone Season source are in excess of the TR NO_X Ozone Season emissions limitation set forth in paragraph (c)(1)(i) above, then:

(A). The owners and operators of the source and each TR NO_X Ozone Season unit at the source shall hold the TR NO_X Ozone Season allowances required for deduction under 40 CFR 97.524(d); and

(B). The owners and operators of the source and each TR NO_X Ozone Season unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart BBBBB and the Clean Air Act.

(2) TR NO_X Ozone Season assurance provisions.

(i). If total NO_X emissions during a control period in a given year from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such NO_X emissions during such control period exceeds the common designated representative's assurance level for the state

and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR NO_X Ozone Season allowances available for deduction for such control period under 40 CFR 97.525(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.525(b), of multiplying—

(A). The quotient of the amount by which the common designated representative's share of such NO_X emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such NO_X emissions exceeds the respective common designated representative's assurance level; and

(B). The amount by which total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state for such control period exceed the state assurance level.

(ii). The owners and operators shall hold the TR NO_X Ozone Season allowances required under paragraph (c)(2)(i) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(iii). Total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period in a given year exceed the state assurance level if such total NO_X emissions exceed the sum, for such control period, of the State NO_X Ozone Season trading budget under 40 CFR 97.510(a) and the state's variability limit under 40 CFR 97.510(b).

(iv). It shall not be a violation of 40 CFR part 97, subpart BBBBB or of the Clean Air Act if total NO_X emissions from all TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total NO_X emissions from the TR NO_X Ozone Season units at TR NO_X Ozone Season sources in the state during a control period exceeds the common designated representative's assurance level.

(v). To the extent the owners and operators fail to hold TR NO_X Ozone Season allowances for a control period in a given year in accordance with paragraphs (c)(2)(i) through (iii) above,

(A). The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B). Each TR NO_X Ozone Season allowance that the owners and operators fail to hold for such control period in accordance with paragraphs (c)(2)(i) through (iii) above and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart BBBBB and the Clean Air Act.

(3) Compliance periods.

(i). A TR NO_X Ozone Season unit shall be subject to the requirements under paragraph (c)(1) above for the control period starting on the later of May 1, 2015 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.530(b) and for each control period thereafter.

(ii). A TR NO_X Ozone Season unit shall be subject to the requirements under paragraph (c)(2) above for the control period starting on the later of May 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.530(b) and for each control period thereafter.

(4) Vintage of allowances held for compliance.

(i). A TR NO_X Ozone Season allowance held for compliance with the requirements under paragraph (c)(1)(i) above for a control period in a given year must be a TR NO_X Ozone

Season allowance that was allocated for such control period or a control period in a prior year.

(ii). A TR NO_X Ozone Season allowance held for compliance with the requirements under paragraphs (c)(1)(ii)(A) and (2)(i) through (iii) above for a control period in a given year must be a TR NO_X Ozone Season allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(5) Allowance Management System requirements. Each TR NO_X Ozone Season allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR part 97, subpart BBBBB.

(6) Limited authorization. A TR NO_X Ozone Season allowance is a limited authorization to emit one ton of NO_X during the control period in one year. Such authorization is limited in its use and duration as follows:

(i). Such authorization shall only be used in accordance with the TR NO_X Ozone Season Trading Program; and

(ii). Notwithstanding any other provision of 40 CFR part 97, subpart BBBBB, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(7) Property right. A TR NO_X Ozone Season allowance does not constitute a property right.

(d) Title V permit revision requirements.

(1) No title V permit revision shall be required for any allocation, holding, deduction, or transfer of TR NO_X Ozone Season allowances in accordance with 40 CFR part 97, subpart BBBBB.

(2) This permit incorporates the TR emissions monitoring, recordkeeping and reporting requirements pursuant to 40 CFR 97.530 through 97.535, and the requirements for a continuous emission monitoring system (pursuant to 40 CFR part 75, subparts B and H), an excepted monitoring system (pursuant to 40 CFR part 75, appendices D and E), a low mass emissions excepted monitoring methodology (pursuant to 40 CFR 75.19), and an alternative monitoring system (pursuant to 40 CFR part 75, subpart E). Therefore, the Description of TR Monitoring Provisions table for units identified in this permit may be added to, or changed, in this title V permit using minor permit modification procedures in accordance with 40 CFR 97.506(d)(2) and 70.7(e)(2)(i)(B) or 71.7(e)(1)(i)(B).

(e) Additional recordkeeping and reporting requirements.

(1) Unless otherwise provided, the owners and operators of each TR NO_X Ozone Season source and each TR NO_X Ozone Season unit at the source shall keep on site at the source each of the following documents (in hardcopy or electronic format) for a period of 5 years from the date the document is created. This period may be extended for cause, at any time before the end of 5 years, in writing by the Administrator.

(i). The certificate of representation under 40 CFR 97.516 for the designated representative for the source and each TR NO_X Ozone Season unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such certificate of representation and documents are superseded because of the submission of a new certificate of representation under 40 CFR 97.516 changing the designated representative.

(ii). All emissions monitoring information, in accordance with 40 CFR part 97, subpart BBBBB.

(iii). Copies of all reports, compliance certifications, and other submissions and all records made or required under, or to demonstrate compliance with the requirements of, the TR NO_X Ozone Season Trading Program.

(2) The designated representative of a TR NO_X Ozone Season source and each TR NO_X Ozone Season unit at the source shall make all submissions required under the TR NO_X Ozone Season Trading Program, except as provided in 40 CFR 97.518. This requirement does not change, create an exemption from, or otherwise affect the responsible official submission requirements under a title V operating permit program in 40 CFR parts 70 and 71.

(f) Liability.

(1) Any provision of the TR NO_X Ozone Season Trading Program that applies to a TR NO_X Ozone Season source or the designated representative of a TR NO_X Ozone Season source shall also apply to the owners and operators of such source and of the TR NO_X Ozone Season units at the source.

(2) Any provision of the TR NO_X Ozone Season Trading Program that applies to a TR NO_X Ozone Season unit or the designated representative of a TR NO_X Ozone Season unit shall also apply to the owners and operators of such unit.

(g) Effect on other authorities.

No provision of the TR NO_X Ozone Season Trading Program or exemption under 40 CFR 97.505 shall be construed as exempting or excluding the owners and operators, and the designated representative, of a TR NO_X Ozone Season source or TR NO_X Ozone Season unit from compliance with any other provision of the applicable, approved state implementation plan, a federally enforceable permit, or the Clean Air Act.

TR SO_2 Group 1 Trading Program requirements (40 CFR 97.606)

(a) Designated representative requirements.

The owners and operators shall comply with the requirement to have a designated representative, and may have an alternate designated representative, in accordance with 40 CFR 97.613 through 97.618.

(b) Emissions monitoring, reporting, and recordkeeping requirements.

(1) The owners and operators, and the designated representative, of each TR SO_2 Group 1 source and each TR SO_2 Group 1 unit at the source shall comply with the monitoring, reporting, and recordkeeping requirements of 40 CFR 97.630 (general requirements, including installation, certification, and data accounting, compliance deadlines, reporting data, prohibitions, and long-term cold storage), 97.631 (initial monitoring system certification and recertification procedures), 97.632 (monitoring system out-of-control periods), 97.633 (notifications concerning monitoring), 97.634 (recordkeeping and reporting, including monitoring plans, certification applications, quarterly reports, and compliance certification), and 97.635 (petitions for alternatives to monitoring, recordkeeping, or reporting requirements).

(2) The emissions data determined in accordance with 40 CFR 97.630 through 97.635 shall be used to calculate allocations of TR SO_2 Group 1 allowances under 40 CFR 97.611(a)(2) and (b) and 97.612 and to determine compliance with the TR SO_2 Group 1 emissions limitation and assurance provisions under paragraph (c) below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.630 through 97.635 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(c) SO_2 emissions requirements.

(1) TR SO_2 Group 1 emissions limitation.

(i). As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR SO_2 Group 1 source and each TR SO2 Group 1 unit at the source shall hold, in the source's compliance account, TR SO_2 Group 1 allowances available for deduction for such control period under 40 CFR 97.624(a) in an amount not less than the tons of total SO_2 emissions for such control period from all TR SO_2 Group 1 units at the source.

(ii). If total SO_2 emissions during a control period in a given year from the TR SO_2 Group 1 units at a TR SO_2 Group 1 source are in excess of the TR SO_2 Group 1 emissions limitation set forth in paragraph (c)(1)(i) above, then:

(A). The owners and operators of the source and each TR SO_2 Group 1 unit at the source shall hold the TR SO_2 Group 1 allowances required for deduction under 40 CFR 97.624(d); and

(B). The owners and operators of the source and each TR SO_2 Group 1 unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation 40 CFR part 97, subpart CCCCC and the Clean Air Act.

(2) TR SO_2 Group 1 assurance provisions.

(i). If total SO_2 emissions during a control period in a given year from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such SO_2 emissions during such control period exceeds the common designated representative's assurance level for the state and

such control period, shall hold (in the assurance account established for the owners and operators of such group) TR SO_2 Group 1 allowances available for deduction for such control period under 40 CFR 97.625(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.625(b), of multiplying—

(A). The quotient of the amount by which the common designated representative's share of such SO_2 emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such SO_2 emissions exceeds the respective common designated representative's assurance level; and

(B). The amount by which total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state for such control period exceed the state assurance level.

(ii). The owners and operators shall hold the TR SO_2 Group 1 allowances required under paragraph (c)(2)(i) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(iii). Total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period in a given year exceed the state assurance level if such total SO_2 emissions exceed the sum, for such control period, of the state SO_2 Group 1 trading budget under 40 CFR 97.610(a) and the state's variability limit under 40 CFR 97.610(b).

(iv). It shall not be a violation of 40 CFR part 97, subpart CCCCC or of the Clean Air Act if total SO_2 emissions from all TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total SO_2 emissions from the TR SO_2 Group 1 units at TR SO_2 Group 1 sources in the state during a control period exceeds the common designated representative's assurance level.

(v). To the extent the owners and operators fail to hold TR SO_2 Group 1 allowances for a control period in a given year in accordance with paragraphs (c)(2)(i) through (iii) above,

(A). The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B). Each TR SO_2 Group 1 allowance that the owners and operators fail to hold for such control period in accordance with paragraphs (c)(2)(i) through (iii) above and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart CCCCC and the Clean Air Act.

(3) Compliance periods.

(i). A TR SO_2 Group 1 unit shall be subject to the requirements under paragraph (c)(1) above for the control period starting on the later of January 1, 2015 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(ii). A TR SO_2 Group 1 unit shall be subject to the requirements under paragraph (c)(2) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(4) Vintage of allowances held for compliance.

(i). A TR SO_2 Group 1 allowance held for compliance with the requirements under paragraph (c)(1)(i) above for a control period in a given year must be a TR SO_2 Group 1 allowance that was allocated for such control period or a control period in a prior year.

(ii). A TR SO_2 Group 1 allowance held for compliance with the requirements under paragraphs (c)(1)(ii)(A) and (2)(i) through (iii) above for a control period in a given year must be a TR SO_2 Group 1 allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(5) Allowance Management System requirements. Each TR SO_2 Group 1 allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR part 97, subpart CCCCC.

(6) Limited authorization. A TR SO_2 Group 1 allowance is a limited authorization to emit one ton of SO_2 during the control period in one year. Such authorization is limited in its use and duration as follows:

(i). Such authorization shall only be used in accordance with the TR SO_2 Group 1 Trading Program; and

(ii). Notwithstanding any other provision of 40 CFR part 97, subpart CCCCC, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(7) Property right. A TR SO_2 Group 1 allowance does not constitute a property right.

(d) Title V permit revision requirements.

(1) No title V permit revision shall be required for any allocation, holding, deduction, or transfer of TR SO_2 Group 1 allowances in accordance with 40 CFR part 97, subpart CCCCC.

(2) This permit incorporates the TR emissions monitoring, recordkeeping and reporting requirements pursuant to 40 CFR 97.630 through 97.635, and the requirements for a continuous emission monitoring system (pursuant to 40 CFR part 75, subparts B and H), an excepted monitoring system (pursuant to 40 CFR part 75, appendices D and E), a low mass emissions excepted monitoring methodology (pursuant to 40 CFR part 75.19), and an alternative monitoring system (pursuant to 40 CFR part 75, subpart E), Therefore, the Description of TR Monitoring Provisions table for units identified in this permit may be added to, or changed, in this title V permit using minor permit modification procedures in accordance with 40 CFR 97.606(d)(2) and 70.7(e)(2)(i)(B) or 71.7(e)(1)(i)(B).

(e) Additional recordkeeping and reporting requirements.

(1) Unless otherwise provided, the owners and operators of each TR SO_2 Group 1 source and each TR SO_2 Group 1 unit at the source shall keep on site at the source each of the following documents (in hardcopy or electronic format) for a period of 5 years from the date the document is created. This period may be extended for cause, at any time before the end of 5 years, in writing by the Administrator.

(i). The certificate of representation under 40 CFR 97.616 for the designated representative for the source and each TR SO_2 Group 1 unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such certificate of representation and documents are superseded because of the submission of a new certificate of representation under 40 CFR 97.616 changing the designated representative.

(ii). All emissions monitoring information, in accordance with 40 CFR part 97, subpart CCCCC.

(iii). Copies of all reports, compliance certifications, and other submissions and all records made or required under, or to demonstrate compliance with the requirements of, the TR SO_2 Group 1 Trading Program.

(2) The designated representative of a TR SO_2 Group 1 source and each TR SO_2 Group 1 unit at the source shall make all submissions required under the TR SO_2 Group 1 Trading Program, except

as provided in 40 CFR 97.618. This requirement does not change, create an exemption from, or otherwise affect the responsible official submission requirements under a title V operating permit program in 40 CFR parts 70 and 71.

(f) Liability.

(1) Any provision of the TR SO_2 Group 1 Trading Program that applies to a TR SO_2 Group 1 source or the designated representative of a TR SO_2 Group 1 source shall also apply to the owners and operators of such source and of the TR SO_2 Group 1 units at the source.

(2) Any provision of the TR SO_2 Group 1 Trading Program that applies to a TR SO_2 Group 1 unit or the designated representative of a TR SO_2 Group 1 unit shall also apply to the owners and operators of such unit.

(g) Effect on other authorities.

No provision of the TR SO_2 Group 1 Trading Program or exemption under 40 CFR 97.605 shall be construed as exempting or excluding the owners and operators, and the designated representative, of a TR SO_2 Group 1 source or TR SO_2 Group 1 unit from compliance with any other provision of the applicable, approved state implementation plan, a federally enforceable permit, or the Clean Air Act.

Exhibit 13

Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program Proposed Rule EPA-HQ-OAR-2016-0186

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

Table 1 of this document contains a tentative list of state, local, and tribal regulations and statutes that may be affected by the EPA's proposed rulemaking identified above. This list is intended to encompass all affirmative defense provisions contained within EPA-approved part 70 (title V) operating permit programs.[1] Table 2 of this document contains a tentative list of state, local, and tribal EPA-approved title V programs that do not appear to explicitly establish an affirmative defense contrary to the EPA's interpretation of the Clean Air Act (CAA), as reflected in this proposed rulemaking. These lists do ***not*** constitute any type of determination as to the adequacy or inadequacy of any specific program provisions.

As indicated in the proposed rule identified above, the EPA is requesting comment on whether the provisions identified in Table 1 of this document, as well as any additional title V affirmative defense provisions that are not currently identified in Table 1 of this document, may be affected if the proposed rule is finalized. The EPA is presenting and soliciting comment on these lists *for informational purposes only*. For further information, see Section V.A of the preamble to the proposed rule.

Table 1. Part 70 Programs that Appear to Contain Title V Affirmative Defense Provisions

EPA Region	Permitting Authority	Affirmative Defense Provision
1	Connecticut	RCSA § 22a-174-33(p)(2)
	Maine	06-096 CMR 140(2)(AA)
	Massachusetts	310 CMR 7.00: Appendix C(16)
	Rhode Island	APCR § 29.6.11

[1] This list is not intended to include any affirmative defense provisions contained in state regulations or statutes that are not part of an EPA-approved title V program (including state-only regulations, SIP provisions that are not included within a state's EPA-approved title V program, or statutes that are not included within a state's EPA-approved title V program).

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
2	New Jersey	NJAC 7:27-22.3(nn); NJAC 7:27-22.16(l)
	New York	6 NYCRR 201-1.5; 6 NYCRR 201-6.5(c)
	Puerto Rico	Regla 603, Reglamento para el Control de la Contaminacion Atmosferica
	U.S. Virgin Islands	12 Virgin Islands R. & Regs. § 206-71(d)
3	Delaware	7 DAC 1130.6.7
	District of Columbia	DCMR 20-302.7
	Maryland	COMAR 26.11.03.24
	Virginia	9 VAC 5-80-250
	West Virginia	W. Va. CSR § 45-30-5.7
4	Alabama	ADEM Admin. Code r. 335-3-16-.11(2)
	AL—Huntsville	Huntsville Air Pollution Control R. & Regs. § 3.3.8(b)
	AL—Jefferson Co.	Jefferson Co. Air Pollution Control R. & Regs. § 18.11.2
	Florida	F.A.C. 62-213.440(1)(d)5
	Kentucky	401 KAR 52:020, § 24
	Kentucky—Louisville	LMAPCD Regulation 2.16 § 4.7
	Mississippi	11 Miss. Admin. Code Pt. 2, R. 6.3.G
	South Carolina	S.C. Code Regs. 61-62.70 § 70.6(g)
	Tennessee	Tenn. Comp. R. & Regs. 1200-03-09-.02(11)(e)7
	TN—Chattanooga-Hamilton Co.	Chattanooga City Code § 4-57(g)
	TN—Knox Co.	Knox Co. Air Quality Mgmt. Regs. § 25.70.F.7
	TN—Nashville-Davidson Co.	Metropolitan Health Dept., Div. Pollution Control Regs. § 13-3(g)
	TN—Memphis-Shelby Co.	City of Memphis § 16-77; Shelby County § 3-5

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
5	Illinois	415 ILCS 5/39.5.7.k
	Indiana	326 IAC 2-7-16
	Michigan	MCL 324.5527
	Minnesota	Minn. R. 7007.1850
	Ohio	OAC 3745-77-07(G)
6	Arkansas	ACA 014.01.93-001 Reg. 26.707
	Louisiana	LAC 33.III.507.J
	New Mexico	20.2.70.304 NMAC
	NM--Albuquerque	20.11.42.12(E) NMAC
	Oklahoma	OAC 252:100-8-6(e)
7	Iowa	567 IAC 22.108(16)
	Kansas	KAR 28-19-512(d)
	Missouri	10 CSR 10-6.065(6)(C)7
	Nebraska	129 NAC Ch. 11
	NE—Lincoln-Lancaster Co.	Lincoln-Lancaster Co. Air Pollution Control Program Art. 2 § 11
	NE—City of Omaha	Omaha Municipal Code § 41-2
8	Colorado	5 CCR 1001-5, Part C, § VII
	Montana	ARM 17.8.1214(5) to (8)
	North Dakota	N.D.A.C. 33-15-14-06.5.g
	South Dakota	ARSD 74:36:05:16.01(18)
	Southern Ute Tribe	Reservation Air Code § 2-117
	Utah	Utah Admin. Code R307-415-6g
	Wyoming	WAQSR Ch. 6, § 3(l)

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
9	Arizona	A.A.C. R18-2-306.E
	AZ—Maricopa Co.	Maricopa Co. Air Pollution Control Regs. Rule 130
	AZ—Pima Co.	Pima Co. Code §§ 17.12.180.E, 17.12.185.D
	AZ—Pinal Co.	Pinal Co. AQCD Reg. 3-1-081.E
	CA—Sacramento Metropolitan	Sacramento Metropolitan AQMD Rule 207 § 414
	CA—San Joaquin Valley	San Joaquin Valley Unified APCD Rule 2520 § 13.4
	CA—San Luis Obispo Co.	San Luis Obispo Co. APCD Rule 216 § L.5
	CA—Santa Barbara Co.	Santa Barbara Co. APCD Rule 1303 § F
	CA—South Coast	South Coast AQMD Rule 3002(g)
	CA—Ventura Co.	Ventura Co. APCD Rule 33.9 § D
	CA—Yolo-Solano	Yolo-Solano AQMD Rule 3.8 § 314
	Hawaii	HAR § 11-60.1-16.5
	Nevada	NAC 445B.326
10	Alaska	18 AAC 50.235
	Idaho	IDAPA 58.01.01.332
	Oregon	OAR 340-214-0360
	OR—Lane Regional	LRAPA § 36-040
	Washington (including local air authorities)	WAC 173-401-645
	WA—EFSEC	WAC 463-78-005(2)

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

Table 2. Part 70 Programs that Do Not Appear to Contain Title V Affirmative Defense Provisions

EPA Region	Permitting Authority
1	New Hampshire
	Vermont
3	Pennsylvania
	PA—Allegheny Co.
	PA—Philadelphia Co.
4	Georgia
	North Carolina
	NC—Forsyth Co.
	NC—Mecklenburg Co.
	NC—Western
5	Wisconsin
6	Texas

EPA Region	Permitting Authority
9	CA—Amador Co.
	CA—Amador Co.
	CA—Antelope Valley
	CA—Bay Area
	CA—Butte Co.
	CA—Calaveras Co.
	CA—Colusa Co.
	CA—El Dorado Co.
	CA—Feather River Co.
	CA—Glenn Co.
	CA—Great Basin
	CA—Imperial Co.
	CA—Eastern Kern Co.
	CA—Lake Co.
	CA—Lassen Co.
	CA—Mariposa Co.

EPA Region	Permitting Authority
9	CA—Mendocino Co.
	CA—Modoc Co.
	CA—Mojave Desert
	CA—Monterey Bay
	CA—North Coast
	CA—Northern Sierra
	CA—Northern Sonoma Co.
	CA—Placer Co.
	CA—San Diego Co.
	CA—Shasta Co.
	CA—Siskiyou Co.
	CA—Tehama Co.
	CA—Tuolumne Co.
	NV—Clark Co.
	NV—Washoe Co.

Exhibit 14

Iowa Department of Natural Resources
Draft Title V Operating Permit Fact Sheet

This document has been prepared to fulfill the public participation requirements of 40 CFR Part 70 and 567 Iowa Administrative Code (IAC) 22.107(6). 40 CFR Part 70 contains operating permit regulations pursuant to Title V of the Clean Air Act.

The Iowa Department of Natural Resources (DNR) finds that:

1. MidAmerican Energy Co. – George Neal South, located at 2761 Port Neal Circle, Salix, IA 51052 has applied to renew their Title V Operating Permit. The designated responsible official of this facility is Shannon Brown.
2. MidAmerican Energy Co. – George Neal South is an Electric Utility. This facility consists of 34 significant emission units with potential emissions of:

Pollutant	**Abbreviation**	**Potential Emissions** (Tons per Year)
Particulate Matter (≤ 2.5 μm)	$PM_{2.5}$	927.14
Particulate Matter (≤ 10 μm)	PM_{10}	934.09
Particulate Matter	PM	948.98
Sulfur Dioxide	SO_2	12,102.75
Nitrogen Oxides	NO_x	5,955.45
Volatile Organic Compounds	VOC	126.36
Carbon Monoxide	CO	12,738.90
Lead	Lead	0.75
Hazardous Air Pollutants [(1)]	HAP	95.24

[(1)] May include the following: Hydrogen fluoride, Hydrochloric Acid, Isophorone, and Acetaldehyde.

3. MidAmerican Energy Co. – George Neal South submitted a Title V Operating Permit renewal application on November 17, 2022. Based on the information provided in these documents, DNR has made an initial determination that the facility meets all the applicable criteria for the issuance of an operating permit specified in 567 IAC 22.107.
4. DNR has complied with the procedures set forth in 567 IAC 22.107, including those regarding public notice, opportunity for public hearing, and notification of EPA and surrounding state and local air pollution programs.

DNR procedures for reaching a final decision on the draft permit:

1. The public comment period for the draft permit will run from August 22, 2024 through September 21, 2024. During the public comment period, anyone may submit written comments on the permit. Mail signed comments to Taylor Dailey at the DNR address shown below. The beginning date of this public comment period also serves as the beginning of the U.S. Environmental Protection Agency's (EPA) 45-day review period, provided the EPA does not seek a separate review period.
2. Written requests for a public hearing concerning the permit may also be submitted during the comment period. Any hearing request must state the person's interest in the subject matter, and the nature of the issues proposed to be raised at the hearing. DNR will hold a public hearing upon finding, on the basis of requests, a significant degree of relevant public interest in a draft permit. Mail hearing requests to Taylor Dailey at the DNR address shown below.
3. DNR will keep a record of the issues raised during the public participation process, and will prepare written responses to all comments received. The comments and responses will be compiled into a responsiveness summary document. After the close of the public comment period, DNR will make a final decision on the permit application. The responsiveness summary and the final permit will be available to the public upon request.

   Taylor Dailey
   Iowa Department of Natural Resources - Air Quality Bureau
   Wallace State Office Building
   502 E 9th St.
   Des Moines, Iowa 50319-0034
   Phone: (515) 725-9539
   E-mail: Taylor.Dailey@dnr.iowa.gov

DNR concludes that:

1. DNR has authority under 455B.133 Code of Iowa to promulgate rules contained in 567 IAC Chapters 20-35, including, but not limited to, rules containing emission limits, providing for compliance schedules, compliance determination methods and issuance of permits.
2. DNR has the authority to issue operating permits for air contaminant sources and to include conditions in such permits under 455B.134 Code of Iowa.
3. The emission limits included in this permit are authorized by 455B.133 Code of Iowa and 567 IAC Chapters 20-35.
4. DNR is required to comply with 567 IAC Chapter 22 in conjunction with issuing a Title V Operating Permit.
5. The issuance of this permit does not preclude the DNR from pursuing enforcement action for any violation.

Title V Permit Review Notes

Applicant:	**MidAmerican Energy Company – George Neal South**
SIC Code:	4911 (Electric Services)
City:	Salix
County:	Woodbury
EIQ#:	92-3599
Facility#:	97-04-011
Permit #:	97-TV-003R4
Reviewer:	Taylor Dailey
Date:	August 2024

Facility Identification

Facility Name:	MidAmerican Energy Company – George Neal South
Facility Location:	2761 Port Neal Circle, Salix, Iowa 51052
Responsible Official:	Shannon Brown
Phone:	(712) 277-5222

Background

MidAmerican Energy Company – George Neal South is an Electric Services plant (SIC 4911). MidAmerican Energy Company – George Neal South has applied to renew their Part 70 Title V Operating Permit. The facility consists of 34 significant emission units and 25 insignificant units.

This is the fourth permit renewal for MidAmerican Energy Company – George Neal South. The renewal application was received November 17, 2022.

Regulatory Status

MidAmerican Energy Company – George Neal South is a major source for Title V. See Table 1 major source by pollutant.

Table 1
Title V Major Source by Pollutant

Pollutant	Major For
PM_{10}	☒
SO_2	☒
NO_x	☒
VOC	☒
CO	☒
Lead	☐
Individual HAP	☒
Total HAP	☒

Program Applicability:

- PSD: YES. This facility is considered a major stationary source and is one of the 28 listed source categories for PSD.
- NSPS: YES. See Table 2.

Table 2
Emission Units Subject to NSPS

Emission Point	Emission Unit	Emission Unit Description	NSPS Subparts
EP-003	EU-003	Neal 4 Boiler	A, D
EP-006	EU-006	Transfer Tower #3 - Coal Conveying	A, Y
EP-007	EU-007A	Transfer Tower #1 - Coal Conveyor #2 to #3	
	EU-007B	Transfer Tower #1 - Coal Conveyor #2 to #6	
EP-007C	EU-007C	Transfer Tower #1 - Surge Bin	
EP-008	EU-008	Transfer Tower #2 - Coal Conveying	
EP-009	EU-009	Coal Silos & Tripper	
EP-010	EU-010A	Coal Unloading - Hopper to Feeder	
	EU-010B	Coal Unloading - Feeder to Belt #1	
	EU-010C	Coal Unloading - Belt #1 to Belt #2	
EP-041	EU-041	Diesel Engine Emergency Fire Pump	A, IIII
EP-046	EU-046A	3 Belt - Elevator Belt	A, Y
	EU-046B	3 Belt - Boom Belt	
	EU-046C	Stackout	
	EU-046D	Reclaim Wheel	
	EU-046E	Elevator Belt - Boom Belt	

- NESHAP Part 63: YES. See Table 3.

Table 3
Emission Units Subject to NESHAP

Emission Point	Emission Unit	Emission Unit Description	NESHAP Subparts
EP-003	EU-003	Neal 4 Boiler	A, UUUUU
EP-012	EU-012	Diesel Generator	A, ZZZZ
EP-041	EU-041	Diesel Engine Emergency Fire Pump	A, ZZZZ

- Acid Rain: YES
- Stratospheric Ozone Protection: YES
- Prevention of Accidental Releases: NO
- CAM: YES.
  (a) Neal 4 Boiler (EP-003) has controlled and uncontrolled PM PTE >100 TPY.

(b) Coal Conveying Units/Ash Storage units EP-007C (Transfer Tower #1 - Surge Bin), EU-008 (Transfer Tower #2 - Coal Conveying), EU-009 (Coal Silos & Tripper), EU-022 (Flyash Storage Silo B), EU-023 (Flyash Storage Silo A), and EU-207 (Unit 4 Recycle Silo) have uncontrolled PM PTEs > 100 TPY; all sources listed are subject to CAM.

Periodic Monitoring

Periodic Monitoring requirements were determined using Periodic Monitoring Guidance procedures. Actual emissions from emission points with permit limits were also reviewed to determine if additional periodic monitoring should be required.

The period monitoring evaluation indicates O&M plans and stack testing as shown below in Table 4.

Table 4
Periodic Monitoring Guidance Results

Emission Point	Emission Unit Description	O&M Plan Type	Stack Testing
EP-003	Neal 4 Boiler	Agency	2 tests, PM, PM_{10}, $PM_{2.5}$
EP-007C	Transfer Tower #1 - Surge Bin	Facility	1 test, PM
EP-008	Transfer Tower #2 - Coal Conveying	Facility	1 test, PM & PM_{10}
EP-009	Coal Silos & Tripper	Facility	1 test, PM & PM_{10}
EP-022	Flyash Storage Silo B	Facility	1 test, PM
EP-023	Flyash Storage Silo A	Facility	1 test, PM
EP-206	Unit 4 Lime Silo	Facility	None
EP-207	Unit 4 Recycle Silo	Facility	1 test, PM *
EP-212	Lime Truck Loadout Silo Vent	Facility	None

*Stack testing is not required because the bin vent filter is a passive system and there is airflow only during silo loading and unloading. Since the airflow is not constant, the requirements of the PM test method cannot be met.

CAM plans are required for all the emission points shown in Table 4 except EP-206 and EP-212. O&M plans are required for EP-206 and EP-212 as indicated.

In addition to the emission points listed in Table 4, facility O&M plans are required at EP-204, EP-205, and EP-211 since these emission points are equipped with control devices.

Two stack tests for PM, PM_{10}, and $PM_{2.5}$ are required in the draft permit for EP-003 and are to be completed within one year of permit issuance and between 2.5 and 3.5 years of permit issuance.

Stack tests are not required at the emission points shown in Table 5 because the actual emissions are one tenth or less than one tenth of potential emissions, and the limits for these units are unlikely to be exceeded.

Table 5
Stack Testing Not Required as Indicated

Emission Point	Emission Unit Description
EP-007C	Transfer Tower #1 - Surge Bin
EP-008	Transfer Tower #2 - Coal Conveying
EP-009	Coal Silos & Tripper
EP-022	Flyash Storage Silo B
EP-023	Flyash Storage Silo A

Opacity Monitoring

Visible emissions monitoring is typically required in the Title V permit in accordance with the department's procedures when an emission point is subject to an opacity emission limit that is less than 40%.

EP-006, EP-007, EP-010, and EP-46 have 20% opacity limits, but visible emissions monitoring is not required because these are fugitive sources.

EP-007C, EP-008, EP-009, EP-022, EP-023, and EP-207 have opacity limits less than 40%, but these units are subject to CAM and the CAM plan includes daily visible emissions monitoring.

Visible emissions monitoring is required for EP-204, EP-205, EP-206, EP-211, and EP-212.

Compliance Status

The facility is considered to be in compliance.

Emissions:

Table 6
Potential Emissions

Pollutant	Potential Emissions (TPY)
$PM_{2.5}$	927.42
PM_{10}	934.09
PM	948.98
SO_2	12,102.75
NO_x	5,955.45
VOC	126.36
CO	12,738.90
Lead	0.75
Total HAP	95.24

Changes Made to the Title V Permit Since the Previous Draft of Renewal 4

The original comment period for this permit was from May 9 to June 8, 2024. The DNR received public comments on June 7, 2024. Based on those comments, additional requirements of 40 CFR 63 UUUUU (MATS) have been added to EP-003. Also, the Affirmative Defense language in G14 of General Conditions has been removed. With these changes, the DNR has decided to re-notice the updated draft permit. During this new comment period August 22, 2024 – September 21, 2024, the only portions of the permit open to public comment are the changes made for MATS and Affirmative Defense. Please refer to Responsiveness Summary at the end of this document for more details.

Changes Made to the Title V Permit Since the Previous Issuance (Renewal 3)

General Changes

- Updated the permit number.
- Updated the Responsible Official and Permit Contact Person.
- Updated the Emission Point Characteristics explanatory paragraph with the current template language.
- Updated the General Conditions section to include current template language.

Specific Changes

- EP-002 emissions units, EU-002A, EU-002B, EU-002C were put together as one source (EU-002) now that the haul road is paved. There is no construction permit associated with this emission unit and it is a fugitive source.

- A construction permit was updated for modifications since the last Title V permit was issued. See Table 7.
- EP-005 & EP-011: Removed Monofill sources from the permit due to the equipment being removed by the facility. They were all fugitive sources and there was no construction permit associated with them.
- EP-003: Removed the following unpaved road language from EP-003 (page 16) in the permit. MidAmerican mentioned that all of the roads at the facility were paved, making the language covering unpaved roads not applicable.

1. The following conditions are required on the unpaved haul roads at the facility:
   A. Fugitive emissions from unpaved haul roads shall be controlled by applying a chemical dust suppressant. Applications of the dust suppressant and the recordkeeping requirements described in Condition 15C shall begin at the same time as the startup of Unit 4 after installation of the FGD and SNCR systems. A control efficiency of 95% shall be maintained on all unpaved haul roads. MidAmerican may elect to use any chemical dust suppressant that is capable of achieving the 95% control efficiency. In the event that the manufacturer or distributor of the dust suppressant recommends a different amount of chemical dust suppressant or MidAmerican chooses to use a different chemical dust suppressant, MidAmerican shall notify DNR of the change in application rates and/or chemical dust suppressant and the manufacturer's or distributor's recommendations.
   B. If the selected dust suppressant cannot be applied because the ambient air temperature (as measured at the facility during daylight operating hours) will be less than 35 F or conditions due to weather, in combination with the application of the chemical dust suppressant could create hazardous driving conditions, then the chemical dust suppressant application shall be postponed and applied as soon after the scheduled application date as the conditions preventing the application have abated.
   C. For unpaved roads, records of dust suppressant application shall be maintained and include the dates of each application, the chemical dust suppressant used, the application intensity in gal/yd^2, the dilution ratio, and the operator's initials. If the suppressant is not applied as scheduled, the records should so indicate and provide an explanation.

Since all of the roads are paved at the facility, we recommend that MidAmerican submits a modification to update the conditions at a future date.

Table 7
Construction Permits Issued and Modified
Since the Current Title V Permit was Issued

Emission Point	Emission Unit	Emission Unit Description	Construction Permit Number
EP-003	EP-003	Neal 4 Boiler – Fuel Oil #2	05-A-655-P4
		Neal 4 Boiler - Coal	

Other Information

EU-013 and EU-014, Transfer Tower #2 and #1 Heating Boilers are on the Insignificant Activities Equipment List. These boilers provide comfort/space heat; therefore, they are not subject to NESHAP DDDDD.

RESPONSIVENESS SUMMARY

For:

Title V Operating Permit 97-TV-003R4 DRAFT

MidAmerican Energy Company – George Neal South
Salix, Iowa

July 24, 2024

INTRODUCTION

The following is a summary of the comments received and responses by the Iowa Department of Natural Resources (DNR) during the public comment period for a Title V operating permit for MidAmerican Energy Co. – George Neal South in Salix, Iowa. The public comment period ran from May 9, 2024 through June 8, 2024. During the public comment period, one combined comment letter was received that was signed by three environmental groups - with Sunil Bector and Joshua Smith representing the Sierra Club, Joshua T. Mandelbaum representing the Environmental Law & Policy Center, and Michael R. Schmidt representing Iowa Environmental Council. The full comment letter is attached at the end of this responsiveness summary. No other comments were received from any other entities during the comment period. DNR's responses are organized in the same order as in the comment letter.

REVISED RULE CITATIONS

Please note that since the public notice period concluded, the 567 IAC citations in the Title V Operating Permit have been updated to use the citations as amended May 15, 2024 that became effective on June 19, 2024.

When 567 IAC as amended May 15, 2024, and cited in Title V permit becomes State Implementation Plan (SIP) approved, it will supersede 567 IAC as amended February 8, 2023. Prior to May 15, 2024, all Title V rule citations in the Title V permit were found and cited in 567 IAC Chapter 22. During the period from May 15, 2024, to the date that 567 IAC as amended May 15, 2024, is approved into the SIP, both 567 IAC as amended May 15, 2024 and 567 IAC as amended February 8, 2023 form the legal basis for the applicable requirements included in Title V permit. A crosswalk showing the citation changes is attached to the revised Title V permit and posted on the DNR Air Quality Bureau website.

COMMENTS

1. Environmental Groups' Combined Comment:

I. Governing Law and Regulations

The Clean Air Act is intended to protect and enhance the public health and public welfare of the nation.[1] On May 7, 2024, the U.S. Environmental Protection Agency ("EPA") published a final rule to strengthen and update the National Emission Standards for Hazardous Air Pollutants for Coal- and Oil-Fired Electric Utility Steam Generating Units, otherwise known as the Mercury and Air Toxics Standards ("MATS") for power plants.[2] Among other changes, the revised MATS reduces the emission standard for filterable particulate matter (fPM) and requires regulated sources like the George Neal South plant to demonstrate compliance with the fPM

[1] *See* 42 U.S.C. § 7401(b)(1).

[2] U.S. EPA, National Emission Standard for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 89 Fed. Reg. 38,505 (May 7, 2024), *available at:* https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal--and-oil-fired-electric-utility-steam

standard by using PM continuous emission monitoring systems (CEMS).[3] Timely compliance with the MATS is necessary to prevent adverse public health impacts. For example, uncontrolled releases of mercury from coal-burning power plants can damage children's developing nervous systems, reducing their ability to think and learn.[4] Releases of other toxic air pollutants from these plants can cause a range of dangerous health problems in adults, from cancer to respiratory illnesses.[5]

State air quality agencies that are delegated implementation authority under the Clean Air Act (such as DNR) develop and implement plans by which they ensure attainment of the federal National Ambient Air Quality Standards and other standards. The air quality standards contained in each implementation plan are applied to specific major emissions sources through the "Title V" permitting program.[6] Major stationary sources of air pollution are prohibited from operating except in compliance with an operating permit issued under Title V of the Act.[7] Title V permits must require compliance with all applicable federal, state, and local regulations in one legally enforceable document, thereby ensuring that all Clean Air Act requirements are applied to the facility.[8] These permits must include emission limitations and other conditions necessary to assure a facility's continuous compliance with all applicable requirements.[9] Title V permits must also contain monitoring, recordkeeping, reporting, and other requirements to assure continuous compliance by sources with emission control requirements.[10]

As EPA explained in the preamble to its Title V Program rule, "regulations are often written to cover broad source categories," leaving it "unclear which, and how, general regulations apply to a source."[11] Title V permits bridge this gap by clarifying and making more readily enforceable a source's pollution control requirements, thus, providing an easy way "to establish whether a source is in compliance."[12] To this end, the provisions of a Title V permit must be sufficiently clear and specific to ensure that all applicable requirements are enforceable as a practical matter. An interested person should be able to understand from the permit how much pollution the plant is legally authorized to emit and how the source is monitored for compliance.

EPA delegated to Iowa the authority to administer the Title V operating permit program within the State. Accordingly, Title V permits issued by DNR must include enforceable emission limitations and standards and such other conditions as are necessary to

---

[3] *Id*.
[4] *Id*.
[5] *Id*.
[6] *See* 42 U.S.C. §§ 7410, 7661.
[7] 42 U.S.C. § 7661a(a); 40 C.F.R. § 70.5(a).
[8] *See* 42 U.S.C. §§ 7661a(a) and 7661c(a); 40 C.F.R. § 70.6(a)(1).
[9] *See id*.
[10] *See* 40 C.F.R. Part 70.
[11] U.S. EPA, Operating Permit Program, 57 Fed. Reg. 32,250, 32,251 (July 21, 1992).
[12] *Id*.

assure compliance with all applicable requirements at the time of permit issuance.[13] "Applicable requirements" include standards or other requirements of the Clean Air Act that are codified in state or federal laws such as regulations that have been promulgated or approved by EPA through rulemaking at the time of permit issuance but that have future effective compliance dates, as well as standards that are effective at the time of permit issuance.[14]

DNR Response:
The DNR will add the MATS rule applicable requirements to the draft Title V permit. It should be noted that until DNR adopts the MATS rule into the Iowa Administrative Code (IAC), the State of Iowa is not the administrator of the regulation - the Environmental Protection Agency (EPA) is.

Recommended Action:
Additional applicable requirements from MATS will be added to the draft Title V permit. The DNR will place the updated draft Title V permit on public notice for an additional 30-day comment period.

2. Environmental Groups' Combined Comment:

II. The Draft Permit Fails to Include Clear Conditions Governing Compliance with the New Mercury and Air Toxics Standard.

As discussed above, Title V permits are the mechanisms by which regulators consolidate and clarify all Clean Air Act requirements for a particular source. Accordingly, a Title V permit must contain sufficient information to allow a reader to compare the permit to the compliance reports for a facility and determine if there are any violations. Specifically, it must contain more than mere citations to applicable requirements; it must provide the substance of each requirement and serve as an "easy way to establish whether a source is in compliance with regulations under the Act."[15]

Here, the Draft Permit fails to satisfy these requirements. Despite EPA's new rule governing the emission of mercury and other air toxics from power plants, the Draft Permit does not appear to incorporate any additional restrictions on the operation of the George Neal South plant that are designed to achieve compliance with the new MATS standard, nor does it identify any retrofits that are needed to meet the new standard.
While the Draft Permit does refer to the relevant regulatory provision, it does not identify any specific compliance options that George Neal South intends to utilize in order to meet the new standard.

The final permit must allow the public to understand how MidAmerican will comply with the new standard and to rely on enforceable permit conditions that specify

[13] *See* 42 U.S.C. § 7661c(a); 40 C.F.R. § 70.6(a)(1).
[14] *See* 40 C.F.R. § 70.2
[15] 57 Fed. Reg. at 32,251.

emission limits and monitoring options. As noticed for public comment, the Draft Permit does not incorporate the revised MATS requirements explicitly; instead, Page 18 of the Draft Permit references 40 CFR 63 Subpart UUUUU, which is insufficient. Given its lack of detail regarding MATS compliance and monitoring, the Draft Permit should be revised to include the specific, enforceable limits necessary to ensure compliance with the MATS rule.

DNR Response:
See discussion under item 1 above.

Recommended Action:
Additional applicable requirements from MATS have been added to the draft Title V permit. The DNR will place the updated draft Title V permit on public notice for an additional 30-day comment period.

3. Environmental Groups' Combined Comment:

III. The Draft Permit's Particulate Matter Compliance Method Lacks Practical Enforceability

The Draft Permit must be sufficiently clear and specific to ensure that all applicable requirements are enforceable as a practical matter. As stated by EPA, the requirement of "practical enforceability" can be described as follows:

> A permit is enforceable as a practical matter (or practically enforceable) if permit conditions establish a clear legal obligation for the source [and] allow compliance to be verified. Providing the source with clear information goes beyond identifying the applicable requirement. It is also important that permit conditions be unambiguous and do not contain language which may intentionally or unintentionally prevent enforcement.[16]

It is not clear in the Draft Permit how the permittee shall comply with the particulate matter limits generally. For example, Page 13 of the Draft Permit documents that sulfur dioxide and nitrogen dioxide emissions limits shall be measured by CEMS, along with the relevant averaging period, but there is no similar documentation regarding the compliance demonstration method for PM. The Draft Permit should be revised accordingly to avoid this vague status quo, which inhibits practical enforceability.

[16] EPA Region 9 Title V Permit Review Guidelines, Sept. 9, 1999, p. 111-46, quoted in: *In the Matter of Midwest Generation LLC, Joliet Generating Station*, EPA Administrator Order (June 24, 2005) at 17-18, available at https://www.epa.gov/sites/default/files/2015-08/documents/midwest_generation_joliet_decision2004.pdf.

DNR Response:
All periodic monitoring requirements for all the emission units were evaluated by the application of the Department's Periodic Monitoring Guidance (PMG) adopted in 567 IAC 24.108(3)"b" which states,

> Where the applicable requirement does not require periodic testing or instrumental or noninstrumental monitoring (which may consist of record keeping designed to serve as monitoring), periodic monitoring sufficient to yield reliable data from the relevant time period that are representative of the source's compliance with the permit, as reported pursuant to subrule 24.108(5). Such monitoring shall be determined by application of the "Periodic Monitoring Guidance" (as amended through October 24, 2012) available from the department.

The PMG is used to determine monitoring requirements when the other applicable requirements, such as DNR construction permits, federal regulations, etc., do not require periodic monitoring for a specific emission unit and for a specific pollutant. The PMG was developed by the DNR and a committee of representatives from regulated industries to provide staff and industry with guidance on how to determine what constitutes acceptable periodic monitoring which must be included to satisfy the Part 70 periodic monitoring requirements. The application of the PMG ensures a consistent approach to incorporating monitoring requirements into Title V permits in a fair and equitable way. The EPA approved the adoption of the PMG into Iowa SIP on March 15, 2002 and the PMG can be located at DNR Air Quality Bureau's website and is also attached to this Responsiveness Summary.

Recordkeeping is sometimes adequate for periodic monitoring purposes. If recordkeeping is not adequate, periodic testing will be required. To determine the amount of periodic testing for controlled sources, the PMG requires the evaluation of the pre-control and post-control Potential to Emit (PTE) to determine the number of stack tests (one or two during the Title V term) and impose either a Facility Operation and Maintenance (O&M) plan, an Agency O&M plan, or no O&M plan. An Agency O&M plan is proposed by a facility and approved by the agency, and it requires a monitoring plan with enforceable corrective action provisions and/or source testing if corrective action fails. A required Agency O&M is included in the Title V permit. In contrast, Facility O&M plans are developed and implemented by a facility, and only the general requirements for a facility O&M plan are included in a Title V permit.

Similarly, the PMG will evaluate the PTE and determine the appropriate amount of monitoring requirements for uncontrolled sources. However, O&M plans are not applicable to uncontrolled sources because they do not have control equipment.

If recordkeeping and periodic testing are insufficient to assure compliance with the applicable requirement, direct or indirect monitoring can be required. Direct monitoring includes continuous emission monitors (CEMs), predictive emission monitoring systems (PEMs), or

continuous opacity monitoring systems (COMs). Indirect monitoring is to monitor one or more compliance indicators and specify a range of indicator values that assure compliance.

Specifically, for emission point EP-003 regarding particulate emissions, the draft Title V operating permit requires a COM, a continuous triboelectric bag leak detection system for complying with compliance assurance monitoring (CAM) under 40 CFR Part 64, and two EPA reference method stack tests for PM, PM10, and PM2.5 to be conducted during the 5-year permit term. The use of the opacity CEM in conjunction with the stack tests and bag leak detection system assures proper operation of the control equipment assure compliance with the emission limits. Additional PM monitoring requirements from MATS will be added to the draft Title V permit.

Recommended Action:
Additional monitoring requirements from MATS will be added to the draft Title V permit. The DNR will place the updated draft Title V permit on public notice for an additional 30-day comment period.

4. Environmental Groups' Combined Comment:

IV. The Draft Permit Contains an Unlawful Affirmative Defense to Liability for Exceedances of Technology-Based Limits.

The Draft Permit provides an unlawful "affirmative defense" to liability in an enforcement action "non-compliance with technology based limitations" if the violation is due to an "emergency."[17] The Draft Permit defines emergency broadly to include "unforeseeable events beyond the control of the source," such as malfunction periods.[18] This affirmative defense is identical to EPA's now-repealed affirmative defense,[19] and would preclude a federal court in an enforcement action from finding liability and ordering penalties, if the relevant factors are met. The Draft Permit's affirmative defense provision is contrary to the Clean Air Act, which provides federal district courts—not states or EPA—with exclusive jurisdiction to "apply any appropriate civil penalties" after considering the mandatory statutory factors in citizen suits brought to enforce applicable emission limits and standards.[20]

In July 2023, EPA confirmed this interpretation when the agency finalized its removal of an identical affirmative defense for emergencies from EPA's federal Title V

[17] Draft Permit at 85 (citing 567 IAC 22.108(16)).
[18] Draft Permit at 85.
[19] *See* 40 C.F.R. §§ 70.6(g), 71.6(g) (2014), *repealed by* U.S. EPA, Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program, 88 Fed. Reg. 47,054 (July 21, 2023).
[20] 42 U.S.C. § 7604(a); *id*. § 7413(e)(1) (providing mandatory factors for court to consider "[i]n determining the amount of any penalty to be assessed under this section or section 7604(a)"); *see also Nat. Res. Def. Council v. EPA*, 749 F.3d 1055, 1063 (D.C. Cir. 2014) (holding that § 7604(a) "creates a private right of action, and as the Supreme Court has explained, 'the Judiciary, not any executive agency, determines "the scope"—including the available remedies— "of judicial power vested by" statutes establishing private rights of action'") (*quoting City of Arlington v. FCC*, 133 S.Ct. 1863, 1871 n.3 (2013)).

regulations.[21] In doing so, EPA made clear that affirmative defense provisions in Title V permits are "inconsistent with the enforcement structure of the [Clean Air Act] and thus legally impermissible," because they "operate to limit a court's authority or discretion to determine the appropriate remedy in an enforcement action."[22] In the final rule removing affirmative defense provisions from EPA's federal operating permit regulations, EPA made clear that states "must also remove title V-based affirmative defense provisions contained in individual operating permits."[23] EPA further explained that:

> any impermissible affirmative defense provisions within individual operating permits that are based on a title V authority and that apply to federally-enforceable requirements will need to be removed. As explained in the 2016 proposal, the EPA expects that any necessary permit changes should occur in the ordinary course of business, such as during periodic permit renewals or revisions. *At the latest*, states would be expected to remove affirmative defense provisions from individual permits by the next periodic permit renewal that occurs following either (1) the effective date of this rule (for permit terms *based on* 40 CFR 70.6(g) or 71.6(g)) or (2) the EPA's approval of state program revisions (for permit terms based on a state affirmative defense provision).[24]

Moreover, in that rulemaking, EPA specifically identified 567 IAC 22.108(16)—DNR's cited authority for the Draft Permit—as being an impermissible affirmative defense.[25]

Here, DNR must remove the emergency affirmative defense from the Draft Permit now, rather than waiting for EPA to approve any state revision to the Iowa permitting program, because 567 IAC 22.108(16) is based on EPA's now-repealed affirmative defense at 40 C.F.R. § 71.6(g). Indeed, Iowa's affirmative defense provision is identical to EPA's now-defunct federal affirmative defense.[26] The Draft Permit's emergency affirmative defense provision, like the federal counterpart, is unlawful and must be removed.

DNR Response:
Although affirmative defense rule currently exists in 567 IAC 24.108(16), the DNR agrees that it is not enforceable because the underlying basis in 40 CFR 71.6(g) has been repealed by EPA. DNR plans to conduct a future rulemaking to remove the affirmative defense from 567 IAC.

---

[21] 88 Fed. Reg. 47,054 (July 21, 2023).
[22] *Id*. at 47,032, 47,039.
[23] *Id*. at 47,046.
[24] *Id*. at 47,031 (emphasis added); see also id. at 47,041("It is also important to reiterate that the EPA is basing the current action on its interpretation of the CAA in light of relevant caselaw indicating that these affirmative defense provisions must be removed because they are inconsistent with the enforcement structure of the CAA.")
[25] Ex. 1, Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program, Proposed Rule, EPA-HQ-OAR-2016- 0186 *(attached).*
[26] *Compare* 567 IAC 22.108(16), *with* 40 C.F.R. § 71.6(g) (2014).

Recommended Action:
The Emergency Defense for Excess Emissions general condition G14 item 3 (emergency affirmative defense) will be removed from the Title V Operating Permit General Conditions. The DNR will place the updated draft Title V permit on public notice for an additional 30-day comment period.

Attachment 1: DNR Periodic Monitoring Guidance

Attachment 2: Environmental Groups' Comment Letter

Periodic Monitoring Guidance

If an emission unit is subject to an applicable requirement that takes the form of an emission limit or standard, and this emission limit or standard does not have associated requirements for periodic testing or instrumental or non-instrumental monitoring (which may consist of recordkeeping designed to serve as monitoring), then the permit writer must develop periodic monitoring conditions for the applicable requirement. These monitoring requirements must ensure the use of terms, test methods, units, averaging periods and other statistical conventions consistent with the applicable requirement. A list of applicable requirements that do not require additional periodic monitoring requirements are contained in Appendix A. Periodic monitoring may consist of recordkeeping, periodic testing, direct or indirect monitoring. The permit writer should consider the size of an emissions unit, the toxicity of the pollutant under consideration, the attainment status of the area where the emission unit is located, the compliance history of the facility, the likelihood of deviations from the emissions standard and other appropriate factors in the evaluating type of periodic monitoring appropriate for an applicable requirement. This guidance is established to provide the permit writer guidance concerning the requirements for a periodic monitoring program. It is not intended that this guidance prohibits the facility from proposing a program that differs from this guidance, or that the permit writer does not have the flexibility and discretion to approve monitoring programs that deviate from the guidance, if reason for the deviations are adequately justified. The tables in the Attachment 1 provide a guide for periodic monitoring. An exception to Attachment 1 may be for Volatile Organic Compounds (VOCs) applicable requirements with no short term standards. In such a case no periodic testing would be required. Attachment 2 defines the terms used in Attachment 1. Attachment 3 describes factors used in evaluating a reduction in testing predicted by Attachment 1.

Recordkeeping

Recordkeeping alone is sometimes adequate for periodic monitoring purposes. It is most frequently used in combination with emission factors for verification of annual “tons per year” standards. For instantaneous or hourly standards, the variability of emission factors and the inconvenience of short term recordkeeping usually disqualifies it as a periodic monitoring method. An example of where recordkeeping alone might be used for monitoring compliance with a short term emission limit is where records of the quantity of the fuel oil combusted and the oil’s sulfur content are kept at frequencies compatible with a SO_2 short term limit.

Periodic Testing

The Department will require periodic testing only after determining that recordkeeping is insufficient to assure compliance with the applicable requirement. If the permit writer determines that periodic testing is needed as a permit requirement, then the term or condition requiring testing should clearly specify the time frame in which the testing is to be conducted, along with any notification and reporting requirements. If testing/recertification is conducted pursuant to a direct monitoring requirement on a direct monitoring system, such as a continuous emission monitor requirement due to acid rain program in an electrical utility, that test would be adequate for the periodic testing requirements. If the test is conducted pursuant to an indirect monitoring requirement, then any monitoring parameters to be recorded during testing should be included as a term or condition in the testing. The number of tests outlined in the Attachment 1 is the total number of tests required during the life span of the operating permit. A partial list of reference test methods is contained in Appendix B.

General Requirements for Direct or Indirect Monitoring

The Department will require monitoring only after determining that recordkeeping and periodic testing are insufficient to assure compliance with the applicable requirement. Consistent with its commitment to protect the health and welfare of Iowans with the minimum regulatory burden, the Department will work with facilities proposing a program that differs from this guidance to determine an appropriate monitoring program.

The permit writer must include the following elements when developing permit conditions for monitoring:

1. Requirements to insure the location and installation of the monitor is sufficient to provide representative data.
2. Requirements that specify verification procedures including installation, calibration and operation of the monitor. These verification procedures are usually done, in most cases, in reference to manufacturer's recommendations to ensure that the monitor is in proper operational status.

General Requirements for Direct or Indirect Monitoring Continued...

3. Requirements that specify QA/QC procedures that ensure the continuing validity of the recorded data.

4. Requirements that specify monitoring frequency, data collection, and averaging period sufficient to yield reliable data commensurate with the time period over which an exceedence or excursion is likely to occur based on the characteristics and variability of the emissions unit.

5. Requirements that specify a percentage of data availability sufficient to satisfy a minimum data availability requirement that is applicable to the monitoring under a separate applicable requirement, or if no such requirement applies, a data availability that is consistent with the monitoring method to be used and at least 90% over all averaging periods.

Direct Monitoring

Direct monitoring of emission rates or standards by use of continuous emission monitors (CEMs), predictive emission monitoring systems (PEMs), or continuous opacity monitoring systems (COMs) is the most straightforward and accurate method of determining compliance with emission limitations or standards. Owing to the expense of these systems, the Department will not require direct monitoring of pollutants in order to meet the periodic monitoring requirements of Title V in most cases. However, if federal, state, or local requirements require the use of these direct monitoring systems to demonstrate compliance with applicable requirements, then these systems must be used for periodic monitoring**.** If a direct monitoring system is installed for other purposes apart from demonstrating compliance with applicable requirements, this system may be used but is not required for periodic monitoring. If federal, state, or local requirements specify a percentage of data availability sufficient to satisfy a minimum data availability requirement, then that requirement will be sufficient for periodic monitoring. If a direct monitoring device is chosen by the applicant or required by the permit writer, then the Title V permit must contain terms and conditions that require that data gathered is in terms consistent with the applicable requirement, and allow for reporting of exceedances.

Indirect Monitoring

An indirect monitoring program is to be developed through a cooperative effort between the facility and the permitting authority. First, the facility proposes to monitor one or more compliance indicators, and specifies a range of indicator values that assure compliance. An indicator range may be a true range, comprised of upper and lower limits such as 3.0 to 4.0 inches of water column for differential pressure or a single maximum or minimum value such as greater than 1700^0 F for an incinerator. If the emission unit is a significant emitter, then the facility shall also propose to conduct a compliance test in order to verify that the source is in compliance while the monitored parameters are in the indicator range. The facility makes a commitment to take timely corrective action during periods of excursion where the indicators are out of range. A corrective action may include an investigation of the reason for the excursion, evaluation of the situation and necessary follow-up action to return operation within the indicator range**.** An excursion is determined by the averaged discrete data point over a period of time. An excursion does not necessarily indicate a violation of an applicable requirement. If the corrective action measures fail to return the indicators to the appropriate range, the facility will report the exceedence to the department and conduct source testing within 90 days of the exceedence to demonstrate compliance with applicable requirements. If the test demonstrates compliance with emission limits then new indicator ranges must be set for monitoring and the new ranges must be incorporated in the operating permit. If the test demonstrates noncompliance with emission limits, then the facility, within 60 days, proposes a schedule to implement corrective action to bring the source into compliance and demonstrate compliance.

Next, the permit reviewer must evaluate the facility's proposal for its ability to minimize emissions at least to the levels specified by the applicable requirement. The permit conditions must specify the indicator range, the corrective action measures, and any appropriate recordkeeping and reporting requirements. The permit conditions must clearly indicate the compliance status of the source during implementation of the corrective action measures.

Attachment 1

Periodic Monitoring for Non-Hazardous Air Pollutants With Applicable Requirements

Controlled Sources

	Minor		**Significant**		**Major**	
Uncontrolled* Minor	No O&M	No tests				
Uncontrolled* Significant	Facility O&M	No tests	Facility O&M	+One test		
Uncontrolled* Major	Facility O&M	+One test	+Agency O&M	+One test	Agency O&M	+Two tests

Uncontrolled Sources

Minor	**Significant**	**Major**
No tests	+One test	+One test

Periodic Monitoring for HAPs With Applicable Requirements

Controlled Sources

	Minor		**Major**	
Uncontrolled* Minor	No O&M	No tests		
Uncontrolled* Major	Facility O&M	+One test	Agency O&M	+Two tests

Uncontrolled Sources

Minor	**Major**
No tests	+One test

* Uncontrolled potential to emit for a controlled source is the pre-control PTE or the PTE of the source with control efficiency set to zero.

+ The number of tests outlined in the Attachment 1 is the number of tests required during the life span of the operating permit.

Attachment 2

Periodic Monitoring Definitions

1. **Non-Hazardous Air Pollutants:** These include the criteria pollutants for which National Ambient Air Quality (NAAQ) standards exist which are particulate matter (PM_{10}), sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), and lead (Pb). Other Non-Hazardous Air Pollutants include volatile organic compounds (VOCs), particulate matter (PM), fluorides, sulfuric acid mist, total reduced sulfur compounds (TRS).

2. **HAPs or Hazardous Air Pollutants:** These are any of the 188 pollutants listed in the section 112 of the Clean Air Act Amendments (CAAA) which are known or suspected of being toxic or carcinogenic.

3. **Major:** If the unit's potential emissions are at or above the Title V major source threshold (100 Tons Per Year (TPY) of any regulated air pollutant or 10 TPY of any single HAP or 25 TPY of combined HAPs).

4. **Significant:** If the unit's potential emissions are at or above the PSD significance threshold which are 40 TPY of SOx, NOx, and VOCs, 100 TPY of CO, 25 TPY of PM, 15 TPY of PM10 and 0.6 TPY of Pb. (HAPs have no PSD significance threshold; if emissions are above the Title V threshold then the unit is major, if not then the unit is minor).

5. **Minor:** If a unit emits below the significance threshold then it is minor.

6. **Controlled Source:** Emission units with control equipment with *allowable emission rate to be used to determine the minor, significant or major threshold.

7. **Uncontrolled Source:** Emission units with no control equipment with *allowable emission rate to be used to determine the minor, significant or major threshold.

8. **Uncontrolled*:** Emission units with control equipment where the control efficiency of the control equipment is set at zero. Federally enforceable limits on hours of operation or quantity of materials handled are to be used in calculating Uncontrolled* potential to emit.

9. **Agency O&M:** An O&M plan that the facility proposes and the agency reviews that requires monitoring plan with enforceable corrective action provisions and source testing if corrective action fails. As a minimum the O&M plan is required for the last emissions control device prior to emitting to the ambient air.

Periodic Monitoring Definitions Continued...

10. **Facility O&M:** An O&M plan developed and implemented by the facility. As a minimum the O&M plan is required for the last emissions control device prior to emitting to the ambient air.

11. **Applicable Requirement**: The term "applicable requirement" is defined in rule 567 IAC 22.100. that includes the following:
    - i). Any standard or other requirement provided for in the applicable implementation plan approved or promulgated by EPA through rule making under Title I of the Act that implements the relevant requirements of the Act, including any revisions to that plan promulgated in 40 CFR 52 as amended through August 4, 1994;
    - ii). Any term or condition of any preconstruction permits issued pursuant to regulations approved or promulgated through rule making under Title I, including Parts C and D, of the Act;
    - iii). Any standard or other requirement under section 111 of the Act (subrule 23.1(2)), including section 111(d);
    - iv). Any standard or other requirement under section 112 of the Act, including any requirement concerning accident prevention under 112(r)(7) of the Act;
    - v). Any standard or other requirement of the acid rain program under Title IV of the Act or the regulations promulgated thereunder;
    - vi). Any requirements established pursuant to section 504(b) or section 114(a)(3) of the Act;
    - vii). Any standard or other requirement governing solid waste incineration, under section 129 of the Act;
    - viii). Any standard or other requirement for consumer and commercial products, under section 183(e) of the Act;
    - ix). Any standard or other requirement for tank vessels under section 183(f) of the Act;
    - x). Any standard or other requirement of the program to control air pollution from outer continental shelf sources, under section 328 of the Act;
    - xi). Any standard or other requirement of the regulations promulgated to protect stratospheric ozone under Title VI of the Act, unless the administrator has determined that such requirements need not be contained in a Title V permit; and
    - xii). Any national ambient air quality standard or increment or visibility requirement under part C of Title I of the Act, but only as it would apply to temporary sources permitted pursuant to section 504(e) of the Act.

* If a facility has proper documentation to support that a source has operated less than 876 hours per year for the past two consecutive years, then actual emissions may be used to determine the appropriate threshold.

Attachment 3

Factors Used In Evaluating A Reduction In Testing Predicted By Attachment 1

The Department may consider the following factors in evaluating a reduction in testing predicted by Attachment 1. The Department retains its discretion to adopt approaches on a case-by-case basis that differs from this guidance where appropriate.

1. Sources which have been tested in compliance within the past year and for which the results have been accepted by the IDNR.
2. Sources which have been tested in compliance by a significant margin and are equipped with a level of control that can easily achieve the allowable emission rate (example is a bagfilter on a source subject to 0.1 grain/dscf).
3. Identical or similar sources at a facility that meet the criteria of 1 or 2.
4. Sources where the company is willing to take a "no visible emission" action level on a well-controlled source with a lenient allowable emission rate.
5. A controlled source required by permit condition to pre-clean or oil material being handled and subject to a lenient standard (0.1 grain/dscf).
6. Sources for which testing is determined to create a safety hazard or for which significant modifications would be required to accommodate testing.
7. Sources with enforceable restrictions on hours of operation to less than 876 hours per year.
8. Sources where, on a case-by-case basis, the judgement of the Department is that specific information or circumstances warrant waiving testing that the Attachment #1 matrix would otherwise require. Such additional information or circumstances might include (but are not limited to):
    - i) Industry specific emission factors and control efficiencies,
    - ii) Stack tests that are more than one year old,
    - iii) Stack tests on similar sources at other facilities, and
    - iv) Sources that have no EPA Reference Method for stack testing.

Appendix A-Exemptions from Periodic Monitoring Requirements

Exempted Emission Limitations or Standards

NSPS or NESHAP standards proposed after 11/15/90.
Stratospheric ozone protection requirements.
Acid Rain Program requirements.

Exempted Emission Units

Backup utility power units that are exempt from all part 75 monitoring requirements, are operated solely for providing electricity during peak periods or emergency situations, and for which actual emissions for the previous 3 years are less than 50% of the major source cutoff.

Appendix B-Partial List of Reference Test Methods

$PM_{2.5}$-40 CFR Part 51 App. M, Methods 201A and 202
PM_{10}-40 CFR Part 51 App. M, Methods 201A and 202
SO_x-40 CFR Part 60 App. A, Method 6C
NO_x-40 CFR Part 60 App. A, Method 7E
CO-40 CFR Part 60 App.A, Method 10
Pb-40 CFR Part 60 App A, Method 12
Stack Opacity-40 CFR Part 60 App A, Method 9
Fugitive Opacity-40 CFR Part 60 App A, Method 22
PM (federal)-40 CFR Part 60 App. A, Method 5
PM (state)-40 CFR Part 60 App. A, Method 5 and 40 CFR Part 51 App. M, Method 202
40 CFR Part 60 App. A, Method 5 and
40 CFR Part 51 App. M, Method 202

June 7, 2024

Via e-mail to Taylor.Dailey@dnr.iowa.gov

Taylor Dailey
Iowa Department of Natural Resources - Air Quality Bureau
Wallace State Office Building
502 E 9th St.
Des Moines, Iowa 50319-0034

Re: Comments on DNR's Proposal to Renew the Title V Operating Permit for MidAmerican Energy Company – George Neal South, Permit No. 97-TV-003R4 DRAFT

Dear DNR Representative Dailey:

The Environmental Law and Policy Center, Iowa Environmental Council, and Sierra Club (collectively, "Environmental Commenters") respectfully submit these comments regarding the draft Title V Operating Permit for MidAmerican Energy Company – George Neal South ("Draft Permit"), published by the Iowa Department of Natural Resources ("DNR") on May 9, 2024. The Draft Permit does not include clear conditions governing compliance with the new mercury and air toxics standard, does not plainly indicate how compliance with particulate matter emissions limits generally is achieved, and contains an unlawful affirmative defense to liability for exceedances of technology-based limits. We respectfully request that DNR revise the permit to fix these deficiencies.

I. Governing Law and Regulations

The Clean Air Act is intended to protect and enhance the public health and public welfare of the nation.[1] On May 7, 2024, the U.S. Environmental Protection Agency ("EPA") published a final rule to strengthen and update the National Emission Standards for Hazardous Air Pollutants for Coal- and Oil-Fired Electric Utility Steam Generating Units, otherwise known as the Mercury and Air Toxics Standards ("MATS") for power plants.[2] Among other changes, the revised MATS reduces the emission standard for filterable particulate matter (fPM) and requires regulated sources like the

[1] *See* 42 U.S.C. § 7401(b)(1).
[2] U.S. EPA, National Emission Standard for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 89 Fed. Reg. 38,505 (May 7, 2024), *available at:* https://www.federalregister.gov/documents/2024/05/07/2024-09148/national-emission-standards-for-hazardous-air-pollutants-coal--and-oil-fired-electric-utility-steam

George Neal South plant to demonstrate compliance with the fPM standard by using PM continuous emission monitoring systems (CEMS).[3] Timely compliance with the MATS is necessary to prevent adverse public health impacts. For example, uncontrolled releases of mercury from coal-burning power plants can damage children's developing nervous systems, reducing their ability to think and learn.[4] Releases of other toxic air pollutants from these plants can cause a range of dangerous health problems in adults, from cancer to respiratory illnesses.[5]

State air quality agencies that are delegated implementation authority under the Clean Air Act (such as DNR) develop and implement plans by which they ensure attainment of the federal National Ambient Air Quality Standards and other standards. The air quality standards contained in each implementation plan are applied to specific major emissions sources through the "Title V" permitting program.[6] Major stationary sources of air pollution are prohibited from operating except in compliance with an operating permit issued under Title V of the Act.[7] Title V permits must require compliance with all applicable federal, state, and local regulations in one legally enforceable document, thereby ensuring that all Clean Air Act requirements are applied to the facility.[8] These permits must include emission limitations and other conditions necessary to assure a facility's continuous compliance with all applicable requirements.[9] Title V permits must also contain monitoring, recordkeeping, reporting, and other requirements to assure continuous compliance by sources with emission control requirements.[10]

As EPA explained in the preamble to its Title V Program rule, "regulations are often written to cover broad source categories," leaving it "unclear which, and how, general regulations apply to a source."[11] Title V permits bridge this gap by clarifying and making more readily enforceable a source's pollution control requirements, thus, providing an easy way "to establish whether a source is in compliance."[12] To this end, the provisions of a Title V permit must be sufficiently clear and specific to ensure that all applicable requirements are enforceable as a practical matter. An interested person should be able to understand from the permit how much pollution the plant is legally authorized to emit and how the source is monitored for compliance.

EPA delegated to Iowa the authority to administer the Title V operating permit program within the State. Accordingly, Title V permits issued by DNR must include

---

[3] *Id*.
[4] *Id*.
[5] *Id*.
[6] *See* 42 U.S.C. §§ 7410, 7661.
[7] 42 U.S.C. § 7661a(a); 40 C.F.R. § 70.5(a).
[8] *See* 42 U.S.C. §§ 7661a(a) and 7661c(a); 40 C.F.R. § 70.6(a)(1).
[9] *See id*.
[10] *See* 40 C.F.R. Part 70.
[11] U.S. EPA, Operating Permit Program, 57 Fed. Reg. 32,250, 32,251 (July 21, 1992).
[12] *Id*.

enforceable emission limitations and standards and such other conditions as are necessary to assure compliance with all applicable requirements at the time of permit issuance.[13] "Applicable requirements" include standards or other requirements of the Clean Air Act that are codified in state or federal laws such as regulations that have been promulgated or approved by EPA through rulemaking at the time of permit issuance but that have future effective compliance dates, as well as standards that are effective at the time of permit issuance.[14]

II. The Draft Permit Fails to Include Clear Conditions Governing Compliance with the New Mercury and Air Toxics Standard.

As discussed above, Title V permits are the mechanisms by which regulators consolidate and clarify all Clean Air Act requirements for a particular source. Accordingly, a Title V permit must contain sufficient information to allow a reader to compare the permit to the compliance reports for a facility and determine if there are any violations. Specifically, it must contain more than mere citations to applicable requirements; it must provide the substance of each requirement and serve as an "easy way to establish whether a source is in compliance with regulations under the Act."[15]

Here, the Draft Permit fails to satisfy these requirements. Despite EPA's new rule governing the emission of mercury and other air toxics from power plants, the Draft Permit does not appear to incorporate any additional restrictions on the operation of the George Neal South plant that are designed to achieve compliance with the new MATS standard, nor does it identify any retrofits that are needed to meet the new standard. While the Draft Permit does refer to the relevant regulatory provision, it does not identify any specific compliance options that George Neal South intends to utilize in order to meet the new standard.

The final permit must allow the public to understand how MidAmerican will comply with the new standard and to rely on enforceable permit conditions that specify emission limits and monitoring options. As noticed for public comment, the Draft Permit does not incorporate the revised MATS requirements explicitly; instead, Page 18 of the Draft Permit references 40 CFR 63 Subpart UUUUU, which is insufficient. Given its lack of detail regarding MATS compliance and monitoring, the Draft Permit should be revised to include the specific, enforceable limits necessary to ensure compliance with the MATS rule.

III. The Draft Permit's Particulate Matter Compliance Method Lacks Practical Enforceability

The Draft Permit must be sufficiently clear and specific to ensure that all

[13] *See* 42 U.S.C. § 7661c(a); 40 C.F.R. § 70.6(a)(1).
[14] *See* 40 C.F.R. § 70.2.
[15] 57 Fed. Reg. at 32,251.

applicable requirements are enforceable as a practical matter. As stated by EPA, the requirement of "practical enforceability" can be described as follows:

> A permit is enforceable as a practical matter (or practically enforceable) if permit conditions establish a clear legal obligation for the source [and] allow compliance to be verified. Providing the source with clear information goes beyond identifying the applicable requirement. It is also important that permit conditions be unambiguous and do not contain language which may intentionally or unintentionally prevent enforcement.[16]

It is not clear in the Draft Permit how the permittee shall comply with the particulate matter limits generally. For example, Page 13 of the Draft Permit documents that sulfur dioxide and nitrogen dioxide emissions limits shall be measured by CEMS, along with the relevant averaging period, but there is no similar documentation regarding the compliance demonstration method for PM. The Draft Permit should be revised accordingly to avoid this vague status quo, which inhibits practical enforceability.

IV. The Draft Permit Contains an Unlawful Affirmative Defense to Liability for Exceedances of Technology-Based Limits.

The Draft Permit provides an unlawful "affirmative defense" to liability in an enforcement action "non-compliance with technology based limitations" if the violation is due to an "emergency."[17] The Draft Permit defines emergency broadly to include "unforeseeable events beyond the control of the source," such as malfunction periods.[18] This affirmative defense is identical to EPA's now-repealed affirmative defense,[19] and would preclude a federal court in an enforcement action from finding liability and ordering penalties, if the relevant factors are met. The Draft Permit's affirmative defense provision is contrary to the Clean Air Act, which provides federal district courts—not states or EPA—with exclusive jurisdiction to "apply any appropriate civil penalties" after

---

[16] EPA Region 9 Title V Permit Review Guidelines, Sept. 9, 1999, p. 111-46, quoted in: *In the Matter of Midwest Generation LLC, Joliet Generating Station,* EPA Administrator Order (June 24, 2005) at 17-18, available at https://www.epa.gov/sites/default/files/2015-08/documents/midwest_generation_joliet_decision2004.pdf.

[17] Draft Permit at 85 (citing 567 IAC 22.108(16)).

[18] Draft Permit at 85.

[19] *See* 40 C.F.R. §§ 70.6(g), 71.6(g) (2014), *repealed by* U.S. EPA, Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program, 88 Fed. Reg. 47,054 (July 21, 2023).

considering the mandatory statutory factors in citizen suits brought to enforce applicable emission limits and standards.[20]

In July 2023, EPA confirmed this interpretation when the agency finalized its removal of an identical affirmative defense for emergencies from EPA's federal Title V regulations.[21] In doing so, EPA made clear that affirmative defense provisions in Title V permits are "inconsistent with the enforcement structure of the [Clean Air Act] and thus legally impermissible," because they "operate to limit a court's authority or discretion to determine the appropriate remedy in an enforcement action."[22] In the final rule removing affirmative defense provisions from EPA's federal operating permit regulations, EPA made clear that states "must also remove title V-based affirmative defense provisions contained in individual operating permits."[23] EPA further explained that:

> any impermissible affirmative defense provisions within individual operating permits that are based on a title V authority and that apply to federally-enforceable requirements will need to be removed. As explained in the 2016 proposal, the EPA expects that any necessary permit changes should occur in the ordinary course of business, such as during periodic permit renewals or revisions. *At the latest*, states would be expected to remove affirmative defense provisions from individual permits by the next periodic permit renewal that occurs following either (1) the effective date of this rule (for permit terms *based on* 40 CFR 70.6(g) or 71.6(g)) or (2) the EPA's approval of state program revisions (for permit terms based on a state affirmative defense provision).[24]

Moreover, in that rulemaking, EPA specifically identified 567 IAC 22.108(16)—DNR's cited authority for the Draft Permit—as being an impermissible affirmative defense.[25]

---

[20] 42 U.S.C. § 7604(a); *id*. § 7413(e)(1) (providing mandatory factors for court to consider "[i]n determining the amount of any penalty to be assessed under this section or section 7604(a)"); *see also Nat. Res. Def. Council v. EPA*, 749 F.3d 1055, 1063 (D.C. Cir. 2014) (holding that § 7604(a) "creates a private right of action, and as the Supreme Court has explained, 'the Judiciary, not any executive agency, determines "the scope"—including the available remedies—"of judicial power vested by" statutes establishing private rights of action'") (*quoting City of Arlington v. FCC*, 133 S.Ct. 1863, 1871 n.3 (2013)).
[21] 88 Fed. Reg. 47,054 (July 21, 2023).
[22] *Id*. at 47,032, 47,039.
[23] *Id*. at 47,046.
[24] *Id*. at 47,031 (emphasis added); see also id. at 47,041("It is also important to reiterate that the EPA is basing the current action on its interpretation of the CAA in light of relevant caselaw indicating that these affirmative defense provisions must be removed because they are inconsistent with the enforcement structure of the CAA.")
[25] Ex. 1, Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program, Proposed Rule, EPA-HQ-OAR-2016-0186 *(attached).*

Here, DNR must remove the emergency affirmative defense from the Draft Permit now, rather than waiting for EPA to approve any state revision to the Iowa permitting program, because 567 IAC 22.108(16) is based on EPA's now-repealed affirmative defense at 40 C.F.R. § 71.6(g). Indeed, Iowa's affirmative defense provision is identical to EPA's now-defunct federal affirmative defense.[26] The Draft Permit's emergency affirmative defense provision, like the federal counterpart, is unlawful and must be removed.

V. Conclusion

Environmental Commenters respectfully request that DNR modify the Draft Permit such that it (a) incorporates the revised MATS requirements, (b) clearly demonstrates the George Neal South plant's PM emissions limits and compliance methods to foster practical enforceability, and (c) removes the unlawful affirmative defense provision. We appreciate DNR's consideration of these comments. Please do not hesitate to contact the undersigned if you would like to discuss them further.

Sincerely,

/s/ Sunil Bector
Sunil Bector
Senior Attorney
Sierra Club
2101 Webster, Suite 1300
Oakland, CA 94612
(415) 977-5759
sunil.bector@sierraclub.org

/s/ Joshua Smith
Joshua Smith
Sierra Club
Senior Attorney
2101 Webster St., Suite 1300
Oakland, CA 94612
(415) 977-5660
joshua.smith@sierraclub.org

/s/ Joshua T. Mandelbaum
Joshua T. Mandelbaum (AT0010151)
Environmental Law & Policy Center
505 5th Avenue, Suite 333
Des Moines, Iowa 50309
(515)-244-0253
jmandelbaum@elpc.org

/s/ Michael R. Schmidt
Michael R. Schmidt
Staff Attorney
Iowa Environmental Council
505 5th Avenue, Suite 850
Des Moines, Iowa 50309
(515) 244-1194
schmidt@iaenvironment.org

[26] *Compare* 567 IAC 22.108(16), *with* 40 C.F.R. § 71.6(g) (2014).

Removal of Title V Emergency Affirmative Defense Provisions from State Operating Permit Programs and Federal Operating Permit Program Proposed Rule EPA-HQ-OAR-2016-0186

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

Table 1 of this document contains a tentative list of state, local, and tribal regulations and statutes that may be affected by the EPA's proposed rulemaking identified above. This list is intended to encompass all affirmative defense provisions contained within EPA-approved part 70 (title V) operating permit programs.[1] Table 2 of this document contains a tentative list of state, local, and tribal EPA-approved title V programs that do not appear to explicitly establish an affirmative defense contrary to the EPA's interpretation of the Clean Air Act (CAA), as reflected in this proposed rulemaking. These lists do ***not*** constitute any type of determination as to the adequacy or inadequacy of any specific program provisions.

As indicated in the proposed rule identified above, the EPA is requesting comment on whether the provisions identified in Table 1 of this document, as well as any additional title V affirmative defense provisions that are not currently identified in Table 1 of this document, may be affected if the proposed rule is finalized. The EPA is presenting and soliciting comment on these lists *for informational purposes only*. For further information, see Section V.A of the preamble to the proposed rule.

Table 1. Part 70 Programs that Appear to Contain Title V Affirmative Defense Provisions

EPA Region	Permitting Authority	Affirmative Defense Provision
1	Connecticut	RCSA § 22a-174-33(p)(2)
	Maine	06-096 CMR 140(2)(AA)
	Massachusetts	310 CMR 7.00: Appendix C(16)
	Rhode Island	APCR § 29.6.11

[1] This list is not intended to include any affirmative defense provisions contained in state regulations or statutes that are not part of an EPA-approved title V program (including state-only regulations, SIP provisions that are not included within a state's EPA-approved title V program, or statutes that are not included within a state's EPA-approved title V program).

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
2	New Jersey	NJAC 7:27-22.3(nn); NJAC 7:27-22.16(l)
	New York	6 NYCRR 201-1.5; 6 NYCRR 201-6.5(c)
	Puerto Rico	Regla 603, Reglamento para el Control de la Contaminacion Atmosferica
	U.S. Virgin Islands	12 Virgin Islands R. & Regs. § 206-71(d)
3	Delaware	7 DAC 1130.6.7
	District of Columbia	DCMR 20-302.7
	Maryland	COMAR 26.11.03.24
	Virginia	9 VAC 5-80-250
	West Virginia	W. Va. CSR § 45-30-5.7
4	Alabama	ADEM Admin. Code r. 335-3-16-.11(2)
	AL—Huntsville	Huntsville Air Pollution Control R. & Regs. § 3.3.8(b)
	AL—Jefferson Co.	Jefferson Co. Air Pollution Control R. & Regs. § 18.11.2
	Florida	F.A.C. 62-213.440(1)(d)5
	Kentucky	401 KAR 52:020, § 24
	Kentucky—Louisville	LMAPCD Regulation 2.16 § 4.7
	Mississippi	11 Miss. Admin. Code Pt. 2, R. 6.3.G
	South Carolina	S.C. Code Regs. 61-62.70 § 70.6(g)
	Tennessee	Tenn. Comp. R. & Regs. 1200-03-09-.02(11)(e)7
	TN—Chattanooga-Hamilton Co.	Chattanooga City Code § 4-57(g)
	TN—Knox Co.	Knox Co. Air Quality Mgmt. Regs. § 25.70.F.7
	TN—Nashville-Davidson Co.	Metropolitan Health Dept., Div. Pollution Control Regs. § 13-3(g)
	TN—Memphis-Shelby Co.	City of Memphis § 16-77; Shelby County § 3-5

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
5	Illinois	415 ILCS 5/39.5.7.k
	Indiana	326 IAC 2-7-16
	Michigan	MCL 324.5527
	Minnesota	Minn. R. 7007.1850
	Ohio	OAC 3745-77-07(G)
6	Arkansas	ACA 014.01.93-001 Reg. 26.707
	Louisiana	LAC 33.III.507.J
	New Mexico	20.2.70.304 NMAC
	NM--Albuquerque	20.11.42.12(E) NMAC
	Oklahoma	OAC 252:100-8-6(e)
7	Iowa	567 IAC 22.108(16)
	Kansas	KAR 28-19-512(d)
	Missouri	10 CSR 10-6.065(6)(C)7
	Nebraska	129 NAC Ch. 11
	NE—Lincoln-Lancaster Co.	Lincoln-Lancaster Co. Air Pollution Control Program Art. 2 § 11
	NE—City of Omaha	Omaha Municipal Code § 41-2
8	Colorado	5 CCR 1001-5, Part C, § VII
	Montana	ARM 17.8.1214(5) to (8)
	North Dakota	N.D.A.C. 33-15-14-06.5.g
	South Dakota	ARSD 74:36:05:16.01(18)
	Southern Ute Tribe	Reservation Air Code § 2-117
	Utah	Utah Admin. Code R307-415-6g
	Wyoming	WAQSR Ch. 6, § 3(l)

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

EPA Region	Permitting Authority	Affirmative Defense Provision
9	Arizona	A.A.C. R18-2-306.E
	AZ—Maricopa Co.	Maricopa Co. Air Pollution Control Regs. Rule 130
	AZ—Pima Co.	Pima Co. Code §§ 17.12.180.E, 17.12.185.D
	AZ—Pinal Co.	Pinal Co. AQCD Reg. 3-1-081.E
	CA—Sacramento Metropolitan	Sacramento Metropolitan AQMD Rule 207 § 414
	CA—San Joaquin Valley	San Joaquin Valley Unified APCD Rule 2520 § 13.4
	CA—San Luis Obispo Co.	San Luis Obispo Co. APCD Rule 216 § L.5
	CA—Santa Barbara Co.	Santa Barbara Co. APCD Rule 1303 § F
	CA—South Coast	South Coast AQMD Rule 3002(g)
	CA—Ventura Co.	Ventura Co. APCD Rule 33.9 § D
	CA—Yolo-Solano	Yolo-Solano AQMD Rule 3.8 § 314
	Hawaii	HAR § 11-60.1-16.5
	Nevada	NAC 445B.326
10	Alaska	18 AAC 50.235
	Idaho	IDAPA 58.01.01.332
	Oregon	OAR 340-214-0360
	OR—Lane Regional	LRAPA § 36-040
	Washington (including local air authorities)	WAC 173-401-645
	WA—EFSEC	WAC 463-78-005(2)

Title V Affirmative Defense Provisions in State, Local, and Tribal Part 70 Programs

Table 2. Part 70 Programs that Do Not Appear to Contain Title V Affirmative Defense Provisions

EPA Region	Permitting Authority
1	New Hampshire
	Vermont
3	Pennsylvania
	PA—Allegheny Co.
	PA—Philadelphia Co.
4	Georgia
	North Carolina
	NC—Forsyth Co.
	NC—Mecklenburg Co.
	NC—Western
5	Wisconsin
6	Texas

EPA Region	Permitting Authority
9	CA—Amador Co.
	CA—Amador Co.
	CA—Antelope Valley
	CA—Bay Area
	CA—Butte Co.
	CA—Calaveras Co.
	CA—Colusa Co.
	CA—El Dorado Co.
	CA—Feather River Co.
	CA—Glenn Co.
	CA—Great Basin
	CA—Imperial Co.
	CA—Eastern Kern Co.
	CA—Lake Co.
	CA—Lassen Co.
	CA—Mariposa Co.

EPA Region	Permitting Authority
9	CA—Mendocino Co.
	CA—Modoc Co.
	CA—Mojave Desert
	CA—Monterey Bay
	CA—North Coast
	CA—Northern Sierra
	CA—Northern Sonoma Co.
	CA—Placer Co.
	CA—San Diego Co.
	CA—Shasta Co.
	CA—Siskiyou Co.
	CA—Tehama Co.
	CA—Tuolumne Co.
	NV—Clark Co.
	NV—Washoe Co.

Exhibit 15

ICJC Hydrogen Work Group
Recommendations to Illinois Hydrogen Economy Task Force

The Hydrogen Work Group of the Illinois Clean Jobs Coalition (ICJC) appreciates the Task Force's careful consideration of the benefits and risks of developing Illinois' hydrogen economy. We believe clean, electrolytic hydrogen has an important role in hard-to-decarbonize sectors of Illinois' economy, and we support the Task Force's efforts to develop a hydrogen economy that provides environmental and economic benefits to our state. To achieve that goal, we respectfully offer the following 8 recommendations. These are necessary to ensure that Illinois' hydrogen economy develops safely and in accordance with our state's climate and environmental justice commitments.

Environmental Justice

1. **The Task Force should meaningfully engage with and seek input from environmental justice organizations in Illinois before releasing its recommendations.**

2. **The Task Force's recommendations should be guided by three principles:**

    a. Hydrogen projects must never add environmental burdens in environmental justice communities.

    b. Hydrogen projects should benefit environmental justice communities.

    c. Environmental justice communities must have meaningful say in decisions about hydrogen projects impacting their communities.

Hydrogen Production

3. **All hydrogen produced and used in Illinois should come from electrolyzers powered by zero-carbon resources, not from fossil fuels.**

    a. Producing hydrogen from fossil fuels emits substantial pollution. International Energy Agency, *Towards hydrogen definitions based on their emissions intensity*, p. 41 Fig. 2-2, https://iea.blob.core.windows.net/assets/acc7a642-e42b-4972-8893-2f03bf0bfa03/Towardshydrogendefinitionsbasedontheiremissionsintensity.pdf.

    b. Carbon, capture, and sequestration (CCS) technology does not capture all of this pollution, nor does it capture the upstream emissions from producing the natural gas that is used to produce hydrogen. *Id.* at 9.

4. **All electrolytic hydrogen produced and used in Illinois should meet the 3 criteria for clean hydrogen production: (1) additionality, (2) hourly matching, (3) deliverability.**

    a. Without these criteria, hydrogen production will increase greenhouse gas emissions and undermine our state and national climate goals. *See, e.g.*, Evolved Energy Research, *45V Hydrogen Production Tax Credits: Three-Pillars Accounting Impact Analysis* (June 2023), https://www.evolved.energy/post/45v-three-pillars-impact-analysis (concluding that requiring the three criteria for the federal hydrogen production tax credit "improves emissions outcomes and still allows for the rapid scaleup of clean hydrogen production

in the U.S."); Letter from National Caucus of Environmental Legislators to U.S. Dep't of Treasury *et al*. (June 8, 2023), https://www.ncelenviro.org/articles/state-legislators-call-for-criteria-in-usage-of-hydrogen-tax-credit/ (urging the federal government to require the three criteria for the federal hydrogen production tax credit).

b. **Additionality =** only new/surplus zero-carbon resources power electrolyzers.

    i. Without additionality, the carbon intensity of electrolytic hydrogen production is twice that of hydrogen produced from fossil fuels. W. Ricks *et al.*, *Minimizing Emissions from Grid-Based Hydrogen Production in the United States*, 2023 Environ. Res. Lett. 18 014025, https://iopscience.iop.org/article/10.1088/1748-9326/acacb5 ("Princeton Study 2023").

c. **Hourly matching =** electrolyzers run only during the same hours when new/surplus zero-carbon resources are supplying power to the grid.

    i. Without hourly matching, the carbon intensity of electrolytic hydrogen is twice that of hydrogen produced from fossil fuels or more. *Id.*

    ii. Requiring weekly or annual matching instead of hourly matching is "universally ineffective at reducing consequential emissions from grid-based hydrogen production." *Id.; see also* Letter from hydrogen producers to U.S. Dep't of Treasury *et al*. (June 15, 2023), https://s3.documentcloud.org/documents/23854072/hourly-matching-industry-letter-final.pdf (urging hourly matching requirements for the federal hydrogen production tax credit); B. Gerber & K. Daly, *How hourly tracking can prevent a "clean" hydrogen boondoggle* (July 10, 2023), https://www.utilitydive.com/news/hourly-tracking-clean-hydrogen-renewable-energy-grid-emissions/685960/ (op-ed from energy tracking companies stating that "hourly matching is feasible, in use today, and absolutely necessary for deploying clean hydrogen and building a clean grid").

d. **Deliverability =** the zero-carbon resources powering the electrolyzers are located in the same load balancing authority as the electrolyzers (e.g. PJM or MISO).

    i. Without deliverability**,** zero-carbon resources "cannot be relied on to eliminate emissions from hydrogen production" due to transmission constraints. Princeton Study 2023.

e. **These 3 criteria can be achieved while producing electrolytic hydrogen that is cost-competitive with hydrogen produced from fossil fuels.**

    i. *See id.*; W. Ricks & J. Jenkins, *The Cost of Clean Hydrogen with Robust Emissions Standards: A Comparison Across Studies*, (Apr. 19, 2023), https://zenodo.org/record/7948769; Energy Innovation, *Smart Design of 45V Hydrogen Production Tax Credit Will Reduce Emissions and Grow the Industry* (Apr. 11, 2023), https://energyinnovation.org/publication/smart-design-of-45v-hydrogen-production-tax-credit-will-reduce-emissions-and-grow-the-industry/;

Jacobson *et al.*, *Impacts of green hydrogen for steel, ammonia, and long-distance transport on the cost of meeting electricity, heat, cold, and hydrogen demand in 145 countries running on 100% wind-water-solar*, Smart Energy (Aug. 2023), https://www.sciencedirect.com/science/article/pii/S2666955223000138#gs1 (countering the theory that electrolyzers must operate as close to 24/7 as possible to produce green hydrogen as cheaply as possible).

Hydrogen Use

5. **Wherever possible, zero-carbon electricity should be used directly instead of hydrogen. Where direct electrification is not possible and hydrogen is burned instead, the strongest nitrogen oxide (NOx) controls should be required.**

    a. Direct electrification is considerably more efficient than using hydrogen.

        i. **Power sector:** The "roundtrip efficiency"[1] of storing zero-carbon electricity in a lithium-ion battery and using it later is ~90%. *See, e.g.,* Tesla Megapack Product Details, https://www.tesla.com/megapack/design. By contrast, the roundtrip efficiency of using zero-carbon electricity to produce hydrogen that is later burned to generate electricity is ~20%. (Calculated using information from GE, *Power to Gas: Hydrogen for Power Generation*, 5 at Tbl. 3 (2019), https://pdf4pro.com/amp/view/hydrogen-for-power-generation-whitepaper-ge-com-6652da.html). *See also* N.A. Sepulveda, *et al.,* Nature Energy, *The design space for long-duration energy storage in decarbonized power systems*, Tbl. 1 (Mar. 29, 2021), https://dspace.mit.edu/handle/1721.1/138145.2 (showing roundtrip efficiencies ranging from 18-46% for "Power-H2-Power" storage technologies). Therefore, hydrogen for energy storage should only be considered on timescales longer than batteries can hold their charge, e.g. seasonal storage coupled with fuel cells.

        ii. **Transportation sector:** Only 25% of the zero-carbon electricity used to produce hydrogen makes it to the wheels of a hydrogen fuel cell vehicle, compared to 75% in a battery-electric vehicle. Traton, *Fraunhofer analysis sees battery-electric trucks at an advantage over hydrogen trucks* (Feb. 7, 2022), https://traton.com/en/newsroom/press-releases/fraunhofer-analysis-battery-electric-trucks-advantage-over-hydrogen-trucks.html.

    b. Burning hydrogen produces harmful pollution.

        i. "GE combustion studies indicate a 50/50 mixture by volume of hydrogen/ natural gas could increase the concentration of NOX in the gas turbine exhaust by 35 percent." GE, *Hydrogen as a Fuel for Gas Turbines*, 5 (2022), https://www.ge.com/content/dam/gepower-new/global/en_US/downloads/gas-new-site/future-of-energy/hydrogen-fuel-for-gas-turbines-gea34979.pdf ("GE 2022").

[1] The ratio of energy put in to energy retrieved from storage.

ii. NOx exposure "can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms." USEPA, https://www.epa.gov/no2-pollution/basic-information-about-no2.

iii. Unlike burning hydrogen in combustion engines or turbines, hydrogen fuel cells (e.g. in long-haul trucks or for energy storage) do not produce air pollution. *See, e.g.*, Congressional Research Service, *Hydrogen in Electricity's Future*, 9-10 (June 30, 2020), https://crsreports.congress.gov/product/pdf/R/R46436 ("Hydrogen fuel cells emit only water, so there are no carbon dioxide emissions and no air pollutants that create smog and cause health problems at the point of operation.").

c. Burning a blend of hydrogen and natural gas instead of natural gas produces only marginal reductions in climate pollution.

i. There is not a 1:1 relationship between the amount of hydrogen burned and CO2 reduced. To achieve a 50% reduction in CO2, a power plant would need to burn a hydrogen/fossil gas blend that is ~75% hydrogen. (GE 2022).

d. Hydrogen itself is a greenhouse gas and has a climate-warming potential over 30x that of CO2 in a 20-year period. Ocko & Hamburg, *Climate consequences of hydrogen emissions*, Atmospheric Chemistry & Physics (July 20, 2022), https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf.

6. Hydrogen should be targeted to high-value applications in hard-to-decarbonize sectors, like steel production, chemical fertilizer production, and long-haul trucking.

a. USDOE's National Clean Hydrogen Strategy and Roadmap identifies "[t]arget[ing] strategic, high-impact uses for clean hydrogen" as a key strategy to "ensure that clean hydrogen is developed and adopted as an effective decarbonization tool for maximum benefit to the United States" and specifically identifies chemical and steel manufacturing and heavy-duty transportation. *See* p.2, https://www.hydrogen.energy.gov/clean-hydrogen-strategy-roadmap.html.

7. Hydrogen should not be used in low-value applications that have better decarbonization options, like:

a. Vehicles other than heavy-duty, long-haul trucks.

i. Based on on-road demonstrations in 2022, industry experts determined that 65% of medium-duty and 49% of heavy-duty trucks are already electrifiable today. J. Lund *et al., Charting the Course for Early Truck Electrification* (2022) https://rmi.org/insight/electrify-trucking/.

b. Combustion in the power sector. See above re: inefficiency & NOx pollution.

c. Blending into gas distribution lines for heating or cooking. See above re: inefficiency & NOx pollution.

8. **Before Illinois' hydrogen economy grows, regulations must be developed to mitigate the safety risks of transporting and storing hydrogen, including regulations against blending or transporting hydrogen through natural gas pipelines that were not designed to, or have not been retrofitted to, safely transport hydrogen.**

    a. Hydrogen can leak up to 3x faster than fossil gas. Ocko & Hamburg 2022.

    b. "Hydrogen is extremely flammable, making it susceptible to combustion, even in small concentrations . . . Flammability remains a significant concern for distribution pipelines in residential areas." Blanton *et al.*, *Investing In The Us Natural Gas Pipeline System To Support Net-Zero Targets*, Columbia Center on Global Energy Policy (Apr. 2021), https://www.energypolicy.columbia.edu/wp-content/uploads/2021/04/GasPipelines_CGEP_Report_111522.pdf; *see also* Pipeline Safety Trust, *Hydrogen Pipeline Safety: Summary for Policymakers* (Jan. 2023), https://pstrust.org/wp-content/uploads/2023/01/hydrogen_pipeline_safety_summary_1_18_23.pdf ("The report[2] finds that transporting hydrogen by pipeline poses serious explosion risk due to hydrogen's flammability, propensity to leak, pipeline integrity issues, and other factors."); Hydrogen Tools,[3] *Hydrogen Compared with Other Fuels*, https://h2tools.org/bestpractices/hydrogen-compared-other-fuels (explaining that hydrogen's "flammability range" is "very wide compared to other fuels" and that under optimal combustion conditions, "a small spark will ignite it"); U.S. DOE, Safe Use of Hydrogen, https://www.energy.gov/eere/fuelcells/safe-use-hydrogen ("Some of hydrogen's properties require additional engineering controls to enable its safe use," including its "wide range of flammable concentrations").

    c. "The dispersion behavior of hydrogen is different than other gases, given the small size of hydrogen atoms, and it is colorless, tasteless, and odorless, so that specific sensors or odorization would be required to detect it." Blanton 2021; *see also* H2Tools ("Hydrogen burns with a pale blue flame that is nearly invisible in daylight, so it is almost impossible to detect by the human senses").

    d. ~96% of U.S. gas transmission pipelines are steel, and hydrogen can embrittle steel pipes. Blanton 2021. "The potential introduction of hydrogen into the existing natural gas pipeline network is currently limited by technical concerns," which "include leakage, safety, and function." *Id.* Blending more than 20% hydrogen into existing natural gas systems "brings significant challenges." *Id.* *See also* Pipeline Safety Trust 2023.

    e. **USDOT, Pipeline & Hazardous Materials Safety Administration**: "Having adequate codes and standards for all aspects of a 'hydrogen economy' is a major institutional barrier to deploying hydrogen. Enabling a hydrogen economy will require new consumer products, new model building codes and equipment and other technical standards." https://primis.phmsa.dot.gov/comm/hydrogen.htm.

[2] https://pstrust.org/wp-content/uploads/2022/11/11-28-22-Final-Accufacts-Hydrogen-Pipeline-Report.pdf.
[3] "The Pacific Northwest National Laboratory developed the Hydrogen Tools Portal through support from the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy." https://h2tools.org/about.

Exhibit 16

Accufacts Inc.
"Clear Knowledge in the Over Information Age"

Report:
Safety of Hydrogen Transportation by Gas Pipelines

Accufacts Inc. Final 11/28/2022

About Accufacts Inc.

Accufacts Inc ("Accufacts") has an extensive chemical engineering and process safety management background, involving direct operational and engineering experience in refining, pipelines, and production. This experience includes handling, processing, and moving high pressure high purity hydrogen, including gas mixtures, and too many first-hand experiences with hydrogen releases, many resulting in explosions, given the unique "reactive" properties of hydrogen as compared to methane. Accufacts also brings several decades of involvement in pipeline safety regulatory development at the federal and various state levels, as well as numerous pipeline failure incident investigations in North America.

Report:
Safety of Hydrogen Transportation by Gas Pipelines

prepared for the

Pipeline Safety TRUST

Credible.
Independent.
In the public interest.

http://www.pstrust.org/

by
Richard B. Kuprewicz
President, Accufacts Inc.
kuprewicz@comcast.net
November 28, 2022

This report is developed from information clearly in the public domain. The views expressed in this document represent the opinions of the author.

Table of Contents

I. Executive Summary

Accufacts' key positions concerning hydrogen transportation in pipelines as discussed in this report are summarized in Table 1.

Table 1 Accufacts key positions on hydrogen introduction into transportation pipelines to address global warming

Scenario	Accufacts' Position
Hydrogen blending into gas distribution systems	Should not be permitted at any level because of hydrogen's ability to explode especially in buildings, and the weaker downstream gas pipeline systems within public buildings not intended for hydrogen.
Gas transmission systems	As most gas transmission pipelines feed into distribution systems, hydrogen blending should not be allowed in such existing gas transmission pipelines feeding distribution systems.
Limited existing gas transmission not supplying gas distribution systems	May be suitable for hydrogen blends that only service major industrial gas users, if knowledge gaps can be resolved and pipeline integrity can be demonstrated for hydrogen service.
New gas transmission pipelines designed for hydrogen service	New smaller diameter gas transmission pipelines may be suitable for hydrogen service.

II. Introduction

The Pipeline Safety Trust asked Accufacts Inc. ("Accufacts") to review and comment on various aspects related to hydrogen pipeline safety. Depending on the source of hydrogen production, some applications of hydrogen may be considered a greenhouse gas reducer, as governments and the private sector attempt to meet commitments toward reducing greenhouse gas emissions that contribute to climate change. One application of hydrogen under consideration is to blend gaseous hydrogen into existing natural gas (methane) pipeline systems for combustion by end users. As this report explains, pipelines containing hydrogen pose significantly increased dangers and risks compared to conventional natural gas pipelines.

This report identifies serious concerns about the pursuit of hydrogen blending options for existing gas transmission or gas distribution pipelines given the increased danger and small impact that such blending would have on emissions contributing to climate

change. Hydrogen blending in most existing U.S. gas pipeline systems may not prove viable, given such factors as:

1. the interplay between gas transmission and distribution pipeline systems as most transmission systems supply distribution systems which should not receive hydrogen even as blends,
2. the many information gaps that must be resolved to demonstrate integrity of existing gas pipeline systems to transport hydrogen, even as lower concentration blends,
3. the significant natural gas leakage on many gas distribution pipeline systems across the U.S., and the slipperiness of hydrogen indicates that leakage would be worse when carrying hydrogen and demonstrates a need for pipe replacement that will take time and be expensive,
4. moving hydrogen from traditional industrial settings, such as more open-air refineries and chemical plants, to commercial/residential confined buildings never designed nor intended for such efforts, and
5. the limited benefit, and possible drawbacks, of hydrogen blending to reduce greenhouse gas emissions contributing to climate change.

There may be some unique transmission and distribution systems that may be able to safely accept hydrogen blending, but Accufacts investigations spanning many systems across the country show such opportunities will be rare. Transportation of higher purity hydrogen in some selective gas transmission pipelines may be the most likely near-term approach for the use of hydrogen to reduce greenhouse gas emissions that contribute to climate change.

Transportation of hydrogen by pipeline should be approached with caution and limited to facilities capable of transporting it without leaks or failures. Adding hydrogen to existing pipelines introduces significant additional threats into neighborhoods because of hydrogen's unique properties. This paper intends to advance discussions regarding best applications of hydrogen by assessing options and risks concerning hydrogen transportation by pipeline and by providing recommendations to prudently address additional dangers associated with hydrogen in pipelines.

III. Key Background

Governments and oil and gas companies are looking to hydrogen as a means to decarbonize segments of the energy and industrial sectors. The 2021 Infrastructure Investment and Jobs Act appropriated $9.5 billion for clean hydrogen and the 2022 Inflation Reduction Act provides additional policies and incentives for hydrogen. The U.S. Department of Energy ("DOE") launched the Hydrogen Shot in 2021, seeking to reduce the cost of clean hydrogen by 80% to $1 per 1 kilogram in 1 decade,[1] and the DOE opened applications for its regional clean hydrogen hub program in September

[1] https://www.energy.gov/eere/fuelcells/hydrogen-shot

2022.[2] How hydrogen will be integrated as a fuel and energy storage mechanism is still being determined, but whichever applications are prioritized, hydrogen transportation pathways will be necessary to facilitate deployment. It is generally expected that the best use of hydrogen will be for high-heat, hard-to-electrify sectors such as certain industrial processes, and that it is preferable for hydrogen production and end-use to be in close proximity.[3]

As these opportunities take shape, the concept of blending hydrogen into natural gas pipelines is under discussion. The Draft DOE National Clean Hydrogen Strategy and Roadmap proposes the following future activities: "development of injection standards for blending hydrogen into natural gas pipelines," "assessing opportunities to repurpose natural gas infrastructure for hydrogen," and "identifying conditions under which deployment of new infrastructure would be necessary."[4] Oil and gas industry stakeholders are offering proposals involving the movement of hydrogen via new or converted pipelines, or as blends of hydrogen into existing natural gas transmission or distribution pipelines. For example, a recent gas industry sponsored report suggests blending of hydrogen up to 20% by volume into existing gas utility distribution systems as a solution to get to "Net-Zero."[5]

A recent UC Riverside Report for the California Public Utilities Commission ("Blending Report") identifies many, but not all, major relevant safety issues related to hydrogen movement by pipelines.[6] This Blending Report also documents over six pages of technical questions or "knowledge gaps" needing further assessment and prudent resolution.[7] In addition to the gaps identified by UC Riverside, Accufacts, recommends three further key technical knowledge gaps where additional assessment and information is needed (see page 14).

The Pipeline and Hazardous Materials Safety Administration, or PHMSA, the federal office responsible for minimum pipeline safety at the federal level, is also advancing important safety research in some related technical pipeline safety matters concerning hydrogen movement in pipelines.[8] These above-mentioned efforts will take many

---

[2] https://www.energy.gov/articles/biden-harris-administration-announces-historic-7-billion-funding-opportunity-jump-start

[3] See pp. 40 &41, https://www.hydrogen.energy.gov/pdfs/clean-hydrogen-strategy-roadmap.pdf.

[4] *Ibid.,* p. 45.

[5] American Gas Association ("AGA") Study prepared by ICF, "Net-ZERO Emissions Opportunities for Gas Utilities," February 8, 2022, p. 104.

[6] Prepared by the University of California, Riverside with subcontractor Gas Technology Institute, for the California Public Utilities Commission, "Final Report - Hydrogen Blending Impacts Study," filed 7/18/2022, R1302908.

[7] *Ibid.,* pp. 111 – 116.

[8] See the Pipeline and Hazardous Materials Safety Administration ("PHMSA") Research Announcement #693JK322RA0001 at:

years to reach appropriate technical resolution, understanding, and acceptance by various regulators, decisionmakers, pipeline operators, and the public.

When compared to methane (i.e., natural gas), hydrogen (H_2) has several unique physical properties, identified in this report, that make movement by pipeline especially dangerous. Natural gas, once processed for end use, is about 95% methane (CH_4), and thus gas transmission and distribution pipelines are designed to transport gas comprised primarily of methane. Hydrogen, or gas mixtures containing hydrogen, are more prone to leak out of a containment vessel such as a pipeline. Such hydrogen driven releases are not only more likely to migrate and are easier to explode, burning hotter than methane natural gas streams, but also contribute to climate change as an indirect greenhouse gas. In layman's terms, hydrogen is more "slippery" when compared to natural gas. Important modifications to minimum federal and state pipeline safety regulations are warranted, whether attempting to use new hydrogen pipelines, or converting existing pipelines to hydrogen gas service, including blending options.

IV. Hydrogen has unique physical properties making it significantly more reactive when compared to methane

Hydrogen transported in pipelines is a clear, odorless gas that, when released, can burn with a very light blue flame that may not be visible in daylight. It is not unusual for hydrogen releases to explode and then burn. Hydrogen has some unique properties that in chemical engineering terms make hydrogen more "reactive" as compared to other hazardous hydrocarbons moved in transportation pipelines, such as methane as natural gas. These hydrogen properties make movement by transportation pipeline, whether via gas transmission or gas distribution, substantially more dangerous than conventional natural gas pipeline operations. Based on hydrogen release events, many with explosion, the following are major points for discussion to help in understanding these important property differences when it comes to hydrogen transportation by pipeline, even as gas mixtures, as compared to conventional natural gas:

1. Hydrogen has a much greater flammability range (4.0 – 75.6 vol%) as compared to methane (5.0 – 15 vol%), so it is more susceptible to combustion.
2. Hydrogen has a much lower autoignition temperature that favors ignition and resulting detonation/explosion as compared to natural gas when ignition sources are not present.
3. The combustion characteristics of hydrogen are quicker and more efficient (i.e., faster burn velocity), producing a more rapid/efficient combustion than natural gas, often with explosive outcomes, either outside or in structures.
4. Hydrogen on a per pound basis has slightly greater than 2.5 times the energy density of methane.
5. Being a much smaller atom/molecule, hydrogen or hydrogen gas mixtures can more easily leak out of a pipeline, and once released migrate more easily into

https://primis.phmsa.dot.gov/matrix/RfpInfo.rdm?rfp=90&s=280E4A9F749B439AA5FC1923F6C29803&c=1.

soils and nearby buildings where such contained releases involving hydrogen are more likely to explode as compared to methane.

6. Hydrogen is an indirect greenhouse gas, with potentially thirty-three times the warming power of carbon dioxide in the first 20 years.

***Flammability*:** Flammability range describes the minimum and maximum concentrations at which a given vaporous substance will ignite or combust when mixed with air. The significantly greater range of flammability for hydrogen over methane clearly indicates that hydrogen releases have a much wider range of concentrations favoring combustion as compared to natural gas.[9]

Autoignition: Autoignition temperature is the lowest temperature required to ignite a gas or vapor in air spontaneously (without a spark or flame being present). Hydrogen has a lower autoignition temperature (1040 °F) than methane (1103 °F).[10] This lower autoignition temperature contributes to a higher likelihood that pipeline releases will explode and then burn for some time, fueled by pipeline inventory.

Combustion: Hydrogen burns faster than methane and once ignited, has faster flame speeds coupled with a higher combustion efficiency. Such factors contribute to hydrogen releases tending to detonate/explode with extreme energy release from pipeline fed fires generating very high temperatures. Higher purity hydrogen fed fires generate very high and fatal heat radiation densities that tend to shift toward the ultraviolet rather than the more conventional infrared heat radiation spectrum associated with methane fires. Such burning releases are hard to see in daylight but are still very destructive/fatal to receptors, such as the public, who may not be aware of such unique heat radiation and thus remain too close to such events.[11]

Density: On a per pound basis hydrogen is one of the highest energy density gases, especially when compared to methane. The Blending Report appears to focus on much lower pressure (at the end use) burner tip combustion, citing combustion by volume density associated with appliances. Such comparisons miss the much greater consequences of energy release of hydrogen using density by pound associated with pipeline releases. Hydrogen releases from pipelines are easier to explode and then continue to burn depending on the fuel supply, which for pipelines can be considerable tonnage spanning significant time. Because of pipeline inventory increased from pressure, pipeline releases do not shut off quickly, even when valves are closed as the system depressures. Such pipeline-fed flames result in very high heat releases (think of a powerful blowtorch). The tremendous amount of energy release capable from

[9] American Institute of Chemical Engineers, "Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs," 1994, p. 48.
[10] *Ibid.*
[11] Hydrogen Tool, "Hydrogen Compared with Other Fuels," at https://h2tools.org/hydrogen-compared-other-fuels.

pipelines should be using energy density per pound as the appropriate parameter to capture hydrogen related pipeline release consequences.[12]

Leakage: Hydrogen, being the smallest atom, makes containment challenging for pressurized pipelines, even as a H_2 molecule. Such releases underground will be prone to migrate considerable distances, especially if the earth above the pipeline is capped, with asphalt or concrete for example, as is often the case with gas distribution systems. While not a defined technical property, in layman's terms think of hydrogen or hydrogen/natural gas blends as being more "slippery" than natural gas. Hydrogen or hydrogen natural gas mixtures will likely have not only a greater propensity to leak, but such releases will more easily migrate laterally underground from pipelines and eventually accumulate if confined in structures to dangerous concentrations.[13]

Indirect Greenhouse Gas: Hydrogen is an indirect greenhouse gas which, through a series of chemical reactions, increases the amount of greenhouse gases like methane in the atmosphere. A recent study estimated that hydrogen emissions could have about 30 times the warming power of carbon dioxide, pound for pound, over the first 20 years after being emitted.[14] The study also found that depending on the leak rates of methane and hydrogen, the development of "blue hydrogen," where hydrogen is produced from natural gas and the CO_2 emissions are captured and sequestered, could actually increase warming in the next few decades. This is an especially important consideration given hydrogen's propensity to leak as well as its potential ability to increase leakage rates in hydrogen/natural gas blends.

Accufacts finds it odd that the cited papers discussing and driving the hydrogen economy and hydrogen's possible use in transportation pipelines fail to prudently address the many unique properties of hydrogen that make it significantly more dangerous compared to methane transported in such natural gas pipelines. Especially disingenuous is the failure of hydrogen release discussions to outline the differences in such releases in more industrial facilities (such as refineries, chemical plants, or major electric power plants) where releases are outdoors and away from the public, versus the consequences of such releases in buildings containing the public, where explosions forces are seriously magnified. Such deficiencies demonstrate a lack of experience concerning the dangers in hydrogen release events, especially explosions.

---

[12]See Energy Density of Hydrogen - The Physics Factbook, "Energy Density of Hydrogen," at https://hypertextbook.com/facts/2005/MichelleFung.shtml.

[13] Many states have imposed leak classification and leak grading requirements for their intrastate natural gas pipelines that are based on methane.

[14] Ilissa B. Ocko and Steven P. Hamburg, article in Atmospheric Chemistry and Physics, "Climate consequences of hydrogen emissions," Volume 22, Issue 14, published July 20, 2022, p. 9359, Figure 3 at https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf.

V. Additional factors that influence decisions to utilize hydrogen in natural gas transportation pipelines

Beyond hydrogen's additional reactivity, there are features of existing gas pipelines that make introduction of hydrogen into natural gas transportation pipelines concerning. Currently there are slightly less than 300,000 miles of onshore gas transmission and slightly more than 2,300,000 miles of natural gas distribution pipeline, consisting of mains and services lines.[15] A third category of gas transportation pipeline, gas gathering, that mostly evolved from the advancement of gas production from shale formation fracking, also exists, but this category of pipeline is not likely to involve hydrogen. It is important to recognize some of the general differences between natural gas transmission and distribution systems that can affect safe pipeline operation and public safety regarding the possible addition of hydrogen in such existing pipelines:

A. For Natural Gas Transmission Pipelines

Transmission pipelines are usually large-diameter, high-pressure pipelines designed to move large volumes of gas per day with diameters ranging from 4-42 inches. Gas transmission pipelines mainly serve other pipelines, electric power plants, large industrial facility fuel consumers, local distribution center systems, and large liquified natural gas (LNG) facilities. Most gas transmission pipelines are composed of steel with some minor mileage consisting of composites. The majority of transmission pipelines operate at much higher pressures and Specified Minimum Yield Strength levels, or SMYS, as defined in federal pipeline safety regulations, that place them into the rupture consequence regime if certain anomalies in the pipeline grow to defects.[16] Ruptures are the pipeline failures that fracture, usually in microseconds, generating big craters ejecting tons of steel pipe, and upon ignition generate fireballs, releasing extremely high heat fluxes that burn for considerable time. Leaks are gas releases where the pipe failure usually doesn't quickly grow with time, such as a puncture or corrosion through wall pitting. Thus, gas transmission pipelines can release gas as either leaks or ruptures. Not all natural gas leaks are immediately dangerous, but all gas pipeline ruptures are dangerous, given the over-pressure forces and pipe shrapnel generated from pipe rupture, and extremely high heat radiation if ignition occurs.

Gas transmission pipelines are usually located in well-defined pipeline rights-of-way ("ROW") of varying widths, that by federal regulation are required to be posted to indicate that a gas transmission pipeline ROW is in the area. Most gas transmission pipeline ROWs are controlled by easement contracts that usually limit landowner activity such as no buildings on such pipeline ROWs by contract. The result is that structures are not usually too exposed to transmission pipeline gas leaks, though pipeline ruptures of high-pressure gas transmission pipelines can

[15] PHMSA website Annual Report Mileage Summary Statistics, at: https://www.phmsa.dot.gov/data-and-statistics/pipeline/data-and-statistics-overview.
[16] 49CFR§192.3 Definitions.

easily impact structures well beyond the ROW. Such easement ROWs for transmission pipelines are not always the case. Recent Accufacts investigations and a new definition in PHMSA's proposed gas transmission pipeline regulation have made public that a small minority of gas transmission pipelines do not have a defined easement nor ROW.[17] A small group of gas pipelines can become transmission if a pipeline operator voluntarily designates so to PHMSA. This PHMSA change in transmission pipeline definition can lead to situations where some transmission pipelines are not on ROWs, placing them near structures.

B. For Natural Gas Distribution Pipelines

Gas distribution pipelines are generally smaller diameter, lower pressure mains and service lines operating at less than 20% SMYS. Gas distribution pipelines range on the order of ½-inch to 24-inch in diameter, though cast iron pipelines, which operate at very low pressures, can be larger in diameter. These gas distribution systems consist of a network of pipe "grids" of mains in towns, cities, and neighborhoods which then feed into service lines running to homes, businesses, as well as some power plants and smaller LNG peaking facilities. Gas distribution systems operate at less than 20% SMYS at MAOP. By their nature gas distribution systems are close to structures. In some cases, usually associated with older installations, part of the gas distribution system is inside structures, such as basements.

For various reasons plastic has taken over gas distribution in many new installations as well as pipe replacement projects, with current mileage in this country consisting of slightly over two-thirds consisting of a wide range of plastics, and the remaining about one-third of the gas distribution mileage consisting of steel or iron-based materials, such as cast iron.[18] A smattering of distribution pipeline miles are of other materials, such as copper. From a pipe failure/fracture mechanics point of view, by nature of their lower stress levels, gas distribution pipelines don't rupture or fracture like higher pressure gas transmission pipelines, they leak. While many gas distribution system leaks are not dangerous, some methane gas leaks can be quite dangerous if the leaked gas reach structures. Some gas distribution systems are over one-hundred years old with much of these older systems constructed of cast iron, wrought iron, and earlier forms of carbon steel. These older iron-based pipelines are prone to brittle cracking failures that release gas as leaks.

[17] PHMSA Final Rule for 49CFR Part 192, "Pipeline Safety: Safety of Gas Transmission Pipelines: Repair Criteria, Integrity Management Improvements, Cathodic Protection, Management of Change, and Other Related Amendments," issued August 4, 2022, § 192.3 Definitions vii, Transmission line.

[18] PHMSA, Pipeline Mileage and Facilities, 2010+ Pipeline Miles and Facilities, "Gas Distribution Pipeline Miles by Material," at website: https://www.phmsa.dot.gov/data-and-statistics/pipeline/data-and-statistics-overview.

It has also been well known for many decades that specific types of early plastic gas distribution pipe, such as Adyl A, Century, ABS, and certain other plastics, are also prone to cracking that favors gas leakage.[19] In some parts of the country, gas distribution systems may also exhibit various forms of plastic or metal "connection" failures that can be another source of leakage. It is currently not illegal to leak natural gas. None of these gas distribution systems containing such crack threats, connection threats, or proximity issues within or near a building should be permitted to allow blended hydrogen in their operation. Such gas distribution systems dramatically increase the dangers from hydrogen driven pipeline leakage near/in structures with very little benefit from hydrogen blending to reduce carbon emissions.

1. The internal piping in buildings is the weakest link that should prevent hydrogen blending in gas distribution systems

While some distribution systems have spent considerable efforts trying to tighten their systems to reduce methane leakage, the weakest link in this process is the downstream lower pressure internal gas systems within structures that are fed by the gas distribution systems. Such lower pressure internal systems are not governed by pipeline safety regulations for transportation pipelines but are usually addressed by other organizations (such as local fire or building codes that vary considerably across the country). Adding a new substance like hydrogen, with its greater ability to leak and explode, to the wide range of internal piping used in structures intended for methane, will have serious public safety consequences. Hydrogen is a very unforgiving gas, that can easily explode in the open, but is especially destructive when explosion occurs in the confinement of buildings, such as residences. It is this final factor that leads Accufacts to conclude that hydrogen, even as blends, should never be allowed in gas distribution systems.

VI. Can pipelines be a critical link to a hydrogen economy?

A listing of possible production sources of hydrogen, compared to the possible consumers of such hydrogen to effectively reduce greenhouse gases, demonstrates that pipelines may be needed to connect supply to demand. One important question regarding the emerging hydrogen economy is to what extent, if at all, existing natural gas pipelines should be utilized for such efforts and when new, specially built pipelines designed for hydrogen service are warranted.

[19] Report of Phase I Investigations prepared by joint work/study groups, identifying some types of plastic pipe susceptible to cracking and used to help develop the Distribution Integrity Management Program, or DIMP, federal pipeline safety regulations that became effective in August 2011, "Integrity Management for Gas Distribution," December 2005, Risk Control Practices Report – Exhibit E, p. 43.

A. Current hydrogen pipeline miles in the U.S. are not typical

U.S. pipeline developers, owners, operators, and regulators have limited experience with hydrogen pipelines, and even less experience with natural gas/hydrogen blended pipelines. Currently there are slightly under 300,000 miles of onshore natural gas transmission pipelines and slightly over 2,300,000 miles of natural gas distribution (mains and services lines) pipelines in the U.S.[20] A review and analysis of the public database from PHMSA indicates, that as of the end of 2021, the U.S. had slightly more than 1,500 miles of hydrogen transmission pipeline.[21] The bulk of this limited hydrogen transmission pipeline mileage, about 85%, is in three major transmission pipelines. These three lines consist of hydrogen pipelines no greater than 18 to 20-inches in diameter at their largest diameter of high-pressure pipeline with the preponderance of their mileage consisting of much smaller diameter pipe of 12-inches or less. Pipe diameter plays a controlling factor in the tonnage of gas that can be released from a pipeline in the event of a leak or a pipeline rupture. These three major pipelines are mainly located in the Gulf Coast region with over 80% of the pipeline mileage in areas of lower building density, defined as a class location unit 1 under current federal pipeline safety regulations.[22]

The movement of hydrogen by very limited mileage of pipelines in the U.S. is mainly in rural areas. Transporting hydrogen in pipelines is very uncommon, representing 0.5% of gas transmission pipelines. It is very important to understand and clearly communicate how hydrogen, even blended, can affect not only new but existing gas transmission and distribution systems as it relates to public safety.

B. Most existing gas transportation pipeline systems are not suited for hydrogen, even as blends

Current minimum federal pipeline safety regulations do not prevent the blending of hydrogen into existing natural gas transportation pipelines. In the past decade after the implementation of Distribution Integrity Management Program, or DIMP, regulation, many billions of dollars have been invested across the U.S., with the

---

[20] See Pipeline and Hazardous Materials and Safety Administration, or PHMSA, websites for year 2021 at: https://www.phmsa.dot.gov/data-and-statistics/pipeline/data-and-statistics-overview.

[21] PHMSA Gas Transmission & Gathering Annual Data – 2010 to present (ZIP) at: https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids.

[22] As a cost reduction effort, some in the gas pipeline industry have been trying to get area classification regulations that apply only to gas transmission pipelines removed from federal minimum pipeline safety regulations. Such removal would significantly increase the risks associated with hydrogen transportation by transmission pipeline. Class location requirements basically prescribe thicker pipe or lower MAOP to be imposed, increasing pressure related safety margins within a certain time period, as building density and other factors increase around a gas transmission pipeline.

primary focus on pipe replacement to reduce hazardous natural gas leaks. Even this leak focus has not prepared gas systems for the additional risks associated with hydrogen blending.

Further studies and discussions are warranted to identify necessary changes in federal pipeline safety and siting regulations to prudently address the dangers of transporting hydrogen in existing pipelines, especially given the many unique properties that make hydrogen more dangerous than natural gas in gas transmission or distribution systems. PHMSA's federal pipeline safety regulations do not address pipeline siting issues, as siting is usually, but not always, handled by other agencies, like the Federal Energy Regulatory Commission, or FERC, whose charters are not pipeline safety. But FERC does not have jurisdiction to determine siting or routing or whether there is a need for a hydrogen pipeline, so none of the risks of transporting hydrogen in an existing line have been considered by FERC or any other permitting agency.

Hydrogen pipelines fall into two main categories: 1) movement of purer hydrogen in a gaseous state via new construction or conversion of existing pipelines to hydrogen service, and 2) blending hydrogen to form a mix with existing natural gas pipelines as essentially gas transmission and/or distribution pipelines. As efforts to reduce the impacts of climate change drive some fossil fuel gas pipelines into underutilization or obsolescence, there is great temptation to try to convert this existing pipeline infrastructure to extend its lifecycle. While possible hydrogen/methane blending discussions are understandable, these proposals frequently ignore the dynamics and interplay between transmission and distribution systems, and where hydrogen use might be best used to timely address climate change. It is also important to recognize how hydrogen can affect gas transmission and gas distribution as well as the public differently. Some existing gas transmission pipeline systems (most likely the smaller diameter intrastate pipelines) may be capable of moving higher purity hydrogen specifically targeted to major fossil fuel consumers (i.e., electric power plants and large industry fuel consumers). Many of the gas distribution systems across the country contain materials that are not compatible with hydrogen, even in blends. There are existing gas transmission and distribution pipelines that should not be considered for hydrogen service, even limited blended service.

For example, numerous intrastate gas transmission pipelines cannot be inspected by highly specialized inline inspection ("ILI" or "smart pigs") tools. Such multi-ton tools might possibly help in identifying cracking threats, though this advancing technology and its prudent application, are still evolving, leaving much room for misuse as too many rupture failures have occurred after ILI tool runs have failed to identify threats. In addition, a substantial portion of transmission pipelines are of a vintage that is more susceptible to cracking threats related to manufacturing. These same transmission pipelines also may contain various factors that can lead to hydrogen deterioration of the steel and failure.

Likewise, there are many gas distribution pipelines, such as those constructed of cast iron, wrought iron, and earlier forms of carbon steel, where such iron-based pipelines tend to exhibit brittle cracking failures that are prone to leakage. As previously mentioned, it has also been well known for many decades that specific types of plastic gas distribution pipe are prone to cracking. In some parts of the country gas distribution systems also contain "connection" risks, either for steel or plastic pipe. One of the benefits of over a decade of DIMP pipeline safety regulation is that not only have many pipeline operators gained a better understanding of their distribution systems, but the public has the ability to gain a better appreciation of distribution systems in their area. It is worth noting that DIMP's focus is on pipeline safety, usually the reduction of grade 1 leaks designated as hazardous, and not on methane leak reduction, which historically is not illegal.

C. Is transporting hydrogen, especially in existing systems, a dangerous experiment?

It is easy to be lulled into the temptation that hydrogen blending into existing natural gas systems should start with lower concentrations that may eventually be increased as time and experience is gained. The fact is that the rush to utilize hydrogen could be a very dangerous experiment:

1. Few existing gas transmission systems may be suitable for conversion to hydrogen

Only certain users of natural gas are expected to transition to hydrogen combustion in a decarbonized economy. Most existing natural gas transmission pipelines transport and deliver gas to many sources that cannot or should not receive hydrogen, either as higher purity or lower purity streams. Comingling gas transmission systems with hydrogen blends would make it impossible to selectively target power plants and large industrial consumers with hydrogen without imposing blended hydrogen streams on distribution systems they also serve. These likely candidates for hydrogen conversion, however, are going to be in a rare minority of the total transmission pipeline miles in the U.S. given the requirement to service their distribution clients. The few existing gas transmission pipelines that may be suitable to move hydrogen, if they can meet the challenges of hydrogen compatibility that needs to be demonstrated, are most likely going to drive to higher purity hydrogen to favor the economics of decarbonization at such large industrial consumers.

2. Hydrogen blending for natural gas distribution systems ignores the very real dangers of introducing hydrogen into confined buildings while overstating climate change emission benefits

With regard to gas distribution systems servicing residential, commercial, and industrial customers, there are both safety and climate reasons not to pursue

blending. Most decarbonization analyses conclude that building electrification is the most cost-effective decarbonization pathway, accompanied by generation shifting. But proposals to instead continue to use gas distribution infrastructure to transport hydrogen continue to proliferate, raising numerous questions regarding the potential climate benefit and safety risks concerning the reactive nature of hydrogen in such public structures. Furthermore, hydrogen itself is an indirect greenhouse gas and recent research indicates that hydrogen use may not yield climate benefits depending on such factors as: 1) how much hydrogen is ultimately emitted from various production sources (i.e., blue or green) and the fossil fuels it replaces, 2) the leakage rate across the hydrogen supply/delivery chain, and 3) the time period utilized to evaluate global warming impacts associated with hydrogen.[23] It is clear that whenever possible, electrification with renewable energy sources would achieve a much better emissions reduction, and more efficiently, without imposing hydrogen dangers on residents. It is important not to overstate the benefits of hydrogen to mitigate climate change, while understating the very real dangers to the public of hydrogen transportation in pipelines.

VII. Why is California rushing forward on hydrogen?

California merits special mention as this state has established several ambitious climate goals and timelines to reduce greenhouse gas emissions (e.g., a 2016 California law requiring dramatic cuts in emissions by 2030, and a mandated objective of carbon neutrality by 2045). The use of hydrogen as previously explained may play an important role in trying to reach these goals, but a detailed plan going forward has not been agreed upon.

A. Observations on a recent hydrogen Blending Report for California

A 2022 report, Hydrogen Blending Impacts Study, prepared for the California Public Utilities Commission, raises many questions concerning the possible impacts of hydrogen pipeline safety, for both new and existing gas transmission and distribution systems within the state.[24] This report is an important step and will require much time and money to address the many knowledge gaps it identifies. The proposed three-year timeline presented in the Blending Report may be overly optimistic about the effort necessary to resolve these information gaps given the extensive specialized knowledge and experience needed.[25] Before any significant

[23] Ilissa B. Ocko and Steven P. Hamburg, article in Atmospheric Chemistry and Physics, "Climate consequences of hydrogen emissions," Volume 22, Issue 14, published July 20, 2022, pp. 9350 – 9352 at https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf.

[24] Prepared by: University of California, Riverside with subcontractor: Gas Technology Institute, for the California Public Utilities Commission, "Final Report - Hydrogen Blending Impacts Study," filed 7/18/2022, R1302908.

[25] *Ibid.,* Summary and Recommendations, pp. 111 – 116.

hydrogen blending option or consideration is moved forward, these issues need to be clearly addressed and made public, especially concerning existing pipeline infrastructure in California.

In addition to the knowledge gaps identified in the Blending Report, there are other considerations that will significantly impact any informed safety decisions and related timing involving hydrogen transportation via pipeline:

1) The extreme heat and temperatures generated by burning hydrogen supplied from a pressurized pipeline release (leak or rupture) as compared to a methane natural gas release must be explicitly accounted for in considering the risks imposed on communities by transporting hydrogen by pipeline.
2) While identifying the potential of crack risk in plastic distribution pipelines, the Blending Report fails to adequately explore crack threat dangers in steel transmission pipelines. Crack threats greatly increase the risks to communities from transporting hydrogen by pipeline.
3) Of the two basic types of energy density, gravimetric (per unit mass) and volumetric (per unit volume), the Blending Report focused on volumetric. This misses the unique capability of pipelines to release incredible amounts of gas tonnage, whether via leak, or the much more insidious pipeline ruptures as defined by pipeline fracture mechanics.[26] No other form of onshore transportation is capable of the tonnage release capability as that from pipelines. Lower pressure gas distribution systems can leak many tons of gas, especially if such releases contain hydrogen. Because of its unique properties, hydrogen influenced pipeline releases will most likely explode, and then burn incredibly hot, fed by pipeline inventory for considerable periods of time. The gravimetric parameter should play a critical role in hydrogen pipeline evaluations and decisions.

Over the past several decades the majority of new or replacement pipe installed in gas distribution systems in the U.S. has been various forms of plastic, largely because of cost considerations. The report properly points out the need for further detailed follow-up before hydrogen is even considered for introduction into existing gas distribution systems within California.

Cracking threats are a bona fide threat to steel transmission pipelines, both vintage and new gas transmission pipelines. Despite all the advances in fracture mechanics used to estimate time to failure of transmission pipeline steel cracking threats, the real issue remains assessment techniques to reliably identify and properly characterize the pipeline crack threat well before its failure, as too many recent pipeline ruptures after ILI tool runs across the U.S. have demonstrated. The Blending Report identifies certain cracking issues but fails to describe how to reliably identify and avoid such threats, especially in gas transmission pipelines.

[26] *Ibid.,* Conclusions, p. 109.

The Blending Report, however, states many important observations:

> "Further research and development is required that considers the system integrity and durability at all levels of steels (low-, medium-, high-strength), distribution-level polymer pipes, and all components, valves & sealants used throughout the different network levels. The impact of integrity and durability on safety as the blending percent and pressure increase requires an in-depth study of leak detection, odorization, gas build-up, dispersion dynamics, and safety zones to account for changes in flammability, ignition, and explosivity."[27]

Crack identification in gas transmission pipelines, even with current ILI technologies are challenging, especially if the pipelines are moving hydrogen. Given the many miles and wide disparity in types, grades, and vintages of gas transmission and distribution pipe, there are pipeline systems within California that should never receive hydrogen, even in mixtures because of cracking release potential that will allow hydrogen release.

Hydrogen blending into natural gas pipelines presents increased safety risks across complex pipeline networks, such as an increased risk of explosion and fire that could harm people. To protect the public, hydrogen blending should not be pursued without additional research, clear standards to safeguard people and the environment, and investigations to resolve outstanding questions of risk.

VIII. Recommended areas needing additional safety focus to advance the hydrogen economy with pipelines

Given the discussions in this report, Accufacts recommends the following additional efforts concerning the possible use of pipelines to try and address climate change with hydrogen:

A. Gas utilities should not pursue hydrogen blending into their systems and regulators should prohibit the blending of hydrogen in gas distribution systems.

Given the dangers that hydrogen introduces into gas distribution systems, the propensity of such systems even now to leak methane, the close proximity to structures for these gas systems, as well as the ability of hydrogen to release within structure "weakest link" internal piping not regulated as transportation pipelines, hydrogen addition into gas distribution pipelines should be prohibited. The benefits of adding hydrogen to such systems to address global warming are questionable and do not warrant the many dangers placed on the public. Hydrogen is clearly not methane.

[27] *Ibid.,* Recommendations, p. 109.

B. PHMSA should update reporting requirements to include any percentage of hydrogen blended into a transportation pipeline.

For pipeline operators contemplating blending hydrogen into their system, PHMSA should require that such operators report their blending efforts and concentrations, prior to such efforts, to assure that the public is also timely notified of such increased dangers from hydrogen activities. This should not include streams where hydrogen is relatively low or "trace" concentrations which should be defined in regulations. An acceptable level of hydrogen concentration releases in structures should be scientifically developed and demonstrated.

C. Existing transmission pipelines <u>that should not be candidates for hydrogen transportation</u> should be clearly identified.

As discussed in this report, certain pipeline systems should not be candidates for hydrogen transportation, even in blended mixtures, because of their material incompatibility with hydrogen, the propensity to leak or possibly rupture and inability to properly assess certain pipeline threats. Inability to run advancing/developing technology ILI tools within a gas transmission pipeline would be one characteristic that removes a pipeline from transporting hydrogen.

D. PHMSA should require gas transmission pipelines converting to transport hydrogen, either blends or higher purity, to conduct spike hydrotests.

Federal regulations governing the transportation of gas must be amended to insure that before conversion to hydrogen service, pipelines possibly containing manufacturing cracking threats, must be subject to a spike hydrostatic pressure test as defined in federal pipeline safety regulations.[28] Because of the unique properties and dangers associated with hydrogen, "Other technology or other technical evaluation process" further outlined in federal pipeline safety regulation must not be permitted. If traceable, verifiable, and complete records of the pipeline needed to verify manufacturing cracking threats cannot be provided, the pipeline must not be allowed to be placed into hydrogen service.

E. Pipeline safety leakage survey regulations should be specifically enhanced for pipelines transporting hydrogen.

Given the propensity of hydrogen or hydrogen/methane mixtures to increase gas leakage that works against the goal of reducing emissions contributing to climate change, enhanced pipeline safety regulations are warranted in the area of leak surveys. Such additional regulations should include advanced gas leak detection surveys methods (especially using remote detection technologies) and increased frequency on systems moving hydrogen over current natural gas regulations. Historically, it has not been illegal to leak natural gas from gas pipelines, either transmission or distribution. Some states have imposed more frequent leak surveys more stringent than federal minimums, but even these

[28] 49CFR§192.506(a) Transmission lines: Spike hydrostatic pressure test.

state regulations apply only to intrastate pipelines and may not be sufficient for all systems that might move hydrogen or hydrogen blends.

F. Foster research advances on hydrogen compatibility of steel transmission pipelines and their components.

It is well known that hydrogen can deteriorate certain forms of steel pipelines and their components. While the pipeline industry has been aware of such threats, further research in this area is needed to identify specific conditions where hydrogen threatens transmission pipeline operations. Such important information needs to be made public before a rush into an ill prepared real-world pipeline experiment.

G. The knowledge gaps identified in the recent Blending Report for California should be addressed and the results made public.

If hydrogen blending options for existing pipelines are pursued, the information knowledge gaps identified in the Blending Report need to be completed and made public before such efforts are attempted. Specifically, as identified in the Blending Report, additional studies are needed regarding the safety impact on pipeline integrity and durability as concentration of hydrogen and operating pressure increase on existing gas systems. These studies should address design criteria, leak detection, odorization, gas build-up, dispersion dynamics, and increased safety zones to account for changes in flammability, ignition, and explosivity of natural gas systems blending hydrogen. Such important research efforts will take time.

H. For California, the CPUC should fully explore and confirm the heat release capability and combustion dynamics from pipelines containing hydrogen, both as leaks and ruptures.

Given the CPUC's jurisdiction over intrastate gas pipeline safety, this organization should require that the hydrogen heat release and combustion dynamics be affirmed and made public before any decision regarding the use of hydrogen be allowed into existing intrastate gas pipeline systems within California. The gravimetric energy density of hydrogen should be the controlling parameter for pipelines moving hydrogen.

IX. Conclusions

The above hydrogen discussions work to undermine arguments that hydrogen and methane should be treated the same with respect to movement by pipeline. Informed transparent public discussions are warranted, especially given the additional risks associated with hydrogen's unique properties that make movement in pipelines, especially in neighborhoods, more dangerous than conventional natural gas fossil fuel movements in such pipeline infrastructure. Since pipelines are easily capable of placing more tonnage of hazardous material in a neighborhood than other forms of transportation, caution is advised in such matters as it relates to the introduction of

hydrogen in such infrastructure. Clearly, because of its unique physical properties, hydrogen is more dangerous than natural gas.

Many questions remain on the effects of hydrogen in pipelines before we race forward with attempts to shift to a hydrogen economy to try and address climate change. Specific prescriptive pipeline safety regulations setting clear minimum enforcement standards targeted at various attempts to move hydrogen via pipeline are required before we try to convince the public that such transportation can be safely performed.

In addition, certain types of gas transmission and gas distribution pipeline systems are woefully inadequate to move hydrogen safely, even as blends, and these pipelines should not be allowed to perform such a task. It should become evident that blending options mixing hydrogen into many existing natural gas pipeline systems significantly increase the dangers to the public with little material benefit in reducing emissions that significantly contribute to climate change.

Richard B Kuprewicz

Richard B. Kuprewicz,
President,
Accufacts Inc.

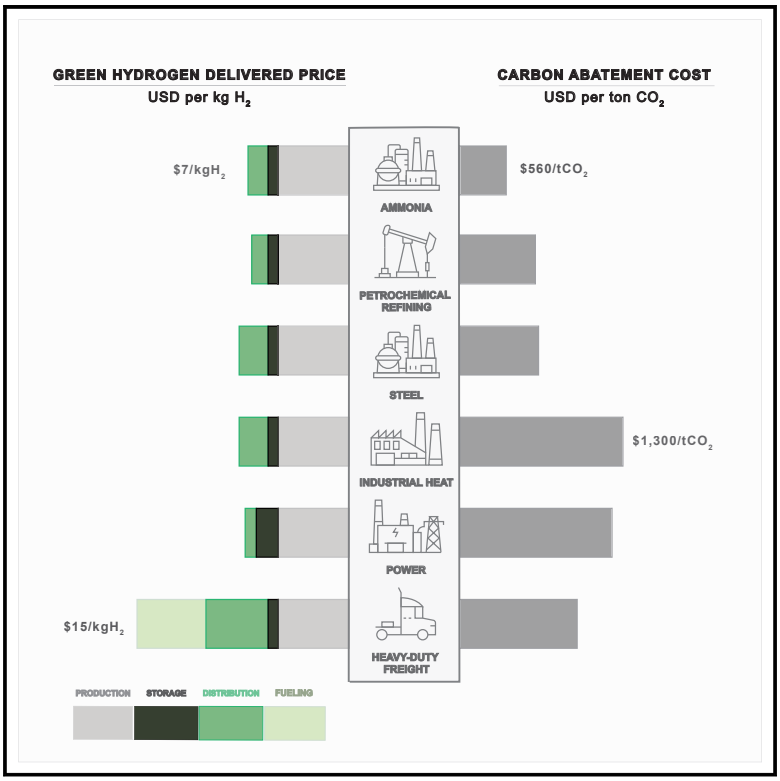
Exhibit 17

Joule

Article

Carbon abatement costs of green hydrogen across end-use sectors

Graphical abstract



Highlights

- Estimates green hydrogen delivered price and carbon abatement costs across US sectors
- Green hydrogen currently costs \$500–1,250/tCO_2 across all sectors
- Storage and distribution costs may limit green hydrogen's economic viability
- A broad technological strategy necessary for decarbonizing hard-to-abate sectors

Authors

Roxana T. Shafiee, Daniel P. Schrag

Correspondence

rshafiee@fas.harvard.edu

In brief

Green hydrogen has emerged as a potentially important pathway in decarbonizing a variety of hard-to-abate sectors, with many organizations predicting that it will become cost competitive with fossil fuels as production costs fall. Yet, many recent analyses do not consider storage and distribution costs or how these costs may vary across end uses. Here, we determined the carbon abatement costs of using green hydrogen across sectors of the US economy based on end-use-specific delivered prices that include storage and distribution.

Shafiee & Schrag, 2024, Joule *8*, 1–9
December 18, 2024
https://doi.org/10.1016/j.joule.2024.09.003

CellPress

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003

Joule

CellPress

Article

Carbon abatement costs of green hydrogen across end-use sectors

Roxana T. Shafiee[1,4,5,*] and Daniel P. Schrag[1,2,3,4]
[1]Harvard University Center for the Environment, Cambridge, MA 02138, USA
[2]Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138, USA
[3]Harvard John A. Paulson School of Engineering and Applied Sciences, Boston, MA 02134, USA
[4]Belfer Center for Science and International Affairs, Harvard Kennedy School, Cambridge, MA 02134, USA
[5]Lead contact
*Correspondence: rshafiee@fas.harvard.edu
https://doi.org/10.1016/j.joule.2024.09.003

CONTEXT & SCALE Hydrogen generated via electrolysis using renewable energy (green hydrogen) has gained prominence as a potential strategy in decarbonizing hard-to-abate sectors of the economy, in which electrification is technically challenging or prohibitively expensive. Many governments have set policy targets and, in some cases, financial incentives for green hydrogen production, with the expectation that production costs will fall rapidly in the coming decades, providing low-cost carbon abatement opportunities across many sectors. Yet, many recent analyses do not consider the storage and distribution costs of delivering green hydrogen to different sectors or how these costs may vary across end uses. Here, we determined the carbon abatement costs (USD per ton of CO_2 abated) of using green hydrogen across sectors of the US economy. We base our calculations on current and future delivered prices, which we estimate taking into consideration how each end use will utilize storage and distribution infrastructure. We show that at current prices, green hydrogen is a prohibitively expensive abatement strategy across all end uses examined, with carbon abatement costs of \$500–1,250/tCO_2 in some cases exceeding the cost of direct air capture. Even if production costs reduce to \$2/kgH_2, carbon abatement opportunities at less than \$250/tCO_2 are limited to ammonia production. Without significant cost reductions in storage and distribution, future carbon abatement opportunities will remain limited to these niche applications, demonstrating the need for continued investment in other decarbonization strategies at earlier stages of development.

SUMMARY

Green hydrogen has emerged as a potentially important pathway in decarbonizing the hard-to-abate sectors, including freight, dispatchable power, and industry. Many organizations predict that green hydrogen will become cost competitive with fossil fuels as production costs fall. However, most published green hydrogen cost estimates do not consider storage and distribution costs and how they vary across sectors. We estimate the carbon abatement cost of green hydrogen across major sectors in the United States, considering each sector's storage and distribution requirements. At current delivered prices, green hydrogen is a prohibitively expensive abatement strategy, with carbon abatement costs of \$500–1,250/tCO_2 across sectors. If production costs reduce to \$2/kgH_2, low-cost carbon abatement opportunities will remain limited to sectors already using hydrogen (e.g., ammonia) unless storage and distribution costs decrease. Our findings suggest that green hydrogen's potential is narrower than suggested, emphasizing the need for diverse technological options to decarbonize hard-to-abate sectors.

INTRODUCTION

Hydrogen has gained considerable attention for its potential to decarbonize sectors that are hard to abate, such as industry, heavy-duty transport, and dispatchable power. This interest focuses on hydrogen produced using solar- or wind-generated electricity (i.e., green hydrogen), with many governments setting policy targets and, in some cases, financial incentives for green hydrogen production.[1] Numerous studies and reports estimate that green hydrogen currently costs \$3–7/kg to produce but will halve in cost by 2030 and reduce 4-fold by 2050 as the deployment of hydrogen expands.[2–8] With such cost reductions,

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003

it has been predicted that green hydrogen will become widely cost competitive with hydrogen produced using natural gas (gray hydrogen) or fossil fuels themselves.[2–8]

However, production costs are only one component of the final delivered price of green hydrogen. The average pump price of gray hydrogen in California ($16/kg$H_2$) is 10 times greater than production costs alone ($1–2/kg$H_2$[9,10]) due to the significant storage and distribution infrastructure needed to deliver hydrogen to fueling stations. Many prominent reports either overlook these storage and distribution costs entirely[8,11] or, more often, do not consider how these cost components will differ between end-use sectors,[2–5,12] which can vary considerably in their storage requirements and demand profiles. Although low costs of hydrogen storage and distribution (<$1/kg$H_2$) are possible through economies of scale,[13,14] this requires high utilization of storage and distribution infrastructure, which is not applicable to all end-use sectors. If storage and distribution infrastructure is used at a low rate, costs increase significantly. Salt cavern storage costs increase from less than $0.50/kg$H_2$ to $6/kg$H_2$, on average, if stores are cycled fewer than 10 times per year,[14] for example, in the context of seasonal changes in demand (e.g., heating or electricity generation).

The exclusion of—or failure to consider—production, storage, and distribution costs at the most appropriate rate for each end-use sector has led to several misleading economic comparisons. These comparisons typically contrast the retail prices of fossil fuels (which include these additional costs) with green hydrogen production costs alone[2,3,15] or invoke low storage and distribution costs that only apply at high utilization rates.[4,5,12] This calls into question recent claims that green hydrogen can provide low-cost carbon abatement opportunities across many different end uses.[4,16]

Here, we determined the carbon abatement costs of green hydrogen by sector, based on estimates of the current delivered price of green hydrogen that include end-use-specific storage and distribution costs. We also conducted our analysis on future prices, assuming production costs fall in line with what is expected. We performed our analyses on sectors where hydrogen is already used as a chemical feedstock or reductant—petrochemical refining, ammonia production, and steelmaking in the direct reduced iron and electric arc (DRI-EAF) pathway. We also examined sectors where hydrogen is not currently used but has been proposed—high-grade heat in industrial processes such as cement, dispatchable power, and heavy-duty road freight.[1–3] In the absence of empirical data, we first estimated green hydrogen delivered prices by end use, assessing how each sector will likely utilize storage and distribution infrastructure. We then assigned accurate costs to each end use from published literature, using final delivered price estimates to calculate the cost of using hydrogen to abate carbon emissions in each sector. Although there will certainly be niche opportunities where costs are lower than the ones presented here—for example, in regions where very inexpensive electricity is available from hydroelectric power—our aim here is to provide a broad, comparative cost analysis across sectors to determine the potential for hydrogen to play a dominant role in the decarbonization of these sectors rather than examining individual scenarios or special situations. Finally, it is important to note that although our study focuses on green hydrogen, our storage and distribution cost analysis also applies to blue hydrogen, whereby CO_2 emissions from natural gas or coal conversion are captured and stored.

Delivered price of green hydrogen by end-use sector

To estimate the delivered price of green hydrogen across end-use sectors, we draw from published reports and studies (Figure 1) that have calculated the levelized cost of hydrogen production, storage, and distribution (Equation 1, 2, and 3). Levelized costs are the total costs to produce, store, or distribute hydrogen over the lifetime of a production plant or project, on a per kg basis:

$$\text{Levelized cost of hydrogen } (\$ / \text{kgH}_2) = \frac{C_{NPC}}{\sum_{n}^{N} i_d \text{CumulativeHydrogen (kg)}} \quad \text{(Equation 1)}$$

$$C_{NPC} = C_{CapEx} + \sum_{n}^{N} i_d \left(C_{OpEx} + C_{Decomm}\right) \quad \text{(Equation 2)}$$

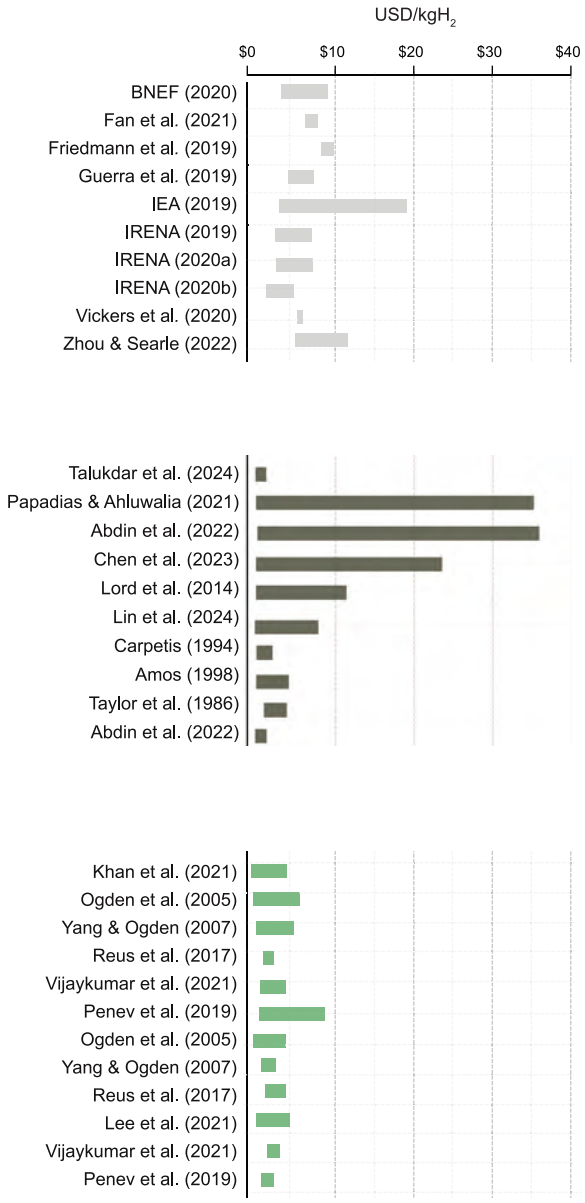
$$i_d = \text{discount rate} \quad \text{(Equation 3)}$$

where C_{NPC} is the net present cost, the sum of all costs over the lifetime of a project, including capital costs (C_{CapEx}), operational costs (C_{OpEx}), and decommissioning costs (C_{Decomm}), discounted to the present value using a specified discount rate (i_d) and cumulative hydrogen, refers to the total hydrogen produced, stored, or distributed (in kg). In our analysis, we assumed that production costs will not vary by end-use sector, although this remains uncertain. We estimated production costs by taking an average of published estimates, which we compiled in this study (Figure 1). Only production costs based on current, or recent (2019–2024), electricity and electrolyzer capital costs in the United States were included, and we excluded any costs where electrolyzer utilization rates were overestimated considering average renewable capacity factors (see experimental procedures for further detail).

To determine the storage and distribution costs for each end use in our analysis, we assessed each sector's potential utilization rate of storage and distribution infrastructure. Sectors that utilize storage and distribution infrastructure at a greater rate will pay lower levelized costs by increasing the cumulative hydrogen stored and transported over a project's lifetime (Equation 1). A hydrogen fueling station distributed with less than ~10 tons of hydrogen per day (tpd) will not benefit from same economies of scale as a large industrial plant that consumes thousands of tons of hydrogen a day.

For distribution, the utilization rate depends on each sector's potential demand for hydrogen at an individual site level, which we determined based on the current consumption of fossil fuels (or energy requirements) in these industries (see experimental procedures for further detail). Our analysis indicates that the

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003



A Levelized cost of production

Electrolyzer CapEx $/kW	**Electricity price** $/MWh	**Utilization rate** %
1,100–1,400	0–45	15–58
1,000	80	80
1,691	0.45–183	40–90
1,000	40–70	20–90
650–800	40–151	6–34
770–840	17–85	18–34
770	20	12–37
650–1,000	20–65	36
1,000	29–38	32–38
1,000	49–80	95

B Levelized cost of storage

Storage type	**Utilization rate** cycles/year
Salt cavern	4-12
Salt cavern	4-12
Salt cavern	4-12
Salt cavern	4-12
Salt cavern	4-12
Salt cavern	4-12
Compressed gas	52–365
Compressed gas	52–365
Compressed gas	52–365
Compressed gas	52–365

C Levelized cost of distribution

Distribution type	**Distance** km	**Utilization rate** tpd
Pipeline	10–500	1–15,300
Pipeline	50–300	15–100
Pipeline	50–300	1.5–100
Pipeline	250	50
Pipeline	100	1.5–5
Pipeline	7	0.4–1.5
Truck (gH_2)	50–300	15–100
Truck (gH_2)	50–300	1.5–100
Truck (gH_2)	250	50
Truck (gH_2)	100	2–50
Truck (gH_2)	100	1.5
Truck (gH_2)	7	0.4–0.95

Figure 1. Levelized costs of green hydrogen production, storage, and distribution compiled from published literature
(A–C) Range of published levelized costs of (A) production,[2–6,8,11,17,18] (B) storage,[14,19–26] and (C) distribution,[13,27–32] with key underlying cost assumptions.

hydrogen demand at a specific facility varies over 4 orders of magnitude between different sectors (Table 1). The higher demands come from power plants where hydrogen would be used instead of natural gas to generate electricity, whereas the lower demands come from industrial facilities, such as steelmaking using electric arc furnaces, where hydrogen would be used as a chemical reductant. The lowest demand is in the freight sector (<10 tpd per fueling site), where hydrogen would replace diesel fuel.

For all end uses except the power sector, we predict that storage will be necessary not only to mitigate transient but also regular mismatches in supply and demand, for instance, during routine maintenance periods or short spikes in demand. For this purpose, stores may be accessed at least once per month or at greater frequencies. As these sectors do show significant seasonality in demand, we would not expect these end uses to require access to additional hydrogen stores to mitigate these demand fluctuations. In contrast, the energy demand of the power sector is highly seasonal and will, therefore, require additional longer-term storage, accessed a few times a year, to meet peaks in electricity demand associated with summer air conditioning. If hydrogen is also used for longer duration dispatchable power (as an alternative to batteries) on a decarbonized grid, we estimate stores may need to be accessed more frequently, at ~10 times/year, to meet demand

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003

Table 1. Analysis of storage and distribution utilization rates by end-use sector

Sector	Storage utilization rate (storage cycles per year)	Distribution utilization rate (plant/site demand, tons H_2 per day)
Petrochemical refining	12–365 times per year (daily–monthly)	8,645
Ammonia production	12–365 times per year (daily–monthly)	100
Cement (Industrial heat)	12–365 times per year (daily–monthly)	75
Steel (DRI-EAF)	12–365 times per year (daily–monthly)	40
Power	(1) 12–365 times per year (daily–monthly) (2) 3–12 times per year (every three months–monthly)	52,000
Heavy-duty road freight	12–365 times per year (daily–monthly) [a]	<10

[a]Heavy-duty freight sector also requires storage as part of fueling stations, although these costs are dealt with separately (see the main text).

over longer periods when solar and wind are unreliable. Although not necessarily requiring large-scale seasonal storage, the freight sector will require additional storage as part of fueling stations—although we deal with these costs separately (see experimental procedures).

Carbon abatement costs

We calculated carbon abatement costs (Equation 4) by end-use sector, based on the green hydrogen delivered prices we estimated in this study (Figure 2), current (2022) fossil fuel prices in the United States, and their average carbon intensities (Table 1):

$$\text{Carbon abatement cost } (\$/\text{mton}_{CO2}) = \frac{\Delta \text{DeliveredPrice}}{\Delta CO_2 \text{emissions}} \quad \text{(Equation 4)}$$

In our analysis, we assume a fully decarbonized green hydrogen supply chain; our results, therefore, are a lower bound on carbon abatement costs because including full lifecycle greenhouse gas emissions will increase the carbon abatement costs presented here. We also calculated carbon abatement costs if green hydrogen production costs decrease in line with predictions to $\$2/kgH_2$,[2–4,7,33] with all other costs remaining the same. Further detail is available in the experimental procedures.

RESULTS

Delivered price of green hydrogen by end-use sector

We estimate that in the United States, green hydrogen can currently be delivered, on average, at between $7.01 and $15.25/kgH_2$, with the lowest delivered prices to petrochemical refineries ($7.01 ± $2.79/kgH_2$) followed by ammonia production plants ($7.51 ± $3.17/kgH_2$) due to their high daily demands for hydrogen and their need for only short-term storage with high utilization rates (Table 1). Average delivered prices are greater in the power sector ($7.85 ± $4.04/kgH_2$), due to the need for seasonal storage, and in DRI-EAF steelmaking ($7.92 ± $3.15/kgH_2$) and cement making ($7.92 ± $3.15), as these end uses have lower site-level demands and thus distribution rates (Table 1). Finally, average delivered prices are the greatest in the heavy-duty freight sector ($15.25 ± $4.99) due to the low distribution volumes to individual fueling stations and the additional costs associated with each station (Figure 2).

Carbon abatement costs

Across the sectors we examined, average carbon abatement costs range from $563 to 1,272/tCO_2$, with the lowest abatement costs in ammonia synthesis ($563 ± $356/tCO_2$) and petrochemical refining ($693 ± $356/tCO_2$), where green hydrogen would be replacing gray hydrogen produced through steam methane reforming. For DRI-EAF steelmaking, where hydrogen would be used as a chemical reductant, we estimate carbon abatement costs to be $711/tCO_2$ (± $353). We estimate the greatest carbon abatement costs (~$1,300 ± $532/tCO_2$) when hydrogen would serve as a source of industrial heat. In the power sector, where hydrogen would replace natural gas, we estimate carbon abatement costs to be $1,203 (± $657/tCO_2$). Finally, for heavy-duty road freight, carbon abatement costs are $778 (± $383/tCO_2$). If production costs fall to $2/kg, average carbon abatement costs across all end uses will remain above $500/tCO_2$ (Figure 3). The exceptions to this are the industries in which hydrogen would be used as a chemical feedstock or reductant: ammonia synthesis ($214 ± $138/tCO_2$), petrochemical refining ($344 ± $138/tCO_2$), and DRI-EAF steelmaking ($471 ± $219/tCO_2$).

DISCUSSION

In our analysis, we estimated the carbon abatement costs of green hydrogen across end uses in the United States, assessing the potential for hydrogen to provide a major decarbonization strategy for each sector. Based on current delivered prices (estimated here) and the price of incumbent fossil fuels (Table 2), green hydrogen is a prohibitively expensive abatement strategy across many major sectors. Green hydrogen carbon abatement costs currently exceed, on average, $500/tCO_2$ across the sectors examined here (Figure 3) and in several sectors are more than $1,000/tCO_2$—an order of magnitude greater than the price of carbon in California.[34]

Many reports predict that with increased deployment, electrolyzer costs will reduce by 50–70%,[2,7,33,40] following a similar cost reduction trajectory to solar photovoltaics, off-shore wind, and battery technologies. Although it is highly uncertain whether electrolyzer capital costs will reduce significantly, given their design complexity,[41] if their costs fall in line with predictions,

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003

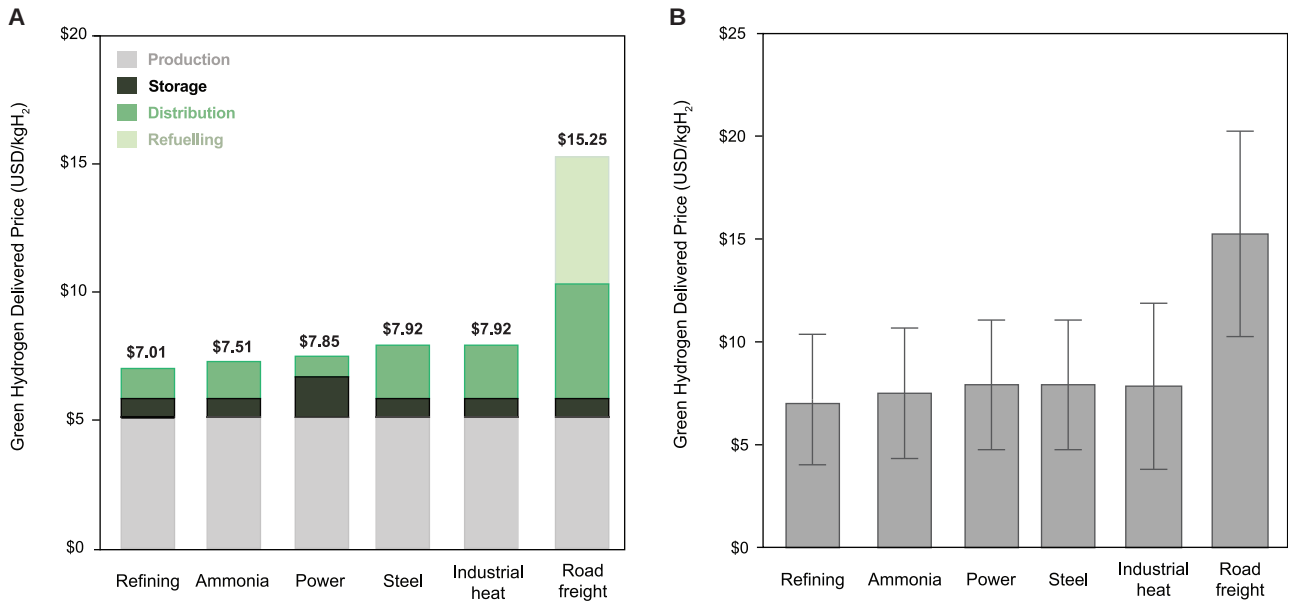


Figure 2. Estimated delivered price of green hydrogen by end-use sector

(A and B) Average delivered green hydrogen prices by component and end-use sector (A), average delivered green hydrogen prices by end-use sector (B). Error bars show standard deviation.

green hydrogen can, in theory, be produced at <$2/kg$H_2$ using renewable electricity, even at low utilization rates. The lowest-reported future cost estimates (<$1/kg$H_2$)[3], however, assume a continued drop in the price of renewable electricity (often assuming that curtailed electricity can be sourced at no cost), which is much less certain given the high cost reductions in the past decades.

Our analyses indicate that, even if production costs reduce to $2/kg$H_2$, storage and distribution costs at current levels will prevent hydrogen from providing widespread, low-cost abatement

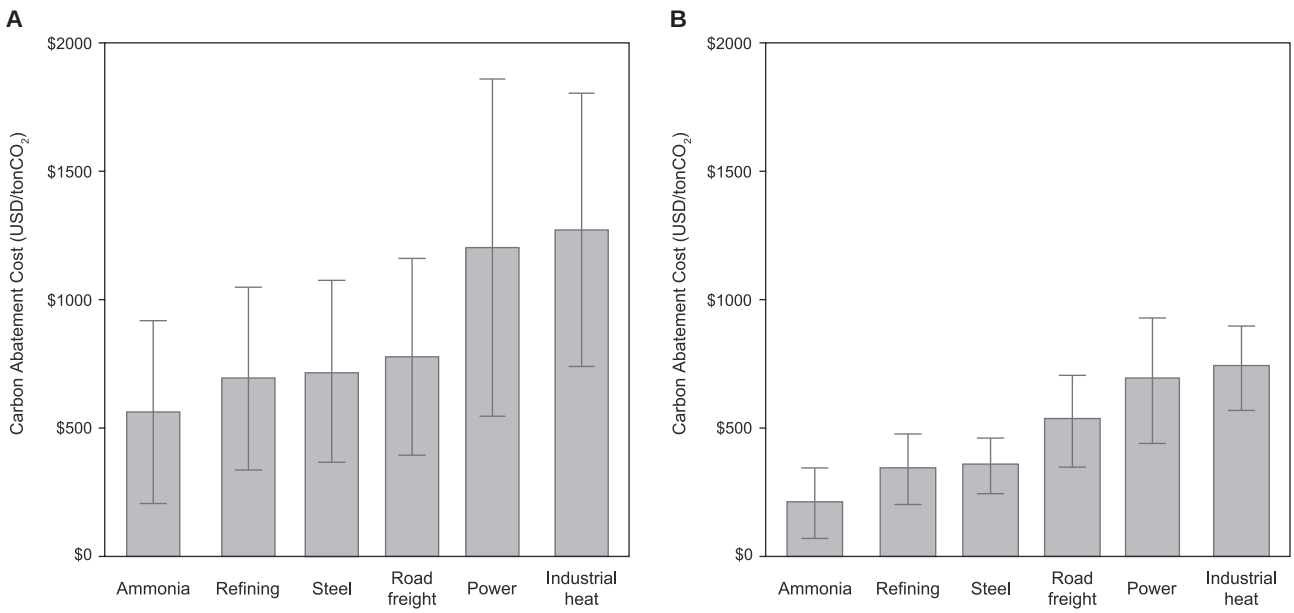


Figure 3. Carbon abatement cost of green hydrogen across end-use sectors

(A and B) Average carbon abatement costs by end-use sector (with error bars showing standard deviation) at current green hydrogen delivered prices (A) and if production costs decrease to $2/kg$H_2$ but all other costs remain the same (B).

Please cite this article in press as: Shafiee and Schrag, Carbon abatement costs of green hydrogen across end-use sectors, Joule (2024), https://doi.org/10.1016/j.joule.2024.09.003

Table 2. Proposed end uses for green hydrogen included in our analysis, the fuel or feedstock that green hydrogen would replace in that sector, and assumptions regarding carbon intensity and fuel costs

End use	Fuel or feedstock	Carbon intensity	Fuel cost (USD)
Petrochemical refining	gray hydrogen	9 $kgCO_2/kgH_2$ (SMR)[35]	\$0.84/kgH_2[36]
Steel (DRI-EAF)	gray hydrogen	9 $kgCO_2/kgH_2$ (SMR)[35]	\$1.60/kgH_2[36]
Ammonia production	gray hydrogen	9 $kgCO_2/kgH_2$ (SMR)[35]	\$2.50/kgH_2[36]
Industrial heat	natural gas for high-grade heat	52 $kgCO_2$/mmbtu[37]	\$3.64/mmbtu[36]
Power	natural gas for power	0.4 $kgCO_2$/kWh[37]	\$0.01/kWh[36]
Heavy-duty road freight	diesel	0.06 $kgCO_2$/ton-mile[38]	\$4/gal[39]

Gray hydrogen refers to hydrogen produced through steam methane reforming (SMR). DRI-EAF: direct reduction of iron, electric arc furnace pathway.

opportunities at less than the \$100/tCO_2 predicted by some reports.[4,17] Our results suggest that petrochemical refining and ammonia production sectors, where storage and distribution costs are low and hydrogen is already used, are the most likely to benefit from reductions in the cost of hydrogen production. In most sectors, storage and distribution costs, which are one-third to one-half of the total delivered price (Figure 2), means that future reductions in production costs will have only a marginal impact on the overall price.

It is important to note that the highest carbon abatement costs presented here also reflect the low prices of fossil fuels in the United States (Table 1). In Europe, where fuel prices are significantly higher (natural gas prices in Europe are approximately 5-fold greater than natural gas prices in the United States,[42,43] carbon abatement costs will be lower. For example, assuming an equivalent green hydrogen delivered price, the carbon abatement cost for ammonia production and petrochemical refining in Europe is \$400/tCO_2 compared with \$563/tCO_2 in the United States.

Conclusions

The high carbon abatement costs estimated in our analysis—which are in many cases double or triple recent estimates for direct air capture of CO_2 from the atmosphere[44]—do not eliminate green hydrogen from consideration in playing an essential role in decarbonizing hard-to-abate sectors, including heavy transportation and industrial heating. It is possible that the costs of hydrogen production, storage, and distribution will decline dramatically, that the costs of fossil fuels will increase, or that the urgency to limit the impacts of climate change will allow for higher sustained penalties on carbon emissions in the future. But the high carbon abatement costs detailed here suggest that a broader policy strategy for decarbonizing these sectors would be prudent. At this early stage of technological readiness of green hydrogen, we suggest that it is premature for governments to provide so much support for green hydrogen without also supporting alternative approaches to the decarbonization of these sectors, including advanced biofuels, advanced battery and charging technologies, and approaches for electrification of high-grade heat. Our analysis also emphasizes the urgent need for research and development in pathways aimed at achieving lower hydrogen storage and distribution costs rather than focusing on hydrogen production. Until such technologies exist, the commercial use of green hydrogen will be limited to a much narrower section of the energy system than many studies currently envisage.

EXPERIMENTAL PROCEDURES

Methodology

Here, we determined the carbon abatement costs of using green hydrogen across different end-use sectors in the United States. Our analysis focused on the following hard-to-abate industries, where hydrogen is currently used as a chemical feedstock/reductant or where hydrogen has been proposed:

- Petrochemical refining and ammonia production (as a chemical feedstock)
- Cement making (as a source of industrial heat)
- Direct reduction of iron electric arc furnace steelmaking (as a chemical reductant)
- Dispatchable power
- Heavy-duty freight (trucking)

Although there have been some proposals for their use, we did not consider home heating or light-duty freight where electrification is likely to be the main decarbonization pathway. In the absence of empirical data, we estimated current delivered prices of green hydrogen by end-use sector, drawing from published studies and reports that have calculated green hydrogen production, storage, and distribution costs under a range of assumptions currently plausible for the United States (more detail below). We estimated production costs (which we assume to be the same for all end uses) by averaging across compiled production values (Figure 1). However, this approach is not appropriate for storage and distribution because sectors will utilize infrastructure at different rates and thus pay different costs. We analyzed each sector's potential storage and distribution utilization to determine which compiled storage and distribution costs were most relevant for each end use (based on the utilization rate used to calculate the estimates). We calculated carbon abatement costs (Equation 4) by end-use sector, based on the green hydrogen delivered prices we estimated in this study (Figure 2), current (2022) fossil fuel prices in the United States, and their average carbon intensities (Table 1).

Compilation of production, storage, and distribution costs

To assign relevant production, storage, and distribution costs to each end use, we drew from published studies that have estimated costs across the hydrogen supply chain.[2–6,11,13,14,18–32,45,46] First, we compiled cost estimates of hydrogen production, storage, and distribution from published literature, including peer-reviewed articles, technical reports, and policy publications. Web of Science and Policy Commons were used to search for relevant studies and reports, using the terms outlined in the Table S1. We only considered studies that reported levelized costs (Equations 1, 2, and 3), with stated utilization rates, or that provided sufficient detail on costs to calculate levelized costs across a range of different utilization rates. If calculating levelized costs (Equation 1), we assumed system operating lifetimes of 30 years and a discount rate of 10%. For production, we excluded studies where electrolyzer costs were not based on their cost today (a minimum of \$750/kWh[40,41]) or where electrolyzer utilization rates were overestimated based on the source of electricity (i.e., above the capacity factors of wind and solar). For simplicity, we only considered cost estimates of salt caverns,

compressed gas storage, pipelines, or trucks transporting compressed hydrogen gas, as these are the lowest-cost, most technologically-mature forms of storage and distribution. Although there are other forms of hydrogen storage and distribution (e.g., ammonia, liquid organic hydrogen carriers), they are all currently at greater cost than the aforementioned types[14]—this does not exclude these technologies from playing a greater role in the future should their costs come down.

Storage and distribution requirements by end-use sector

The potential storage utilization rates of each sector were estimated by analyzing seasonality or cyclicity in current demand for fossil fuels by the power, industrial, and transport sectors.[47–49] For the power and industrial sectors, we examined natural gas demand, and for the transport sector, we examined diesel demand. Our analysis assumes that all end uses would require some form of short-term storage to mitigate transient interruptions in supply but that the need for other forms of storage is sector-specific (e.g., for fueling stations and seasonal storage in the power sector).

We estimated distribution utilization rates by estimating each sector's daily demand at a plant or site level. For petrochemical refining, where hydrogen is already used, we used current records of petrochemical refining of gray hydrogen demands,[48] divided by the total number of refineries in the United States,[50] to yield an average hydrogen demand per plant. Hydrogen demand was converted from barrels per day to metric tons per day based on a conversion rate of 19,426 standard cubic feet of hydrogen per barrel. As specific hydrogen consumption data are not available for ammonia production, we calculated gray hydrogen demand based on ammonia production rates,[51] assuming 1 ton of ammonia requires 178 kg of hydrogen, divided by the number of ammonia plants in the United States.

To estimate hydrogen distribution rates in the power sector, we used current power sector natural gas consumption rates,[47] assuming that power plants would completely replace natural gas with hydrogen (i.e., not co-blending). Plant level demands were calculated from natural gas consumption rates by converting to the energy equivalent mass of hydrogen and dividing by the number of power plants in the United States. For cement, where hydrogen would be used to generate industrial heat, we calculate potential hydrogen demand based on current industrial heat requirements[52] and cement production rates by dividing by the number of sites in the United States.[53,54] For DRI-EAF steelmaking, where hydrogen would be used as a reductant, we estimated hydrogen demand, assuming a requirement of 58 kgH_2/ton of steel produced through this pathway,[2] current US DRI-EAF production rates, and the number of plants in the United States.[55,56]

For heavy-duty freight, we used published estimates of fueling station daily hydrogen demands that are based on early market levels of penetration levels.[28,29,32,46]

Estimating delivered prices of green hydrogen by end use

We assigned each sector in our analysis a production, storage, and distribution cost to estimate a final delivered price. For production, which we assume is end-use agnostic, we took the mean and standard deviation of compiled production cost estimates (Figure 1). For storage and distribution, we did the same, but only those data based on appropriate utilization rates, which we determine in our analysis (see key assumptions). If sectors had multiple potential storage configurations, we took an average of potential storage costs to account for these differences. For the transport sector, which also bears the cost of fueling stations, we took an average price of fueling stations at the early market stage from the small number of studies examining these costs.[28,29,32,46]

Carbon abatement costs

Marginal carbon abatement costs (hereafter abbreviated to carbon abatement costs) were calculated using our end-use-specific estimates of green hydrogen delivered prices and current (2024) fossil fuel delivered prices (Table 2[57]). Carbon intensity assumptions[35,37] are outlined in Table 2. For heavy-duty freight, we assume a fuel economy of 8.9 miles per diesel gallon equivalent (mpdge) for conventional diesel heavy-duty vehicles (classes 7–8)[38] and 11.3 mpdge for hydrogen fuel cell electric vehicles.[58] We assume a payload of 20 metric tons for both types of vehicle. For power, we assume hydrogen is converted to electrical energy at a similar efficiency as conventional gas turbines.[59] We did not include costs associated with hydrogen retrofits (e.g., producing industrial heat or power) or ownership of fuel cell vehicles, but we recognize that these may increase abatement costs.

RESOURCE AVAILABILITY

Lead contact

Further information and requests for resources and materials should be directed to and will be fulfilled by the lead contact, Dr. Roxana T. Shafiee (rshafiee@fas.harvard.edu).

Materials availability

This study did not generate new unique materials.

Data and code availability

This study did not generate any original data or code.

ACKNOWLEDGMENTS

The authors thank Henry Lee, John Holdren, and Priyank Lathwal for helpful discussions.

AUTHOR CONTRIBUTIONS

Conceptualization, R.T.S. and D.P.S.; methodology, R.T.S. and D.P.S., investigation, R.T.S. and D.P.S.; writing – original draft, R.T.S. and D.P.S.; writing – review and editing, R.T.S. and D.P.S.

DECLARATION OF INTERESTS

The authors declare no competing interests.

SUPPLEMENTAL INFORMATION

Supplemental information can be found online at https://doi.org/10.1016/j.joule.2024.09.003.

Received: May 28, 2024
Revised: August 8, 2024
Accepted: September 16, 2024
Published: October 8, 2024

REFERENCES

1. International Energy Agency (2023). Global Hydrogen Review (International Energy Agency). https://www.iea.org/reports/global-hydrogen-review-2023.
2. International Energy Agency (2019). The Future of Hydrogen (International Energy Agency). https://www.iea.org/reports/the-future-of-hydrogen.
3. International Renewable Energy Agency (2019). Hydrogen: A Renewable Energy Perspective. International Renewable Energy Agency. https://www.irena.org/publications/2019/Sep/Hydrogen-A-renewable-energy-perspective/.
4. Bloomberg New Energy Finance (2019). Hydrogen: The Economics of Production from Renewables (Bloomberg).
5. Guerra, O.J., Eichman, J.D., Kurtz, J., and Hodge, B.M. (2019). Cost Competitiveness of Electrolytic Hydrogen. Joule *3*, 2425–2443. https://doi.org/10.1016/j.joule.2019.07.006.
6. Fan, Z., Ochu, E., Braverman, S., Lou, Y., Smith, G., Bhardwaj, A., Brouwer, J., McCormick, C., and Friedmann, J. (2021). Green Hydrogen in a Circular Carbon Economy: Opportunities and Limits (Columbia Center for Global Energy Policy). https://www.energypolicy.columbia.edu/publications/green-hydrogen-circular-carbon-economy-opportunities-and-limits/.

7. Glenk, G., Holler, P., and Reichelstein, S. (2023). Advances in Power-to-Gas Technologies: Cost and Conversion Efficiency. Energy Environ. Sci. *16*, 6058–6070. https://doi.org/10.1039/D3EE01208E.

8. Friedmann, J., Fan, Z., and Tang, K. (2019). Low Carbon Heat Solutions for Heavy Industry: Sources, Options, and Cost Today (Columbia Center for Global Energy Policy). https://www.energypolicy.columbia.edu/publications/low-carbon-heat-solutions-heavy-industry-sources-options-and-costs-today/.

9. Berner, J., Crowell, M., and Martinez, A. (2022). Joint Agency Staff Report on Assembly Bill 8: 2022 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California (California Energy Commission & California Air Resources Board). https://www.energy.ca.gov/sites/default/files/2022-12/CEC-600-2022-064.pdf.

10. Katebah, M., Al-Rawashdeh, M., and Linke, P. (2022). Analysis of Hydrogen Production Costs in Steam-Methane Reforming Considering Integration with Electrolysis and CO2 Capture. Cleaner Eng. Technol *10*, 100552. https://doi.org/10.1016/j.clet.2022.100552.

11. Vickers, J., Peterson, D., and Randolph, K. (2020). DOE Hydrogen and Fuel Cells Program Record: Cost of Electrolytic Hydrogen Production with Existing (Technology Publishing. United States Department of Energy). https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/20004-cost-electrolytic-hydrogen-production.pdf?Status=Master.

12. U.S. Department of Energy (2023). Pathways to Commercial Lift-Off: Clean Hydrogen (Department of Energy). https://liftoff.energy.gov/clean-hydrogen/.

13. Khan, M.A., Layzell, D., and Young, C. (2021). The Techno-Economics of Hydrogen Pipelines. Transit. Accel. Tech. Briefs *1*, 1–40. https://transitionaccelerator.ca/reports/the-techno-economics-of-hydrogen-pipelines/.

14. Abdin, Z., Khalilpour, K., and Catchpole, K. (2022). Projecting the Levelized Cost of Large-Scale Hydrogen Storage for Stationary Applications. Energy Convers. Manag. *270*, 116241. https://doi.org/10.1016/j.enconman.2022.116241.

15. Reed, J. (2022). Can Green Hydrogen Be a Cost Competitive Transportation Fuel by 2030? (Institute of Transportation Studies, University of California, Irvine). https://doi.org/10.7922/G2513WJ8.

16. International Renewable Energy Agency (2022). Global Hydrogen Trade to Meet the 1.5°C Climate Goal: Part II – Technology Review of Hydrogen Carriers (International Renewable Energy Agency). https://www.irena.org/Publications/2022/Apr/Global-hydrogen-trade-Part-II.

17. International Renewable Energy Agency (2020a). Green Hydrogen: A Guide to Policy Making (International Renewable Energy Agency). https://www.irena.org/Publications/2020/Nov/Green-hydrogen.

18. Zhou, Y., and Searle, S. (2022). Cost of Renewable Hydrogen Produced Onsite at Hydrogen Refueling Stations in Europe. Int. Council Clean Transp. https://theicct.org/publication/fuels-eu-onsite-hydro-cost-feb22/

19. Talukdar, M., Blum, P., Heinemann, N., and Miocic, J. (2024). Techno-economic analysis of underground hydrogen storage in Europe. iScience *27*, 108771. https://doi.org/10.1016/j.isci.2023.108771.

20. Papadias, D.D., and Ahluwalia, R.K. (2021). Bulk storage of hydrogen. Int. J. Hydrog. Energy *46*, 34527–34541. https://doi.org/10.1016/j.ijhydene.2021.08.028.

21. Chen, F., Ma, Z., Nasrabadi, H., Chen, B., Saad Mehana, M.Z.S., and Van Wijk, J. (2023). Capacity assessment and cost analysis of geologic storage of hydrogen: A case study in Intermountain-West Region USA. Int. J. Hydrog. Energy *48*, 9008–9022. https://doi.org/10.1016/j.ijhydene.2022.11.292.

22. Lord, A.S., Kobos, P.H., and Borns, D.J. (2014). Geologic Storage of Hydrogen: Scaling Up to Meet City Transportation Demands. Int. J. Hydrog. Energy *39*, 15570–15582. https://doi.org/10.1016/j.ijhydene.2014.07.121.

23. Carpetis, C. (1982). Estimation of storage costs for large hydrogen storage facilities. Int. J. Hydrog. Energy *7*, 191–203. https://doi.org/10.1016/0360-3199(82)90146-X.

24. Amos, W.A. (1999). Costs of Storing and Transporting Hydrogen. NREL/TP-570-25106; ON: DE00006574 (National Renewable Energy Laboratory). https://www.nrel.gov/docs/fy99osti/25106.pdf.

25. Lin, N., Xu, L., and Moscardelli, L.G. (2024). Market-based asset valuation of hydrogen geological storage. Int. J. Hydrog. Energy *49*, 114–129. https://doi.org/10.1016/j.ijhydene.2023.07.074.

26. Taylor, J.B., Alderson, J.E.A., Kalyanam, K.M., Lyle, A.B., and Phillips, L.A. (1986). Technical and economic assessment of methods for the storage of large quantities of hydrogen. Int. J. Hydrog. Energy *11*, 5–22. https://doi.org/10.1016/0360-3199(86)90104-7.

27. Ogden, J., Yang, C., Johnson, N., Ni, J., and Lin, Z. (2005). Technical and Economic Assessment of Transition Strategies Toward Widespread Use of Hydrogen as an Energy Carrier (Institute of Transportation Studies). https://escholarship.org/uc/item/2jj0p5b2.

28. Reuß, M., Grube, T., Robinius, M., Preuster, P., Wasserscheid, P., and Stolten, D. (2017). Seasonal storage and alternative carriers: A flexible hydrogen supply chain model. Appl. Energy *200*, 290–302. https://doi.org/10.1016/j.apenergy.2017.05.050.

29. Lee, Y., Lee, U., and Kim, K. (2021). A comparative techno-economic and quantitative risk analysis of hydrogen delivery infrastructure options. Int. J. Hydrog. Energy *46*, 14857–14870. https://doi.org/10.1016/j.ijhydene.2021.01.160.

30. Penev, M., Zuboy, J., and Hunter, C. (2019). Economic analysis of a high-pressure urban pipeline concept (HyLine) for delivering hydrogen to retail fueling stations. Transp. Res. D *77*, 92–105. https://doi.org/10.1016/j.trd.2019.10.005.

31. Yang, C., and Ogden, J. (2007). Determining the Lowest-Cost Hydrogen Delivery Mode. Int. J. Hydrog. Energy *32*, 268–286. https://doi.org/10.1016/j.ijhydene.2006.05.009.

32. Vijayakumar, V., Jenn, A., and Fulton, L. (2021). Low carbon scenario analysis of a hydrogen-based energy transition for on-road transportation in California. Energies *14*, 7163. https://doi.org/10.3390/en14217163.

33. Way, R., Ives, M.C., Mealy, P., and Farmer, J.D. (2022). Empirically Grounded Technology Forecasts and the Energy Transition. Joule *6*, 2057–2082. https://doi.org/10.1016/j.joule.2022.08.009.

34. California Air Resources Board (2024). Cap-and-Trade Program Data Dashboard. https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-data/cap-and-trade-program-data-dashboard#Figure7.

35. International Energy Agency (2023). Comparison of the Emissions Intensity of Different Hydrogen Production Routes, 2021. https://www.iea.org/data-and-statistics/charts/comparison-of-the-emissions-intensity-of-different-hydrogen-production-routes-2021.

36. U.S. Energy Information Administration. Manufacturing Energy Consumption Survey, 2018, Table 7.1. 2021. https://www.eia.gov/consumption/manufacturing/data/2018/pdf/Table7_1.pdf.

37. U.S. Energy Information Administration (2023). Carbon Dioxide Emissions Coefficients. https://www.eia.gov/environment/emissions/co2_vol_mass.php.

38. U.S. Department of Energy (2023). Alternative Fuels Data Center: Maps and Data - Average Fuel Economy by Major Vehicle Category. https://afdc.energy.gov/data.

39. U.S.; Energy; Information Administration (2023). Gasoline and Diesel Fuel Update. https://www.eia.gov/petroleum/gasdiesel/.

40. Schmidt, O., Gambhir, A., Staffell, I., Hawkes, A., Nelson, J., and Few, S. (2017). Future Cost and Performance of Water Electrolysis: An Expert Elicitation Study. Int. J. Hydrog. Energy *42*, 30470–30492. https://doi.org/10.1016/j.ijhydene.2017.10.045.

41. Doyle, P., and Krasowski, P. (2023). Achieving Affordable Green Hydrogen Production Plants (Ramboll). https://www.ramboll.com/net-zero-explorers/what-will-it-take-to-reduce-capex-in-green-hydrogen-production.

42. International Monetary Fund (2024). Global Price of Natural Gas, EU [PNGASEUUSDM] (Federal Reserve Bank of St. Louis). https://fred.stlouisfed.org/series/PNGASEUUSDM.

43. U.S. Energy Information Administration (2024). Henry Hub Natural Gas Spot Price. https://www.eia.gov/dnav/ng/hist/rngwhhdM.htm.

44. National Academies of Sciences, Engineering, and Medicine (2019). Negative Emissions Technologies and Reliable Sequestration: A Research Agenda (The National Academies Press). https://nap.nationalacademies.org/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda.

45. International Renewable Energy Agency (2020). Green Hydrogen Cost Reduction: Scaling Up Electrolyzers to Meet the 1.5°C Climate Goal (International Renewable Energy Agency). https://www.irena.org/publications/2020/Dec/Green-hydrogen-cost-reduction.

46. Reddi, K., Elgowainy, A., Rustagi, N., and Gupta, E. (2017). Impact of hydrogen refueling configurations and market parameters on the refueling cost of hydrogen. Int. J. Hydrog. Energy *42*, 21855–21865. https://doi.org/10.1016/j.ijhydene.2017.05.122.

47. U.S. Energy Information Administration (2024). Natural Gas Consumption by End-Use. https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm.

48. U.S. Energy Information Administration (2024). Refinery and Blender Net Input. https://www.eia.gov/dnav/pet/pet_pnp_inpt_dc_nus_mbbl_m.htm.

49. U.S. Energy Information Administration (2024). Natural Gas Weekly Update. https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2021/04_01/.

50. U.S. Energy Information Administration (2023). Petroleum Refineries, U.S. Energy (Atlas Press). https://atlas.eia.gov/datasets/6547eda91ef84cc386e23397cf834524_22/about.

51. U.S. Geological Survey (2023). Mineral Commodity Summaries – Nitrogen (Fixed)–Ammonia. https://pubs.usgs.gov/periodicals/mcs2023/mcs2023-nitrogen.pdf.

52. Fruehan, R.J., Paxton, H.W., and Lankford, W.T. (2000). Theoretical Minimum Energies to Produce Steel for Selected Conditions (United States Department of Energy). https://www.energy.gov/eere/amo/articles/itp-steel-theoretical-minimum-energies-produce-steel-selected-conditions-march.

53. U.S. Geological Survey (2024). Mineral Commodity Summaries – Cement. https://pubs.usgs.gov/periodicals/mcs2024/mcs2024.pdf.

54. International Cement Review (2024). Cement Plants Located in United States. https://www.cemnet.com/global-cement-report/country/united-states.

55. U.S. Geological Survey (2024). Mineral Commodity Summaries – Iron and Steel. https://pubs.usgs.gov/periodicals/mcs2024/mcs2024.pdf.

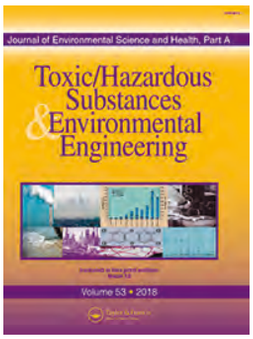
56. U.S. Environmental Protection Agency (2022). Standards of Performance for Steel Plants: Electric Arc Furnaces Constructed After 10/21/74 & On or Before 8/17/83; Standards of Performance for Steel Plants: Electric Arc Furnaces & Argon-Oxygen Decarburization Constructed After 8/17/83. https://www.epa.gov/system/files/documents/2022-05/FRN-ElectricArcFurnaces-NSPS-Proposal.pdf.

57. U.S. Energy Information Administration (2023). Natural Gas Industrial Price. https://www.eia.gov/dnav/ng/NG_PRI_SUM_A_EPG0_PIN_DMCF_A.htm.

58. Clean Air Task Force (2023). Zero Emission Long-Haul. Heavy Duty Trucking. https://www.catf.us/resource/zero-emission-long-haul-heavy-duty-trucking.

59. Koç, Y., Yağlı, H., Görgülü, A., and Koç, A. (2020). Analysing the performance, fuel cost and emission parameters of the 50 MW simple and recuperative gas turbine cycles using natural gas and hydrogen as fuel. Int. J. Hydrog. Energy *45*, 22138–22147. https://doi.org/10.1016/j.ijhydene.2020.05.267.

Exhibit 18



Journal of Environmental Science and Health, Part A
Toxic/Hazardous Substances and Environmental Engineering

ISSN: 1093-4529 (Print) 1532-4117 (Online) Journal homepage: www.tandfonline.com/journals/lesa20

Environmental impact of biogas: A short review of current knowledge

Valerio Paolini, Francesco Petracchini, Marco Segreto, Laura Tomassetti, Nour Naja & Angelo Cecinato

To cite this article: Valerio Paolini, Francesco Petracchini, Marco Segreto, Laura Tomassetti, Nour Naja & Angelo Cecinato (2018) Environmental impact of biogas: A short review of current knowledge, Journal of Environmental Science and Health, Part A, 53:10, 899-906, DOI: 10.1080/10934529.2018.1459076

To link to this article: https://doi.org/10.1080/10934529.2018.1459076

Published online: 13 Apr 2018.

JOURNAL OF ENVIRONMENTAL SCIENCE AND HEALTH, PART A
2018, VOL. 53, NO. 10, 899–906
https://doi.org/10.1080/10934529.2018.1459076

Taylor & Francis
Taylor & Francis Group

Environmental impact of biogas: A short review of current knowledge

Valerio Paolini[a], Francesco Petracchini[a], Marco Segreto[a], Laura Tomassetti[a], Nour Naja[b], and Angelo Cecinato[a]

[a]National Research Council of Italy, Institute of Atmospheric Pollution Research, Monterotondo, Italy; [b]Boston Northeastern University, Chemical Engineering Department, Boston, Massachusetts, USA

ABSTRACT

The social acceptance of biogas is often hampered by environmental and health concerns. In this study, the current knowledge about the impact of biogas technology is presented and discussed. The survey reports the emission rate estimates of the main greenhouse gases (GHG), namely CO_2, CH_4 and N_2O, according to several case studies conducted over the world. Direct emissions of gaseous pollutants are then discussed, with a focus on nitrogen oxides (NO_x); evidences of the importance of suitable biomass and digestate storages are also reported. The current knowledge on the environmental impact induced by final use of digestate is critically discussed, considering both soil fertility and nitrogen release into atmosphere and groundwater; several case studies are reported, showing the importance of NH_3 emissions with regards to secondary aerosol formation. The biogas upgrading to biomethane is also included in the study: with this regard, the methane slip in the off-gas can significantly reduce the environmental benefits.

ARTICLE HISTORY
Received 26 January 2018
Accepted 23 March 2018

KEYWORDS
Air quality; anaerobic digestion; biogas; digestate; renewable energy; secondary aerosol; waste management

Introduction

The environmental benefits of biogas technology are often highlighted, as a valid and sustainable alternative to fossil fuels.[1] Together with the reduction of greenhouse gas (GHG) emissions, biogas can enhance energy security, thanks to its high energetic potential.[2–4] As a renewable energy source, it allows exploiting agricultural and zootechnical byproducts and municipal wastes, with a lower impact on air quality when compared to combustion-based strategies for these biomasses.[5–7] Furthermore, while ashes from combustion find scarce agronomic applications,[8,9] the by-product of anaerobic digestion, i.e. digestate, looks as a reliable material for agricultural uses.[10] Another important advantage of biogas technology is its easy scalability, allowing exploiting the energetic potential of decentralized biomass sources.[11,12] Finally, biogas can be upgraded to biomethane, suitably used as a vehicle fuel, or injected into national natural gas grids,[13,14]

The energy potential of biogas is reported in Figure 1, based on data from the World Bioenergy Association.[15] For Europe, China and USA, data are detailed in terms of the following sources: manure, agriculture residues, energy crops, organic fraction of municipal solid waste (MSW), agro-industry waste and sewage sludge. For the total world biogas potential, data are only divided into waste (i.e. organic fraction of MSW, agro-industry waste and sewage sludge) and agricultural byproducts (i.e. manure, agriculture residues and energy crops).

In spite of the above cited advantages, social opposition is often observed towards biogas plants, generally based on concerns about environmental and health issues.[16] The frequency on which these opposition phenomena are observed depends on different factors, including the inclusion strategies and the considered country.[17,18] In order to overcome social and cultural barriers hampering a wider diffusion of biogas, the accurate and complete evaluation of the environmental impact of these processes remains an issue of high scientific and technical relevance. The aim of this work is to report an updated state of the art of current knowledge about the environmental impact of biogas and biomethane.

Greenhouse gas emissions

A main objective of biogas industry is the reduction of fossil fuel consumption, with the final goal of mitigating global warming. However, anaerobic digestion is associated to the production of several greenhouse gases, namely carbon dioxide, methane and nitrous oxide. As a consequence, dedicated measures should be taken in order to reduce these emissions. According to Hijazi,[19] the main measures to improve the global warming reduction potential of biogas plants are: to use a flare avoiding methane discharge, to cover tanks, to enhance the efficiency of combined heat and power (CHP) units, to improve the electric power utilisation strategy, to exploit as much thermal energy as possible, to avoid leakages. Similar conclusions were obtained by Buratti and co-workers[20] for the specific case study of cereal crops in Umbria, Italy. Biomethane chain exceeds the minimum value of GHG saving (35%) mainly due to the open storage of digestate; usual practices to improve GHG reduction (up to 68.9%) include using heat and electricity produced by the biogas CHP plant, and covering digestate storage tanks.

CONTACT Dr. Valerio Paolini v.paolini@iia.cnr.it National Research Council of Italy, Institute of Atmospheric Pollution Research, via Salaria km 29,300; 00015, Monterotondo (RM), Italy.

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/lesa.

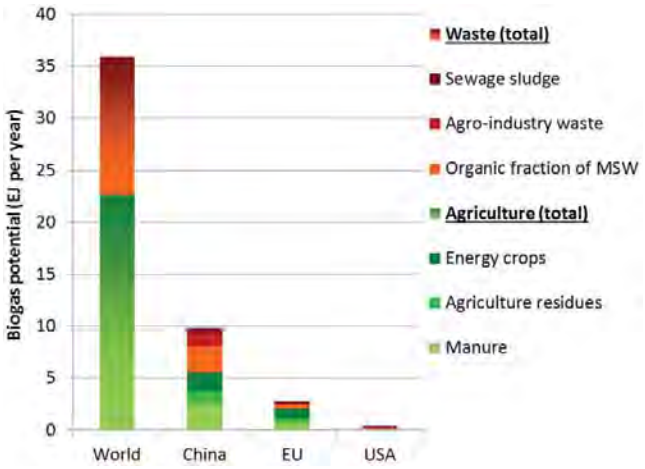


Figure 1. Energy potential of biogas.

The impact induced by biogas plants on global warming needs to be studied case by case. Bachmaier and co-workers[21] calculated the GHG impact of ten agricultural biogas plants. GHG emissions coming from electricity production in the investigated biogas plants ranged from −85 to 251 g CO_2-eq/kWh_{el}, and the GHG saving was 2.31 – 3.16 kWh_{fossil}/kWh_{el}. The results obtained also highlighted that reliable estimates of GHG emissions in the case of electricity production from biogas can be only made on the basis of individual monitoring data, for instance: reduction of direct methane emission and leakage, exploiting of heat obtained from cogeneration, amount and nature of input material, nitrous oxide emission (e.g. from energy crop cultivation) and digestate management. Battini and co-workers,[22] in a case study of an intensive dairy farm situated in the Po valley (Italy), calculated a GHG emission reduction due to anaerobic digestion ranging between −23.7% and −36.5%, depending on digestate management. In a Finnish case study,[23] the GHG release reduction was estimated equal to 177.0, 87.7 and 125.6 Mg of CO_2 eq. yr^{-1} for dairy cow, sow and pig farms, respectively. Optimizing all process parameters looks important with regard to final environmental impact: for instance, a specific case study on wastewater treatment showed that the process optimization could result into the emission abatement equal to 1,103 kg CO_2 eq/d for N_2O, 256 kg eq/d for CO_2 and 87 kg CO_2 eq/d for CH_4.[24]

Carbon dioxide emissions

Harmful compounds and air contaminants are introduced into the environment during biogas production and use through both combustion processes and diffusive emissions. Considering carbon dioxide, combustion of biogas leads to efficient methane oxidation and conversion to CO_2, with a rate of 83.6 kg per GJ (based on a biogas with 65% CH_4 and 35% CO_2[25]). Other releases of this contaminant are related to transport and storage of biomass, as well as digestate use. In the case of both biogas combustion and biomass/digestate emission, CO_2 is considered as biogenic and calculated neutral with regards to the impact on climate. Taking into account the reduction of fossil fuel, it can be demonstrated that biogas production leads globally to mitigation of anthropogenic greenhouse impact of the environment. Poeschl and co-workers[26] have investigated the CO_2 emissions associated to biogas production from several feedstocks, and the relative contribution of feedstock supply, biogas plant operation and infrastructure, biogas utilization and digestate management. According to this study, biogas use gives rise to a negative CO_2 balance because CO_2 caption results every time higher, in absolute values, than positive emissions from feedstock supply and biogas plant operation. As expected, biogas production from byproducts (e.g. from food residues, pomace, slaughter waste, cattle manure, etc.) is a more sustainable approach than energy crops utilization such as whole-wheat plant silage. Besides, digestate management provides significant contributions to total emission reduction in the case of specific feedstock such as municipal solid waste. A dedicated section of this study will below discuss the impact of digestate in full details, in paragraph 5.

Methane emissions

Methane released by biogas processes is not considered relevant for health issues: though exposure to hydrocarbon mixtures can have some adverse effects on humans,[27] no evidence exists of relevant interactions between methane and biologic systems.[28] However, methane is a greenhouse gas whose global warming power is estimated to be 28–36 times higher than CO_2 over 100 years: as such, it is the second major component among anthropogenic greenhouse chemicals.[29] Hence, in evaluating the impact of biogas industry on climate change, methane emissions are a point of primary importance. Methane can be released during biogas incomplete combustion; however a strong contribution to this contaminant comes out from diffusive emission related to biomass storage and digestate management. On the other hand, other biomass management strategies must be taken into account to abate emissions related to biogenic methane. In the above mentioned study of Poeschl and co-workers,[26] methane emissions were also discussed; in all investigated cases, the emission rates were below 5 g kg^{-1}. Considering cattle manure, important reductions in methane emission are related to digestate processing and handling, since this kind of biomass is characterized by high methane emission rate when spread in the field without any pre-treatment.

Nitrous oxide

Besides CO_2 and CH_4, nitrous oxide (N_2O) is another important GHG: Due to its high greenhouse effect potential, N_2O emissions from biogas production processes can result into a significant contribution to global warming budget.[30,31] The relative impact of nitrous oxide mostly depends on the chosen climate metrics: indeed, N_2O impact can even exceed those of CO_2 and CH_4, when the considered metric is Global Temperature change Potential with a time horizon of 100 years (namely GTP-100).[32]

Total GHG emission for energy production from biogas are generally calculated in a range between 0.10 and 0.40 kg CO2-eq/kWh_{el}, which is for instance 22–75% less than GHG emissions caused by the present energy mix in Germany.[33] The wide uncertainty about the estimates of global warming mitigation potential depends on N_2O emission rate assessment

as well as on storage and use as a fertilizer of digestate, as discussed in paragraphs below.

Gaseous pollutants from biogas combustion

Along GHG reduction benefits, it must be considered that biogas combustion is associated to release of pollutants in the atmosphere; therefore, the correct assessment of these emissions is a key point in social acceptance of this technology. A summary of emission factors for the main gaseous pollutants are reported in Table 1.

Carbon monoxide (CO) is produced in all oxidation processes of carbon containing materials, and is an important by-product of incomplete combustion of biogas. Methane emission rates are 0.74 and 8.46 and g CO per Nm^{-3} CH_4 for flaring and CHP, respectively.[34] CO emissions related to energy production are estimated in a range between 80 and 265 mg CO MJ^{-1}, depending on the plant efficiency.[35]

Sulphur dioxide (SO_2) emissions from biogas plants manly depend on the desulphurization degree of the introduced biogas. The SO_2 emission rate of a CHP biogas plant is estimated to lie in the range 19.2–25 mg MJ^{-1}.[25] The UK National Society for Clean Air (NSCA) estimates an emission factor of 80 and 100 $g_{SO2}/tonn_{waste}$ for flaring and CHP, respectively.[36] The relatively high SO_2 concentrations in the proximity of biogas plants can depend on different reasons, e.g.: direct emission from biogas combustion, H_2S oxidation from diffusive emissions, and diesel truck exhausts.[37]

Emissions of NO_x are one of the most critical point with regard to environmental impact of biogas plants.[38] According to Kristensen and co-workers,[35] the NO_x emission level of biogas is, in general, higher than for natural gas engines: the averaged aggregated emission factor is 540 g NO_x GJ^{-1}, which is more than three times the rate from natural gas engines. When emission factor is reported to methane consumption, an emission factor of 0.63 and 11.6 g $_{NOx}/Nm^3_{CH4}$ can be assumed for flaring and CHP, respectively.[34] The importance of controlling this pollutant is demonstrated by several case studies. For instance, Battini and co-workers[22] in the above mentioned case study of an intensive dairy farm situated in the Po valley (Italy) reported a low enhancement in acidification (5.5–6.1%), particulate matter emissions (0.7–1.4%) and eutrophication (+0.8%), while on the other hand a significant enhancement in photochemical ozone formation potential (41.6–42.3%) was calculated. In another case study, Carreras-Sospedra and co-workers[39] estimated a potential enhancement of up to 10% of NO_x emission in 2020 in California (US); nevertheless, their study included both biogas and biomass burning. Indeed, the lower emissions of methane from storage and the credits from substituted electricity are not enough to compensate the increase in NO_x emissions from the biogas combustion.

Biogas is a gaseous fuel rich in volatile organic compounds (VOCs), compared to natural gas: indeed, VOCs concentration normally ranges between 5 and 500 mg/Nm^3, and in some cases up to 1700 mg/Nm^3 were observed.[40,41] Generally, only non-methane volatile organic compounds (NMVOC) are considered in these studies. If combustion is assumed to reduce VOCs concentration of 99%,[42] VOCs emission from biogas combustion are in general lower, compared to liquid and solid biofuels. However, a specific critical issue can be highlighted for formaldehyde. In a case study conducted on anaerobic waste treatment plants in Barcelona (Spain), VOC emission factors was in the range 0.9 ± 0.3 g s^{-1}, contributing for 0.3–0.9% of total VOCs in the area. On the other hand, formaldehyde emission factors from biogas engines were found between 0.2 and 3.0 mg s^{-1}, resulting in a ~2% contribution to the total.[43] It is important to remark that a similar emission pattern is observed for natural gas: indeed, formaldehyde is a by-product of methane oxidation. Compared to natural gas, emissions of VOCs are 40% lower in biogas engines, while formaldehyde emissions are slightly lower and higher aldehydes (present in natural gas due to the presence of higher hydrocarbons) are almost absent.[35]

Noticeably, fuel-cycle emissions can be strongly influenced by the raw materials. For instance, CO_2, CO, NO_x, hydrocarbons and particles may differ by a factor of 3–4 between ley crops, straw, sugar beet byproducts, liquid manure, food industry waste and municipal solid waste. On the other hand, differences by a factor of up to 11 can be observed in SO_2 emissions, due to the high variability of H_2S and organic sulphur compounds in the produced biogas.[44]

Table 1. Emission factors of biogas plants operating direct biogas combustion.

Pollutant	Emission factor (g GJ^{-1})	Source
Carbon monoxide (CO)	310	Nielsen et al.,[25]
	256	Kristensen et al.,[35]
Sulphur dioxide (SO_2)	25	Nielsen et al.,[25]
Nitrogen oxides (NO_x)	202	Nielsen et al.,[25]
	540	Kristensen et al.,[35]
Non-methane volatile organic compounds (NMVOC)	10	Nielsen et al.,[25]
	21.15	Kristensen et al.,[35]
Formaldehyde (CH_2O)	8.7	Nielsen et al.,[25]
	14	Kristensen et al.,[35]

Impact of feedstock and digestate storage and treatment

In the biogas combustion management, feedstock and digestate storage and treatments can be the most important processes to achieve the global warming benefits of biogas production processes. Indeed, the impact of a biogas plant on GHG emission is heavily influenced by feedstock storage: most of N_2O can be abated when a closed storage is used for manure and co-digestion feeding.[45]

Emissions from uncovered biomass storage have also been identified as the main ammonia source along the whole biogas production chain,[46] and closed storage is strongly advised.

In a specific French case study of anaerobic digestion and composting plant for municipal solid waste, Beylot and co-workers[38] have identified four conditions for process operation, which highly influence the impact of the whole plant; they are: (i) the features of degradation of the fermentable fraction; (ii) the collection efficiency of gas streams released by biological operations; (iii) the abatement effectiveness of collected pollutants; and (iv) NO_x emission rate from

biogas combustion. The importance of digestate storage step has been highlighted by Battini and co-workers,[22] in the above mentioned case study of intensive dairy farm situated in the Po valley (Italy): GHG emission reduction due to AD, calculated as equal to −23.7%, can reach −36.5% when a gas-tight tank is used for digestate storage.

A proper design and management of feedstock and digestate storage units looks also important in order to mitigate the odour impact of the plant. Indeed, the two major sources of the olfactory annoyance are biomass storage production of biogas and digestate composting units.[47] Closed-operated hydrothermal hydrolysis has positive effects on overall fugitive odour control in plants; on the other hand, eventual fugitive emissions during high-temperature and seemingly open pre-treatments can be the principal source of odours.[48]

In conclusion, gas tight storage should always be advised, since the corresponding GHG and ammonia fugitive emissions are even more important those coming from fertilizers.[49] As mentioned above, avoiding leakages and using closed tanks are among the most important ways to reduce the global warming impact of biogas plants.[19]

Impact of digestate final use

The use of agricultural and zootechnical byproducts and MSW as soil improver and fertilizer is a sustainable approach, allowing to reduce the production, transport and use of synthetic chemicals: however, spreading untreated biomass on soils sometimes implies the release into the atmosphere of huge amounts of chemicals such as methane, nitrous oxide, ammonia, volatile hydrocarbons, etc. Anaerobic digestion of biomass followed by the use of digestate as biofertilizer is a common practice related to biogas production. In this paragraph, the current knowledge concerning the environmental impact of this practice is briefly discussed.

A recent study on this topic[50] concluded that direct effects of anaerobic digestion on long-term sustainability in terms of soil fertility and environmental impact at the field level are of minor relevance; indeed, the most relevant issue (with regard to both emissions to atmosphere and in soil fertility) is related to possible changes in cropping systems. According to this study, the main direct aftermaths of anaerobic digestion are short-term effects on soil microbial activity and changes in the soil microbial community. Considering soil quality, digestate is significantly more inert vs. atmospheric and biological agents than the biomass itself: this property results into a lower degradation rate of the organic matter. In fact, labile fractions of original biomass such as carbohydrates are rapidly degraded, causing the enrichment of more persistent molecules such as lignin and non-hydrolysable lipids.[51] In a specific case study on pig slurry anaerobic digestion, a high biological stability of biomasses was achieved, with a Potential Dynamic Respiration Index (PDRI) close to 1,000 mg O_2 kg VS^{-1} h^{-1}.[10]

With regard to nitrate leaching and release into the atmosphere of ammonia and nitrous oxide, the current state of knowledges needs to be improved: however, the impact is considered "negligible or at least ambiguous".[50] The "ambiguity" of previous studies, as highlighted by this Author, is probably due to the different impact of digestate depending on the type of considered soil. For instance, Eickenscheidt and co-workers[52] investigated the emission of methane, nitrous oxide and ammonia from untreated manure and digestate applied on several soils: while methane emissions did not significantly change, high N_2O emissions were observed in the correspondence of high carbon loadings. A significative impact of soil moisture-soil mineral-N interactions on N_2O emissions was also observed by Senbayram and co-workers.[31]

Considering N_2O and CH_4, digestate can give rise to significant emission rates into the atmosphere: however, these emissions are generally lower than untreated biomass.[53] As for nitrous oxide, digested products are more recalcitrant than fresh slurry; thus, microbial degradation is slower, in which leads to relatively few anoxic microsites and poor N_2O emission compared to fresh slurry application.[54–56] Conversely, methane emissions from digestate are generally lower than those of original biomass, since the methanogenic potential is reduced: this is particularly relevant in the presence of reduced methane coming from manure[26,45] (Poeschl et al., 2012; Boulamanti et al., 2013). As for methane emission, an exception is known in the specific case of rice cultivation: indeed, adding digestate to paddy results into the methane emission rate enhancement from 16.9 to 29.9 g m^{-2},[57] whilst no significant effects are observed for N_2O.[57,58]

Based on the above-cited literature, N_2O and CH_4 emissions from digestate are not critical, while ammonia release and nitrate leaching are still a critical point. For instance, ammonia emissions from digestate higher than from original manure have been observed in several studies.[56,59,60] It was also reported that up to 30% of nitrogen can be lost by ammonia volatilization, due to the enhancement of soil pH.[59,60] Specifically, Matsunaka and co-workers[61] reported a 13% nitrogen volatilization as ammonia, when anaerobically digested cattle slurry was used as soil fertilizer for grassland. The practice of fertilizing soil with anaerobically digested materials increases soil concentration of NO_3^- (+30/40% compared to raw cattle slurry): this is associated to the four times more readily degradable organic C increased microbial biomass, depleting nitrogen and oxygen concentration in soil and resulting in the 10 times increase of CO_2 and N_2O emissions.[62] A proper management of digestate can mitigate its environmental impact: ammonia emission rates ranging from 1.6 to 30.4 were reported, depending on the adopted practice.[63]

With regards to pesticides, heavy metals and harmful microorganisms, the risk of food chain contamination is generally considered low,[64] but the soil burden of persistent organic pollutants (POPs) caused by the use of digestate as biofertilizer still needs to be fully assessed.[65] On the other hand, anaerobic digestion can have relevant effects on phytotoxicity of specific biomass: for instance, the phyto-toxic character of olive mill effluent is reduced after anaerobic digestion,[66] and the degradation of aflatoxin B1 from corn grain can be reached.[67] Finally, an odour reduction up to 82–88% can be obtained.[63]

In conclusion, the main critical issue in final use of digestate is nitrogen release into the environment, which can be reduced by applying the best practices for preserving soil quality. The management of nitrogen dosage is sometimes difficult because of the feedstock variability. It is also important to remark that fugitive emissions from digestate storage are generally more

important than those released by its use into soil, as indicated above.[20,49]

Impact on particulate matter

With regards to particulate matter (PM), biogas combustion is not a significant emission source when compared to other fuels: emission factors of 0.238 and 0.232 g/Nm$^3_{CH4}$ have been estimated for flaring and CHP, respectively.[34] However, secondary PM formation can occur, due to NO_x emissions from CHP and NH_3 volatilization from storage and digestate final use. Indeed, during secondary PM formation, the prominent roles of ammonia[68] and NO_x[69] are ascertained. As reported by Boulamanti and co-worker,[45] NO_x emissions are in general the principal source of secondary PM from biogas. As discussed above, closed storage can significantly abate ammonia emissions, resulting also into the global reduction of PM formation from this contaminant.

Impact of biogas upgrading to biomethane

Biomethane production is an efficient approach to increase the market share of biogas, resulting in a further reduction of fossil fuels. The equivalent CO_2 saving raises considerably if methane slip is limited to 0.05%,[70] while the process results no longer sustainable when methane losses reach 4%. Biomethane use as an alternative to gasoil is expected to improve local air quality, with regards to NO_x and particulate matter. As a consequence, biogas upgrading for vehicle fuelling purposes produces optimum benefits with respect to photochemical oxidant formation, marine eutrophication and ecotoxicity; on the other hand, scarce benefits are observed in terms of climate change compared to biogas combustion in CHP.[71]

Depending on several factors such as energy consumption, production and transport of materials used, produced waste and methane slip, the environmental impact of biomethane production depends on the upgrading technology adopted. In PSA, the eventual recovery of the off-gas plays a key role.[72,73] Starr and co-workers[74] reported that the most CO_2-efficient upgrading technology for MSW biogas is the BABIU (bottom ash upgrading) based on ash produced by municipal waste

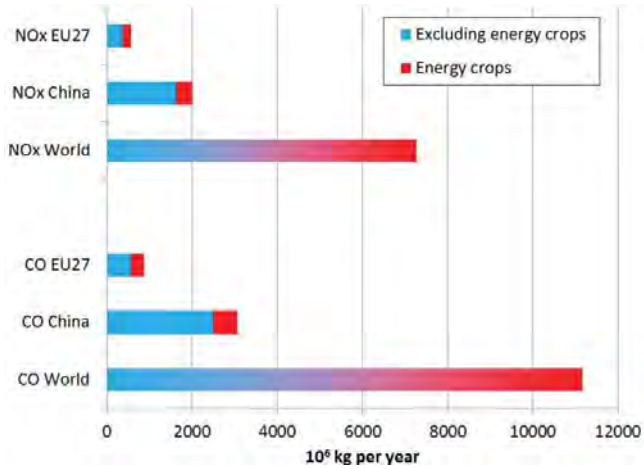


Figure 2. Emission potential of biogas plants for NO_x and CO.

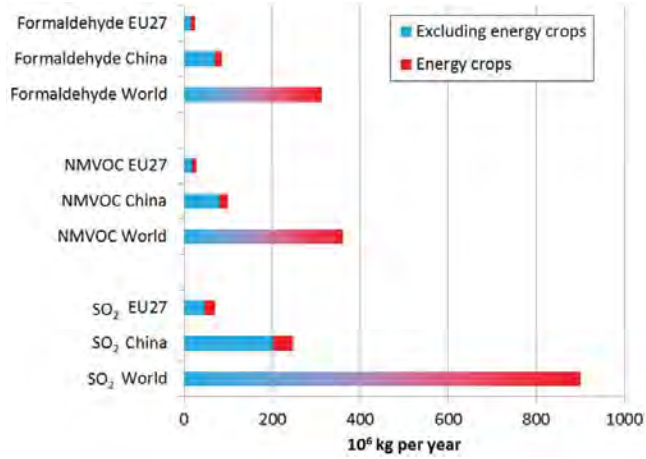


Figure 3. Emission potential of biogas plants for formaldehyde, NMVOC and SO_2.

incinerators. The condition required is that the incinerator lies within 125 km from the biogas upgrading plant. Considering water scrubbing in basic solutions, a lower impact can be achieved by replacing KOH with NaOH. Water from biogas upgrading plants can be recycled in the process or treated as wastewater, depending on chemical composition: the most common VOC in the wastewater of biogas upgrading plants are p-cymene, d-limonene and 2-butanone[75]; the maximum VOC content is observed in MSW treatment plants, reaching up to 238 mg/L, but no inhibition is observed when wastewaters are recycled in the plant.

Along its impact on climate, biomethane use as gasoil substitute of is expected to improve urban air quality, because emission factors of methane are up to 10 times lower than those of liquid fuels, considering PM, VOCs and polycyclic aromatic hydrocarbons.[76] Biomethane injection in the national grid may also reduce residential solid fuels consumption in some specific regions, with relevant benefits on indoor air quality and human health.[77]

Global emission potential

The potential emission associated to biogas plants is reported in Figure 2 (NO_x and CO) and in Figure 3 (for formaldehyde, NMVOC and SO_2). Data are obtained combining emission factors reported in Table 1[25] and energy potential reported in Figure 1. For Europe and China, the contribution of energy crops is reported separately, since their use is often disregarded due to its negative impact on land availability for food. In the case of the global potential, the relative contribution of energy crops is not available.

Conclusions

Biogas can significantly contribute to abate greenhouse gas emissions. However, attention must be payed towards undesired emissions of methane and nitrous oxide (N_2O). The emission budgets of the two compounds are scarcely related to direct release from biogas/biomethane combustion, whilst biomass storage and digestate management are the critical steps. Similar considerations apply to ammonia: to reduce its impact on secondary aerosol formation, efficient biomass and digestate

storage should always be recommended. Among all the gaseous pollutants considered in direct emission from biogas combustion, nitrogen oxides (NO_x) level were worth of some concern in several case studies. On the other hand, volatile organic compounds do not seem to constitute a critical issue. Considering the aftermaths of digestate spreading on soil quality, further studies are needed in order to fully assess the long-term impact. In the medium-short term, digestate seems to be preferable compared to untreated biomass. The upgrading to biomethane can generally improve air quality and reduce GHG emissions; however methane losses in the off-gas can affect the sustainability of the whole process.

Acknowledgments

The study is part of the ISAAC project (Increasing Social Awareness and Acceptance of biogas and biomethane), funded by the European Commission within the Horizon 2020 programme under grant agreement no. 691875.

References

[1] Cecchi, F.; Cavinato, C. Anaerobic Digestion of Bio-Waste: A Mini-Review Focusing on Territorial and Environmental Aspects. *Waste Manage. Res.* **2015**, *33*, 429–438. DOI:10.1177/0734242X14568610.

[2] Steininger, K. W.; Voraberger, H. Exploiting the Medium Term Biomass Energy Potentials in Austria. A Comparison of Costs and Macroeconomic Impact. *Environ. Resour. Econ.* **2003**, *24*, 359–377. DOI:10.1023/A:1023680125027.

[3] Tricase, C.; Lombardi, M. State of the Art and Prospects of Italian Biogas Production from Animal Sewage: Technical-Economic Considerations. *Renewable Energy* **2009**, *34*, 477–485. DOI:10.1016/j.renene.2008.06.013.

[4] Angelidaki, A.; Alves, M.; Bolzonella, D.; Borzacconi, L.; Campos, J. L.; Guwy, A. J.; Kalyuzhnyi, S.; Jenicek, P.; van Lier; J. B. Defining the Biomethane Potential (BMP) of Solid Organic Wastes and Energy Crops: A Proposed Protocol for Batch Assays. *Water Sci. Technol.* **2009**, *59*(5), 927–934. DOI:10.2166/wst.2009.040.

[5] Fruergaard, T.; Hyks, J.; Astrup, T. Life-Cycle Assessment of Selected Management Options for Air Pollution Control Residues from Waste Incineration. *Sci. Total Environ.* **2010**, *10*(15), 4672–4680. DOI:10.1016/j.scitotenv.2010.05.029.

[6] Giovanis, E. Relationship Between Recycling Rate and Air Pollution: Waste Management in the State of Massachusetts. *Waste Manage.* **2015**, *40*, 192–203. DOI:10.1016/j.wasman.2015.03.006.

[7] Domingo, J. L.; Rovira, J.; Vilavert, L.; Nadal, M.; Figueras, M. J.; Schuhmacher, M. Health Risks for the Population Living in the Vicinity of an Integrated Waste Management Facility: Screening Environmental Pollutants. *Sci. Total Environ.* **2015**, *518–519*, 363–370. DOI:10.1016/j.scitotenv.2015.03.010.

[8] Freire, M.; Lopes, H.; Tarelho; L. A. C. Critical Aspects of Biomass Ashes Utilization in Soils: Composition; Leachability; PAH and PCDD/F. *Waste Manage.* **2015**, *46*, 304–315. DOI:10.1016/j.wasman.2015.08.036.

[9] Vakalis, S.; Boschiero, M.; Moustakas, K.; Sotiropoulos, A.; Malamis, D.; Zerbe, S.; Baratieri; M. Assessing the Suitability of Biomass Ashes from Combustion in Boilers as Soil Fertilizers: Statistical Entropy Analysis and Introduction of the Potassium Utilization Potential Factor. *Waste Biomass Valorization* **2017**, *8*(5), 1569–1576. DOI:10.1007/s12649-017-9852-x.

[10] Tambone, F.; Terruzzi, L.; Scaglia, B.; Adani, F. Composting of the Solid Fraction of Digestate Derived from Pig Slurry: Biological Processes and Compost Properties. *Waste Manage.* **2015**, *35*, 55–61. DOI:10.1016/j.wasman.2014.10.014.

[11] Delzeit, R.; Kellner, U. The Impact of Plant Size and Location on Profitability of Biogas Plants in Germany Under Consideration of Processing Digestates. *Biomass Bioenergy* **2013**, *52*, 43–53. DOI:10.1016/j.biombioe.2013.02.029.

[12] Särkilahti, M.; Kinnunen, V.; Kettunen, R.; Jokinen, A.; Rintala, J. Replacing Centralised Waste and Sanitation Infrastructure with Local Treatment and Nutrient Recycling: Expert Opinions in the Context of Urban Planning. *Technological Forecasting Soc. Change* **2017**, *118*, 195–204. DOI:10.1016/j.techfore.2017.02.020.

[13] Yang, L.; Ge, X.; Wan, C.; Yu, F.; Li, Y. Progress and Perspectives in Converting Biogas to Transportation Fuels. *Renew. Sust. Energ. Rev.* **2014**, *40*, 1133–1152. DOI:10.1016/j.rser.2014.08.008.

[14] Bekkering; J.; Hengeveld; E. J.; van Gemert; W. J. T.; Broekhuis; A. A. Will Implementation of Green Gas Into the Gas Supply be Feasible in the Future? *Appl. Energ.* **2015**, *140*, 409–417. DOI:10.1016/j.apenergy.2014.11.071.

[15] WBA (World Bioenergy Association). Global bioenergy statistics. **2016**. available at http://worldbioenergy.org/uploads/WBA%20Global%20Bioenergy%20Statistics%202016.pdf (Last access January **2015**).

[16] Capodaglio, A. G.; Callegari; A.; Lopez, M. V. European Framework for the Diffusion of Biogas Uses: Emerging Technologies; Acceptance; Incentive Strategies; and Institutional-Regulatory Support. *Sustainability* **2016**, *8*, 298–315. DOI:10.3390/su8040298.

[17] Wallquist, L.; L'Orange Seigo, S.; Visschers, V. H. M.; Siegrist, M. Public Acceptance of CCS System Elements: A Conjoint Measurement. *Int. J. Greenhouse Gas Control* **2012**, *6*, 77–83. DOI:10.1016/j.ijggc.2011.11.008.

[18] Soland, M.; Steimer, N.; Walter, G. Local Acceptance of Existing Biogas Plants in Switzerland. *Energy Policy* **2013**, *61*, 802–810. DOI:10.1016/j.enpol.2013.06.111.

[19] Hijazi, O.; Munro, S.; Zerhusen, B.; Effenberger, M. Review of Life Cycle Assessment for Biogas Production in Europe. *Renewable Sustainable Energy Rev.* **2016**, *54*, 1291–1300. DOI:10.1016/j.rser.2015.10.013.

[20] Buratti, C.; Barbanera, M.; Fantozzi, F. Assessment of GHG Emissions of Biomethane from Energy Cereal Crops in Umbria; Italy. *Appl. Energy* **2013**, *108*, 128–136. DOI:10.1016/j.apenergy.2013.03.011.

[21] Bachmaier, J.; Effenberger, M.; Gronauer, A. Greenhouse Gas Balance and Resource Demand of Biogas Plants in Agriculture. *Eng. Life Sci.* **2010**, *10*(6), 560–569. DOI:10.1002/elsc.201000073.

[22] Battini, F.; Agostini, A.; Boulamanti, A. K.; Giuntoli, J.; Amaducci, S. Mitigating the Environmental Impacts of Milk Production Via Anaerobic Digestion of Manure: Case Study of a Dairy Farm in the Po Valley. *Sci. Total Environ.* **2014**, *481*, 196–208. DOI:10.1016/j.scitotenv.2014.02.038.

[23] Kaparaju, P.; Rintala, J. Mitigation of Greenhouse Gas Emissions by Adopting Anaerobic Digestion Technology on Dairy; Sow and Pig Farms in Finland. *Renewable Energy* **2011**, *36*, 31–41. DOI:10.1016/j.renene.2010.05.016.

[24] Mikosz, J. Analysis of Greenhouse Gas Emissions and the Energy Balance in a Model Municipal Wastewater Treatment Plant. *Desalination Water Treat.* **2016**, *57*(59), 28551–28559. DOI:10.1080/19443994.2016.1192491.

[25] Nielsen, M.; Nielsen, O. K.; Plejdrup, M. *Danish emission inventory for stationary combustion plants. Scientific Report from DCE – Danish Centre for Environment and Energy; No. 102*; **2014**. Available at http://dce2.au.dk/pub/SR102.pdf (Last access January **2018**).

[26] Poeschl, M.; Ward, S.; Owende, P. Environmental Impacts of Biogas Deployment e Part I: Life Cycle Inventory for Evaluation of Production Process Emissions to Air. *J. Cleaner Product.* **2012**, *24*, 168–183. DOI:10.1016/j.jclepro.2011.10.039.

[27] Simmons, J. E. Nephrotoxicity Resulting from Multiple Chemical Exposures and Chemical Interactions. *Toxicology of Chemical Mixtures*; Academic Press: San Diego (USA), **1994**; pp 335–360.

[28] Prasad, S.; Zhao, L.; Gomes, J. Methane and Natural Gas Exposure Limits. *Epidemiology* **2011**, *22*(1), S251. DOI:10.1097/01.ede.0000392463.93990.1e.

[29] IPCC (International Panel on Climate Change). *Climate Change 2013; Contribution to the Fifth Assessment Report of the Working*

Group I; The Physical Science Basis; Available at http://www.ipcc.ch/report/ar5/wg1/ (Last access January **2018**).

[30] Carter, M. S.; Hauggard-Nielsen, H.; Heiske, S.; Jensen, M.; Thomsen, S.; Schmidt, J. E.; Johansen, A.; Ambus, P. Consequences of field N2O Emissions for the Environmental Sustainability of Plant-Based Biofuels Produced Within an Organic Farming System. *Global Change Biol. (CBG) Bioenergy* **2012**, *4*, 435–452. DOI:10.1111/j.1757-1707.2011.01132.x.

[31] Senbayram, M.; Chen, R.; Wienforth, B.; Herrmann, A.; Kage, H.; Mühling, K. H.; Dittert, K. Emission of N2O from Biogas Crop Production Systems in Northern Germany. *Bioenerg. Res.* **2014**, *7*, 1223–1236. DOI:10.1007/s12155-014-9456-2.

[32] Iordan, C.; Lausselet, C.; Cherubini, F. Life-Cycle Assessment of a Biogas Power Plant with Application of Different Climate Metrics and Inclusion of Near-Term Climate Forcers. *J. Environ. Manage.* **2016**, *184*, 517–527. DOI:10.1016/j.jenvman.2016.10.030.

[33] Meyer-Aurich, A.; Schattauer, A.; Hellebrand, H. J.; Klauss, H.; Plöchl, M.; Berg, W. Impact of Uncertainties on Greenhouse Gas Mitigation Potential of Biogas Production from Agricultural Resources. *Renewable Energy* **2012**, *37*, 277–284. DOI:10.1016/j.renene.2011.06.030.

[34] USEPA (United States Environmental Protection Agency). *Background Information Document for Updating AP42 Section 2.4 for Estimating Emissions from Municipal Solid Waste Landfills. Office of Research and Development. Report number EPA/600/R-08-116*; **2008**. Available at: https://www3.epa.gov/ttnchie1/ap42/ch02/draft/db02s04.pdf (Last access January **2018**).

[35] Kristensen, P. G.; Jensen, J. K.; Nielsen, M.; Illerup, J. B. Emission Factors for Gas Fired CHP units <25 MW. Danish Gas Technology Centre and National Environmental Research Institute of Denmark. **2004**. Available at http://www.dgc.eu/sites/default/files/filarkiv/documents/C0402_emissions_factors.pdf (Last access January **2018**).

[36] NSCA (National Society for Clean Air and Environment of United Kingdom). *Comparison of Emissions from Waste Management Options*; BN2 9QA; Brighton, UK, **2002**.

[37] Petracchini, F.; Romagnoli, P.; Paciucci, L.; Vichi, F.; Imperiali, A.; Paolini, V.; Liotta, F.; Cecinato, A. Influence of Transport from Urban Sources and Local Biomass Combustion on the Air Quality of a Mountain Area. *Environ. Sci. Pollut. Res.* **2017**, *24*(5), 4741–4754. DOI:10.1007/s11356-016-8111-1.

[38] Beylot, A.; Vaxelaire, S.; Zdanevitch, I.; Auvinet, N.; Villeneuve, J. Life Cycle Assessment of Mechanical Biological Pre-Treatment of Municipal Solid Waste: A Case study. *Waste Manage.* **2015**, *39*, 287–294. DOI:10.1016/j.wasman.2015.01.033.

[39] Carreras-Sospedra, M.; Williams, R.; Dabdub, D. Assessment of the Emissions and Air Quality Impacts of Biomass and Biogas Use in California. *J. Air Waste Manage. Assoc.* **2016**, *66*(2), 134–150. DOI:10.1080/10962247.2015.1087892.

[40] Rasi, S.; Veijanen, A.; Rintala, J. Trace Compounds of Biogas from Different Biogas Production Plants. *Energy* **2007**, *32*, 1375–1380. DOI:10.1016/j.energy.2006.10.018.

[41] Salazar Gomez, J. I.; Lohmann, H.; Krassowski, J. Determination of Volatile Organic Compounds from Biowaste and Cofermentation Biogas Plants by Single-Sorbent Adsorption. *Chemosphere* **2016**, *153*, 48–57. DOI:10.1016/j.chemosphere.2016.02.128.

[42] Smet, E.; Van Langenhove, H.; De Bo, I. The Emission of Volatile Compounds During the Aerobic and the Combined Anaerobic/Aerobic Composting Of Biowaste. *Atmos. Environ.* **1999**, *33*, 1295–1303. DOI:10.1016/S1352-2310(98)00260-X.

[43] Gallego, E.; Roca, F. J.; Perales, J. F.; Guardino, X.; Gadea, E.; Garrote, P. Impact of Formaldehyde and VOCs from Waste Treatment Plants Upon the Ambient Air Nearby an Urban Area (Spain). *Sci. Total Environ.* **2016**, *568*, 369–380. DOI:10.1016/j.scitotenv.2016.06.007.

[44] Borjesson, P.; Berglund, M. Environmental Systems Analysis of Biogas Systems-Part I: Fuel-Cycle Emissions. *Biomass Bioenergy* **2006**, *30*, 469–485. DOI:10.1016/j.biombioe.2005.11.014.

[45] Boulamanti, A. K.; Donida Maglio, S.; Giuntoli, J.; Agostini, A. Influence of Different Practices on Biogas Sustainability. *Biomass Bioenergy* **2013**, *53*, 149–161. DOI:10.1016/j.biombioe.2013.02.020.

[46] Sommer, S. G. Ammonia volatilization from farm tanks containing anaerobically digestedanimal slurry. *Atmos. Environ.* **1997**, *31*, 863–868. DOI:10.1016/S1352-2310(96)00250-6.

[47] Clarke, K.; Romain, A. C.; Locoge, N.; Redon, N. Application of Chemical Mass Balance Methodology to Identify the Different Sources Responsible for the Olfactory Annoyance at a Receptor-Site. *Chem. Eng. Trans.* **2012**, *30*, 79–84.

[48] Liu, J.; Wang, X.; Nie, X.; Li, R.; Song, M. In-Situ Emission Characteristics of Odorous Gases from two Food Waste Processing Plants. *J. Mater. Cycles Waste Manag.* **2013**, *15*, 510–515. DOI:10.1007/s10163-013-0174-1.

[49] Clemens, J.; Trimborn, M.; Weiland, P.; Amon, B. Mitigation of Greenhouse Gas Emissions by Anaerobic Digestion of Cattle Slurry. *Agric. Ecosyst. Environ.* **2006**, *112*, 171–177. DOI:10.1016/j.agee.2005.08.016.

[50] Möller, K. Effects of Anaerobic Digestion on Soil Carbon and Nitrogen Turnover; N Emissions; and Soil Biological Activity. A review. *Agron. Sustain. Dev.* **2015**, *35*, 1021–1041. DOI:10.1007/s13593-015-0284-3.

[51] Tambone, F.; Genevini, P.; D'Imporzano, G.; Adani, F. Assessing Amendment Properties of Digestate by Studying the Organic Matter Composition and the Degree of Biological Stability During the Anaerobic Digestion of the Organic Fraction of MSW. *Bioresour. Technol.* **2009**, *100*, 3140–3142. DOI:10.1016/j.biortech.2009.02.012.

[52] Eickenscheidt, T.; Freibauer, A.; Heinichen, J.; Augustin, J.; Drösler, M. Short-Term Effects of Biogas Digestate and Cattle Slurry Application on Greenhouse Gas Emissions Affected by N Availability from Grasslands on Drained Fen Peatlands and Associated Organic Soils. *Biogeosciences* **2014**, *11*, 6187–6207. DOI:10.5194/bg-11-6187-2014.

[53] Oshita; K.; Okumura, T.; Takaoka, M.; Fujimori, T.; Appels, L.; Dewil, R. Methane and Nitrous Oxide Emissions Following Anaerobic Digestion of Sludge in Japanese Sewage Treatment Facilities. *Bioresour. Technol.* **2014**, *171*, 175–181. DOI:10.1016/j.biortech.2014.08.081.

[54] Clemens, J.; Huschka, A. The Effect of Biological Oxygen Demand of Cattle Slurry and Soil Moisture on Nitrous Oxide Emissions. *Nutr. Cycling Agroecosyst.* **2001**, *59*, 193–198. DOI:10.1023/A:1017562603343.

[55] Oenema, O.; Wrage, N.; Velthof, G. L.; van Groenigen, J. W.; Dolfing, J.; Kuikman, P. J. Trends in Global Nitrous Oxide Emissions from Animal Production Systems. *Nutr. Cycl. Agroecosys.* **2005**, *72*, 51–65. DOI:10.1007/s10705-004-7354-2.

[56] Möller, K.; Stinner, W. Effects of Different Manuring Systems with and Without Biogas Digestion on Soil Mineral Nitrogen Content and Gaseous Nitrogen Losses (Ammonia; Nitroux Oxide). *Europ. J. Agronomy* **2009**, *30*, 1–16. DOI:10.1016/j.eja.2008.06.003.

[57] Singla, A.; Inubushi, K. Effect of Biogas Digested Liquid on CH4 and N2O Flux in Paddy Ecosystem. *J. Integr. Agric.* **2014**, *13*(3), 635–640. DOI:10.1016/S2095-3119(13)60721-2.

[58] Win, A. T.; Toyota, K.; Win, K. T.; Motobayashi, T.; Ookawa, T.; Hirasawa, T.; Chen, D.; Lu, J. Effect of Biogas Slurry Application on CH4 and N2O Emissions; Cu and Zn Uptakes by Whole Crop Rice in a Paddy Field in Japan. *Soil Sci. Plant Nutr.* **2014**, *60*, 411–422. DOI:10.1080/00380768.2014.899886.

[59] Ghoneim, A.; Ueno, H.; Ebin, A.; Asagi, N.; El Darag, A. Analysis of Nitrogen Dynamics and Fertilizer use Efficiency Using the Nitrogen 15 Isotope Dilution Method Following the Application of Biogas Slurry or Chemical Fertilizer. *Int. J. Soil Sci.* **2008**, *3*(1), 11–19. DOI:10.3923/ijss.2008.11.19.

[60] VTT (Technical Research Centre of Finland). Greenhouse gas emissions and removals in Finland. 15 March **2006**. Available at https://tilastokeskus.fi/tup/khkinv/fin_nir_2006.pdf.

[61] Matsunaka, T.; Sawamoto, T.; Ishimura, H.; Takakura, K.; Takekawa, A. Efficient use of Digested Cattle Slurry from Biogas Plant with Respect to Nitrogen Recycling in Grassland. *Int. Cong. Ser.* **2006**, *1293*, 242–252. DOI:10.1016/j.ics.2006.03.016.

[62] Johansen, A.; Carter, M. S.; Jensen, E. S.; Hauggard-Nielsen, H.; Ambus, P. Effects of Digestate from Anaerobically Digested Cattle Slurry and Plant Materials on Soil Microbial Community and

Emission of CO2 and N2O. *Appl. Soil Ecol.* **2013**, *63*, 36–44. DOI:10.1016/j.apsoil.2012.09.003.

[63] Riva, C.; Orzi, V.; Carozzi, M.; Acutis, M.; Boccasile, G.; Lonati, S.; Tambone, F.; D'Imporzano, G.; Adani, F. Short-Term Experiments in Using Digestate Products as Substitutes for Mineral (N) Fertilizer: Agronomic Performance; Odours; and Ammonia Emission Impacts. *Sci. Total Environ.* **2016**, *547*, 206–214. DOI:10.1016/j.scitotenv.2015.12.156.

[64] Govasmark, E.; Stäb, J.; Holen, B.; Hoornstra, D.; Nesbakk, T.; Salkinoja-Salonen, M. Chemical and Microbiological Hazards Associated with Recycling of Anaerobic Digested Residue Intended for Agricultural Use. *Waste Manag.* **2011**, *12*, 2577–2583. DOI:10.1016/j.wasman.2011.07.025.

[65] Suominen, K.; Verta, M.; Marttinen, S. Hazardous Organic Compounds in Biogas Plant end Products-Soil Burden and Risk to Food Safety. *Sci. Total Environ.* **2014**, *491*, 192–199. DOI:10.1016/j.scitotenv.2014.02.036.

[66] Filidei, S.; Masciandaro, G.; Ceccanti, B. Anaerobic Digestion of Olive Oil Mill Effluents: Evaluation of Wastewater Organic Load and Phytotoxicity Reduction. *Water Air Soil Pollut.* **2003**, *145*, 79–94. DOI:10.1023/A:1023619927495.

[67] Salati, S.; D'Imporzano, G.; Panseri, S.; Pasquale, E.; Adani, F. Degradation of Aflatoxin B1 During Anaerobic Digestion and Its Effect on Process Stability. *Int. Biodeterior. Biodegradation* **2014**, *94*, 19–23. DOI:10.1016/j.ibiod.2014.06.011.

[68] Erisman, J. W.; Schaap, M. The Need for Ammonia Abatement with Respect to Secondary PM Reductions in Europe. *Environ. Pollut.* **2004**, *129*, 159–163. DOI:10.1016/j.envpol.2003.08.042.

[69] Harrison, R. M.; Jones, A. M.; Lawrence, R. G. Major Component Composition of PM10 and PM2.5 from Roadside and Urban Background Sites. *Atmos. Environ.* **2004**, *38*(27), 4531–4538. DOI:10.1016/j.atmosenv.2004.05.022.

[70] Ravina, M.; Genon, G. Global and Local Emissions of a Biogas Plant Considering the Production of Biomethane as an Alternative End-Use Solution. *J. Cleaner Product.* **2015**, *102*, 115–126. DOI:10.1016/j.jclepro.2015.04.056.

[71] Beylot, A.; Villeneuve, J.; Bellenfant, G. Life Cycle Assessment of Landfill Biogas Management: Sensitivity to Diffuse and Combustion Air Emissions. *Waste Manage.* **2013**, *33*, 401–411. DOI:10.1016/j.wasman.2012.08.017.

[72] Pertl, A.; Mostbauer, P.; Obersteiner, G. Climate Balance of Biogas Upgrading Systems. *Waste Manage.* **2010**, *30*, 92–99. DOI:10.1016/j.wasman.2009.08.011.

[73] Petracchini, F.; Paolini, V.; Liotta, F.; Paciucci; L.; Facci, E. Vacuum Swing Adsorption on Natural Zeolites from Tuffs in a Prototype Plant. *Environ. Prog. Sustainable Dev.* **2017b**, *36*(3), 887–894. DOI:10.1002/ep.12530.

[74] Starr, K.; Gabarrell, X.; Villalba, G.; Talens Peiro, L.; Lombardi, L. Potential CO2 Savings Through Biomethane Generation from Municipal Waste Biogas. *Biomass Bioenergy* **2014**, *62*, 8–16. DOI:10.1016/j.biombioe.2014.01.023.

[75] Nilsson Påledal, S.; Arrhenius, K.; Moestedt, J.; Engelbrektsson, J.; Stensen, K. Characterisation and Treatment of VOCs in Process Water from Upgrading Facilities for Compressed Biogas (CBG). *Chemosphere* **2016**, *145*, 424–430. DOI:10.1016/j.chemosphere.2015.11.083.

[76] EMEP/EEA (European Monitoring and Evaluation Programme; European Environmental Agency). Emission inventory guidebook 2016. Section 1.A.3.b.iii Heavy-duty vehicles including buses. Available at https://www.eea.europa.eu/publications/emep-eea-guidebook-2016 (Accessed January **2018**).

[77] Semple, S.; Apsley, A.; Wushishi, A.; Smith, J. Commentary: Switching to Biogas What Effect Could It Have on Indoor Air Quality and Human Health? *Biomass Bioenergy* **2014**, *10*, 125–129. DOI:10.1016/j.biombioe.2014.01.054.

Exhibit 19

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

DATE STAMPED JUNE 21, 2017

Mr. Louis DiBerardinis
Director of EHS Office
Massachusetts Institute of Technology
N52-496
77 Massachusetts Avenue
Cambridge, MA 02139-4307

RE: **CAMBRIDGE**
Transmittal No.: X262144
Application No.: NE-15-018
Class: OP
FMF No. 314888; RO No. 314889
AIR QUALITY PLAN APPROVAL

Dear Mr. DiBerardinis:

The Massachusetts Department of Environmental Protection (MassDEP or Department), Bureau of Air and Waste, has reviewed the Massachusetts Institute of Technology (MIT or Facility) Major Comprehensive Plan Application (Application) listed above, dated December, 2015. This Application concerns the proposed construction and operation of two nominal 22 megawatt (MW) combined heat and power (CHP) units, each consisting of a combustion turbine generator (CTG) with an associated heat recovery steam generator (HRSG) equipped with a natural gas-fired duct burner (DB), to be located in a building that will be constructed on Albany Street at the site of an existing surface parking lot on the Cambridge, Massachusetts campus, between MIT Building N16 at 60 Albany Street and MIT's existing Albany Parking Garage at 32 Albany Street. The new building will be designated as MIT Building 42C.

Your Application also involves the proposed construction and operation of a 2 MW Ultra-Low Sulfur Distillate (ULSD)-fired emergency engine to be operated in the event of a power outage in order to start the proposed combustion turbines. In addition, your Application proposes to cease the burning of the higher polluting residual fuel oil in your existing boilers, BLR-42-3, BLR-42-4, and BLR-42-5, in favor of committing to burn natural gas as the primary fuel with limited ULSD as a backup fuel in said boilers and to also significantly reduce the quantity of allowable backup ULSD firing in your existing boilers BLR-42-7 and BLR-42-9. Collectively these changes at your Facility are referred to by MIT as the Combustion Turbine Expansion Project (hereinafter referred to as "Project" for purposes of this Plan Approval).

Additionally, MIT recently installed, independent of the Project, three new cooling towers, Cooling Tower 11, Cooling Tower 12, and Cooling Tower 13 and these units are also considered by MassDEP as part of the Project.

The December 2015 Application was revised and resubmitted in May 2016 and on December 21, 2016 and insert pages were submitted on March 31, 2017. The Application bears the seal and signature of Andrew Jablonowski, P.E., Massachusetts Registered Professional Engineer number 39123.

This Application was submitted in accordance with 310 Code of Massachusetts Regulations (CMR) 7.02 Plan Approval and Emission Limitations as contained in 310 CMR 7.00 "Air Pollution Control" regulations adopted by MassDEP pursuant to the authority granted by Massachusetts General Laws, Chapter 111, Section 142 A-O, Chapter 21C, Section 4 and 6, and Chapter 21E, Section 6. MassDEP's review of your Application has been limited to air pollution control regulation compliance and does not relieve you of the obligation to comply with any other regulatory requirements.

MassDEP has determined that the Application is administratively and technically complete and that the Application is in conformance with the Air Pollution Control regulations and current air pollution control engineering practice, and hereby grants this Plan Approval for said Application, as submitted, subject to the conditions listed below.

This Plan Approval allows for construction and operation of the Project and provides information on the Project description, emission control systems, emissions limits, Continuous Emissions Monitoring Systems (CEMS), Continuous Opacity Monitoring Systems (COMS), monitoring/testing, record keeping, and reporting requirements as well as applicable special conditions.

On April 11, 2011, MassDEP and the U.S. Environmental Protection Agency Region 1 (EPA) executed an agreement regarding the Federal Prevention of Significant Deterioration of Air Quality (PSD) titled "Agreement for Delegation of the Federal PSD program by EPA to MassDEP" (PSD Delegation Agreement). This PSD Delegation Agreement directs that all Permits issued by MassDEP under the Agreement follow the applicable procedures in 40 CFR 52.21 and 40 CFR Part 124 regarding permit issuance, modification and appeals. MIT's Project triggers PSD review for particulate matter (PM) including PM having a diameter of less than or equal to 10 microns (PM_{10}) and PM having a diameter of less than or equal to 2.5 microns ($PM_{2.5}$), collectively referred to as PM/PM_{10}/ $PM_{2.5}$, and greenhouse gases (GHG) expressed as carbon dioxide equivalents (CO_2e). Therefore, MassDEP is concurrently issuing a separate PSD Permit for emissions of those pollutants as well as an accompanying PSD Fact Sheet for the Project.

The PSD Fact Sheet for the PSD Permit is attached to this Plan Approval. The Fact Sheet explains MassDEP's evaluation of Best Available Control Technology (BACT) for PSD-applicable emissions of PM/PM_{10}/$PM_{2.5}$ and GHG expressed as CO_2e, of air quality impacts, and of other special considerations of PSD review.

Pursuant to 310 CMR 7.02(3)(j)6., the emission limits in MassDEP's approval of the Project must represent the most stringent emission limit as specified in 310 CMR 7.02(8). Under 310 CMR 7.02(8)(a)2., such limits must represent BACT. Under 310 CMR 7.00 Definitions,

> BEST AVAILABLE CONTROL TECHNOLOGY means an emission limitation based on the maximum degree of reduction of any regulated air contaminant emitted from or which results from any regulated facility which the Department, on a case-by-case basis taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems and techniques for control of each such contaminant. The best available control technology determination shall not allow emissions in excess of any emission standard established under the New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants or under any other applicable section of 310 CMR 7.00, and may include a design feature, equipment specification, work practice, operating standard, or combination thereof.

As such, MIT has provided, in the application, a BACT analysis for the subject Emission Units which are proposed to be installed and operated (two nominal 22 MW CHP units, each consisting of a CTG with an associated HRSG and one 2 MW ULSD-fired emergency engine). MassDEP has reviewed said BACT analysis and has established BACT emission rates for the PSD and non-PSD subject air contaminants that are regulated by this Plan Approval including: nitrogen oxides (NO_X), volatile organic compounds (VOC), carbon monoxide (CO), PM/PM_{10}/$PM_{2.5}$, sulfur dioxide (SO_2), sulfuric acid mist (H_2SO_4), GHG expressed as CO_2e, and ammonia (NH_3). The BACT determinations contained in this Plan Approval, as applicable to the two nominal 22 MW CHP units (each consisting of a CTG with an associated HRSG) and one 2 MW ULSD-fired emergency engine conform to MassDEP's regulations and guidance and result in BACT emission limits consistent with those established and published in EPA's RACT/BACT/LAER Clearinghouse (RBLC) and BACT determinations made in Massachusetts.

Please review the entire Plan Approval, as it stipulates the conditions with which the owner/operator (Permittee) must comply in order for the Project to be operated in compliance with this Plan Approval.

1. DESCRIPTION OF FACILITY AND APPLICATION

MIT currently operates its Central Utilities Plant (CUP), which includes one 21 MW CTG with an associated HRSG equipped with duct burner, one 2 MW emergency generator, BLR-42-3, BLR-42-4, and BLR-42-5, all located in MIT Building 42 at 59 Vassar Street in Cambridge. In addition, MIT operates, as part of the CUP, two additional boilers, BLR-42-7 and BLR-42-9, in MIT Building N16, located to the rear of the CUP, at 60 Albany Street, and seven cooling towers also located near the CUP between Vassar and Albany Streets. The emission units currently operated by MIT's CUP are described in Table 1 below:

Table 1: Existing Central Utility Plant Emission Units			
EU	Description of EU	EU Design Capacity	Post-Project Status
GT-42-1A	ASEA Brown Boveri GT10 Combustion Turbine Generator	229 MMBtu/hr input 21 megawatt output	Unit will be permanently **removed** from service.
HRSG-42-1B	Applied Thermal Systems Supplementary-fired Heat Recovery Steam Generator	210.7 MMBtu/hr input total, of which 64.7 MMBtu/hr is input from duct burner firing	Unit will be permanently **removed** from service.
BLR-42-3	Wickes Type R Boiler	116.2 MMBtu/hr input	Unit will remain; switch from natural gas and No. 6 fuel oil firing capability to natural gas as primary fuel with ULSD as limited backup fuel and with decreased total allowable fuel oil usage.
BLR-42-4	Wickes Type R Boiler	116.2 MMBtu/hr input	Unit will remain; switch from natural gas and No. 6 fuel oil firing capability to natural gas as primary fuel with ULSD as limited backup fuel and with decreased total allowable fuel oil usage.
BLR-42-5	Riley Type VP Boiler	145.2 MMBtu/hr input	Unit will remain; switch from Natural gas and No. 6 fuel oil firing capability to natural gas as primary fuel with ULSD as limited backup fuel and with decreased total allowable fuel oil usage.
BLR-42-7	Indeck boiler	99.7 MMBtu/hr input	Unit will remain; natural gas as primary fuel with ULSD as limited backup fuel and with decreased total allowable fuel oil usage.

Table 1: Existing Central Utility Plant Emission Units			
EU	Description of EU	EU Design Capacity	Post-Project Status
BLR-42-9	Rentech Model 0	119.2 MMBtu/hr input (ULSD) 125.8 MMBtu/hr input (Natural gas)	Unit will remain; natural gas as primary fuel with ULSD as limited backup fuel and with decreased total allowable fuel oil usage.
DG-42-6	Caterpillar 3516 Diesel Generator	20.2 MMBtu/hr input 2 megawatt output	Unit will remain
Cooling Tower 7	Wet mechanical cooling towers	varies	Unit will remain
Cooling Tower 8			Unit will remain
Cooling Tower 9			Unit will remain
Cooling Tower 10			Unit will remain
Cooling Tower 11			Unit will remain
Cooling Tower 12			Unit will remain
Cooling Tower 13			Unit will remain

Table 1 Key:
EU = Emission Unit
MMBtu/hr = 1,000,000 British thermal units per hour
ULSD = Ultra-Low Sulfur Distillate, having a sulfur content of no more than 0.0015 percent by weight

MIT's proposed Project includes the construction and operation of two new nominal 22 MW Solar Titan 250 CTGs, identified as CTG 200 and CTG 300, which will each utilize natural gas as the primary fuel with ULSD as a limited backup fuel including no more than 48 hours per consecutive twelve month period (C12MP) for testing and no more than 168 hours per C12MP including testing and during periods when natural gas is unavailable or unable to be burned in the equipment. Combustion exhaust gases from each of the proposed CTGs, CTG 200 and CTG 300, will pass through its own associated HRSG, identified as HRSG 200 and HRSG 300, respectively. As such the two proposed CHPs are referred to as CTG 200/HRSG 200 and CTG 300/HRSG 300. Each HRSG will be equipped with supplementary firing capability via a natural gas-fired DB having a maximum design input rating of 134.0 million British thermal units (MMBtu) per hour (MMBtu/hr). Each HRSG's DB will be solely natural gas-fired without any backup fuel firing capability whatsoever. Each CTG will feature a Dry Low NO_X (DLN) combustor during both natural gas and limited backup ULSD firing for control of NO_X. Each HRSG will be equipped with

a selective catalytic reduction (SCR) system for post-combustion control of NO_X and with an oxidation catalyst for post-combustion control of both CO and VOC. The two proposed CHPs, CTG 200/HRSG 200 and CTG 300/HRSG 300, will be housed entirely within a building to be designated as MIT Building 42C, which will be constructed at the site of an existing ground level parking lot between Albany and Vassar Streets near the rear of the existing CUP. In addition to the construction and operation of CTG 200/HRSG 200 and CTG 300/HRSG 300, the Project includes the construction and operation of one 2 MW ULSD-fired emergency engine, identified by MIT as Cold Start Engine, which will be housed on the roof of Building 42C. Though independent of the Project, three new cooling towers, identified as Cooling Tower 11, Cooling Tower 12, and Cooling Tower 13 were recently installed in 2016 to the rear of the CUP and emissions from said units are included in the emission calculations and air dispersion modeling and, as such, they are considered part of the Project.

In addition to the above-mentioned installations, the Project also proposes specific alterations to the current operating scenarios of certain existing CUP emission units. Specifically the Project includes switching to a less polluting fuel use scenario in existing CUP boilers, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7 and BLR-42-9. Boilers BLR-42-3, BLR-42-4, and BLR-42-5 will each switch from their current capability of burning either No.6 residual oil or natural gas to the capability of burning natural gas as the primary fuel with ULSD as the only backup fuel for no more than 48 hours per C12MP for testing and for no more than 168 hours per C12MP including testing and when natural gas is unavailable or unable to be burned in the equipment. In addition to the fuel oil usage restriction in BLR-42-3, BLR-42-4, and BLR-42-5, the Project also includes imposing a more stringent fuel oil restriction in two other existing boilers, BLR-42-7 and BLR-42-9. Currently BLR-42-7 and BLR-42-9 are each permitted to burn ULSD for a maximum of 720 hours per C12MP. The alteration to their operating scenario as a result of the Project will reduce allowable ULSD firing in each boiler to no more than 48 hours of ULSD firing per C12MP for testing and to no more than 168 hours of ULSD firing per C12MP, including testing and as a backup fuel when natural gas is unavailable or unable to be burned in the equipment.

One dedicated extractive CEMS shall be installed and operated on each of the two CHPs, CTG 200/HRSG 200 and CTG 300/HRSG 300, to continuously sample, analyze and record NO_X, CO and NH_3 concentration levels plus the percentage of oxygen (O_2) in each of the HRSGs exhausts. There will be no bypass of its associated HRSG from either CTG such that NO_X emissions from each CTG shall be controlled by its associated SCR and CO and VOC emissions from each CTG shall be controlled by its associated oxidation catalyst. Each CEMS shall have an associated data acquisition and handling system (DAHS) to collect, record, and process each CHP's air emissions data and to calculate the air emissions in units of parts per million, pounds per hour and pounds per MMBtu heat input.

As of issuance of this Plan Approval, MIT has not submitted a Quality Assurance and Quality Control (QA/QC) Plan to describe detailed, complete, step-by-step procedures and operations for activities relating to the CEMS. MIT shall be required to submit such a Plan ninety (90) days prior to commencement of operation of the subject Emission Units. Please see Table 10, Reporting Requirements of this Approval.

2. EMISSION OFFSETS AND NONATTAINMENT REVIEW

MassDEP evaluated whether the Emission Offsets and Nonattainment Review provisions of 310 CMR 7.00 Appendix A apply to the Project.

310 CMR 7.00: Appendix A: Emission Offsets and Nonattainment Review applies to a new major source or major modification of an existing major source located in a non-attainment area; or a new major source or major modification for NO_X or VOC emissions anywhere in Massachusetts, with applicability determined separately for NO_X and VOC. The Facility is not located in a nonattainment area. With respect to NO_X and/or VOC emissions, Appendix A applies for a new major source of 50 or more tons per year (TPY) or a major modification of an existing major source that causes a net emissions increase of 25 TPY.

MIT is an existing major source of NO_X emissions. As such, the proposed Project must be evaluated to determine potential applicability of Non-Attainment New Source Review for NO_X under Regulation 310 CMR 7.00: Appendix A. The proposed permitted emissions increase from this Project is 26.4 tons per year for NO_X. However, Regulation 310 CMR 7.00: Appendix A provides for calculating a Project's net emissions increase of NO_X by accounting for increases and decreases in emissions in order to determine applicability. MIT provided an analysis to determine the net emissions increase of NO_X in Appendix B of their Application for the Project. As illustrated therein, in addition to the emissions increase of 26.4 tons per year from the Project, MIT accounted for all other increases and decreases in NO_X emissions over the contemporaneous period for the Project, 2016-2020. MIT is a dynamic campus, installing and removing combustion equipment as campus needs dictate, and therefore maintains a tracking procedure in order to monitor Facility-wide changes in NO_X emissions over time. As such, MIT demonstrated in its Application that, over the 5 year period applicable to Nonattainment Review for NO_X for operation of the Project, the emissions increase in NO_X from this Project in addition to other increases amount to 62.43 tons NO_X and the decreases in NO_X emissions amount to 52.95 tons which results in a net NO_X emission increase of 9.48 tons which is considerably less than the applicability threshold of 25 tons. Therefore the proposed Project does not trigger Non-Attainment New Source Review for NO_X and, as such, is not subject to Regulation 310 CMR 7.00: Appendix A.

MIT is not an existing major source of VOC emissions and proposed VOC emissions from this Project are less than 25 tons per year. Therefore the proposed Project does not trigger Non-Attainment New Source Review for VOC and, as such, is not subject to Regulation 310 CMR 7.00: Appendix A.

3. AIR QUALITY IMPACT ANALYSIS

The EPA has promulgated National Ambient Air Quality Standards (NAAQS) for six air contaminants known as criteria pollutants for the protection of public health and welfare. MassDEP has also promulgated Massachusetts Ambient Air Quality Standards (MAAQS) for the same six pollutants, but has not updated the MAAQS recently. The criteria pollutants are Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Particulate Matter (PM_{10} and $PM_{2.5}$), Carbon Monoxide (CO), Ozone (O_3), and Lead (Pb). The NAAQS and MAAQS include both primary and secondary

standards of different averaging periods. The primary standards protect public health and the secondary standards protect public welfare, such as damage to property or vegetation.

MassDEP holds that a demonstration of compliance with the NAAQS is sufficient to assure compliance with the MAAQS, except for the 24-hour and annual SO_2 MAAQS and annual PM_{10} MAAQS, which averaging periods are no longer regulated by the NAAQS.

Pursuant to 310 CMR 7.02(3)(j)1., the emission limits in MassDEP's approval of the Project must ensure that the emissions from the Project and the Facility do not result in air quality exceeding either the Massachusetts or National Ambient Air Quality Standards.

Under PSD review, new major sources and major modifications of existing sources are required to use air quality dispersion modeling to predict the air quality impact of their new emissions with respect to pollutants subject to PSD review. MassDEP's June 2011 Modeling Guidance for Significant Stationary Sources of Air Pollution establishes thresholds for prescriptive modeling requirements that apply to the Project, regardless of PSD review. Furthermore, for PSD review and for non-PSD pollutants, modeling related to 310 CMR 7.02 Plan Approvals, as the Massachusetts EPA-approved new source review regulation, must conform to 40 CFR 51 Appendix W, Guideline on Air Quality Models, and associated EPA guidance. Emissions from new major sources and major modification must not cause or contribute to an exceedance of the NAAQS or MAAQS.

MassDEP also requires modeling for non-PSD-regulated pollutant emissions under 310 CMR 7.02 at projects that trigger PSD review.For this Project, the Application includes the analyses required to demonstrate compliance with the MassDEP Ambient Air Toxics Guidelines. The sections below describe those analyses.

Modeling Approach

MIT used dispersion modeling analyses to assess the Facility's and the Project's air impacts of criteria air pollutants and air toxics against applicable significant impact levels (SILs), NAAQS, MAAQS, and MassDEP's Threshold Effects Exposure Limits (TELs) and Allowable Ambient Levels (AALs) Guideline values for air toxics. These analyses were conducted in accordance with EPA's "Guideline on Air Quality Models" (November 2005) and MassDEP's "Modeling Guidance for Significant Stationary Sources of Air Pollution" (June 2011) and as described in the Air Quality Modeling Protocol submitted to MassDEP (June 2015).

MIT used the EPA-recommended AERMOD model (AERMOD version 15181, AERMAP version 11103, and AERMET version 15181) to perform the dispersion modeling. MIT conducted dispersion modeling in a manner that evaluated emissions over a range of operating conditions in an effort to identify the worst case operating scenarios, that is, those that result in the highest predicted ambient impact for each pollutant and averaging period.

Below is the recommendation from MassDEP's modeling guidance:

For existing facilities, "*If maximum predicted impacts of a pollutant due to proposed emission increases from the existing facility are below applicable SILs, the predicted emissions from the modification are considered to be in compliance with the NAAQS for that pollutant. However, a compliance demonstration may be required to ensure that the combined emissions from the existing facility and the modification will not cause or contribute to a NAAQS violation for that pollutant.*"

In accordance with this guidance, the Project's emissions (i.e., the proposed modification) were modeled for comparison to the SILs (results shown in Table 2) and the emissions from the future configuration of the entire facility were modeled for comparison to the NAAQS (results shown in Table 3). As the Project's impacts from 1-hr NO_2, annual NO_2, 24-hr PM_{10}, 24-hr $PM_{2.5}$ and annual $PM_{2.5}$, were greater than the SIL; the Project's impacts along with emissions from the future configuration of the entire CUP were modeled along with nearby interactive sources in a cumulative analysis for comparison to the NAAQS (results shown in Table 4).

MIT used five years (2010 through 2014) of surface Automated Surface Observing System (ASOS) data collected by the National Weather Service (NWS) from the Logan Airport weather station in Boston, Massachusetts and the corresponding upper air data from the Gray, Maine station in the dispersion modeling. The Logan Airport station is located approximately 4.0 miles to the east of MIT and is the closest first order NWS station to the facility. This surface station is representative of the Project area since they are in close proximity and therefore are exposed to the same weather systems and conditions such as urban heat island effects and coastal air-land-sea interactions. The upper air station in Gray, Maine is the most representative upper station for the Boston area. The meteorological data was processed by MIT using the latest versions of U.S. EPA AERMINUTE (version 14337), AERSURFACE (version 13016) and AERMET (version 15181). The Applicant used default processing options in the AERMET processing for this analysis. The preferred ASOS 1-minute wind data was used in the processing to reduce the number of calm hours input to the model.

MIT characterized land use within a 3 kilometer radius of the Facility as urban and therefore used urban dispersion coefficients in the dispersion modeling.

For 1-hr NO_2 impacts the plume volume molar ratio method was utilized (PVMRM); a non-default methodology for determining the conversion rate for NO_x to NO_2 based on the calculation of NO_x moles emitted into the plume, and the amount of O_3 moles contained within the volume of the plume between the source and the receptor. Use of this methodology requires regulatory pre-approval which was sought and granted by MassDEP on October 19th 2015. For annual NO_2 impacts the ambient ratio method (ARM) was used.

For 24-hour $PM_{2.5}$, the Tier 2 approach which uses the 98th percentile seasonal concentration averaged over three years as the background concentration was utilized. The range of seasonal 24-hour background concentrations input to the model were 16.9 (winter), 16.8 (spring), 16.3 (summer) and 12.5 $\mu g/m^3$ (fall).

The modeling predicted air quality concentration impacts on a nested Cartesian coordinate receptor grid extending 10 kilometers from the Facility's main stack (CUP stack). Receptors are discrete points that represent a specific location on a coordinate grid. MIT used a total of 2,415 receptors in the dispersion modeling analysis. The spacing of the receptors ranged from 20 meters close to the MIT facility and increased to 1,000 meters beyond 5 kilometers. This means the receptor field was denser (i.e., more receptors per unit of area) closer in to the facility and less dense with increasing distance away from the facility. The denser part of the grid covered the surrounding area including most of Cambridge and parts of Boston.

Significant Impact Analysis

The first part of the analysis was to predict which pollutants at which averaging times have more than a 'significant' impact on air quality. To identify new pollution sources with the potential to alter significantly ambient air quality, the EPA and MassDEP have adopted "significant impact levels" for the criteria pollutants except ozone and lead. If the predicted impact of the new or modified emission source is less than the SIL for a particular pollutant and averaging period, and the difference between background ambient air quality and the NAAQS is greater than the SIL, then no further evaluation is needed for that pollutant and averaging period. However, if the predicted impact of the new or modified emission source is equal to or greater than the SIL for a particular pollutant and averaging period, then further impact evaluation is required. This additional evaluation must include measured background levels of pollutants, as well as emissions from both the proposed new or modified source and any existing emission sources that may interact with emissions from the proposed new emissions source (referred to as facility-wide and cumulative modeling).

To determine the operating scenario that results in the highest impact for each pollutant and averaging period, the modeling analysis includes the operation of the proposed CTGs and HRSGs at fourteen different operating conditions. The operating conditions were defined by the following parameters: two fuels - natural gas and ULSD, three ambient temperatures – 0, 50, and 60 °F, and five operating loads – 100%, 75%, 65%, 50%, and 40%, plus duct burners on and off. Of the

fourteen sets of results for each pollutant and averaging period, the maximum is compared to the respective SIL and carried forward for comparison to NAAQS and MAAQS if necessary.

Table 2 presents the maximum predicted ambient air quality impacts for the Project (new sources only). Results are presented in concentrations of micrograms per cubic meter ($\mu g/m^3$). For each pollutant and averaging period, it shows the overall maximum predicted Project impact, the SIL, percent of SIL, and operating case. The Project is predicted to have maximum ambient air quality impact concentrations well below SILs for SO_2 and CO for all averaging periods. Maximum impacts are over the SILs for 1-hour and annual NO_2, 24-hour and annual $PM_{2.5}$ and 24-hour PM_{10}.

Table 2 – Results of Significant Impact Level Analysis

Criteria Pollutant	Averaging Period	Significant Impact Level ($\mu g/m^3$)	Maximum Predicted Project Impact [1] ($\mu g/m^3$)	Above SIL?	Operating Case (CTG/HRSG)
NO_2	Annual	1	1.57	**Yes**	NG/ULSD, 60F, 100%, On
	1-Hour	7.5	15.6	**Yes**	ULSD, 0F, 100%, On
SO_2	Annual	1	0.15	No	NG/ULSD, 60F, 100%, On
	24-Hour	5	1.62	No	NG, 60F, 75%, On
	3-Hour	25	2.0	No	NG, 50F, 100%, On
	1-Hour	7.8	2.4	No	NG, 50F, 100%, On
$PM_{2.5}$	Annual	0.3	0.98	**Yes**	NG/ULSD, 60F, 100%, On
	24-Hour	1.2	10.1	**Yes**	ULSD, 0F, 100%, On
PM_{10}	24-Hour	5	14.2	**Yes**	ULSD, 60F, 75%, On
CO	8-Hour	500	7.9	No	ULSD, 60F, 100%, On
	1-Hour	2,000	10.2	No	ULSD, 60F, 75%, On

Table 2 Notes:

1. Maximum predicted Project impacts are the overall highest result in $\mu g/m^3$ output by AERMOD for each respective averaging time.

Table 2 Key:

SIL = Significant Impact Level
NO_2 = Nitrogen Dioxide
SO_2 = Sulfur Dioxide
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter
PM_{10} = Particulate Matter less than or equal to 10 microns in diameter
CO = Carbon Monoxide
NG = Natural Gas
ULSD = Ultra Low Sulfur Diesel Fuel
$\mu g/m^3$ = micrograms per cubic meter
F = degrees Fahrenheit
% = percent
On = duct burners on
CTG/HRSG = combustion turbine generator/heat recovery steam generator

Facility-Wide Modeling Analysis

In accordance with MassDEP modeling guidance, MIT used dispersion modeling to assess the air quality impacts from the entire future configuration of the Facility, all pollutants over all averaging times, including both the existing emission sources and all proposed new sources for comparison to the NAAQS. MIT added these model-predicted impacts to background levels of air quality. MIT used the MassDEP air quality monitoring station closest to and most representative of the Facility, Kenmore Square in Boston, which is only approximately 0.9 miles south of the Facility for representative background air quality. All pollutants are measured at Kenmore Square and the urban environment surrounding the station is similar to the urban environment in Cambridge near the MIT CUP. The actual background values used in the analysis were derived from three years of data recorded over the period from 2012-2014. The same operating cases as shown in Table 2 for each pollutant and averaging period are carried forward for the facility-wide modeling.

Table 3 presents a summary of the facility-wide NAAQS analysis results showing the cumulative impact of both the new and existing sources at MIT when added to background air quality. Results are presented in concentrations of micrograms per cubic meter (ug/m^3). For each pollutant and averaging period, it shows the maximum predicted Facility impact in the form of the standard, the background concentration, the total impact (modeled-predicted impact plus background), the primary and secondary NAAQS, and percent of primary NAAQS.

As shown in Table 3, the future configuration of the Facility is predicted to have maximum ambient air quality impact concentrations below the NAAQS for all pollutants and averaging periods. The results in the table represent worst-case impacts over the entire receptor grid, including the densely spaced receptors in the immediate surrounding neighborhoods. Accordingly, it can be concluded that the NAAQS will remain protected with the addition of the MIT Project, and therefore, the public health and welfare remained protected, even to residents in adjacent neighborhoods.

Table 3 – Results of Facility-Wide Modeling Analysis

Criteria Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Maximum Predicted Facility Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Percent NAAQS (%)
NO_2	Annual [1]	100	Same	4.05	46.2	50.25	50
	1-Hour [2]	188	None	92.7	73.7	166.4	89
SO_2	Annual [(1,3)]	80	None	0.22	4.9	5.1	6
	24-Hour [(3,4)]	365	None	1.7	15.7	17.4	5
		None	1,300	2.7	36.4	39.1	3
	3-Hour [3]	196	None	3.0	23.3	26.3	13
	1-Hour [(5,6)]						
$PM_{2.5}$	Annual [7]	12	Same	1.9	7.7	9.6	80
	24-Hour [8]	35	Same	16.9	16.7	33.6	96
PM_{10}	24-Hour [9]	150	Same	23.6	53.0	76.6	51

Table 3 – Results of Facility-Wide Modeling Analysis							
Criteria Pollutant	**Averaging Period**	**Primary NAAQS ($\mu g/m^3$)**	**Secondary NAAQS ($\mu g/m^3$)**	**Maximum Predicted Facility Impact ($\mu g/m^3$)**	**Background Concentration ($\mu g/m^3$)**	**Total Impact ($\mu g/m^3$)**	**Percent NAAQS (%)**
CO	8-Hour [3]	10,000	None	38.5	1260.2	1298.7	13
	1-Hour [3]	40,000	None	57.0	1962.4	2019.4	5
O_3	8-Hour [10]	147	Same	NA	NA	NA	NA
Pb	3-Month [1]	0.15	Same	0.00376	NA	0.00376	3

Table 3 Notes:

1. Not to be exceeded.
2. Compliance based on 5-year average of the annual 98th percentile of the daily maximum 1 hour average at each modeled receptor. The 1 hour NO_2 standard was effective April 12, 2010.
3. EPA has indicated that the 24 hour and annual average primary standards for SO_2 will be revoked.
4. Not to be exceeded more than once per year.
5. Compliance based on 5-year average of the annual 99th percentile of the daily maximum 1 hour average at each modeled receptor.
6. The 1 hour SO_2 standard was effective as of August 23, 2010.
7. Compliance based on 5-year average of annual arithmetic mean $PM_{2.5}$ concentrations at each modeled receptor.
8. Compliance based on 5-year average of the annual 98th percentile of 24 hour concentrations at each modeled receptor.
9. Not to be exceeded more than once per year on average over 3 years.
10. Compliance based on 3-year average of fourth highest daily maximum 8 hour average ozone concentrations measured at each monitor within an area.

Table 3 Key:

NAAQS = National Ambient Air Quality Standards
EPA = United States Environmental Protection Agency
NO_2 = Nitrogen Dioxide
SO_2 = Sulfur Dioxide
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter
PM_{10} = Particulate Matter less than or equal to 10 microns in diameter
CO = Carbon Monoxide
O_3 = Ozone
Pb = Lead
$\mu g/m^3$ = micrograms per cubic meter
NA = Not Applicable
% = percent

Cumulative Source Analysis

Modeled impacts from the proposed modification are below SILs for SO_2 and CO for all averaging times; therefore, a cumulative analysis including potential nearby interacting sources is only required for $PM_{2.5}$, PM_{10} and NO_2. Therefore, MIT performed a cumulative source analysis where the impacts from the facility were considered in conjunction with nearby significant sources of air pollution. The following nearby sources were included for the pollutants noted:

- Kendall Station (1.2 km) - NO_2, PM_{10} and $PM_{2.5}$
- Blackstone Steam Plant (1.8 km) - NO_2, PM_{10} and $PM_{2.5}$
- MATEP (3.0 km) - NO_2, PM_{10} and $PM_{2.5}$
- Exelon Mystic (3.8 km) - NO_2, PM_{10} and $PM_{2.5}$
- Logan Airport Central Boilers (5.9 km) – NO_2 only
- Veolia Kneeland Street Plant (3.2 km) – NO_2 only

The results of the cumulative analysis are shown in Table 4. Results are presented in concentrations of micrograms per cubic meter ($\mu g/m^3$). For each pollutant and averaging period, it shows the maximum predicted Facility impact in the form of the standard, the interactive source contribution, the background concentration, the total impact (modeled-predicted impacts plus background), the primary and secondary NAAQS, and percent of primary NAAQS.

As shown in Table 4, the cumulative results show the future configuration of the Facility along with significant nearby sources are predicted to have maximum ambient air quality impact concentrations below the NAAQS for all pollutants and averaging periods. The results in the table represent worst-case impacts over portions of the receptor grid where impacts from the Project were significant (i.e., Project only impacts greater than or equal to the SIL). Accordingly, it can be concluded that the NAAQS will remain protected with the addition of the MIT Project, and therefore, the public health and welfare remained protected, even to residents in adjacent neighborhoods.

Table 4 – Results of Cumulative Modeling Analysis

Criteria Pollutant	Averaging Period	Primary NAAQS ($\mu g/m^3$)	Secondary NAAQS ($\mu g/m^3$)	Maximum Predicted Facility Impact ($\mu g/m^3$)	Interactive Source Contribution ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Percent NAAQS (%)
NO_2	Annual [1]	100	Same	4.1	4.1	46.2	54.4	54
	1-Hour [2]	188	None	54.3	0.4	85.0	139.7	74
$PM_{2.5}$	Annual [3]	12	Same	2.34	1.0	7.7	11.0	92
	24-Hour [4]	35	Same	18.1	0.4	15.9	34.4	98
PM_{10}	24-Hour [5]	150	Same	23.6	0.1	53.0	76.7	51

Table 4 Notes:

1. Not to be exceeded.
2. Compliance based on 5-year average of the annual 98th percentile of the daily maximum 1 hour average at each modeled receptor. The 1 hour NO_2 standard was effective April 12, 2010.
3. Compliance based on 5-year average of annual arithmetic mean $PM_{2.5}$ concentrations at each modeled receptor.
4. Compliance based on 5-year average of the annual 98th percentile of 24 hour concentrations at each modeled receptor.
5. Not to be exceeded more than once per year on average over 3 years.

Table 4 Key:
NAAQS = National Ambient Air Quality Standards
NO_2 = Nitrogen Dioxide
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in diameter
PM_{10} = Particulate Matter less than or equal to 10 microns in diameter
$\mu g/m^3$ = micrograms per cubic meter

Air Toxics Analysis

MassDEP has established health based ambient air guidelines for a variety of chemicals (air toxics). These air guidelines establish two limits for each chemical listed: an Allowable Ambient Limit (AAL), which is based on an annual average concentration; and a Threshold Effects Exposure Limit (TEL), which is based on a 24-hour time period. In general, AALs represent the concentration associated with a one in one million excess lifetime cancer risk, assuming a lifetime of continuous exposure to that concentration. The TELs protect the general population from non-cancer health effects. For air toxics that do not pose cancer risks, the AAL is equal to the TEL.

Table 5 presents the projected maximum impacts for each air toxic that will potentially be emitted by the Project at MIT for which an AAL or TEL has been established. Predicted impacts are based on the worst case emission scenarios input to AERMOD. As shown in Table 5, the Project's maximum predicted ambient air quality impact concentrations were significantly below applicable AALs and TELs for all of the air toxics modeled. Accordingly, it can be concluded that residents in adjacent neighborhoods will not be exposed to air toxic compounds above the AALs/TELs from emissions from the MIT Project.

Table 5[1] – Results of Air Toxics Modeling

Pollutant	Averaging Period	AAL/TEL ($\mu g/m^3$)	Maximum Predicted Project Impact ($\mu g/m^3$)
Acetaldehyde	24-Hour (TEL) Annual (AAL)	30 0.4	1.20E-2 1.09E-3
Acrolein	24-Hour (TEL) Annual (AAL)	0.07 0.07	2.12E-3 1.76E-4
Benzene	24-Hour (TEL) Annual (AAL)	0.6 0.1	8.21E-2 1.05E-3
1,3-Butadiene	24-Hour (TEL) Annual (AAL)	1.20 0.002	4.29E-3 2.18E-5
o-Dichlorobenzene	24-Hour (TEL) Annual (AAL)	81.74 81.74	3.51E-4 2.50E-5
Ethylbenzene	24-Hour (TEL) Annual (AAL)	300 300	8.56E-3 8.70E-4
Formaldehyde	24-Hour (TEL) Annual (AAL)	2 0.08	2.16E-1 1.17E-2
Hexane	24-Hour (TEL) Annual (AAL)	95.24 47.62	5.26E-1 3.74E-2

Table 5[1] – Results of Air Toxics Modeling			
Pollutant	**Averaging Period**	**AAL/TEL ($\mu g/m^3$)**	**Maximum Predicted Project Impact ($\mu g/m^3$)**
Naphthalene	24-Hour (TEL) Annual (AAL)	14.25 14.25	1.65E-2 1.80E-4
Propylene Oxide	24-Hour (TEL) Annual (AAL)	6 0.3	7.75E-3 7.89E-4
Toluene	24-Hour (TEL) Annual (AAL)	80 20	5.03E-2 3.67E-3
Xylenes	24-Hour (TEL) Annual (AAL)	11.80 11.80	2.71E-2 1.78E-3
Arsenic	24-Hour (TEL) Annual (AAL)	0.003 0.0003	5.84E-5 5.51E-6
Beryllium	24-Hour (TEL) Annual (AAL)	0.001 0.0004	3.51E-6 4.64E-7
Cadmium	24-Hour (TEL) Annual (AAL)	0.003 0.001	3.21E-4 2.31E-5
Chromium (total)	24-Hour (TEL) Annual (AAL)	1.36 0.68	4.09E-4 3.09E-5
Lead	24-Hour (TEL) Annual (AAL)	0.14 0.07	3.76E-3 7.64E-6
Mercury (elemental)	24-Hour (TEL) Annual (AAL)	0.14 0.07	3.80E-4 5.54E-4
Nickel	24-Hour (TEL) Annual (AAL)	0.27 0.18	1.70E-3 4.45E-5
Selenium	24-Hour (TEL) Annual (AAL)	0.54 0.54	6.71E-3 3.69E-6

Table 5 Notes:

1. Air toxics do not have a NAAQS, with the exception of lead. Modeled values for lead are well below the NAAQS standard of 0.15 $\mu g/m^3$.

Table 5 Key:

AAL = Allowable Ambient Limit
TEL = Threshold Effects Exposure Limit
NAAQS = National Ambient Air Quality Standards
$\mu g/m^3$ = micrograms per cubic meter
E- = exponential to the negative power
E+ = exponential to the positive power

4. ENVIRONMENTAL JUSTICE

Title VI of the federal Civil Rights Act of 1964 applies to all recipients of federal financial assistance. The Executive Office of Energy and Environmental Affairs (EOEEA) is a recipient of federal financial assistance for the administration of the Department's air pollution control program. Section 601 of Title VI provides that:

No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance.

On October 2, 2002, EOEEA adopted an Environmental Justice Policy (EJ Policy) that requires the Department to make environmental justice an integral consideration in the implementation and enforcement of laws, regulations, and policies as a way to comply with Title VI of the federal Civil Rights Act of 1964.

EOEEA, in the July 1, 2016 MEPA Certificate for the MIT Project, concluded that the Project exceeds an Environmental Impact Report (EIR) threshold for air and is located within five miles of designated Environmental Justice (EJ) populations. Therefore, the Project is subject to the EJ Policy which requires enhanced public participation and enhanced analysis of impacts and mitigation under MEPA.

MIT's enhanced public participation has included publishing public notices in multiple languages for both the Expanded Environmental Notification Form (EENF) and the Single Environmental Impact Report (SEIR) which were filed under the Massachusetts Environmental Policy Act (MEPA). These publications were provided in multiple languages and consisted of a Project summary and an invitation to comment on the Project to MEPA. The notifications for the EENF and the SEIR were published in English in *The Cambridge Chronicle* on January 7, 2016 and on May 26, 2016, in Spanish in *El Mundo* on January 7, 2016 and on May 19, 2016, in Chinese in *Sampan* on January 8, 2016 and on May 27, 2016, and in Portuguese in *O Jornal* on January 8, 2016 and on May 20, 2016 respectively. Electronic versions of the SEIR summary fact sheet/public notice in English as well as translated versions in Chinese, French, Portuguese, and Spanish as well as the EENF and SEIR filings were and remain posted on MIT's outreach webpage for the Project, https://powering.mit.edu. Additionally the EENF and SEIR filings were also made available at the Cambridge Public Library's Central Square Branch, located at 45 Pearl Street. A public scoping session was held on January 14, 2016 from 6:00 to 8:00 p.m. at 182 Memorial Drive in Cambridge at which MIT provided interpretation services in Spanish, Portuguese, French, and Cantonese.

Continuing with MIT's public participation efforts, in order to ensure that the local community, including minority and low-income populations, were provided ample opportunity to understand and comment on the Project, MIT published the Notice of Public Hearing and Public Comment Period on the Draft PSD Permit in English, Spanish, Portuguese, French and Chinese (Cantonese). MIT also ensured that interpreters for these languages were available at the Public Hearing. MIT posted electronic copies of the Notice of Public Hearing and Public Comment Period, Proposed

Plan Approval, Draft PSD Permit and Draft PSD Fact sheet on its website, https://powering.mit.edu.

In addition to enhanced public participation, the EJ Policy requires analysis of impacts and mitigation under MEPA. The proposed Project's ambient air impacts, combined with the pre-existing background levels, will meet the federal NAAQS which are designed to protect public health against health effects of air pollutants with a margin of safety and will therefore have no disproportionately high adverse human health or environmental impacts upon any Environmental Justice population. Further, MIT's analysis has shown that, in terms of potential air emission impacts on EJ communities, the proposed Project represents an environmental improvement over existing conditions in nearby areas, including those with minority and low-income populations.

5. EMISSION UNIT IDENTIFICATION

Each Emission Unit (EU) identified in Table 6 is subject to and regulated by this Plan Approval:

Table 6

EU	Description	Heat Rate Input Design Capacity in MMBtu/hr	Pollution Control Device (PCD)
CTG 200	Solar Titan 250 Combustion Turbine, Natural gas as primary fuel, with ULSD as limited backup fuel	219 (HHV) for natural gas firing 212 (HHV) for ULSD firing	Dry Low NO_X Combustor
HRSG 200	Heat Recovery Steam Generator with supplemental natural gas firing via a Duct Burner (DB)	134 (HHV) for natural gas	Selective Catalytic Reduction Oxidation Catalyst
CTG 300	Solar Titan 250 Combustion Turbine, Natural gas as primary fuel, with ULSD as limited backup fuel	219 (HHV) for natural gas firing 212 (HHV) for ULSD firing	Dry Low NO_X Combustor
HRSG 300	Heat Recovery Steam Generator with supplemental natural gas firing via a Duct Burner	134 (HHV) for natural gas	Selective Catalytic Reduction Oxidation Catalyst
Cold Start Engine	CAT DM8263 or equivalent	19.04 (HHV) for ULSD firing	None
BLR-42-3	Wickes Type R Boiler (existing)	116.2	
BLR-42-4	Wickes Type R Boiler (existing)	116.2	
BLR-42-5	Riley Type VP Boiler (existing)	145.2	Coen Low NO_X burner
BLR-42-7[1]	Indeck Dual Fuel Boiler (existing)	99.7	Ultra Low NO_X burner and Flue Gas Recirculation
BLR-42-9[1]	Rentech Boiler Model 0 (existing)	125.8 for natural gas firing 119.2 for ULSD firing	Ultra Low NO_X burner and Flue Gas Recirculation

Table 6			
EU	**Description**	**Heat Rate Input Design Capacity in MMBtu/hr**	**Pollution Control Device (PCD)**
Cooling Tower 11, Cooling Tower 12, Cooling Tower 13	Wet mechanical cooling towers	Varies	High efficiency drift eliminators

Table 6 Notes:
1. Emission Units are considered part of Project solely due to inclusion in increment modeling

Table 6 Key:
EU= Emission Unit
MMBtu/hr = 1,000,000 British thermal units per hour
HHV = higher heating value basis, from Table C-1 to Subpart C of 40 CFR Part 98: 0.138 MMBtu per gallon ULSD and $1.026*10^{-3}$ MMBtu per standard cubic foot natural gas
NO_X = Nitrogen Oxides
ULSD = Ultra Low Sulfur Distillate, having a sulfur content of no more than 0.0015 percent by weight
CTG = combustion turbine generator
HRSG = heat recovery steam generator

6. APPLICABLE REQUIREMENTS

A. OPERATIONAL, PRODUCTION and EMISSION LIMITS

The Project is subject to, and the Permittee shall ensure that the Project shall not exceed the Operational, Production, and Emission Limits as contained in Table 7 below, including notes:

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
CTG 200/ HRSG 200, CTG 300/ HRSG 300, each	**Natural Gas Firing in the CTGs:** Operation at ≥ MECL [2] Natural Gas Heat Input Rate in each CTG ≤ 223.7 MMBtu per hour, HHV [1] Heat Input Rate in each DB: ≤ 134.0 MMBtu per hour, HHV Natural Gas Firing[1] (only fuel of use) Shakedown period for both units shall not exceed 180 days from first fire of either unit. Prior to completion of shakedown of either CTG 200/HRSG 200 or CTG 300/HRSG 300, the existing GT-42-1A and HRSG-42-1B shall be permanently removed from service. (See Table 11, Special Terms and Conditions, of this Approval)	NO_X (no duct firing)	≤ 1.65 lb/hr[1] ≤ 0.0074 lb/MMBtu[1] ≤ 2.0 ppmvd@15% O_2[1]
		NO_X (with duct firing)	≤ 2.65 lb/hr[1] ≤ 0.0074 lb/MMBtu[1] ≤ 2.0 ppmvd@15% O_2[1]
		CO (no duct firing)	≤ 1.00 lb/hr[1] ≤ 0.0045 lb/MMBtu[1] ≤ 2.0 ppmvd@15% O_2[1]
		CO (with duct firing)	≤ 1.61 lb/hr [1] ≤ 0.0045 lb/MMBtu[1] ≤ 2.0 ppmvd @15% O_2[1]
		VOC (no duct firing), as Methane (CH_4)	≤ 0.49 lb/hr[1] ≤ 0.0022 lb/MMBtu[1] ≤ 1.70 ppmvd@15% O_2[1]
		VOC (with duct firing), as Methane (CH_4)	≤ 1.86 lb/hr[1] ≤ 0.0052 lb/MMBtu[1] ≤ 4.0 ppmvd@15% O_2[1]
		Sulfur (S) in Fuel	≤ 1.0 grains/100 scf[1] natural gas
		SO_2 (no duct firing)	≤ 0.64 lb/hr[1] ≤ 0.0029 lb/MMBtu[1]
		SO_2 (with duct firing)	≤ 1.04 lb/hr[1] ≤ 0.0029 lb/MMBtu[1]
		H_2SO_4 (no duct firing)	≤ 0.49 lb/hr[1] ≤ 0.0022 lb/MMBtu[1]
		H_2SO_4 (with duct firing)	≤ 0.79 lb/hr[1] ≤ 0.0022 lb/MMBtu[1]
		$PM/PM_{10}/PM_{2.5}$ (no duct firing)[5]	≤ 4.47 lb/hr[1] ≤ 0.020 lb/MMBtu[1]
		$PM/PM_{10}/PM_{2.5}$ (with duct firing)[5]	≤ 7.14 lb/hr[1] ≤ 0.020 lb/MMBtu[1]
		NH_3 (no duct firing)	≤ 0.61 lb/hr[1] ≤ 0.0027 lb/MMBtu[1] ≤ 2.0 ppmvd@15% O_2[1]
		NH_3 (with duct firing)	≤ 0.97 lb/hr[1] ≤ 0.0027 lb/MMBtu[1] ≤ 2.0 ppmvd@15% O_2[1]
		Greenhouse Gases (GHG)[9], as CO_2e (no duct firing)	≤ 26,194 lb/hr[1] ≤ 117.098 lb/MMBtu[1]
		Greenhouse Gases (GHG) [9], as CO_2e (with duct firing)	≤ 41,885 lb/hr[1] ≤ 117.098 lb/MMBtu[1]
		Opacity	< 5%, except 5% to <10% for ≤ 2 minutes during any one hour[10]

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
CTG 200/ HRSG 200, CTG 300/ HRSG 300, each	**ULSD Firing in the CTGs:** Operation at ≥ MECL[2] ULSD Heat Input Rate in each CTG: ≤ 229.3 MMBtu per hour, HHV[1] Heat Input Rate in each HRSG's DB: ≤ 135.2 MMBtu per hour, HHV Natural Gas Firing[1] (only fuel of use) ≤ 48 hours on ULSD for testing per C12MP, per CTG, ≤ 279,216 gallons ULSD per C12MP, per CTG[6], ≤ 168 operating hours on ULSD per C12MP, per CTG, including ≤ 48 hours on ULSD for testing per C12MP, per CTG, ≤ 1,662 gallons per hour, per CTG ULSD firing in each CTG is restricted to periods during which any of the following events occur: 1. When natural gas is unable to be burned in the equipment; 2. When natural gas is unavailable; and 3. During testing which requires the use of ULSD firing. Shakedown period for both units shall not exceed 180 days from first fire of either unit. Prior to completion of shakedown of either CTG 200/HRSG 200 or CTG 300/HRSG 300, the existing GT-42-1A and HRSG-42-1B shall be permanently removed from service. (See Table 11, Special Terms and Conditions, of this Approval)	NO_X (no duct firing)	≤ 8.02 lb/hr[1] ≤ 0.035 lb/MMBtu[1] ≤ 9.0 ppmvd @ 15% O_2[1]
		NO_X (with duct firing)	≤ 9.50 lb/hr[1] ≤ 0.026 lb/MMBtu[1] ≤ 6.8 ppmvd @15% O_2[1]
		CO (no duct firing)	≤ 3.80 lb/hr[1] ≤ 0.017 lb/MMBtu[1] ≤ 7.0 ppmvd @ 15% O_2[1]
		CO (with duct firing)	≤ 5.29 lb/hr[1] ≤ 0.0145 lb/MMBtu[1] ≤ 6.3 ppmvd @ 15% O_2[1,13]
		VOC (no duct firing), as Methane (CH_4)	≤ 2.02 lb/hr[1] ≤ 0.0088 lb/MMBtu[1] ≤ 6.5 ppmvd @ 15% O_2[1]
		VOC (with duct firing), as Methane (CH_4)	≤ 3.40 lb/hr[1] ≤ 0.0093 lb/MMBtu[1] ≤ 7.0 ppmvd @ 15% O_2[1]
		Sulfur (S) in Fuel	≤ 0.0015 percent Sulfur by weight
		SO_2 (no duct firing)	≤ 0.37 lb/hr[1] ≤ 0.0016 lb/MMBtu[1] ≤ 0.3 ppm @ 15% O_2[1]
		SO_2 (with duct firing)	≤ 0.76 lb/hr[1] ≤ 0.0021 lb/MMBtu[1] ≤ 0.4 ppm @ 15% O_2[1]
		H_2SO_4 (no duct firing)	≤ 0.28 lb/hr[1] ≤ 0.0012 lb/MMBtu[1]
		H_2SO_4 (with duct firing)	≤ 0.58 lb/hr[1] ≤ 0.0016 lb/MMBtu[1]
		$PM/PM_{10}/PM_{2.5}$ (no duct firing)[5]	≤ 7.8 lb/hr[1] ≤ 0.034 lb/MMBtu[1, 12]
		$PM/PM_{10}/PM_{2.5}$ (with duct firing)[5]	≤ 10.6 lb/hr[1] ≤ 0.029 lb/MMBtu[1]
		NH_3 (no duct firing)	≤ 0.66 lb/hr[1] ≤ 0.0029 lb/MMBtu[1] ≤ 2.0 ppmvd @ 15 % O_2[1]
		NH_3 (with duct firing)	≤ 0.98 lb/hr[1] ≤ 0.0029 lb/MMBtu[1] ≤ 2.0 ppmvd @ 15 % O_2[1]
		Greenhouse Gases (GHG)[9], as CO_2e (no duct firing)	≤ 37,516 lb/hr[1] ≤ 163.61 lb/MMBtu[1]
		Greenhouse Gases (GHG)[9], as CO_2e (with duct firing)	≤ 53,347 lb/hr[1] ≤ 146.36 lb/MMBtu[1]
		Opacity	< 5%, except 5% to <10% for < 2 minutes during any one hour[10]

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
CTG 200/ HRSG 200, CTG 300/ HRSG 300, each	Natural Gas Firing in CTG, with or without DB firing **during start-ups**[3,4] Start-up event duration: ≤ 180 minutes	NO_X	≤ 32.0 lb per event
		CO	≤ 201 lb per event
	Natural Gas Firing in CTG, with or without DB firing **during shutdowns**[3,4] Shutdown event duration: ≤ 60 minutes	NO_X	≤ 12.4 lb per event
		CO	≤ 26.3 lb per event
	ULSD Firing in CTG, with or without DB firing **during start-ups**[3,4] Start-up event duration: ≤ 180 minutes	NO_X	≤ 65 lb per event
		CO	≤ 453 lb per event
	ULSD Firing in CTG with or without DB firing **during shutdowns**[3,4] Shutdown event duration: ≤ 60 minutes	NO_X	≤ 25 lb per event
		CO	≤ 129 lb per event
	Operation during transient conditions, which are identified as those while firing natural gas in the CTG when its associated HRSG's Duct Burner heat input is changing by more than 30 MMBtu per hour ≤ 1 hour per occurrence ≤ 20 occurrences per C12MP	NO_X	≤ 4.0 lb/hour[1,8]
		CO	≤ 3.8 lb/hour[1,8]
		VOC	≤ 4.6 lb/hour[1,8]
		NH_3	≤ 1.8 lb/hour[1,8]
CTG 200/ HRSG 200, and CTG 300/ HRSG 300, **combined**	Operation during all conditions **including start-ups, shutdowns, and transient which are identified as those while firing natural gas in the CTG when its associated HRSG's Duct Burner heat input is changing by more than 30 MMBtu per hour**	NO_X	≤ 21.1 tons per C12MP[7]
		CO	≤ 15.3 tons per C12MP[7]
		VOC	≤ 10.15 tons per C12MP[7]
		NH_3	≤ 6.8 tons per C12MP[7]
		H_2SO_4	≤ 5.4 tons per C12MP[7]
		$PM/PM_{10}/ PM_{2.5}$[5]	≤ 50.7 tons per C12MP[7]
		SO_2	≤ 7.2 tons per C12MP[7]
		Greenhouse Gases (GHG)[9], as CO_2e	≤ 295,480 tons per C12MP[7]

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
Cold Start Engine	ULSD is the only fuel of use, ≤ 300 hours per consecutive 12 month period, ≤ 19.04 MMBtu per hour, HHV ≤ 8 hours per day	NO_X	≤ 35.09 lb/hr ≤ 5.3 tons per C12MP
		CO	≤ 2.2 lb/hr ≤ 0.33 tons per C12MP
		VOC	≤ 0.85 lb/hr ≤ 0.13 tons per C12MP
		Sulfur (S) in Fuel	≤ 0.0015 percent Sulfur by weight
		SO_2	≤ 0.029 lb/hr ≤ 0.004 tons per C12MP
		H_2SO_4	≤ 0.022 lb/hr ≤ 0.003 tons per C12MP
		$PM/PM_{10}/ PM_{2.5}$[5]	≤ 0.4 lb/hr ≤ 0.06 tons per C12MP
		Greenhouse Gases (GHG)[9], as CO_2e	≤163.61 lb/MMBtu[1] ≤ 3,115 lb/hr ≤ 467.3 tons per C12MP
		Opacity	< 20%
	The Permittee shall operate and maintain the unit such that it complies with the emission standards as required in 40 CFR 60.4205 over the entire life of the engine.	NA	40 CFR Part 60 Subpart IIII Section 60.4206 and Section 60.4211

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
BLR-42-3, BLR-42-4, BLR-42-5	Within 12 months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operations (after shakedown), whichever occurs earlier: Natural gas is primary fuel; ULSD firing is restricted to periods during which any of the following events occur: 1. When natural gas is unable to be burned in the equipment; 2. When natural gas is unavailable; and 3. During testing which requires the use of ULSD firing. $\leq$ 48 hours on ULSD for testing per C12MP, each, $\leq$ 168 operating hours on ULSD per C12MP, each, including $\leq$ 48 hours on ULSD for testing per C12MP, each The back-up fuel oil switch from No. 6 to ULSD shall occur within 12 months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operations (after shakedown), whichever occurs earlier. (See Table 11, Special Terms and Conditions, of this Approval) Heat Input Rate in each boiler: BLR-42-3: $\leq$ 116.2 MMBtu per hour, HHV BLR-42-4: $\leq$ 116.2 MMBtu per hour, HHV BLR-42-5: $\leq$ 145.2 MMBtu per hour, HHV	PM/PM_{10}/ $PM_{2.5}$[5]	0.0076 lb/MMBtu when firing natural gas[14] 0.055 lb/MMBtu when firing ULSD[14]

Table 7:			
EU	**Operational / Production Limit**	**Air Contaminant**	**Emission Limit**
BLR-42-7	Natural gas is primary fuel; ULSD firing is restricted to periods during which any of the following events occur: 1. When natural gas is unable to be burned in the equipment, 2. When natural gas is unavailable, and 3. During testing which requires the use of ULSD firing. ≤ 48 hours on ULSD for testing per C12MP, per CTG, ≤ 168 operating hours on ULSD per C12MP, each, including ≤ 48 hours on ULSD for testing per C12MP, each Heat Input Rate in each boiler: BLR-42-7: ≤ 99.7 MMBtu per hour, HHV BLR-42-9 on ULSD: ≤ 119.2 MMBtu per hour, HHV BLR-42-9 on Natural Gas: ≤ 125.8 MMBtu per hour, HHV	$PM/PM_{10}/ PM_{2.5}$[5]	0.01 lb/MMBtu when firing natural gas[15] 0.03 lb/MMBtu when firing ULSD[15]
BLR-42-9			0.01 lb/MMBtu when firing natural gas[16] 0.03 lb/MMBtu when firing ULSD[16]
CTG 200/HRSG 200 and CTG 300/HRSG 300, and Cold Start Engine, combined	NA	NO_X[11]	≤ 26.4 tons per C12MP
		CO	≤ 15.7 tons per C12MP
		VOC	≤ 10.3 tons per C12MP
		$PM/PM_{10}/ PM_{2.5}$[5]	≤ 50.8 tons per C12MP
		SO_2	≤ 7.3 tons per C12MP
		Greenhouse Gases (GHG)[9], as CO_2e	≤ 295,948 tons per C12MP
		NH_3	≤ 6.8 tons per C12MP
		H_2SO_4	≤ 5.4 tons per C12MP

Table 7 Notes:

1. BACT emission limits are one hour block averages, and do not include those in which a start-up, shutdown, or transient condition occurs, except heat input and GHG as CO_2e which are 24 hour averages based on one hour block averages.
2. The Minimum Emissions Compliance Load (MECL) is defined as the lowest operational load achievable to maintain compliance with the emission limitations following start-up, pending the completion of an MECL optimization study, as required in Table 8.
3. Start-ups shall last no longer than 180 minutes beginning from the time of flame-on in the combustor (after a period of downtime) until the MECL is reached. Shutdowns shall last no longer than 60 minutes and include the time from dropping below the MECL until flame-out. Start-up and shutdown emission limits and durations apply only to NO_X

and CO as other pollutants are not expected to have emissions in excess of normal operating condition limits and are subject to revision by MassDEP based on review of compliance data and CEMS data generated from the first year of operation.

4. Emissions of SO_2, VOC, PM/PM_{10}/ $PM_{2.5}$, GHG and H_2SO_4 during start-up and shutdown events are not expected to be elevated.
5. Emission limit is for the sum of filterable and condensable particulate matter via EPA Reference Methods 201A and 202 or an equivalent test method(s) approved by MassDEP.
6. The total allowable fuel heat input is based on ULSD usage in each CTG at 229.3 MMBtu/hr for 168 hours per C12MP.
7. C12MP emission limits are based on nominal ratings and include start-up, shutdown, and transient operation emissions and are based on ULSD usage in each CTG at 212 MMBtu/hr for 168 hours per C12MP and of natural gas usage at 219 MMBtu/hr for 8,592 hours per C12MP and natural gas usage in each HRSG's Duct Burner at 125 MMBtu/hr for 4,380 hour per C12MP.
8. Limit applies to the full hour in which transient operations, which are limited to 20 occurrences per C12MP, occur.
9. The CO_2 emission factors from combustion of natural gas and ULSD were obtained from 40 CFR Part 98, Subpart C, Table C-1. The emission factors for other greenhouse gases of consideration, methane (CH_4) and nitrous oxide (N_2O), from combustion of natural gas and ULSD were obtained from 40 CFR Part 98, Subpart C, Table C-2. Greenhouse Gases expressed as Carbon Dioxide equivalent (CO_2e) was calculated by multiplying the individual GHG emission rates for CO_2, CH_4, and N_2O by its 100-year time horizon Global Warming Potential (GWP) factor from 40 CFR Part 98, Subpart A, Table A-1 (GWP factors used were: CO_2 = 1, CH_4 = 25, and N_2O = 298) and summing.
   Emission rates were converted from kg/MMBtu to pounds/MMBtu using the 2.20462 lb/kg conversion factor from 40 CFR Part 98, Table A-2.

   For example, natural gas:
   {(53.06 kg CO_2/MMBtu * 1 kg CO_2e/kg CO_2) + (0.001 kg CH_4/MMBtu * 25 kg CO_2e/kg CH_4) + (0.0001 kg N_2O/MMBtu * 298 kg CO_2e/kg N_2O)} * 2.20462 pounds/kg = 117.098 lb CO_2e/MMBtu
   For example, ULSD:
   {(73.96 kg CO_2/MMBtu * 1 kg CO_2e/kg CO_2) + (0.003 kg CH_4/MMBtu * 25 kg CO_2e/kg CH_4) + (0.0006 kg N_2O/MMBtu * 298 kg CO_2e/kg N_2O)} * 2.20462 pounds/kg = 163.61 lb CO_2e/MMBtu

10. Opacity based on one minute averages per COMS.
11. Facility-wide net NO_X emission increases remain below 25 tons over 5 years due to netting, therefore Nonattainment New Source Review is not applicable.
12. Subject to revision by MassDEP based on review of compliance (stack) testing data generated for the first year of operation in which this operating condition occurs; however, not to exceed the emission rate utilized in the National Ambient Air Quality Standards compliance demonstration.
13. Subject to revision by MassDEP based on review of compliance data generated for the first year of operation in which this operating condition occurs.
14. Emission limits from applicable MassDEP approval, No. MBR-91-COM-027.
15. Emission limits from applicable MassDEP approval, No. MBR-09-COM-007.
16. Emission limits from applicable MassDEP approval, No. MBR-10-COM-007.

Table 7 Key:

EU = Emission Unit
NO_X = Nitrogen Oxides
CO = Carbon Monoxide
VOC = Volatile Organic Compounds, excludes methane and ethane.
S = Sulfur
SO_2 = Sulfur Dioxide
PM = Particulate Matter
PM_{10} = Particulate Matter with particle diameter less than or equal to 10 microns
$PM_{2.5}$ = Particulate Matter with particle diameter less than or equal to 2.5 microns
NH_3 = Ammonia
O_2 = oxygen

H_2SO_4 = sulfuric acid
HAPS = Hazardous Air Pollutants
CO_2e = Greenhouse Gases expressed as Carbon Dioxide equivalent and calculated by multiplying each of the six greenhouse gases (Carbon Dioxide, Nitrous Oxide, Methane, Hydrofluorocarbons, Perfluorocarbons, Sulfur Hexafluoride) mass amount of emissions, in tons per year, by the gas's associated global warming potential published at Table A-1 of 40 CFR Part 98, Subpart A and summing the six resultant values.
No. = Number
C12MP = consecutive twelve month period
lb/hr = pounds per hour
grains/scf = grains per standard cubic foot
MMBtu = 1,000,000 British thermal units
lb/MMBtu = pounds per 1,000,000 British thermal units
ppmvd = parts per million by volume, dry basis
scf = standard cubic feet
@ = at
% = percent
EPA = Unites States Environmental Protection Agency
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
ULSD = Ultra-Low Sulfur Distillate, having a sulfur content of no more than 0.0015 percent by weight
CTG = Combustion Turbine Generator
DB = Duct Burner
HHV = higher heating value basis, from Table C-1 to Subpart C of 40 CFR Part 98: 0.138 MMBtu per gallon ULSD and $1.026*10^{-3}$ MMBtu per standard cubic foot natural gas
MECL = minimum emissions compliance load
< = less than
> = greater than
$\leq$ = less than or equal to
$\geq$ = greater than or equal to
NA = Not Applicable
CEMS = Continuous Emissions Monitoring System

B. NEW SOURCE PERFORMANCE STANDARDS (NSPS)

CTG 200/HRSG 200 and CTG 300/HRSG 300

Federal Regulation 40 CFR Part 60 Subpart KKKK, applies to stationary combustion turbines with a heat input rating greater than or equal to 10 MMBtu/hr, and which commenced construction, reconstruction, or modification after February 18, 2005 as well as any associated HRSGs or DBs.

The NSPS allows the turbine owner or operator the choice of either a concentration based or output based NO_X emission standard. The output based limit is expressed in units of pounds per megawatt-hour output (lb/MW-hr). The applicable NO_X emission standard for CTG 200/HRSG 200 and CTG 300/HRSG 300 is 1.2 lb/MW-hr while combusting natural gas and 3.6 lb/MW-hr when combusting ULSD. The applicable NO_X limits for a 22 MW CTG, such as those proposed for this Project, would be 26.4 pounds per hour (lb/hr) during natural gas firing and 79.2 lb/hr during ULSD firing based on the lb/MW-hr emission standards contained in the regulation. The Permittee has proposed that the Project will comply with these limits for each CHP through the use of dry low-NO_X combustion technology in conjunction with SCR to control NO_X emissions to 2.65 lb/hr during natural gas firing and to 9.50 lb/hr during ULSD firing. Demonstration of compliance with the more stringent NO_X

emission limits contained in this Approval for each the Project's two CHPs will demonstrate compliance with the applicable NO_X emission limits contained in 40 CFR Part 60 Subpart KKKK for said emission units.

40 CFR Part 60 Subpart KKKK also includes SO_2 emission limits. For a turbine located in a continental area, the NSPS fuel sulfur content limit is 26 ng/J (0.060 lb SO_2/MMBtu) heat input. The Permittee will meet the applicable SO_2 emission limit when combusting natural gas with a sulfur dioxide emission rate of 0.0029 lb/MMBtu and of 0.0021 lb/MMBtu when combusting ULSD, both of which are well below the applicable NSPS SO_2 limit of 0.06 lb/MMBtu.

Therefore by complying with the emission limits established in this Approval, the Permittee will meet the applicable SO_2 and NO_X emission standards contained in 40 CFR Part 60 Subpart KKKK. The Permittee shall be required to also comply with all applicable monitoring, record keeping, and reporting requirements of 40 CFR Part 60 Subpart KKKK for each of the two proposed CHPs.

Cold Start Engine

The Cold Start Engine must meet the applicable requirements contained in 40 CFR Part 60, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines." The requirements applicable to emergency engines such as the Cold Start Engine, contained therein, include the purchasing of an engine that is certified to the applicable emission standard contained in 40 CFR 60.4205 for the same model year and maximum engine power, installing and configuring the engine according to the manufacturer's emission-related specifications, limiting maintenance checks and readiness testing to those recommended by manufacturer and for up to 100 hours per year, in addition to performing specific maintenance activities pertaining to filters, hoses, and belts. MIT has proposed to purchase and operate the Cold Start Engine in compliance with the applicable requirements contained in Regulation 40 CFR 60 Subpart IIII.

C. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

CTG 200/HRSG 200 and CTG 300/HRSG 300

Regulation 40 CFR Part 63, Subpart YYYY, "National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines" applies to combustion turbines at major sources of hazardous air pollutant (HAP) emissions. A major source of HAP emissions is a source which has the potential to emit ten or more tons per year of any single HAP, or twenty-five or more tons per year of all HAPs combined. MIT maintains a tracking system to document its status as a non-major (area) source of HAPS. MIT reports and certifies to MassDEP its area source HAP status on an annual basis via Regulation 310 CMR 7.12 Source Registration submittals. MIT is not a major source of HAP emissions and therefore, the Project's combustion turbines are not subject to requirements contained under 40 CFR Part 63 Subpart YYYY.

Cold Start Engine

The proposed Cold Start Engine is subject to 40 CFR Part 63 Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines." Per 40 CFR 63.6590(c)(1), the Cold Start Engine will meet the applicable requirements of 40 CFR Part 63 Subpart ZZZZ by meeting the applicable requirements of 40 CFR Part 60, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines."

D. EMISSIONS TRADING PROGRAM

The Facility is not subject to any of the emissions allowance trading programs such as the Massachusetts CO_2 Budget Trading Program - 310 CMR 7.70.

E. COMPLIANCE DEMONSTRATION

The Project is subject to, and the Permittee shall ensure that the Project shall comply with, the monitoring, testing, record keeping, and reporting requirements as contained in Tables 8, 9, and 10 below:

Table 8

EU	Monitoring and Testing Requirements
CTG 200/ HRSG 200, CTG 300/ HRSG 300	1. The Permittee shall ensure that CTG 200/HRSG 200 and CTG 300/HRSG 300 are constructed to accommodate the emissions (compliance) testing requirements as stipulated in 40 CFR Part 60 Appendix A. The two outlet sampling ports (90 degrees apart from each other) for each Emission Unit must be located at a minimum of one half duct diameter upstream and two duct diameters downstream of any flow disturbance. In addition, the Permittee shall facilitate access to the sampling ports and testing equipment by constructing platforms, ladders, or other necessary equipment.
	2. The Permittee shall monitor date(s) of startup(s) and compliance testing to ensure that compliance testing of CTG 200/HRSG 200 and CTG 300/HRSG 300 is completed within 180 days after initial start-up of the Emission Unit to demonstrate compliance with the emission limits specified in Table 7 of this Plan Approval. All emissions testing shall be conducted in accordance with MassDEP's "Guidelines for Source Emissions Testing" and in accordance with EPA reference test methods as specified in 40 CFR Part 60, Appendix A and 40 CFR Part 51, Appendix M, or by another method which has been approved in writing by both MassDEP and EPA. The Permittee shall schedule the compliance testing such that MassDEP personnel can witness it.

Table 8	
EU	**Monitoring and Testing Requirements**
CTG 200/ HRSG 200, CTG 300/ HRSG 300	3. The Permittee shall conduct initial compliance tests on CTG 200/HRSG 200 and CTG 300/HRSG 300 to document actual emissions of each Emission Unit so as to determine its compliance status with respect to the emission limits in lb/hr, lb/MMBtu, and ppmvd, both with and without DB operation as contained in Table 7 for the pollutants listed below: a. NO_X b. CO c. VOC d. SO_2 e. $PM/PM_{10}/ PM_{2.5}$ f. NH_3 g. H_2SO_4 h. Greenhouse gases as measured by CO_2e Testing for these pollutants for each Emission Unit shall be conducted on natural gas at three (3) load conditions, both with and without duct firing, that cover the entire normal operating range: the minimum emissions compliance load (MECL),100 percent load, and a minimum of one additional load that fall between MECL and 100 percent. Testing on ULSD shall be conducted at one load condition without Duct Burner firing.
	4. During the initial compliance test and all subsequent emissions testing, the Permittee shall monitor emissions to establish a correlation between CO and VOC emissions such that a correlation curve shall be developed. Said correlation curve shall subsequently be used to track VOC emissions based on CEMS data for CO emissions in order to monitor compliance with the emission limits in Table 7 until the next compliance testing is conducted and a new correlation curve is developed at which time that curve shall be utilized to track VOC emissions.
	5. During the initial compliance test and all subsequent emissions testing, the Permittee shall monitor emissions to establish a parametric monitoring system utilizing the Facility's operations data acquisition handling system – DAHS for tracking $PM/PM_{10}/PM_{2.5}$ emissions, both including filterable and condensable particulate matter. Said parametric system shall be used to track emissions of $PM/PM_{10}/PM_{2.5}$ in order to monitor compliance with the emission limits in Table 7 until the next compliance testing is conducted and a new system is developed at which time that system shall be utilized to track $PM/PM_{10}/PM_{2.5}$ emissions.
	6. During the initial compliance test and all subsequent emissions testing, the Permittee shall monitor emissions to establish a parametric monitoring system[1] for tracking H_2SO_4 emissions. Said parametric system shall be used to track emissions of H_2SO_4 in order to monitor compliance with the emission limits in Table 7 until the next compliance testing is conducted and a new system is developed at which time that system shall be utilized to track H_2SO_4 emissions.

[1] Parametric monitoring for H_2SO_4 shall be determined by fuel analysis. Fuel analysis shall consist of 2 samples of natural gas annually and each ULSD delivery. A MassDEP approved methodology shall determine the ratio between sulfur percent in fuel to emitted H_2SO_4.

Table 8	
EU	**Monitoring and Testing Requirements**
CTG 200/ HRSG 200, CTG 300/ HRSG 300	7. The Permittee shall prepare and complete an MECL optimization study. The results of which shall be submitted with the compliance test results report.
	8. Whenever required by MassDEP, the Permittee shall conduct compliance tests on CTG 200/HRSG 200 and CTG 300/HRSG 300 to document actual emissions of each Emission Unit so as to determine its compliance status with respect to the emission limits in lb/hr, lb/MMBtu, and ppmvd, both with and without DB operation as contained in Table 7 for the pollutants listed below: a. VOC b. SO_2 c. PM/PM_{10}/$PM_{2.5}$ d. H_2SO_4 e. Greenhouse gases as measured by CO_2e During said compliance testing, the Permittee shall monitor emissions and update the CO/VOC correlation curve and the PM/PM_{10}/$PM_{2.5}$ and H_2SO_4 parametric monitoring systems, as well as MECL optimization, as deemed appropriate by testing results.
	9. The Permittee shall install, calibrate, test, and operate a Data Acquisition and Handling System(s) (DAHS), CEMS, and COMS serving each CHP to accurately measure and record the following from each CHP: a. O_2 b. NO_X c. CO d. NH_3 e. opacity The CEMS shall include diluents gas (O_2) and fuel flow meters.
	10. The Permittee shall ensure that all emission monitors and recorders serving each Emission Unit comply with MassDEP approved performance and location specifications, and conform with the EPA monitoring specifications at 40 CFR 60.13 and 40 CFR Part 60 Appendices B and F.
	11. The Permittee shall ensure that the subject CEMS and COMS are equipped with properly operated and properly maintained audible and visible alarms to activate whenever emissions or opacity from its associated Emission Unit exceed the applicable short term emission limits established in Table 7 of this Plan Approval.
	12. The Permittee shall operate the CEMS and/or COMS serving each Emission Unit at all times except for periods of CEMS and/or COMS calibration checks, zero and span adjustments, preventative maintenance, and periods of unavoidable malfunction.
	13. The Permittee shall obtain and record emissions data from the CEMS serving each Emission Unit for at least ninety five (95) percent of each Emission Unit's operating hours per quarter, except for periods of CEMS calibration checks, zero and span adjustments, and preventive maintenance.

Table 8	
EU	**Monitoring and Testing Requirements**
CTG 200/ HRSG 200, CTG 300/ HRSG 300	14. All periods of excess emissions occurring, even if attributable to an emergency/malfunction, start-up/shutdown or equipment cleaning, shall be quantified and included by the Permittee in the compilation of emissions and determination of compliance with the emission limits as stated in Table 7 of this Plan Approval. ("Excess Emissions" are defined as emissions which are in excess of the emission limits as stated in Table 7).
	15. The Permittee shall use and maintain its CEMS and/or COMS serving each Emission Unit as "direct-compliance" monitors to measure NO_X, CO, NH_3, O_2, and opacity. "Direct-compliance" monitors generate data that legally documents the compliance status of a source.
	16. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each CTG that monitors and records natural gas consumption in standard cubic feet such that MMBtu/hr heat input can be calculated based on HHV to ensure compliance with Table 7 limits.
	17. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each HRSG's Duct Burner that monitors and records natural gas consumption in standard cubic feet such that MMBtu/hr heat input can be calculated based on HHV to ensure compliance with Table 7 limits.
	18. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each CTG which shall monitor and record ULSD consumption such that gallons per hour and per C12MP and MMBtu/hr heat input can be calculated based on HHV to ensure compliance with Table 7 limits.
	19. The Permittee shall monitor each date and daily hours of operation and total hours of operation for each Emission Unit per month and per C12MP.
	20. The Permittee shall ensure that initial compliance tests for natural gas firing are conducted for start-up periods, shutdown periods, and periods of transient conditions as defined in the Permittee's Application to ensure compliance with the NO_X, CO, VOC and NH_3 limits for those conditions in Table 7. These compliance tests shall represent periods of operation below the MECL for each Emission Unit.
	21. Whenever operating during transient conditions, VOC emissions shall be considered as occurring at the rate determined in the most recent compliance test for transient conditions. NO_X, CO, and NH_3 emissions during transient conditions shall be monitored via CEMS.
	22. If operating at the MECL or greater, and if CO emissions are below the CO emission limit at the given combustion turbine operating conditions, VOC emissions shall be considered as complying with the emission limits contained in this Plan Approval.

Table 8	
EU	**Monitoring and Testing Requirements**
CTG 200/ HRSG 200, CTG 300/ HRSG 300	23. If operating at the MECL or greater, and if CO emissions are above the applicable CO emission limit, VOC emissions shall be considered as occurring at a rate determined according to the equation: $VOC_{actual} = VOC_{limit} \times (CO_{actual}/CO_{limit})$ pending the outcome of compliance testing, after which a VOC/CO correlation curve for each combustion turbine will be developed and used for VOC compliance determination purposes.
	24. The Permittee shall monitor the natural gas and ULSD consumption of each Emission Unit in accordance with 40 CFR Part 60 Subpart KKKK utilizing a continuous monitoring system as approved by MassDEP.
	25. The Permittee shall monitor the sulfur content of the fuel combusted in each Emission Unit in accordance with 40 CFR Part 60 Subpart KKKK, or pursuant to any alternative fuel monitoring schedule developed in accordance with 40 CFR Part 60 Subpart KKKK.
	26. The Permittee shall monitor the load, start-up and shutdown duration, and mass emissions in pounds per event during start-up and shutdown periods.
	27. The Permittee shall monitor the number of occurrences of transient condition events, the duration of each transient condition event, and the mass emissions in pounds per event.
	28. The Permittee shall monitor the operation of each Emission Unit, in accordance with the surrogate methodology or parametric monitoring developed during the most recent compliance test concerning $PM/PM_{10}/PM_{2.5}$ and H_2SO_4 emission limits.
	29. The Permittee shall monitor the hours of operation for testing purposes while firing ULSD in each CTG on a monthly and C12MP basis.
	30. The Permittee shall monitor operations to ensure that the shakedown period for both units shall not exceed 180 days from first fire of either unit.
	31. The Permittee shall monitor operations to ensure that prior to completion of shakedown of either unit, the existing GT-42-1A and HRSG-42-1B shall be permanently removed from service.
Cold Start Engine	32. The Permittee shall monitor operations to ensure compliance with the requirements applicable to emergency engines, as contained in 40 CFR Part 60, Subpart IIII, which include but are not limited to purchasing an engine that has been certified by EPA, operating said emergency engine in accordance with 60.4211(f), not including 60.4211(f)(ii)-(iii), and installing, configuring, operating, and maintaining the engine per the manufacturer's instructions.
	33. The Permittee shall monitor the sulfur content of ULSD fuel oil burned.
	34. The Permittee shall monitor hourly operations to ensure compliance with the operational limits in terms of hours per day and hours per C12MP and emission limits in Table 7.
	35. The Permittee shall monitor operations to ensure that the Cold Start Engine shall not be operated more than 300 hours during any C12MP, including normal maintenance and testing procedures as recommended by the manufacturer.

Table 8	
EU	**Monitoring and Testing Requirements**
Cold Start Engine	36. The Permittee shall monitor operations to ensure that the Cold Start Engine is equipped and operated with a non-turnback hour counter which shall be maintained in good working order.
BLR-42-3, BLR-42-4, BLR-42-5	37. The Permittee shall monitor the date(s) of startup(s) and commencement of normal operation of CTG 200/HRSG 200 and CTG 300/HRSG 300 to ensure that the required fuel switch occurs within twelve months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operation (after conclusion of shakedown), whichever occurs earlier.
CTG 200, CTG 300, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, BLR-42-9	38. The Permittee shall monitor each Emission Unit's ULSD-fired operations to ensure compliance with the requirement that natural gas shall be the primary fuel and that ULSD firing is restricted to no more than 48 hours for testing per C12MP and 168 hours per C12MP including periods during which any of the following events occur: a. When natural gas is unable to be burned in the equipment; b. When natural gas is unavailable; and c. During testing which requires the use of ULSD firing.
	39. For each Emission Unit, the Permittee shall monitor the sulfur content of ULSD burned as well as the reason for and number of hours of ULSD firing, both on a C12MP basis.
BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, BLR-42-9	40. The Permittee shall monitor operations to ensure compliance with limits contained in Table 7 above.
Project-Wide	41. The Permittee shall comply with all required monitoring contained in any applicable New Source Performance Standards (NSPS) contained in 40 CFR Part 60.
	42. The Permittee shall comply with all required monitoring contained in any applicable National Emission Standards for Hazardous Air Pollutants (NESHAPS) contained in 40 CFR Part 63.
	43. The Permittee shall monitor all operations to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	44. If and when MassDEP requires it, the Permittee shall conduct compliance testing in accordance with EPA Reference Test Methods and 310 CMR 7.13.

Table 8 Key:
EU = Emission Unit
EPA = United States Environmental Protection Agency
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
DAHS = Data Acquisition and Handling System
CEMS = Continuous Emission Monitoring System
COMS = Continuous Opacity Monitoring System
SCR = Selective Catalytic Reduction
DB = Duct Burner
CTG = Combustion Turbine Generator
CHP = Combined Heat and Power

O_2 = Oxygen
NO_X = Nitrogen Oxides
CO = Carbon Monoxide
NH_3 = Ammonia
HAP = Hazardous Air Pollutants
PM = Particulate Matter
PM_{10} = Particulate Matter less than or equal to 10 microns in size
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in size
VOC = Volatile Organic Compounds
CO_2e = Greenhouse Gases expressed as Carbon Dioxide equivalent and calculated by multiplying each of the six Greenhouse Gases (Carbon Dioxide, Nitrous Oxide, Methane, Hydrofluorocarbons, Perfluorocarbons, Sulfur Hexafluoride) mass amount of emissions, in tons per year, by the gas's associated global warming potential published at Table A-1 of 40 CFR Part 98, Subpart A and summing the six resultant values.
SO_2 = Sulfur Dioxide
H_2SO_4 = Sulfuric Acid
C12MP = Consecutive twelve month period
lb/hr = pounds per hour
lb/MMBtu = pounds per million British thermal units
ppmvd = parts per million by volume, dry basis
MMBtu/hr = million British thermal units per hour
MassDEP = The Massachusetts Department of Environmental Protection
HHV = higher heating value basis, from Table C-1 to Subpart C of 40 CFR Part 98: 0.138 MMBtu per gallon ULSD and $1.026*10^{-3}$ MMBtu per standard cubic foot natural gas
MECL = Minimum Emissions Compliance Load
ULSD = Ultra-Low Sulfur Distillate, having a sulfur content of no more than 0.0015 percent by weight
Project-wide = CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, and BLR-42-9

Table 9	
EU	**Record Keeping Requirements**
CTG 200/HRSG 200, CTG 300/HRSG 300	1. The Permittee shall maintain records of CTG 200/HRSG 200's and of CTG 300/HRSG 300's hourly fuel heat input rate (MMBtu/hr, HHV) and natural gas consumption in standard cubic feet and ULSD in gallons, both per month and per C12MP, each.
	2. The Permittee shall maintain records of each date and daily hours of operation and total hours of operation of CTG 200/HRSG 200 and CTG 300/HRSG 300 per month and per C12MP.
	3. The Permittee shall maintain on-site permanent records for a period of 5 years of output from all continuous monitors (including CEMS and COMS) for flue gas emissions and opacity.
	4. The Permittee shall maintain a log to record problems, upsets or failures associated with the subject Emission Units' emission control systems, DAHS, CEMS, and/or COMS.
	5. The Permittee shall maintain a record of the CO/VOC correlation curve developed from the most recent compliance test and shall continuously record VOC emissions on the DAHS using said CO/VOC correlation curve.

Table 9	
EU	**Record Keeping Requirements**
CTG 200/HRSG 200, CTG 300/HRSG 300	6. The Permittee shall maintain a record of the date(s) of startup(s) and compliance testing to verify that compliance testing of CTG 200/HRSG 200 and CTG 300/HRSG 300 is completed within 180 days after initial start-up of the Emission Unit to demonstrate compliance with the emission limits specified in Table 7 of this Plan Approval.
	7. The Permittee shall maintain a record of the stack emissions test results report(s) including start-up, shutdown and transient operation data, CO/VOC correlation curve, and parametric monitoring strategies for PM/PM_{10}/$PM_{2.5}$ and H_2SO_4 emissions as well as MECL optimization such that the Final test results report can be submitted to MassDEP as required in Table 10 of this Plan Approval.
	8. The Permittee shall continuously record PM/PM_{10}/$PM_{2.5}$ emissions on the DAHS using the surrogate methodology or parametric monitoring derived from the most recent compliance test.
	9. The Permittee shall maintain a record of all periods of excess emissions, even if attributable to an emergency/malfunction, start-up/shutdown or equipment cleaning, which shall be quantified and included by the Permittee in the compilation of emissions and determination of compliance with the emission limits as stated in Table 7 of this Plan Approval.
	10. The Permittee shall continuously record H_2SO_4 emissions on the DAHS using the surrogate methodology or parametric monitoring derived from the most recent compliance test. Parametric monitoring for H_2SO_4 shall be determined by fuel analysis. Fuel analysis shall consist of two samples of natural gas annually and each ULSD delivery. A MassDEP approved methodology shall determine the ratio between sulfur percent in fuel to emitted H_2SO_4.
	11. The Permittee shall maintain records of the load, start-up and shutdown duration, and mass emissions in pounds per event during start-up and shutdown periods.
	12. The Permittee shall maintain records of the number of occurrences of transient condition events, the duration of each transient condition event, and the mass emissions in pounds per event.
	13. The Permittee shall maintain records of consumption of and the sulfur content of the fuel combusted at the frequency required pursuant to 40 CFR Part 60 Subpart KKKK, or pursuant to any alternative fuel monitoring schedule issued in accordance with 40 CFR Part 60 Subpart KKKK.
	14. The Permittee shall maintain continuous records of SCR and oxidation catalyst inlet temperatures, combustion turbine inlet temperatures and ambient temperatures.
	15. The Permittee shall maintain the SOMP for the urea handling systems serving CTG 200/HRSG 200 and CTG 300/HRSG 300 in a convenient location and make them readily available to all CUP employees.
	16. The Permittee shall maintain a copy of this Plan Approval, underlying Application, and the most up-to-date SOMP for CTG 200/HRSG 200 and CTG 300/HRSG 300.
CTG 200/HRSG	17. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each CTG that records natural gas consumption in standard cubic feet.

Table 9	
EU	**Record Keeping Requirements**
200, CTG 300/HRSG 300	18. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each HRSG's Duct Burner that records natural gas consumption in standard cubic feet.
	19. The Permittee shall install, operate, and maintain a separate fuel metering device and recorder for each CTG which shall record ULSD consumption in gallons per hour and per C12MP.
	20. The Permittee shall maintain a record of the hours of operation for testing purposes while firing ULSD in each CTG on a monthly and C12MP basis.
	21. The Permittee shall maintain records of first fire and the completion of the shakedown period for both units to verify that the shakedown period shall not exceed 180 days from first fire of either unit.
	22. The Permittee shall maintain records of the dates of completion of shakedown of both units as well as the date that the existing GT-42-1A and HRSG-42-1B are permanently removed from service to verify that the existing GT-42-1A and HRSG-42-1B are permanently removed from service prior to the completion of the shakedown of either CTG 200/HRSG 200 or CTG 300/HRSG 300.
Cold Start Engine	23. The Permittee shall maintain a record of the sulfur content of ULSD fuel oil burned.
	24. The Permittee shall maintain records documenting compliance with the requirements applicable to emergency engines, as contained in 40 CFR Part 60, Subpart IIII, which include but are not limited to purchasing an engine that has been certified by EPA, operating said emergency engine in accordance with 60.4211(f), not including 60.4211(f)(ii)-(iii), and installing, configuring, operating, and maintaining the engine per the manufacturer's instructions.
	25. The Permittee shall maintain a record of hourly operations to verify compliance with the operational limits in terms of hours per day and hours per C12MP and emission limits in Table 7.
	26. The Permittee shall maintain records to verify that the Cold Start Engine shall not be operated more than 300 hours during any C12MP, including normal maintenance and testing procedures as recommended by the manufacturer.
	27. The Permittee shall maintain records to verify that the Cold Start Engine is equipped and operated with a non-turnback hour counter which shall be maintained in good working order.
BLR-42-3, BLR-42-4, BLR-42-5	28. The Permittee shall maintain records of date(s) of startup(s) and commencement of normal operation of CTG 200/HRSG 200 or CTG 300/HRSG 300 to verify that the required fuel switch occurs within twelve months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operation (after conclusion of shakedown), whichever occurs earlier.

Table 9	
EU	**Record Keeping Requirements**
CTG 200, CTG 300, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, BLR-42-9	29. The Permittee shall maintain a record of each emission unit's ULSD-fired operations to document compliance with the requirement that natural gas shall be the primary fuel and that ULSD firing for purposes shall not exceed 48 hours per C12MP and is restricted to no more than 168 hours per C12MP including only periods during which any of the following events occur: a. When natural gas is unable to be burned in the equipment; b. When natural gas is unavailable; and c. During testing which requires the use of ULSD firing.
	30. For each Emission Unit, the Permittee shall maintain records of the sulfur content of ULSD burned as well as the reason for and number of hours of ULSD firing, both on a C12MP basis.
BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, BLR-42-9	31. The Permittee shall maintain records to verify compliance with limits contained in Table 7 above.
Project-Wide	32. The Permittee shall maintain adequate records on-site to demonstrate compliance status with all operational, production, and emission limits contained in Table 7 above. Records shall also include the actual emissions of air contaminant(s) emitted for each calendar month and for each C12MP (current month plus prior eleven months). These records shall be compiled no later than the 30th day following each month. An electronic version of the MassDEP approved record keeping form, in Microsoft Excel format, can be downloaded at http://www.mass.gov/eea/agencies/massdep/air/approvals/limited-emissions-record-keeping-and-reporting.html#WorkbookforReportingOn-SiteRecordKeeping.
	33. The Permittee shall maintain records of monitoring and testing as required by Table 8.
	34. The Permittee shall comply with all required recordkeeping contained in any applicable New Source Performance Standards (NSPS) contained in 40 CFR Part 60.
	35. The Permittee shall comply with all required recordkeeping contained in any applicable National Emission Standards for Hazardous Air Pollutants (NESHAPS) contained in 40 CFR Part 63.
	36. The Permittee shall maintain a copy of this Plan Approval, underlying Application and the most up-to-date SOMP for the emission units and pollution control devices approved herein on-site.
	37. The Permittee shall maintain a record of routine maintenance activities performed on the approved emission units and pollution control devices and monitoring equipment. The records shall include, at a minimum, the type or a description of the maintenance performed and the date and time the work was completed.

Table 9	
EU	**Record Keeping Requirements**
Project-Wide	38. The Permittee shall maintain a record of all malfunctions affecting air contaminant emission rates on the approved emission units and pollution control devices and monitoring equipment. At a minimum, the records shall include: date and time the malfunction occurred; description of the malfunction; corrective actions taken; the date and time corrective actions were initiated and completed; and the date and time emission rates and monitoring equipment returned to compliant operation.
	39. The Permittee shall maintain records to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	40. The Permittee shall maintain records required by this Plan Approval on site for a minimum of five (5) years.
	41. The Permittee shall make records required by this Plan Approval available to MassDEP and EPA personnel upon request.

Table 9 Key:

EU = Emission Unit
PCD = Pollution Control Device
SOMP = Standard Operating and Maintenance Procedures
EPA = United States Environmental Protection Agency
DAHS = Data Acquisition and Handling System
CEMS = Continuous Emission Monitoring System
COMS = Continuous Opacity Monitoring System
SCR = Selective Catalytic Reduction
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CO = Carbon Monoxide
NO_X = Nitrogen Oxides
HAP = Hazardous Air Pollutant
NH_3 = Ammonia
PM = Particulate Matter
PM_{10} = Particulate Matter less than or equal to 10 microns in size
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in size
VOC = Volatile Organic Compounds
SO_2 = Sulfur Dioxide
ULSD = Ultra-Low Sulfur Distillate Fuel Oil containing a maximum of 0.0015 weight percent sulfur
H_2SO_4 = Sulfuric Acid
C12MP = Consecutive twelve month period
CUP = Central Utility Plant
CTG = Combustion Turbine Generator
HRSG = Heat Recovery Steam Generator
MassDEP = The Massachusetts Department of Environmental Protection
CHP = Combined Heat and Power
MMBtu/hr = pounds per million British thermal units
HHV = higher heating value basis, from Table C-1 to Subpart C of 40 CFR Part 98: 0.138 MMBtu per gallon ULSD and $1.026*10^{-3}$ MMBtu per standard cubic foot natural gas
Project-wide = CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, and BLR-42-9

Table 10	
EU	**Reporting Requirements**
CTG 200/HRSG 200, CTG 300/HRSG 300	1. The Permittee must obtain written MassDEP approval of an emissions test protocol prior to initial compliance emissions testing of CTG 200/HRSG 200 and CTG 300/HRSG 300 at the Facility. The Permittee shall submit a pre-test protocol at least 30 days prior to the compliance emissions testing. The protocol shall include a detailed description of sampling port locations, sampling equipment, sampling and analytical procedures, and operating conditions for any such emissions testing. In addition, the protocol shall include procedures for: a) the required CO and VOC correlation for CTG 200/HRSG 200 and CTG 300/HRSG 300; and b) parametric monitoring strategies to ensure continuous monitoring of $PM/PM_{10}/PM_{2.5}$ and H_2SO_4 emissions from CTG 200/HRSG 200 and CTG 300/HRSG 30; and c) the MECL optimization plan.
	2. The Permittee shall submit a final stack emissions test results report including start-up, shutdown and transient operation data, CO/VOC correlation curve, and parametric monitoring strategies for $PM/PM_{10}/PM_{2.5}$ and H_2SO_4 emissions as well as MECL optimization to MassDEP within 60 days after completion of the initial and all subsequent compliance emissions testing.
	3. A QA/QC program plan for the CEMS and/or COMS serving CTG 200/HRSG 200 and CTG 300/HRSG 300 must be submitted, in writing, at least 90 days prior to commencement of operation of the subject emission units. MassDEP must approve the QA/QC program prior to its implementation. Subsequent changes to the QA/QC program plan shall be submitted to MassDEP for approval prior to their implementation.
	4. Within 30 days of start-up, the Permittee shall submit a written final CEMS quality assurance/quality (QA/QC) control plan for the long-term operation of the CEMS so as to conform with 40 CFR Part 60 Appendices B and F.

Table 10	
EU	**Reporting Requirements**
CTG 200/HRSG 200, CTG 300/HRSG 300	5. The Permittee shall submit a quarterly Excess Emissions Report to MassDEP by the thirtieth (30th) day of April, July, October, and January covering the previous calendar periods of January through March, April through June, July through September, and October through December, respectively. The report shall contain at least the following information: a) The Facility CEMS, COMS, as well parametric monitoring of PM/PM_{10}/$PM_{2.5}$, and H_2SO_4 emissions excess emissions/opacity data, in a format acceptable to MassDEP. b) For each period of excess emissions/opacity or excursions from allowable operating conditions for the emission unit(s), the Permittee shall list the duration, cause, the response taken, and the amount of excess emissions. Periods of excess emissions shall include, but not be limited to, periods of start-up, shutdown, malfunction, emergency, equipment cleaning, and upsets or failures associated with the emission control system or CEMS or COMS. ("**Malfunction**" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions. "**Emergency**" means any situation arising from sudden and reasonably unforeseeable events beyond the control of this source, including acts of God, which situation would require immediate corrective action to restore normal operation, and that causes the source to exceed a technology based limitation under the **Plan Approval**, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operations, operator error or decision to keep operating despite knowledge of these things.) c) A tabulation of periods of operation of each emission unit and total hours of operation of each emission unit during the calendar quarter. d) The facility CEMS data capture which shows the Facility's compliance status with regard to the required data capture and recording requirements contained in Table 8 above.
	6. After completion of the initial compliance emissions testing program, the Permittee shall submit information for MassDEP review that documents the actual emissions impacts generated by CTG 200/HRSG 200 and CTG 300/HRSG 300 during start-up, shutdown, and transient periods. This information shall be submitted to MassDEP as part of the final emissions test results report.

Table 10	
EU	**Reporting Requirements**
CTG 200/HRSG 200, CTG 300/HRSG 300	7. The Permittee shall submit to MassDEP, in accordance with the provisions of Regulation 310 CMR 7.02(5)(c), plans and specifications for CTG 200/HRSG 200 and CTG 300/HRSG 300, the SCR control system, the oxidation catalyst control system, and the CEMS, COMS, and DAHS once the specific information has been determined, but in any case not later than 30 days prior to commencement of construction/installation of each component of the emission unit.
	8. The Permittee shall submit, in writing, the following notifications to MassDEP within fourteen (14) days after each occurrence: a) date(s) of commencement of construction of CTG 200/HRSG 200 and of CTG 300/HRSG 300; b) date(s) when construction has been completed on CTG 200/HRSG 200 and on CTG 300/HRSG 300; c) date(s) of initial firing of CTG 200/HRSG 200 and of CTG 300/HRSG 300; d) date(s) upon which CTG 200/HRSG 200 and CTG 300/HRSG 300 are either ready for operation or have commenced operation.
	9. The Permittee shall submit to MassDEP a SOMP for the Emission Units and associated control and monitoring/recording systems no later than 30 days prior to commencement of operation of the units. Thereafter, the Permittee shall submit updated versions of the SOMP to MassDEP no later than thirty (30) days prior to the occurrence of a significant change. MassDEP must approve of significant changes to the SOMP prior to the SOMP becoming effective. The updated SOMP shall supersede prior versions of the SOMP.
Cold Start Engine	10. The Permittee shall submit to MassDEP, in accordance with the provisions of 310 CMR 7.02(5)(c), the plans and specifications for the Cold Start Engine and its associated exhaust stack once the specific information has been determined, but in any case not later than 30 days before the construction or installation.
Project-Wide	11. If the Facility is subject to 40 CFR Part 68 due to the presence of a regulated substance above a threshold quantity in a process, the Permittee must submit a Risk Management Plan to EPA no later than the date the regulated substance is first present above a threshold quantity.
	12. The Permittee shall submit an application to update the Facility's Operating Permit. The Permittee may commence construction of the Project. However operation of the proposed equipment/proposed modifications to existing equipment operation cannot occur prior to final approval of the updated Operating Permit.

Table 10	
EU	**Reporting Requirements**
Project-Wide	13. The Permittee shall comply with all applicable reporting requirements of 310 CMR 7.71 (Reporting of Greenhouse Gas Emissions), and 40 CFR Part 98 (Mandatory Greenhouse Gas Emissions Reporting).
	14. The Permittee shall submit to MassDEP all information required by this Plan Approval over the signature of a "Responsible Official" as defined in 310 CMR 7.00 and shall include the Certification statement as provided in 310 CMR 7.01(2)(c).
	15. The Permittee shall notify the Northeast Regional Office of MassDEP, BAW Permit Chief by telephone at (978) 694-3200, by email to nero.air@massmail.state.ma.us , or by fax to (978) 694-3499, as soon as possible, but no later than three (3) business days after discovery of an exceedance(s) of Table 7 requirements. A written report shall be submitted to the following address within ten (10) business days thereafter and shall include: identification of exceedance(s), duration of exceedance(s), reason for the exceedance(s), corrective actions taken, and action plan to prevent future exceedance(s): Department of Environmental Protection 205B Lowell Street Wilmington, Massachusetts 01887 Attn: Permit Chief, Bureau of Air and Waste
	16. The Permittee shall report annually to MassDEP, in accordance with 310 CMR 7.12, all information as required by the Source Registration/Emission Statement Form. The Permittee shall note therein any minor changes (under 310 CMR 7.02(2)(e), 7.03, etc.), which did not require Plan Approval.
	17. The Permittee shall provide a copy to MassDEP of any record required to be maintained by this Plan Approval within thirty (30) days from MassDEP's request.
	18. The Permittee shall comply with all required reporting contained in any applicable New Source Performance Standards (NSPS) contained in 40 CFR Part 60.
	19. The Permittee shall comply with all required reporting contained in any applicable National Emission Standards for Hazardous Air Pollutants (NESHAPS) contained in 40 CFR Part 63.

Table 10 Key:
EU = Emission Unit
CEMS = Continuous Emission Monitoring System
COMS = Continuous Opacity Monitoring System
DAHS = Data Acquisition and Handling System
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
SOMP = Standard Operating and Maintenance Procedures
QA/QC = Quality Assurance/Quality Control
CTG = Combustion Turbine Generator
CO = Carbon Monoxide
PM_{10} = Particulate Matter less than or equal to 10 microns in size
$PM_{2.5}$ = Particulate Matter less than or equal to 2.5 microns in size
VOC = Volatile Organic Compounds
H_2SO_4 = Sulfuric Acid
MassDEP = The Massachusetts Department of Environmental Protection

MECL = Minimum Emissions Compliance Load
Project-wide = CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, and BLR-42-9

7. SPECIAL TERMS AND CONDITIONS

A. The Permittee is subject to, and the Permittee shall ensure that the Project shall comply with, the Special Terms and Conditions as contained in Table 11 below:

Table 11	
EU	**Special Terms and Conditions**
CTG 200/HRSG 200, CTG 300/HRSG 300	1. The Permittee shall ensure that natural gas shall be the sole fuel of use in each of the HRSG's DBs. The Permittee shall ensure that natural gas shall be the primary fuel of use in the CTGs. ULSD firing in the CTGs shall not exceed 48 hours for testing per C12MP, per CHP, and is restricted to no more than 168 hours per C12MP, per CHP, including only periods during which any of the following events occur: a. When natural gas is unable to be burned in the equipment; b. When natural gas is unavailable; and c. During testing which requires the use of ULSD firing.
	2. The Permittee is restricted to a maximum fuel usage for ULSD of 279,216 gallons per C12MP, per CTG.
	3. The Permittee is restricted to a maximum hourly ULSD input rate of 1,662 gallons per hour and maximum operation on ULSD of 168 hours per C12MP, per CTG.
	4. The Permittee shall not allow operation below the MECL, except for start-ups, shutdowns, and transient conditions. Emissions during start-ups, shutdowns, and transient conditions shall be included in the C12MP limits specified in Table 7.
	5. The Permittee shall ensure that the SCR and oxidation catalyst control equipment serving CTG 200/HRSG 200 and CTG 300/HRSG 300 are operational whenever the exhaust temperature at the devices attain the minimum exhaust temperature specified by the vendor and other system parameters are satisfied for their operation. The specific time period required to achieve these exhaust temperature(s) and other system parameters are achieved will vary based on ambient conditions and whether the start-up is cold, warm, or hot.
	6. The Permittee shall develop as part of the Standard Operating Procedures for CTG 200/HRSG 200 and CTG 300/HRSG 300, an MECL optimization protocol to establish minimum operating load(s) that maintain compliance with all emission limits.
	7. The Permittee shall conduct catalyst testing and shall replace the catalysts as appropriate to maintain emissions compliance but at a frequency no less than that recommended by the manufacturer. The Permittee shall maintain records of all testing and replacement actions.

Table 11	
EU	**Special Terms and Conditions**
CTG 200/HRSG 200, CTG 300/HRSG 300	8. The Permittee shall maintain an adequate supply of spare parts on-site to maintain the on-line availability and data capture requirements for the CEMS and COMS equipment serving the CTG 200/HRSG 200 and CTG 300/HRSG 300.
	9. The Permittee shall properly train all personnel to operate CTG 200/HRSG 200 and CTG 300/HRSG 300 and the control and monitoring equipment serving said units in accordance with vendor specifications, including refresher training as warranted by operational changes but not less than once every five (5) years. All persons responsible for the operation of said units shall sign a statement affirming that they have read and understand the approved SOMP.
	10. The Permittee shall comply with all applicable emission standards, monitoring, record keeping, and reporting requirements of 40 CFR Part 60 Subpart KKKK for each of the two proposed CHPs.
	11. The Permittee shall ensure that the shakedown period for both units shall not exceed 180 days from first fire of either unit.
	12. The Permittee shall ensure that prior to completion of shakedown of either unit, the existing GT-42-1A and HRSG-42-1B shall be permanently removed from service and the Permittee shall submit to MassDEP notification of the date that the existing GT-42-1A and HRSG-42-1B are removed from service.
CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine	13. The Permittee shall operate each Emission Unit in accordance with its manufacturer's recommendations as included in each unit's SOMP. MIT shall monitor operations and shall maintain a record of operations and maintenance to verify compliance with this requirement.
Cold Start Engine	14. The Permittee shall comply with all applicable emission standards, monitoring, record keeping, and reporting requirements contained in 40 CFR Part 60 Subpart IIII.
	15. The Permittee shall ensure that the Cold Start Engine shall not be operated more than 300 hours during any C12MP, including normal maintenance and testing procedures as recommended by the manufacturer.
	16. The Permittee shall ensure that the Cold Start Engine is equipped and operated with a non-turnback hour counter which shall be maintained in good working order.
BLR-42-3, BLR-42-4, BLR-42-5	17. The Permittee shall ensure that the required fuel switch occurs within twelve months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operations (after conclusion of shakedown), whichever occurs earlier.

Table 11	
EU	**Special Terms and Conditions**
BLR-42-3, BLR-42-4, BLR-42-5	18. Within twelve months of initial start-up of either CTG 200/HRSG 200 or CTG 300/HRSG 300 or after either CTG 200/HRSG 200 or CTG 300/HRSG 300 commences normal operations (after shakedown), whichever occurs earlier: The Permittee shall ensure that natural gas shall be the primary fuel of use. ULSD firing in each boiler shall not exceed 48 hours for testing per C12MP and is restricted to no more than 168 hours per C12MP including only periods during which any of the following events occur: a. When natural gas is unable to be burned in the equipment; b. When natural gas is unavailable; and c. During testing which requires the use of ULSD firing.
BLR-42-7, BLR-42-9	19. The Permittee shall ensure that natural gas shall be the primary fuel of use. ULSD firing in each boiler shall not exceed 48 hours for testing per C12MP and is restricted to no more than 168 hours per C12MP including only periods during which any of the following events occur: a. When natural gas is unable to be burned in the equipment; b. When natural gas is unavailable; and c. During testing which requires the use of ULSD firing.
Project-Wide	20. The Permittee shall comply with all provisions of 40 CFR Part 60, 40 CFR Part 63, 40 CFR Part 64, 40 CFR Part 68, 40 CFR Part 98, and 310 CMR 6.00 through 8.00 that are applicable to this Project.
	21. The Permittee shall commit to funding all of the mitigation measures discussed in the Section 61 Findings as contained in Section 10 of this Plan Approval. The implementation schedule shall ensure mitigation is implemented prior to or when appropriate in relation to environmental impacts.
	22. The Permittee shall maintain monitoring to ensure and recordkeeping to verify that applicable requirements set forth under Section 61 Findings, as contained in Section 10 of this Plan Approval are complied with.
	23. All requirements of this Approval which apply to the Permittee shall apply to all subsequent owners and/or operators of the Project.
	24. The Permittee shall monitor operations and maintain records of net NO_X emissions over rolling five year periods to verify that that Facility-wide net NO_X emissions increases do not cause 310 CMR 7.00: Appendix A to be applicable.

Table 11 Key:
EU = Emission Unit
CFR = Code of federal regulations
CMR = Code of Massachusetts Regulations
SOMP = Standard Operating and Maintenance Procedures
CEMS = Continuous Emission Monitoring System

COMS = Continuous Opacity Monitoring System
HAP = Hazardous Air Pollutant
NO_X = Nitrogen Oxides
SCR = Selective Catalytic Reduction
CHP = Combined Heat and Power
PSD = Federal Prevention of Significant Deterioration of Air Quality
C12MP = Consecutive twelve month period
ULSD = Ultra Low Sulfur Distillate Fuel Oil containing a maximum of 0.0015 weight percent sulfur
MECL = Minimum Emissions Compliance Load
CTG = Combustion Turbine Generator
MassDEP = The Massachusetts Department of Environmental Protection
QA/QC = Quality Assurance/Quality Control
< = less than
Project-wide = CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, and BLR-42-9

B. STACK INFORMATION

The Permittee shall maintain, and utilize exhaust stacks with the following parameters, as contained in Table 12 below, for the Emission Units that are regulated by this Plan Approval:

Table 12[1]

Emission Unit	Stack Height Above Ground (feet)	Stack Inside Exit Effective Diameter (feet)	Stack Gas Exit Velocity Range (feet per second)	Stack Gas Exit Temperature Range (degrees Fahrenheit)
CTG 200/ HRSG 200[2]	167	7.0	45-70	180-225
CTG 300/ HRSG 300[2]	167	7.0	45-70	180-225
Cold Start Engine	93.5	2.0	81.1	752.1

Table 12 Notes:
1. Stack heights for existing Emission Units have not changed as a result of the Project
2. CTG 200/ HRSG 200 and CTG 300/ HRSG 300 shall each emit through its own flue, both collocated within a single common stack.

C. SOUND

Sound measurements to determine ambient (background) sound levels were conducted at six locations representative of nearest residential receptors property lines in relevant directions from the Project (Table 13). Baseline nighttime sound measurements were taken August 8-August 10, 2014 in the vicinity of the CUP while it was operating under normal conditions. The sound measurements consisted of both A-weighted sound levels and octave band sound levels. A-weighted sound levels emphasize the middle frequency sounds and de-emphasize lower and higher frequency sounds, and are reported in decibels designated as “dBA”. The A-weighted sound levels were recorded for each of the five categories most commonly used to describe ambient

environments: L_{90}, L_{50}, L_{10}, L_{max}, and L_{eq}. The L_{90} level represents the sound level exceeded 90 percent of the time and is used by MassDEP for determining background (ambient) sound levels.

In general, background (L_{90}) levels at the six locations, including three property lines (PL1-PL3) and three nearby residences (R1-R3) as summarized in Table 13 below, ranged from 56 to 63 dBA during nighttime hours.

Calculations of operational acoustic impacts from the Project were calculated using DataKustic's CadnaA noise calculation software, a computer-aided noise abatement program. CadnaA conforms to International Standard ISO-9613.2, "Acoustics – Attenuation of Sound during Propagation Outdoors." The noise model was developed using the primary sources of noise from the Project, which include the following pieces of equipment: CTG packages, the CTGs' air inlet, the CTGs' exhaust stack, the intake and discharge vents, the Cold Start Engine, the gas compressor cooling equipment and the gas compressor. The method evaluated A-weighted sound pressure levels under meteorological conditions favorable to propagation from sources of known sound emissions.

The impact sound levels generated from base load (100% load) operation of the Project modeled by the Permittee are summarized in Table 13 below with requirements pertaining to Sound contained in Table 14 below:

Table 13

Location	Ambient[1] Sound Level exceeded 90 percent of the time (L_{90}), in decibels, A-weighted (dBA)	Modeled Project Only Sound Level (dBA)	Combined Project and Ambient Sound Level (dBA)	Increase Over Ambient Sound Level (dBA)[2]
PL1	61	62	64	3
PL2	59	43	59	0
PL3	63	43	63	0
R1	58	44	58	0
R2	57	37	57	0
R3	56	38	56	0

Table 13 Notes:

1. The background levels observed during equipment operating hours either nighttime or daytime where the sound level is exceeded 90 percent of the time (L_{90}) which is the level regulated by MassDEP Noise Policy 90-001.
2. MassDEP Noise Policy 90-001 limits sound level increases to no more than 10 dBA over the L_{90} ambient levels. Pure tone conditions or tonal sounds, defined as any octave band level which exceeds the levels in adjacent octave bands by 3 dBA or more, are not allowed.

Table 14	
Emission Unit	**Sound/Noise Attenuation and Survey**
Project-wide	1. The Project shall be operated and maintained such that at all times: a. No condition of air pollution shall be caused by sound as provided in 310 CMR 7.01. b. No sound emissions resulting in noise shall occur as provided in 310 CMR 7.10 and MassDEP's Noise Policy 90-001. MassDEP's Noise Policy 90-001 limits increases over the existing L_{90} background level to 10 dBA. Additionally, "pure tone" sounds, defined as any octave band level which exceeds the levels in adjacent octave bands by 3 dBA or more, are also prohibited. The Permittee, at a minimum, shall ensure that the Facility complies with said Policy.
	2. The Permittee shall continue to identify and evaluate all plant equipment that may cause a noise condition. Sound sources from the Project with potential to cause noise include, but are not limited to: CHP packages, CHPs' air inlets, CHPs' exhaust stack, CHPs' enclosure vents, Cold Start Engine, fuel gas compressor station and gas compressor cooling equipment.
	3. The Permittee shall perform the following measures or equivalent alternative measures for the Project to minimize sound emissions as indicated in the Application with regard to noise mitigation: a. The CTGs shall be enclosed and located within the southern section of the new acoustically-designed building toward the existing railroad tracks and other support systems; b. The new building's walls and roof shall have a Sound Transmission Class rating of STC30; c. The equipment and building air ventilation paths shall include treatments such as mufflers, lined ducts, acoustic louvers, and local barriers to provide suitable sound attenuation; d. Major ventilation openings shall be located on the South wall of the new building, facing the railroad tracks and shielded from direct line-of-sight to the community; e. Mufflers shall be installed, as needed, on the CTGs' air intakes, gas exhausts, and enclosure ventilation systems; f. Mufflers shall be installed as needed on non-emergency steam vents. g. Reduced noise lube oil cooler model shall be used or sound barrier walls shall be installed as needed; h. The fuel gas compressor and drive motor shall be installed in a sound-attenuated enclosure located on the roof of the new building and equipped with treated ventilation air paths; and i. The Cold Start Engine shall be installed in a sound-attenuated enclosure located on the roof and equipped with treated ventilation air paths.

Table 14	
Emission Unit	**Sound/Noise Attenuation and Survey**
Project-wide	4. The Permittee shall complete a sound survey in accordance with MassDEP procedures/guidelines within one hundred eighty (180) days after the Project commences operation, while the CUP is in operation, to verify that sound emissions from the Project do not exceed the predicted levels. The Permittee shall submit a sound survey protocol at least 30 days prior to commencing the sound survey for MassDEP review and approval. The Permittee shall submit to MassDEP a written report, describing the results of the required sound survey, within 45 days after its completion.

Table 14 Key:
CHP = Combined Heat and Power
CMR = Code of Massachusetts Regulations
CTG = Combustion turbine generator
CHP = Combined Heat and Power
CUP = Central Utility Plant
dBA = decibels, A-weighted
L_{90} = sound level exceeded 90 percent of the time
MassDEP = Massachusetts Department of Environmental Protection
Project-wide = CTG 200/HRSG 200, CTG 300/HRSG 300, Cold Start Engine, BLR-42-3, BLR-42-4, BLR-42-5, BLR-42-7, and BLR-42-9

8. GENERAL CONDITIONS

The Permittee is subject to, and shall comply with, the following general conditions:

A. Pursuant to 310 CMR 7.01, 7.02, 7.09 and 7.10, should any nuisance condition(s), including but not limited to smoke, dust, odor or noise, occur as the result of the operation of the Facility, then the Permittee shall immediately take appropriate steps including shutdown, if necessary, to abate said nuisance condition(s).

B. If asbestos remediation/removal will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that all removal/remediation of asbestos shall be done in accordance with 310 CMR 7.15 in its entirety and 310 CMR 4.00.

C. If construction or demolition of an industrial, commercial or institutional building will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that said construction or demolition shall be done in accordance with 310 CMR 7.09(2) and 310 CMR 4.00.

D. Pursuant to 310 CMR 7.01(2)(b) and 7.02(7)(b), the Permittee shall allow MassDEP and / or USEPA personnel access to the Facility, buildings, and all pertinent records for the purpose of making inspections and surveys, collecting samples, obtaining data, and reviewing records.

E. This Plan Approval does not negate the responsibility of the Permittee to comply with any other applicable Federal, State, or local regulations now or in the future.

F. Should there be any differences between the Application and this Plan Approval, the Plan Approval shall govern.

G. Pursuant to 310 CMR 7.02(3)(k), MassDEP may revoke this Plan Approval if the construction work is not commenced within two years from the date of issuance of this Plan Approval, or if the construction work is suspended for one year or more.

H. This Plan Approval may be suspended, modified, or revoked by MassDEP if MassDEP determines that any condition or part of this Plan Approval is being violated.

I. This Plan Approval may be modified or amended when in the opinion of MassDEP such is necessary or appropriate to clarify the Plan Approval conditions or after consideration of a written request by the Permittee to amend the Plan Approval conditions.

J. Pursuant to 310 CMR 7.01(3) and 7.02(3)(f), the Permittee shall comply with all conditions contained in this Plan Approval. Should there be any differences between provisions contained in the General Conditions and provisions contained elsewhere in the Plan Approval, the latter shall govern.

9. MASSACHUSETTS ENVIRONMENTAL POLICY ACT

The Project was also subject to the requirements of the Massachusetts Environmental Policy Act (MEPA) Massachusetts General Laws (M.G.L.) Chapter 30, Sections 61-62I and Section 11.08 of the MEPA regulations at 301 CMR 11.00. MIT submitted to the Executive Office of Energy and Environmental Affairs (EOEEA), MEPA Office an expanded environmental notification form (EENF), dated December 15, 2015, and a Single Environmental Impact Report (SEIR), dated May 13, 2016. These documents addressed various environmental media impacts including an air toxics evaluation with an air dispersion modeling study. On July 1, 2016, the Secretary of the Executive Office of Energy and Environmental Affairs issued a certificate that the Single Environmental Impact Report (SEIR) (EEA #15453) adequately and properly complied with MEPA and its implementing regulations.

10. SECTION 61 FINDINGS

Mitigation/Draft Section 61 Findings

The Single EIR contained draft Section 61 Findings associated with each separate State Agency Action identified for the Project.

The Project includes the following mitigation measures to avoid, minimize, and mitigate impacts from the Project, as committed to by MIT:

GHG Emissions

- Use variable frequency drives (VFD) for fuel gas compressor;
- Review use of high-efficiency motors and VFDs in final project design;
- Use waste heat to assist in urea vaporization;
- Use of an adsorption rotary drum dryer associated with the compressed air system;
- Construct HRSGs with surface area and piping required to implement a Medium Temperature Hot Water system;
- Use light-emitting diode (LED) lighting and an occupancy lighting system in the building expansion to reduce electricity use; and,
- Provide a GHG self-certification to the MEPA Office.

Air Quality

- Use of clean-burning fuels (natural gas and ULSD) that are low in sulfur to control particulate matter (PM) and SO_2;
- Removal of residual oil firing for existing Boilers 3, 4, and 5 and removal of ULSD firing for existing Boilers 7 and 9*;
- Low-NO_X combustors and use of Selective Catalytic Reduction (SCR) to control NO_X;
- Minimize CO and VOC emissions through combustion control and use of Ammonia (NH_3) and oxidation catalysts;
- CTs include option to use low-NO_X combustors instead of water injection;
- High efficiency drift eliminators will minimize emissions from new cooling towers;
- Limit use of ULSD to 300 hours per 12-month period; and,
- Will comply with emission rates that meet EPA limits for off-road engines.

***BLR-42-7 and BLR-42-9 will retain their current ability to fire ULSD as a backup fuel for testing and when natural gas is unavailable however will do so at a rate reduced from a current maximum of 720 hours per C12MP to 168 hours per C12MP. The Section 61 Findings have been amended as described in email communications between AJ Jablonowski (Epsilon Associates) and Alexander Strysky (MEPA – EEA), dated January 26 and 30, 2017.*

Noise

- Noise producing equipment (e.g. CTGs, cogeneration equipment, fuel gas compressor and drive motor, and diesel generator) will be enclosed in sound-attenuating materials, enclosures, or behind sound barrier walls;
- Mufflers will be installed on the gas turbine air intake, gas exhaust, turbine enclosure, and ventilation systems;
- Mufflers will be installed on the non-emergency steam vents as necessary;
- Reduced-noise fans with VFDs will be used in the cooling towers;
- Equipment and building air ventilation paths will include treatments (mufflers, lined ducts, acoustic louvers, and local barriers) with suitable sound attenuation; and,
- The shell of the new building will be designed to reduce noise levels to 55 to 60 dBA directly outside the building walls facing the neighborhood.

Construction Period

- Use fencing and barricades to isolate construction areas from pedestrians;

- Encourage use of alternative transportation to the site by construction workers;
- Use construction equipment that meets or exceeds EPA Exhaust Emission Standards;
- Use wetting agents as necessary and covered trucks to reduce the spread of dust;
- Establish a tire cleaning area to prevent dirt from reaching city streets;
- Minimize exposed storage of debris on-site;
- Clean sidewalks and streets to minimize dust aggregation;
- Turn off idling equipment;
- Use and maintain mufflers on construction equipment and enclosures around continuously-operating equipment to reduce noise;
- Separate or shield noisy equipment from sensitive receptors;
- Divert construction waste from landfills by recycling waste material;
- Conduct a hazardous waste survey prior to the start of construction to ensure appropriate disposal of hazardous material, including asbestos;
- Install stormwater management controls to meet City of Cambridge requirements; and,
- Use a Certified Industrial Hygienist to develop and implement Dust Mitigation Plan and air quality requirements during activities that could expose people to contaminated soil or groundwater and other hazardous conditions.

The Permittee shall commit to funding all of the mitigation measures discussed in the Section 61 Findings. The implementation schedule shall ensure mitigation is implemented prior to or when appropriate in relation to environmental impacts.

Section 61 Findings

Based upon its review of the MEPA documents, the Plan Approval Application and amendments thereof submitted to date and MassDEP's regulations, MassDEP finds that the terms and conditions of this Plan Approval constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable. Implementation, compliance and enforcement of the mitigation measures will occur in accordance with the terms and conditions set forth in this Plan Approval.

11. PUBLIC PARTICIPATION

On April 11, 2017 MassDEP issued a Proposed Plan Approval and Draft PSD Permit for this Application. MassDEP offered a Public Comment Period and held a Public Hearing on the proposed actions. Notice of the proposed actions was published in English in the *Boston Globe* on April 17, 2017 and in the *Cambridge Chronicle* on April 20, 2017, both newspapers of general circulation in proximity to the proposed new emission source noted above, in Portuguese in *OJornal* on April 21, 2017, in Spanish in *El Mundo* on April 20, 2017, in Chinese in *Sampan* on April 21, 2017, and in the April 19, 2017 issue of the *Environmental Monitor*. Copies of the notice and the Proposed Plan Approval and Draft PSD Permit were available at the Department of Environmental Protection Metropolitan Boston/Northeast Regional Office at 205B Lowell Street, in Wilmington and appeared on the MassDEP website: www.mass.gov/eea/agencies/massdep/news/comment/ and on the MIT Project webpage at https://powering.mit.edu. The Public Comment Period closed at 5PM on

Tuesday May 23, 2017. MassDEP held a Public Hearing on the Proposed Plan Approval and Draft PSD Permit on Monday May 22, 2017. No oral or written testimony was received at the Public Hearing. Any written comments received during the Public Comment Period have been considered and addressed, as appropriate, in this Plan Approval (and in the PSD Permit). See Response to Comment (RTC) Document attached to PSD Permit.

12. APPEAL PROCESS

This Plan Approval is an action of MassDEP. If you are aggrieved by this action, you may request an adjudicatory hearing. A request for a hearing must be made in writing and postmarked within twenty-one (21) days of the date of issuance of this Plan Approval.

Under 310 CMR 1.01(6)(b), the request must state clearly and concisely the facts, which are the grounds for the request, and the relief sought. Additionally, the request must state why the Plan Approval is not consistent with applicable laws and regulations.

The hearing request along with a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100.00) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

This request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

MassDEP may waive the adjudicatory hearing-filing fee for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request as provided above, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

Should you have any questions concerning this Plan Approval, please contact Edward Braczyk by telephone at 978-694-3289, or in writing at the letterhead address.

Sincerely,

_____
Susan Ruch
Acting Permit Chief and
Deputy Regional Director
Bureau of Air and Waste

_____
Edward J. Braczyk
Supervising Environmental Engineer

_____
Susan McConnell
Environmental Engineer

Enclosure: Communication for Non-English Speaking Parties

cc: A.J. Jablonowski, Epsilon Associates, 3 Mill & Main Place, Suite 250, Maynard, MA 01754
Seth Kinderman, MIT Plant Engineering Manager MIT Central Utilities Plant - Bldg 42, 59 Vassar Street, Cambridge, MA 02139-4308
Cambridge Board of Health, 119 Windsor Street, Ground level, Cambridge, MA 02139
Fire Headquarters, 491 Broadway Street, Cambridge, MA 02138
Metropolitan Area Planning Council, 60 Temple Place, Boston, MA 02111
Cambridge Mayor's Office, 795 Massachusetts Ave., 2nd Floor, Cambridge, MA 02139
Deirdre Buckley, MEPA, Executive Office of Energy and Environmental Affairs, 100 Cambridge Street, Suite 900, Boston, MA 02114.
John Ballam, Department of Energy Resources, 100 Cambridge Street, Suite 1020, Boston, MA 02114
United States Environmental Protection Agency (EPA) – New England Regional Office, 5 Post Office Square, Suite 100, Mail Code OEP05-2, Boston, Massachusetts 02109-3912 Attn: Air Permits Program Manager

ecc: MIT: Zhanna Davidovitz
EPA-New England: Donald Dahl
MassDEP/Boston: Yi Tian

MassDEP/WERO: Marc Simpson
MassDEP/CERO: Roseanna Stanley
MassDEP/SERO: Thomas Cushing
MassDEP/NERO: Susan Ruch
MassDEP/NERO: Ed Braczyk
MassDEP/NERO: Susan McConnell
MassDEP/NERO: Martha Bolis
MassDEP/NERO: Mary Persky

Exhibit 20

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Formaldehyde and VOC Emissions from a General Electric LM6000 Combustion Turbine with SCR and CO Catalysts

1013170

Formaldehyde and VOC Emissions from a General Electric LM6000 Combustion Turbine with SCR and CO Catalysts

1013170

Technical Update, February 2006

EPRI Project Manager

P. Chu

ELECTRIC POWER RESEARCH INSTITUTE
3420 Hillview Avenue, Palo Alto, California 94304-1395 • PO Box 10412, Palo Alto, California 94303-0813 • USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITIES

ORGANIZATION(S) THAT PREPARED THIS DOCUMENT

TRC Environmental

This is an EPRI Technical Update report. A Technical Update report is intended as an informal report of continuing research, a meeting, or a topical study. It is not a final EPRI technical report.

NOTE

For further information about EPRI, call the EPRI Customer Assistance Center at 800.313.3774 or e-mail askepri@epri.com.

CITATIONS

This document was prepared by

TRC Environmental
21 Griffin Road North
Windsor, CT 06095

Principal Investigator
J. Canora

This document describes research sponsored by the Electric Power Research Institute (EPRI).

This publication is a corporate document that should be cited in the literature in the following manner:

Formaldehyde and VOC Emissions from a General Electric LM6000 Combustion Turbine with SCR and CO Catalysts. EPRI, Palo Alto, CA: 2006. 1013170.

PRODUCT DESCRIPTION

This report summarizes measurements to characterize trace organic emissions from New York Power Authority's Harlem River Unit 1 - a simple-cycle, natural gas-fired General Electric (GE) LM6000 combustion turbine, and employing selective catalytic reduction (SCR) and carbon monoxide (CO) catalyst.

Results & Findings

Formaldehyde emissions were higher during the low load and winter tests. Formaldehyde emission concentrations during the winter averaged 46 $\mu g/m^3$ (37 ppb) at high load and 151 $\mu g/m^3$ (121 ppb) at low load. The summer test showed lower formaldehyde emissions compared to the winter tests and also showed a similar pattern of higher formaldehyde emissions at low load. Warm weather formaldehyde concentration averaged 7.9 $\mu g/m^3$ (6.3 ppb) at high load and 41 $\mu g/m^3$ (33 ppb) at low load. Carbon monoxide was also elevated during the low load testing, indicating that incomplete combustion may have been a factor in formaldehyde emissions at low load.

Most volatile organic compounds (VOCs) were below or marginally above the detection limits. The one exception was benzene, which was detected at significant concentrations during both the winter and summer tests. Decreasing levels of benzene emissions were detected. For example, the benzene emission concentrations over the four high load winter tests started at 155 $\mu g/m^3$ (48 ppb) during the first test, decreased each subsequent run, and measured 9.8 $\mu g/m^3$ (3 ppb) during the fourth test – all of which occurred in less than three hours. During the low load winter tests conducted on the following day, benzene was either below detection limit or detected just above the detection limit, with the highest benzene concentration being 0.8 $\mu g/m^3$ (0.3 ppb). There were no obvious measures of either sampling or laboratory contamination, as the trip and field blanks were benzene-free. Lastly, the results were not indicative of gasoline contamination where toluene and xylenes would have also been detected at similar levels.

Challenges & Objectives

The objectives of this study are:

- Characterize aldehyde and VOC emissions from "utility-size" state-of-the-art combustion turbines.
- Evaluate the impact of seasonal effects (ambient temperature) and operating load.

The most significant challenges are the complexity of the trace organic measurements at low ppb levels.

Applications, Values & Use

The results would assist in permitting new combustion turbines, as well as to support reporting estimated emissions for Toxics Release Inventory (TRI).

EPRI Perspective

These results summarize formaldehyde and VOC emission measurements from a simple cycle combustion turbine operating at several operating loads and during summer and winter conditions. The formaldehyde results indicated higher emission concentrations during lower load operation as well as winter operating conditions. The VOCs were generally not detected, with the exception of benzene. Decreasing levels of benzene emissions were detected, and it is unclear whether the measurements are representative of real operating conditions, a sampling/analytical issue, and/or outside contamination. Previous EPRI measurements at a Siemens-Westinghouse 501F gas-fired combustion turbine with SCR and CO catalysts indicated similar results for formaldehyde, but generally not detected values for the VOCs, although benzene was detected during start-up (EPRI 1005408).

Additional trace organic measurements are planned to characterize other combustion turbine designs.

Approach

Measurements were conducted in the winter as well as the summer to evaluate the impact of ambient temperature. Measurements were conducted at full load, as well as a reduced load in order to evaluate the impact of operating load. Investigators measured formaldehyde using EPA SW-846 Method 0011 and 8315a. The VOCs were measured using the volatile organic sampling train (VOST) in accordance with EPA SW-846 Method 0300. Flue gas measurements were conducted at only the stack.

Keywords

Air toxics, formaldehyde, combustion turbines

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) was retained by the Electric Power Research Institute (EPRI) to perform a volatile organic compound (VOC) air emission measurement project on a simple cycle gas turbine generator firing natural gas. The emissions test was conducted on a General Electric LM6000 combustion turbine generator (CTG) operated by the New York Power Authority (NYPA) at the Harlem River site in The Bronx. The LM6000 turbine has a nominal capacity of 48 megawatts and a heat input of approximately 400 MMBtu/hr at 59 degrees F. The project included testing at maximum and partial turbine loads and was repeated during winter and summer weather. Both winter and summer weather emission tests were conducted according to the following test matrix.

Parameter	Sampling Method	Analytical Method	Test Duration (minutes)	Number of Tests at Each Operating Load
Aldehydes and Ketones	SW-846 0011	SW-846 8315a	64	3
VOC (non-water soluable compounds)	SW-846 0030	SW-846 8260	40	4

Target compounds included aldehydes and ketones measured according to EPA SW-846 Method 0011 and 8315a. Samples are collected in dinitrophenylhydrazine (DNPH) solution, which forms a derivative with aldehydes and ketones. The DNPH is extracted in methylene chloride, and the extract is analyzed by high pressure liquid chromatography (HPLC) for multiple compounds.

Target compounds also included non-water soluble volatile organic compounds (VOC) measured according to EPA SW-846 Method 0030 and 8260. The Method 0030 samples are collected on sorbent tubes (Tenax® and charcoal), which are thermally desorbed and analyzed by gas chromatography/mass spectrometry (GC/MS) according to Method 8260. The target compound list included 70 compounds.

The tests were conducted on the stack of the Harlem River Plant Unit 1. Cold weather testing was conducted on December 14-15, 2004 and warm weather testing was conducted on July

13-14, 2005. The GE LM6000 turbine generators are used by NYPA for peak demand power generation and during the winter the generators are typically fired in the late afternoon. The winter tests were conducted between 3:20 and 8:00 PM with ambient temperature in the range of 20 to 25^{o} F. During the summer the generators are typically fired in the early afternoon and the July tests were conducted between noon and 5:00 pm with the ambient temperature in the range of 73 to 81^{o} F.

Sampling was conducted by TRC staff including Jim Canora, Kirk Laakso and Robert Mennillo. Method 0011 laboratory analyses were conducted by Enthalpy Analytical in Raleigh, NC, and Method 0030 VOC analyses were conducted by Air Toxics, Inc in Folsom, CA. Michael Stockstad of NYPA coordinated testing with the plant operation.

The test results are presented and discussed in Section 2 of this report followed by a brief discussion of the process in Section 3. Section 4 presents a description of sampling and analytical methods and Section 5 presents a discussion of measurement quality assurance. Copies of sampling data, sampling calibration forms, process data, and analytical data summaries are included in the appendices.

2.0 SUMMARY AND DISCUSSION OF RESULTS

Test results are summarized in Tables 2-1 and 2-2 for the winter and summer tests. Only 5 compounds (formaldehyde, acetaldehyde, acetone, benzene and toluene) were detected in at least two samples and these compounds are the only compounds included in Tables 2-1 and 2-1. Detection limits for other target compounds are presented in Appendices A – D. In summary, the test program showed increased formaldehyde emissions at low load and at cold weather operations.

Emissions are presented in micrograms per standard cubic meter ($\mu g/m^3$), parts per billion volume (ppbv) and pounds per million Btu (lb/MMBtu). The lb/MMBtu emissions were calculated using the natural gas dry fuel factor (F_d= 8,710 dscf/MMBtu) provided in EPA Method 19. Winter high load tests were conducted on December 14, 2004 with an average power output of 47.95 megawatts and winter low load tests were conducted on the following day with an average power output of 36.88 megawatts. Summer high load tests were conducted on July 13, 2005 with an average power output of 47.76 megawatts and summer low load tests were conducted on the following day with an average power output of 38.02 megawatts.

2.1 Aldehyde and Ketone Emissions – SW-846 Method 0011

Tests showed that formaldehyde emissions were higher during low load and winter weather. Formaldehyde emission concentration during the winter averaged 46.4 $\mu g/m^3$ at high load and 151 $\mu g/m^3$ at low load; concentration was approximately 3 times higher during low load. The summer test showed lower formaldehyde emissions compared to the winter tests and also showed a similar pattern of higher formaldehyde emissions at low load. Warm weather formaldehyde concentration averaged 7.9 $\mu g/m^3$ at high load and 40.7 $\mu g/m^3$ at low load. Carbon monoxide concentration, measured by the plant CEMS, was also elevated during the low load testing, indicating that incomplete combustion may have been a factor in formaldehyde emissions at low load.

2.2 VOC Emissions – SW-846 Method 0030

The cold weather test results showed that most target compounds were below, or marginally above, the detection limits. The one exception was benzene, which was detected at significant concentrations during the high load winter tests. Benzene emission concentrations rapidly decreased over the four high load winter tests, starting at 155 $\mu g/m^3$ during the first test and decreasing to 9.75

$\mu g/m^3$ during the fourth test. During the low load winter tests conducted on the following day, benzene was either below detection limit or marginally detectable; the highest benzene concentration during the low load winter test was 0.84 $\mu g/m^3$. There was no indication of sampling or laboratory contamination, as trip and field blanks were benzene free and the results were not indicative of gasoline contamination where toluene and xylenes would have also been detected at similar levels.

The warm weather test results also showed that most target compounds were below, or marginally above, the detection limits. However, benzene was again detected in decreasing concentrations similar to the cold weather high load test; the warm weather high load benzene emissions decreased from 60.0 to 6.0 $\mu g/m^3$ and the low load decreased from 65.6 to 1.2. As with the winter tests there was no evidence of sampling or laboratory contamination and no indication of gasoline contamination.

Possible explanations for the benzene emissions include benzene in the compressor condensate entering the turbine exhaust through the catalyst inlet dilution air fans. The condensate consists of an oil/water mixture and analyses of the condensate shows significant benzene concentration. The condensate is stored in tanks located near the dilution air fan intake and there is the potential for tank vapors to be injected into the turbine exhaust prior to the catalyst. Benzene emissions as a function of test time to turbine start up were also investigated and the data showed no correlation. Cold weather testing was initiated within 1 hour of a cold turbine start up on both test days and the first day showed high benzene emissions and the second day showed low benzene emissions. Warm weather testing was initiated within 1 hour of start up on the low load day and 6 hours after start up on the high load day, and benzene emissions were similar on both days.

In summary, decreasing levels of benzene emissions were detected and the data indicates the emissions were a transient condition. A possible source of the benzene is the dilution air fans and benzene vapors from condensate storage tanks. There was no correlation with the benzene emissions and the time between testing and turbine start up. There was no evidence of sampling and analytical benzene contamination; however, there is the possibility of an unusual sampling train contamination that only occurred when the sampling system was exposed to high temperature stack gas.

TABLE 2-1
SIMPLE CYCLE GAS TURBINE
COLD WEATHER VOC EMISSIONS TEST SUMMARY

NYPA - HARLEM RIVER UNIT 1

Date	December 14, 2004						December 15, 2005				
Load	High Load (48.0 MW)						Low Load (36.9 MW)				
Test No.	1	2	3	4	Average		1	2	3	4	Average
CEMS Data											
CO (ppm @ 15% O_2)	1.1	1.1	1.1		1.1		2.5	1.9	1.9		2.1
NH_3 (ppm @ 15% O_2)	7.2	7.2	7.4		7.3		7.2	7.0	6.6		6.9
NOx (ppm @ 15% O_2)	2.3	2.3	2.4		2.3		2.2	2.0	2.2		2.1
O_2 (%)	15.1	15.1	15.2		15.1		16.0	15.9	16.0		16.0
Emission Conc (ug/dscm)											
formaldehyde	59.0	49.2	31.0		46.4		165	141	146		151
acetaldehyde	15.3	9.4	10.2		11.6		9.2	28.1	9.4		15.6
acetone	ND	ND	ND		ND		84.2	10.9	69.2		54.8
benzene	155	69.5	18.4	9.8	63.3		0.6	0.84	ND	ND	<0.6
toluene	6.04	2.52	ND	ND	<2.4		ND	ND	ND	ND	ND
Emission Conc (ppbv)											
formaldehyde	47.3	39.4	24.9		37.2		132	113	117		121
acetaldehyde	8.4	5.1	5.6		6.3		5.0	15.3	5.1		8.5
acetone	ND	ND	ND		ND		34.9	4.5	28.7		22.7
benzene	47.8	21.4	5.7	3.0	19.5		0.2	0.3	ND	ND	<0.2
toluene	1.6	0.7	ND	ND	0.6		ND	ND	ND	ND	ND
Emission Rate (lb/mmBtu)											
formaldehyde	1.2E-04	9.6E-05	6.2E-05		9.1E-05		3.8E-04	3.2E-04	3.4E-04		3.5E-04
acetaldehyde	3.0E-05	1.8E-05	2.0E-05		2.3E-05		2.1E-05	6.4E-05	2.2E-05		3.6E-05
acetone	ND	ND	ND		ND		2.0E-04	2.5E-05	1.6E-04		1.3E-04
benzene	3.8E-04	1.7E-04	4.4E-05	2.4E-05	1.5E-04		1.5E-06	2.0E-06	ND	ND	<1.4E-06
toluene	1.5E-05	6.1E-06	ND	ND	<5.7E-06		ND	ND	ND	ND	ND

ND = non-detected
ug/dscm = micrograms per dry standard cubic meter at 68 ^{o}F and 29.92 in Hg
< = detection limit based on averages of detected quantities and detection limits

TABLE 2-2
SIMPLE CYCLE GAS TURBINE
WARM WEATHER VOC EMISSIONS TEST SUMMARY

NYPA - HARLEM RIVER UNIT 1

Date	July 13, 2005						July 14, 2005				
Load	High Load (47.8 MW)						Low Load (38.0 MW)				
Test No.	1	2	3	4	Average		1	2	3	4	Average
CEMS Data											
CO (ppm @ 15% O_2)	1.2	1.2	1.2		1.2		3.6	3.6	3.6		3.6
NH_3 (ppm @ 15% O_2)	3.2	3.3	2.9		3.1		1.3	1.1	1.1		1.2
NOx (ppm @ 15% O_2)	1.9	1.8	1.9		1.9		1.9	1.9	1.9		1.9
O_2 (%)	15.0	15.0	15.0		15.0		15.7	15.7	15.6		15.7
Emission Conc (ug/dscm)											
formaldehyde	12.8	5	5.9		7.9		37.4	41.8	43		40.7
acetaldehyde	ND	ND	ND		ND		ND	ND	ND		ND
acetone	9.5	6.8	18.5		11.6		14.2	4.8	23.6		14.2
benzene	60.0	23.5	11.1	6.0	25.1		65.6	13.8	1.7	1.2	20.6
toluene	1.6	0.9	ND	ND	<0.9		2.1	1.1	ND	ND	<1.0
Emission Conc (ppbv)											
formaldehyde	10.3	4.0	4.7		6.3		30	34	34		33
acetaldehyde	ND	ND	ND		ND		ND	ND	ND		ND
acetone	3.9	2.8	7.7		4.8		5.9	2.0	9.8		5.9
benzene	18.5	7.2	3.4		7.7		20.2	4.3	ND		6.4
toluene	0.4	0.2	ND		0.2		ND	ND	ND		ND
Emission Rate (lb/mmBtu)											
formaldehyde	2.5E-05	9.9E-06	1.2E-05		1.6E-05		8.3E-05	9.5E-05	1.0E-04		9.3E-05
acetaldehyde	ND	ND	ND		ND		ND	ND	ND		ND
acetone	1.9E-05	1.3E-05	3.5E-05		2.3E-05		3.2E-05	1.1E-05	5.5E-05		3.2E-05
benzene	1.2E-04	4.6E-05	2.7E-05	1.1E-05	5.2E-05		1.6E-04	3.3E-05	4.2E-06	3.0E-06	5.0E-05
toluene	3.2E-06	1.8E-06	ND	ND	<1.8E-06		5.0E-06	2.6E-06	ND	ND	<2.5E-06

ND = non-detected
ug/dscm = micrograms per dry standard cubic meter at 68 ^{o}F and 29.92 in Hg
< = detection limit based on averages of detected quantities and detection limits

3.0 PROCESS INFORMATION

3.1 Process Description

New York Power Authority (NYPA) operates ten identical LM-6000 gas turbines, which fire only natural gas. The turbines are located at six separate sites. There are a total of four sites that operate dual units and two sites that operate a single unit. The dual unit sites are Harlem River, Hell Gate, Gowanus and Vernon Blvd. and the single units are Kent and Pouch Terminal. The net capacity for all units is 47 MW. The dual units are restricted to 79.9 MW combined output.

Each gas turbine operates as a simple cycle unit, employing a spray inter-cooling system to optimize power output. Each plant is equipped with Selective Catalytic Reduction (SCR) units for control of oxides of nitrogen and catalytic oxidation units (CO catalyst) for the control of carbon monoxide attached to each combustion turbine. Dilution air fans are used to inject ambient air prior to the catalyst bed to control gas temperature at the catalyst.

3.2 Process Monitoring

The gas turbine stacks are equipped with dedicated continuous emission monitoring systems (CEMS). The CEMS are dry extractive design, and measure stack concentrations of NOx, CO, O_2, and NH_3 on a dry basis. Power output, gas flow rate, and other process operating parameters are also monitored and recorded. Process data and emissions data recorded during the emissions test are included in Appendices E and F.

4.0 SAMPLING AND ANALYTICAL METHODS

Sampling was conducted from four ports in the 150-inch diameter stack. The ports were located 50 feet (4 diameters) downstream of the breeching entrance and greater than 25 feet (2 diameters) upstream of the stack exit. The stack schematic and sampling point locations are presented in Figure 4-1.

4.1 Volatile Organic Compounds

The concentrations of volatile organic compounds were determined using the volatile organic sampling train (VOST) in accordance with EPA SW-846 Method 0030. Four samples were collected during each operating load for a total of 8 samples. One field blank and one trip blank were also collected. Sampling duration was 40 minutes per test.

4.1.1 Sample Collection

A 20-liter (nominal) sample of exhaust gas was collected at a flow rate of approximately 0.5 liter per minute (lpm). A schematic of the sampling train is shown in Figure 4-2. The sampling train includes a heated (250° F ± 25° F) glass-lined probe followed by a glass 3-way valve, and a condenser chilled to 20 °C. A Tenax® cartridge follows the first condenser which is followed by a second condenser and a second sorbent cartridge containing a 3:1 mix of Tenax® and activated charcoal.

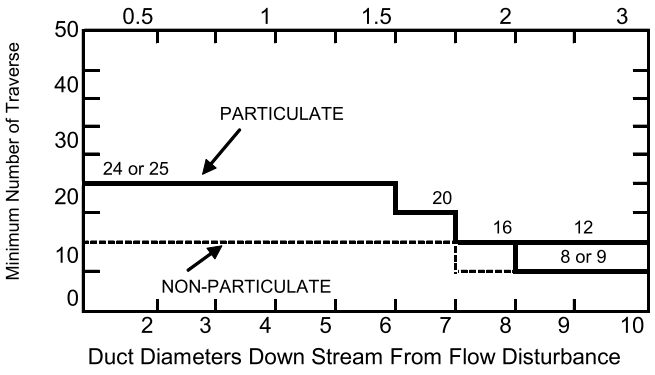
Each pair of sorbent cartridges (Tenax® and Tenax®/charcoal) were desorbed and analyzed together. The field blank and trip blank cartridge pairs were also desorbed and analyzed togather. There was approximately 2 milliliters of condensate from each set of four samples and the condensates were collected in a 40 milliliter vials which were filled to “zero headspace” with purified water. The two condensate samples were analyzed with a purge and trap concentrator for the Method 8260 compounds and no compounds were detected.

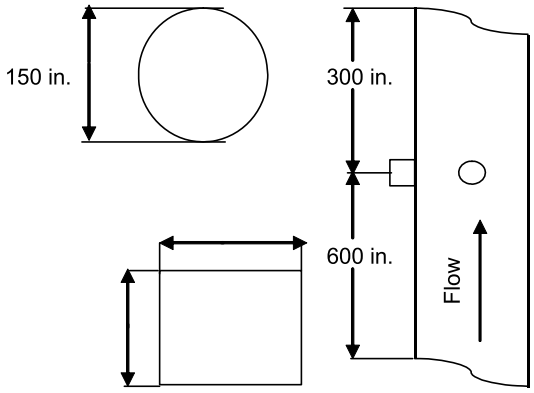
Figure 4-1

TRC Environmental Corporation
EPA Method 1 Data Sheet

Firm	NYPA Harlem River	Total Traverse Points Required	16
Location	Unit 1 Stack	Number of Ports	2
Diameters Upstream	2.0	Points Per Port	8
Diameters Downstream	4.0	Traverse (Horizontal or Vertical)	Horizontal
Nipple Size (in.)	6		

Minimum Number of Traverse Points For Particulate and Non-Particulate Traverses



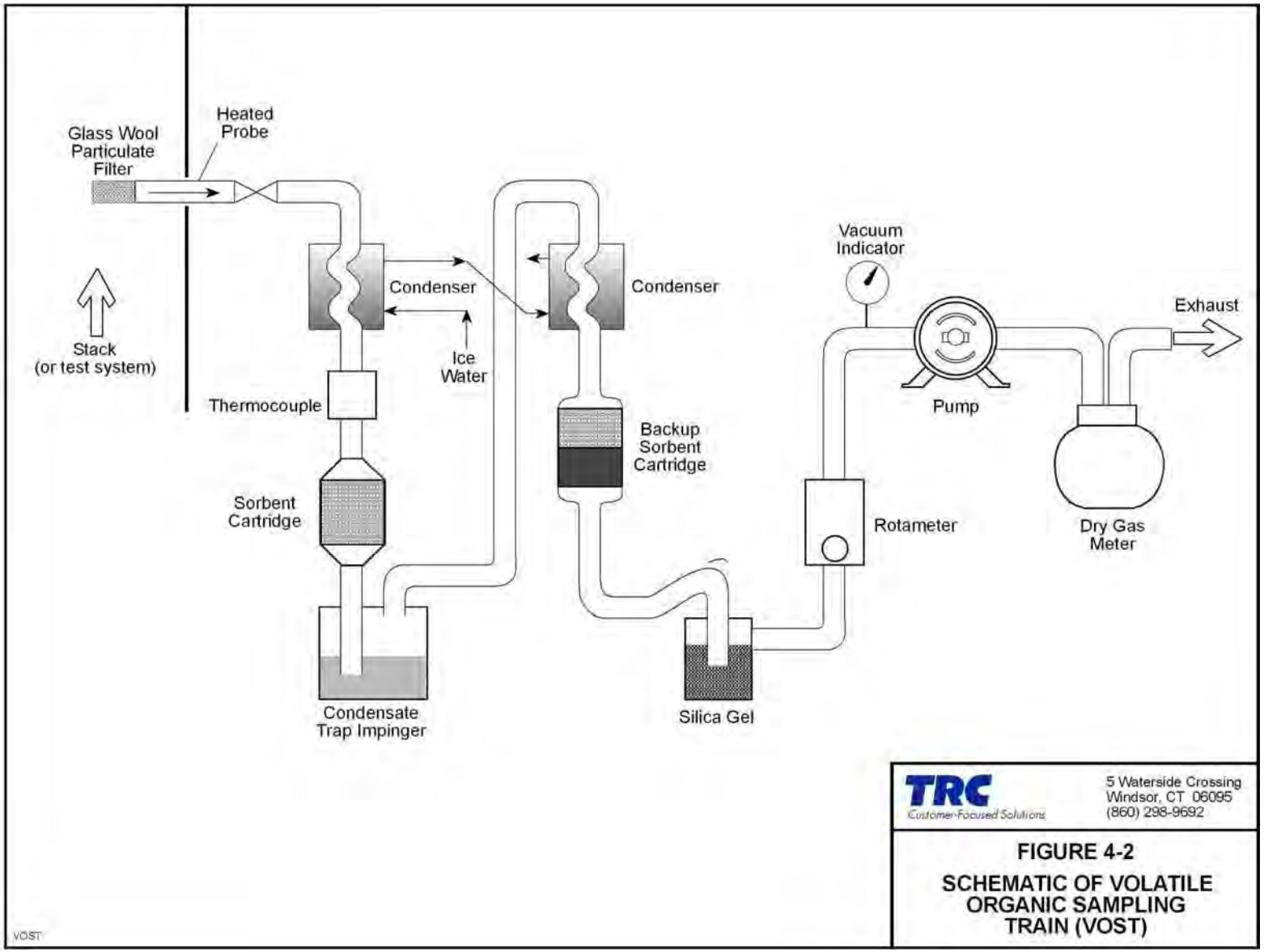


Cross-Sectional Layout For Rectangular Stacks Total	
Total Traverse Points	Matrix
9	3x3
12	4x3
16	4x4
20	5x4
25	5x5

Point Number On a Diameter	(Percent of Stack Diameter from Inside Wall to Traverse Point) (No. of Traverse Points on a Dia.) 4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5	c	85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

Traverse Point Location

Point Number	Distance From Wall	Nipple Size	Total Distance
1	4.8	6.0	10.8
2	15.8	6.0	21.8
3	29.1	6.0	35.1
4	48.5	6.0	54.5
5	101.6	6.0	107.6
6	120.9	6.0	126.9
7	134.3	6.0	140.3
8	145.2	6.0	151.2
9			
10			
11			
12			


Glass Wool Particulate Filter
Heated Probe
Stack (or test system)
Condenser
Ice Water
Condenser
Vacuum Indicator
Exhaust
Pump
Thermocouple
Backup Sorbent Cartridge
Sorbent Cartridge
Rotameter
Dry Gas Meter
Condensate Trap Impinger
Silica Gel
VOST
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
FIGURE 4-2
SCHEMATIC OF VOLATILE ORGANIC SAMPLING TRAIN (VOST)

4.1.2 Sample Recovery

At the completion of each test run, the sample cartridges were sealed with Swagelok fittings and stored on ice until shipment for analysis. Test data was recorded on appropriate field data sheets.

4.1.3 Sample Analysis

Sample analysis was performed by Air Toxics, Inc according to Methods 0030 and 8260. The contents of the paired sorbent cartridges were spiked with an internal standard and thermally desorbed for 11 minutes at 180° C with organic-free nitrogen gas, bubbled through 5 ml of organic-free water, and trapped on an analytical absorbent trap. After the 11-minute desorption, the analytical absorbent trap was rapidly heated to 180° C with the carrier gas flow reversed so that the effluent flow from the analytical trap was directed into the GC/MS. The volatile compounds were separated by temperature-programmed gas chromatography and detected by low-resolution mass spectrometry. The concentrations of volatile compounds were based on calibration runs performed with standards containing the target compounds.

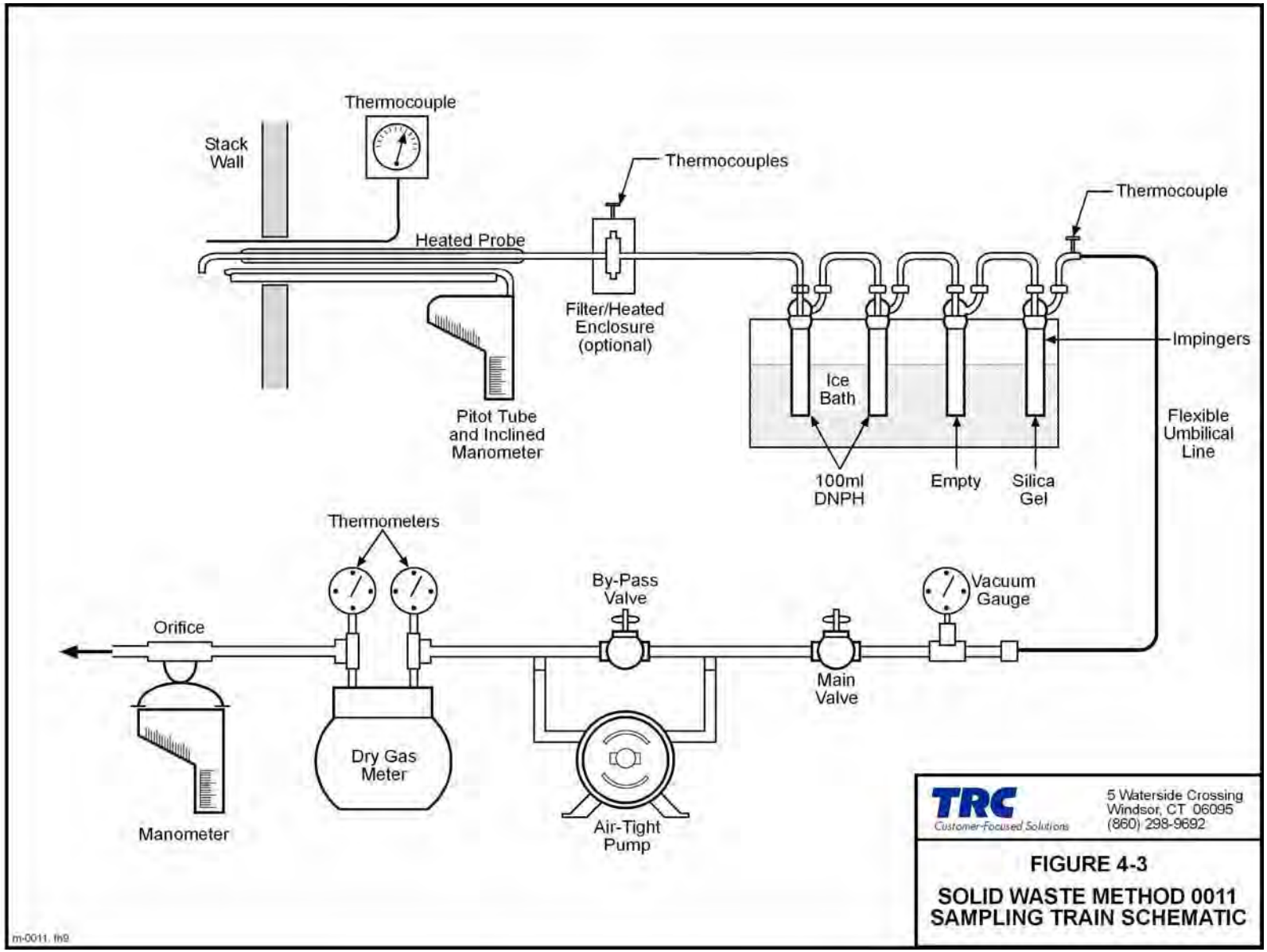
One additional compound was added to the target compound list for this project; this was 1,4-dioxane. The additional compound was quantified as a tentatively identified compound (TIC) using an internal standard calibration and recovery factor.

4.2 Aldehydes and Ketones – SW-846 Method 0011

Emissions measurements for formaldehyde, acetaldehyde, acetone, acrolein, and 16 additional compounds were conducted in accordance with EPA SW-846 Method 0011 and 8315a.

4.2.1 Sample Collection

The sampling train, as shown in Figure 4-3, consisted of a glass nozzle, heated glass-lined probe, four full-size impingers, a vacuum pump, dry gas meter, and calibrated orifice. The first and second impingers were each charged with 100 ml of DNPH solution. The third impinger was empty and the fourth impinger contained 200g of indicating silica gel to capture any remaining moisture. Prior to sampling, the entire impinger train was weighed to the nearest 0.5 gram. A programmable


Thermocouple
Stack Wall
Thermocouples
Thermocouple
Heated Probe
Filter/Heated Enclosure (optional)
Impingers
Ice Bath
Pitot Tube and Inclined Manometer
Flexible Umbilical Line
100ml DNPH
Empty
Silica Gel
Thermometers
By-Pass Valve
Vacuum Gauge
Orifice
Main Valve
Dry Gas Meter
Air-Tight Pump
Manometer
TRC
Customer-Focused Solutions
5 Waterside Crossing
Windsor, CT 06095
(860) 298-9692
FIGURE 4-3
SOLID WASTE METHOD 0011
SAMPLING TRAIN SCHEMATIC
m-0011. fh9

calculator was used to quickly determine the orifice pressure drop required for the measured pitot velocity pressure and stack temperature in order to maintain isokinetic sampling conditions. Sampling flow was adjusted by means of the bypass valve.

4.2.2 Sample Recovery

At the completion of each test the impinger train was weighed to the nearest gram to determine moisture gain. The following sample fractions were collected:

Container No. 1: The nozzle and probe were brushed and rinsed in triplicate with methylene chloride and HPLC water. The rinses were deposited into a glass sample container. The jar was marked, labeled, and sealed with a Teflon-lined lid.

Container No. 2: The contents of the first three impingers were deposited into a 500 ml glass sample jar. The impingers were rinsed in triplicate with methylene chloride and HPLC grade water and the washes deposited into the same jar. The jar was marked, labeled, and sealed with a Teflon-lined lid.

4.2.3 Sample Analysis

The collected liquid samples were submitted for formaldehyde analysis by HPLC according to SW-846 Method 0011.

5.0 QUALITY ASSURANCE

The Project Manager was responsible for developing data of the highest quality. The following discussions present the standard TRC QC procedures for source test emissions. These discussions are organized into sampling, analytical, and reporting procedures.

5.1 Sample Collection

The TRC quality assurance (QA) program for source testing is designed to ensure that emission measurement work is performed by qualified people using proper equipment and following written procedures in order to provide accurate, defensible data. The program is based upon the EPA *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume III (EPA-600/4-77-0276).

Sampling and measurement equipment, including continuous analyzers, recorders, pitot tubes, dry meters, orifice meters, thermocouples, probes, nozzles, and any other pertinent apparatus, are uniquely identified, undergo preventive maintenance, and are calibrated before and after each field effort, following written procedures and acceptance criteria. Most calibrations are performed with standards traceable to the National Institute for Science and Technology (NIST). These standards include wet test meters, standard pitot tubes, and NIST Standard Reference Materials. Records of all calibration data are maintained in TRC files.

During field tests, sampling performance and progress were continually evaluated, and deviations from sampling method criteria were reported to the Field Team Leader who then determined the validity of the test run. All field data were recorded on prepared data sheets. Field Team Leaders maintained a written log describing the events of each day. Field samples, including field blanks, were transported from the field in shockproof, secure containers. Sample integrity was controlled through the use of prepared data sheets, positive sample identification, and chain-of-custody forms.

5.2 Sample Analysis

In the TRC and subcontract laboratories, all QC samples including field blank samples, reagent and filter blanks, and any audit samples were analyzed with the actual test samples. Each laboratory maintains a continuous QC program to monitor instrument response and analyst proficiency and to ensure the precision and accuracy of all analytical results. These programs have been developed in consultation with EPA, NIOSH, and various state departments of health.

Each subcontract laboratory has its own standard internal QA program and was directed by the Project Leaders to conduct additional project specific QC procedures. The laboratory conducted the specified laboratory QC procedures in addition to their internal procedures.

The following quality control procedures were used during this program:

Field Blanks - For each set of samples taken, a field blank was also collected. Field blanks were collected and analyzed for both VOST and Method 0011 samples. The analysis showed that the VOST field blank was clean demonstrating that field procedures were conducted properly. The Method 0011 field blanks contained small amounts of acetone and cyclohexanone and the results were used to blank correct samples. During the warm weather test the Method 0011 blank contained low levels of formaldehyde and the sample results were also blank corrected.

Method Blanks - To ensure that no contamination occurs during the laboratory work-up, the laboratories processed a method blank with all analytical runs. These blanks indicated no contamination from analytical procedures.

Spiked Samples - All VOST cartridges were spiked with known quantities of target compound isotopes prior to sampling to determine the percent recovery and to indicate the overall accuracy. VOST cartridge pairs were spiked with three surrogate isotopes prior to analysis to determine the percent recovery and recoveries were within method specifications. A Method 0011 field spike was also conducted and the formaldehyde recovery was within method specification.

5.3 Reporting

All calculations were performed using an Excel spreadsheet developed by TRC. The final results were checked by a senior-level project scientist.

Export Control Restrictions

Access to and use of EPRI Intellectual Property is granted with the specific understanding and requirement that responsibility for ensuring full compliance with all applicable U.S. and foreign export laws and regulations is being undertaken by you and your company. This includes an obligation to ensure that any individual receiving access hereunder who is not a U.S. citizen or permanent U.S. resident is permitted access under applicable U.S. and foreign export laws and regulations. In the event you are uncertain whether you or your company may lawfully obtain access to this EPRI Intellectual Property, you acknowledge that it is your obligation to consult with your company's legal counsel to determine whether this access is lawful. Although EPRI may make available on a case-by-case basis an informal assessment of the applicable U.S. export classification for specific EPRI Intellectual Property, you and your company acknowledge that this assessment is solely for informational purposes and not for reliance purposes. You and your company acknowledge that it is still the obligation of you and your company to make your own assessment of the applicable U.S. export classification and ensure compliance accordingly. You and your company understand and acknowledge your obligations to make a prompt report to EPRI and the appropriate authorities regarding any access to or use of EPRI Intellectual Property hereunder that may be in violation of applicable U.S. or foreign export laws or regulations.

The Electric Power Research Institute (EPRI)

The Electric Power Research Institute (EPRI), with major locations in Palo Alto, California, and Charlotte, North Carolina, was established in 1973 as an independent, nonprofit center for public interest energy and environmental research. EPRI brings together members, participants, the Institute's scientists and engineers, and other leading experts to work collaboratively on solutions to the challenges of electric power. These solutions span nearly every area of electricity generation, delivery, and use, including health, safety, and environment. EPRI's members represent over 90% of the electricity generated in the United States. International participation represents nearly 15% of EPRI's total research, development, and demonstration program.

Together…Shaping the Future of Electricity

Printed on recycled paper in the United States of America

1013170

ELECTRIC POWER RESEARCH INSTITUTE

3420 Hillview Avenue, Palo Alto, California 94304-1395 • PO Box 10412, Palo Alto, California 94303-0813 • USA

800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

Exhibit 21

Advances in Applied Energy 5 (2022) 100089

Contents lists available at ScienceDirect

Advances in Applied Energy

journal homepage: www.elsevier.com/locate/adapen

Electrification potential of U.S. industrial boilers and assessment of the GHG emissions impact

Carrie Schoeneberger[a,*], Jingyi Zhang[a], Colin McMillan[b], Jennifer B. Dunn[a], Eric Masanet[a,c]

[a] Northwestern University, Department of Chemical and Biological Engineering, Evanston, IL, USA
[b] National Renewable Energy Laboratory, Golden, CO, USA
[c] University of California, Santa Barbara, Bren School of Environmental Science & Management, Santa Barbara, CA, USA

ARTICLE INFO

Keywords:
Industrial boiler dataset
Boiler capacity characterization
Electrification
Decarbonization
Greenhouse gas (GHG) emissions impact

ABSTRACT

Electrification is a key strategy for decarbonizing the industrial sector. Industrial process heating, which still relies heavily on fossil fuel combustion and accounts for the majority of sector wide GHG emissions, is a particularly attractive electrification target. Electrifying industrial boilers represents a cross-cutting opportunity for GHG emissions reductions, given their widespread use in most manufacturing industries. Yet, there are gaps in the understanding of the current population of conventional industrial boilers in the United States that preclude a characterization of boiler electrification's technical potential to reduce fuel consumption and GHG emissions. In this study, we develop an up-to-date dataset of the industrial boiler population in the U.S. and quantify the county-level electricity requirements and net changes in fuel use and GHG emissions under the current electric grid and theoretical future grid scenarios. Our results show an increase of 105 MMmtCO_2e and 73 MMmtCO_2e in GHG emissions from boiler electrification, with and without the replacement of byproduct fuels, respectively, under the current electric grid, and a reduction of 19 MMmtCO_2e and 7 MMmtCO_2e in GHG emissions under a future high renewables electric grid. GHG emissions savings are currently possible only in certain regions of the U.S. unless future grids are decarbonized. We also provide discussion that could be useful for policy makers and manufacturing facilities for advancing the electrification of industrial boilers in locations and industries toward fuel savings and GHG emissions reductions.

1. Introduction

Transitioning energy systems from fossil fuels to decarbonized alternatives is more urgent than ever given the ongoing rise in global greenhouse gas (GHG) emissions and their escalating effects on the climate. With future increases in GHG emissions expected to cause additional warming of the planet [1], the immediate deployment of commercially available clean energy technologies is vital [2]. The electrification of industrial process heating is one such solution to decarbonizing a sector heavily reliant on fossil fuels. While industry has so far remained a difficult sector to decarbonize due to its wide array of products and processes and long-lived, capital-intensive process equipment stocks [3], industrial boilers represent a cross-cutting technology with significant potential for electrification.

With the second highest industrial energy consumption globally as of 2019, the U.S. is an important target for industrial decarbonization [4]. In the U.S., manufacturing industries are responsible for 21% of all energy-related GHG emissions, and process heating accounts for 31% of GHG emissions within manufacturing, as of 2018 [5, 6]. Although industrial heating applications can vary largely across manufacturing industries, in most cases they rely on fuel combustion for both direct-fired process heating and steam production [7]. Conventional boilers are used for steam production in almost all industries and consume roughly one third of the fuel used for process heating in manufacturing [8]. A large share of boiler fuel use is from natural gas (34%) and coal (11%), but a majority (54%) comes from other fuels, including biomass and byproduct fuels, such as black liquor, still gas, and waste gas [8–12]. Switching from fuel-based boilers to electric boilers, may provide a straightforward and substantial opportunity for emissions reductions in many industrial plants.

The electrification potential (the amount of electricity required by electric boilers to meet steam demand) of U.S. industrial boilers and the emissions impact of boiler electrification depend largely on the current stock of conventional boilers and their fuel sources. However, the most recent set of published data on U.S. industrial boilers with key characteristics of industrial subsectors, installed capacity, and fuel types is from 2005 [13], whereas both the structure and energy use characteristics of the U.S. manufacturing sector have since changed substantially.

* Corresponding author at: 2145 Sheridan Rd, E127, Evanston, Illinois, 60208, USA.
E-mail address: carriescho@u.northwestern.edu (C. Schoeneberger).

https://doi.org/10.1016/j.adapen.2022.100089
Received 14 December 2021; Received in revised form 12 February 2022; Accepted 12 February 2022
Available online 16 February 2022

In addition, this previous characterization of boilers is limited in scope and coverage, reporting boiler capacity ranges and fuel types separately for only five subsectors – food, paper, chemicals, refining, and metals – and relying on top-down estimations rather than bottom-up accounting of individual boiler units. It also lacks data on the geographic distribution of conventional industrial boilers, which is essential for evaluating the electric grid emissions associated with electric boiler operations as well as locally available renewable electricity.

While an updated inventory of industrial boilers with technical and geographic detail is needed to provide the basis for current boiler technologies and steam demand, additional assessments of electrified heating technologies and conventional boiler fuel use are also needed to quantify the country-wide energy and emissions effects of electrification. Previous studies have documented the benefits of electrification in industry and identified boilers as a top cross-cutting opportunity [14–17]. Electric boilers have high thermal efficiency (~99%), fast ramp-up times, and low downtime [14] and require no onsite pollution abatement, combustion accessories, such as tanks, fuel links, and exhaust flues, or expensive combustion inspection [18]. They can also offer other non-energy benefits, such as lower capital, maintenance, and administrative costs and physical footprints, but the high cost of electricity relative to natural gas and other fuels has affected their economic feasibility [14]. Electric boilers could significantly increase the electricity load at industrial plants [14] [15], but they can also be operated flexibly to utilize low-cost power supply from renewables [16] and support increased renewable generation [17]. Heat pumps are another important technology for electrified hot water and steam, but they require waste heat from other processes and, thus, are out of scope since this study focuses on drop-in stand-alone boilers. While heat recovery is often already integrated in U.S. facilities for preheating makeup water or in economizers, waste heat for export, such as district heating, could be considered in other countries. This analysis on electric boilers can be useful for future comparisons to heat pumps and other electrotechnologies.

Recent studies assessing the energy and emissions implications of electrifying industrial heat in Germany [19] and in Europe [20] show that emissions savings from electrification are possible only under scenarios where electric boilers are operated in a hybrid setup with renewable electricity or from an electric grid with low carbon intensity. Schüwer et al. calculate an increase of 0.2-0.6 $MMmtCO_2e$/year from electrifying industrial boilers in Germany in 2020 and a decrease of 5.9-15.9 $MMmtCO_2e$/year in 2050, assuming an 80-95% reduction in electricity carbon intensity in 2050 [19]. Several reports centered on U.S. electrification of industry evaluate electric boilers, but either assume limited adoption relative to other electrotechnologies [21] or simplify their accounting of fuel use in a high-level, national analysis [22]. Hasanbeigi et al. estimate savings of 140 TBtu in final energy of industrial boilers and an initial increase in CO_2 emissions, followed by a decrease of 1,000 $MMmtCO_2$/year by 2050, assuming future grid decarbonization [22]. However, these findings based on aggregated national manufacturing energy data [23] exclude fuels categorized as “other,” such as biomass and byproducts used as fuel, in its boiler energy use estimations as well as the additional power plant fuel energy inputs required for electrification.

Since the composition of primary energy sources in the current electric grid differs widely by region within the U.S., a spatial analysis pairing the locations of industrial boilers and regional makeups of the electric grid is needed to provide a more accurate and location-specific estimation of electrification potential. To date, there has been no detailed study on the county-level electrification potential and emissions impact of industrial boilers that also considers the current boiler capacity and fuel type distribution.

This study makes two novel contributions toward understanding the energy and emissions effects of widespread industrial boiler electrification in the United States. First, we develop a comprehensive and up-to-date dataset that characterizes the total population of conventional industrial boilers by county, industrial subsector, installed capacity, and fuel type. Our research integrates multiple national facility-level emissions databases and accounts for remaining boilers based on county-level fuel estimates. Second, we calculate the county-level electrification potential and GHG emissions impact for industrial boilers under multiple electric grid scenarios, considering both the additional fuel use and emissions from electricity generation. This research addresses key knowledge gaps about the climate change mitigation potential of electric boilers and highlights the need for further analysis around assembling facility-level equipment, fuel use, and emissions data from publicly available yet non-standardized data sources.

2. Methods

This analysis extends previous work documented in [24] to achieve two research outcomes: (1) developing a comprehensive and public dataset that characterizes the current stock of conventional industrial boilers in the U.S. and (2) calculating net changes in fuel use and GHG emissions from boiler electrification under different electric grid scenarios.

The methodology for creating our industrial boiler dataset requires integrating data on boiler units reported in the following national emissions databases: the U.S. Environmental Protection Agency’s (EPA) Greenhouse Gas Reporting Program (GHGRP) [25], the Boiler Maximum Achievable Control Technology (MACT) Draft Emissions and Survey Results Database [26], and the National Emissions Inventory (NEI) [27]. To account for boilers not reported in the above databases, estimates of county-level fuel use from the National Renewable Energy Laboratory (NREL) manufacturing thermal energy use dataset [8] are used for deriving the populations and characteristics of remaining boilers. Manufacturing thermal energy use data are then applied to calculations of electrification potential, defined in Section 2.3, by U.S. county and industrial subsector. Net changes in GHG emissions are calculated from emissions factors of fuels avoided and fuels required for electricity, as well as the GHG emissions associated with current and future electric grids.

This section further describes the primary data sources, the process of data integration, and the methods and assumptions used to quantify the electrification potential and net changes in GHG emissions.

2.1. Data sources for industrial boiler characterization

Descriptions of the GHGRP, MACT, and NEI databases and the categories of data included in this study are described in Table 1, and the process of integrating data is described in Section 2.2.

The NREL manufacturing thermal energy use dataset provides county- and industry-level fuel use estimates for conventional boilers, combined heat and power (CHP), and process heating for the year 2014, and is derived from the emissions reporting from the 2014 GHGRP and U.S. Energy Information Administration 2014 Manufacturing Energy Consumption Survey (MECS) data. These fuel use data are used to estimate the populations of conventional boilers not reported in the databases summarized in Table 1.

2.2. Data integration and development of industrial boiler dataset

While the GHGRP, MACT, and NEI databases all supply unit-level characteristics of facility location, subsector, installed capacity, and fuel type, each is organized in a different structure, and integrating the relevant characteristics of boiler units involves a series of data filtering and cross-checking operations. The databases are independent but not necessarily mutually exclusive, meaning that individual boiler units could be present in more than one database and, thus, a process of cross-checking is required to identify and remove duplicate entries.

Fig. 1 summarizes our process for the integration of emissions databases and manufacturing fuel data. The full process flow diagrams and additional details on assembling the inventory of reported boilers

Table 1
Descriptions of the GHGRP, MACT, and NEI databases [28–30].

	GHGRP	MACT	NEI
Main data reported	Unit-level GHG emissions (CO_2, CH_4, N_2O)	Unit-level air pollutants (CO, NOx, PM, SO_2)	Unit-level emissions and air pollutants (VOCs, PM, metals, GHGs, etc.)
Reporting requirements	Mandatory for facilities that generate at least 25,000 mtCO2e/year	Survey	Submitted data provided by State, Local, and Tribal air agencies and supplemented data from U.S. EPA
Reporting frequency	Annual, since 2010	Once, in 2012	Every three years, since 2008
Database category relevant to industrial boilers	Emissions by Unit and Fuel Type: General Stationary Fuel Combustion (Subpart C)	Inventory: Major Source Boilers and Process Heaters	NEI point sources
Data characteristics relevant to this study	Facility ID, NAICS code (6-digit), reporting year, unit name, unit type, unit input capacity (MMBtu/hr), unit fuel type	Facility ID, NAICS code (3-digit), unit ID, unit type, unit design capacity (MMBtu/hr), unit fuel category	Facility ID, NAICS code (6-digit), reporting period, unit ID, unit type, unit design capacity, unit description (for fuel type)
Number of line items in relevant database category	253,683	8,320	8,202,877
Number of boilers from source in final dataset	794	4,412	13,988

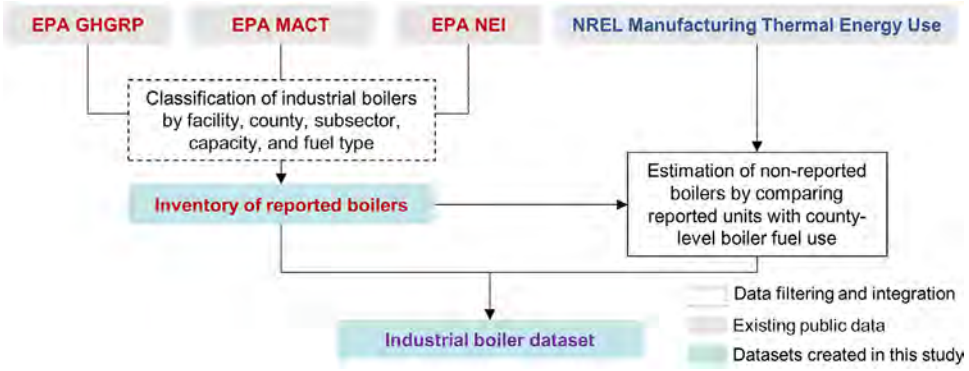


Fig. 1. Flow diagram of data sources and integration for assembling the industrial conventional boiler dataset.

and final industrial boiler dataset are described further in the supporting information (SI) Figures S1 and S2.

With GHGRP data, boilers are selected based on "unit type," "unit name," and North American Industry Classification System (NAICS) codes 31-33, representing the U.S. manufacturing sector. MACT data are likewise filtered for manufacturing NAICS codes and for unit types of industrial boilers, and these are merged with GHGRP boilers by facility, county Federal Information Processing Standards (FIPS) codes, and boiler capacity, and duplicate units are removed. Similarly, NEI boiler data are filtered by NAICS code and unit type, but also through text search for boilers listed by other unit types, such as "other combustion" or "other process equipment," and are then merged with the existing inventory by facility, county FIPS codes, and boiler capacity, with duplicate units removed. CHP boilers are not included in our industrial boiler dataset because replacement or hybridization with electric boilers would significantly affect the electricity generation and economics of CHP operations; consideration of these important effects is beyond the scope of this study. Boilers identified in the EPA databases are checked against a database of industrial CHP facilities, as detailed in Form EIA-923 [31], and CHP boilers are removed.

After devising an inventory of reported units, the remaining (i.e., non-reported) count of boilers per county is estimated by comparing boiler fuel use in each county and subsector, as indicated by the NREL manufacturing thermal energy use dataset, to the maximum boiler fuel use possible from boilers in the inventory of reported units. The equation to calculate the maximum possible boiler fuel use of reported boilers in the inventory, F_{inv}, per county and subsector, is based on the total installed capacity of reported boilers within the county and NAICS subsector, $C_{c,N}$, and reported operating hours per subsector, t_N, shown in Eq. 1. Operating hours data are taken from the GHGRP and averaged for each subsector.

$$F_{inv} = C_{c,N} * t_N \quad (1)$$

We encounter two cases when estimating the counts of non-reported boilers per county and NAICS code: (1) there is boiler fuel use as indicated by the NREL thermal energy use dataset but no reported boilers in our inventory from the Table 1 databases, and (2) there is greater fuel use indicated in the NREL dataset than what reported boilers are estimated to consume according to Eq. 1. In case (1), the count of non-reported boilers, b, is estimated based on the boiler fuel use, $F_{c,N}$, operating hours, and median installed boiler capacity per NAICS subsector, C_N, shown in Eq. 2. The median installed boiler capacity is used in Eq. 2 to reduce the influence of outliers in data where there are no reported boiler data as in case (1), whereas the average installed boiler capacity is used when reported boiler data are available for the county and subsector. In case (2), the count of non-reported boilers is estimated based on the difference between boiler fuel use and the maximum boiler fuel use of reported boilers in the inventory, operating hours, and average installed boiler capacity per county and NAICS subsector, $C_{c,N}$, shown in Eq. 3.

$$\begin{cases} \textit{Case 1: } F_{inv}(=0) < F_{c,N}\ ; & b = \dfrac{F_{c,N}}{t_N * C_N} \quad \text{(Eq. 2)} \\ \textit{Case 2: } F_{inv} < F_{c,N}; & b = \dfrac{(F_{c,N} - F_{inv})}{t_N * C_{c,N}} \quad \text{(Eq. 3)} \end{cases}$$

To account for the boiler capacity values of non-reported boilers, we assume a boiler capacity distribution for the non-reported boilers that reflects the capacity distribution of reported boilers with low boiler capacity ranges (<10 MMBtu/hr and 10-50 MMBtu/hr) per subsector. The distribution of low boiler capacity ranges is used here to account for smaller boilers often overlooked by national databases, which by design capture large units more frequently. Fuel types of the boilers are similarly determined based on the distribution of boiler fuel types per subsector. For non-reported boilers within a county and subsector, the fuel type is estimated according to the percentage of fuel type weighted by boiler energy consumption.

Table 2
Conventional boiler efficiencies by fuel type [34–36].

Boiler fuel type	Efficiency (%)
Natural gas	75
Coal	81
LPG & NGL	82
Diesel	83
Residual fuel oil	83
Coke & breeze	70
Other	70

2.3. Calculations of electrification potential and net changes in boiler fuel use and GHG emissions

Electric boilers are a commercialized technology that pass an electric current through the water between electrodes (electrode boilers) or through immersed heating elements (electric resistance boilers) to produce steam and hot water [32]. While electrode boilers tend to have higher maximum capacities, up to 335 MMBtu/hr, than electric resistance boilers, the efficiencies of both electric boilers are nearly 100% [33]. Electric boilers are also generally more compact than fossil fuel boilers, allowing parallel electric boilers to be viable options for replacing single larger fossil fuel boilers. In our calculations of electrification potential, we therefore assume that electric boilers can fully replace the steam demand from conventional fossil fuel boilers. We also note that the small amount of electricity inputs for boiler controls for both fuel and electric boilers is excluded in our calculation of electrification potential, as the percentage is negligible compared to fuel or electricity directly used for thermal energy. We further assume that sufficient grid capacity exists to enable full boiler electrification in our scenarios, but future studies should consider marginal demand implications on local grids to further assess technical feasibility.

The methodology for calculating the technical potential of boiler electrification is based on previous work that analyzed opportunities for solar industrial process heating, including the use of photovoltaic electricity for electric boilers [24]. From the same NREL manufacturing thermal energy use data, the fuel use for conventional boilers is characterized by county, NAICS subsector, and fuel type and, along with considerations of efficiency losses from fuel combustion, is used to determine the steam demand met by existing boilers.

The electrification potential is defined as the amount of electrical energy required by electric boilers to meet steam demand, and is calculated based on the following equation:

$$E = F_{c,N,f} * \eta_{b,f} * \frac{1}{\eta_e} \quad (4)$$

Where E is electrification potential (MWh), $F_{c,N,f}$ boiler fuel demand per county, NAICS subsector, and fuel type, $\eta_{b,f}$ conventional boiler efficiency by fuel type, and η_e electric boiler efficiency. Conventional boiler efficiencies can vary from boiler to boiler depending on boiler configurations and operating practices, but due to lack of data on individual operations, we assume average nationwide boiler efficiencies dependent on its fuel type (Table 2). Electric boiler efficiency is assumed to be 99% [32].

With the county-level electrification potential, we then calculate net changes in GHG emissions by considering the fuel avoided from conventional boilers as well as the makeup of regional electric grids to account for the source of electricity and their associated emissions. The amount of power plant input fuel required to meet electricity demand is calculated from heat rate values from the EPA's 2019 eGRID database [37] and the resource mix of fuels used in regional electric grids and accounts for grid losses (Fig. 2). Resulting emissions are calculated based on full fuel cycle GHG emissions factors by fuel types, according to EPA combustion emissions factors for GHG inventories [38] and fuel cycle emissions factors from the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model [39]. Emissions from non-fossil sources are assumed to be zero, as the life cycle emissions factors for these electricity generation technologies are a tiny fraction of fossil fuel-based technologies [40].

Net changes in GHG emissions are calculated for each county with the current electric grid and in two potential future electric grid scenarios. Further descriptions of the resource mixes of the electric grids are provided along with results in Section 3.3. In calculating net fuel use and GHG emissions changes, we note several assumptions about the electrification potential, fuel consumption for electricity, and emissions factors. First, the electricity required for electric boilers is based on boiler energy demand from 2014, which is assumed to the same in the year of the electrification analysis for the current grid (2019). Second, the fuel consumption for electricity required by electric boilers is based on power plant heat rate and resource mix data within an eGRID subregion, as opposed to smaller regions of the power grid or larger interconnected regions. Third, average emissions rates for each fuel type are used instead of marginal emissions rates. Although the calculations of electrification potential and GHG emissions impact is for industrial boilers in the U.S., our methods and data considerations can be extended to future technical potential analyses in other countries where the electrification of the industrial sector is important.

3. Results and discussion

3.1. Industrial boiler characterization

The inventory of reported boilers with complete information on location, subsector, capacity, and fuel types amounts to 18,954 units. As discussed previously, there are also many non-reported units, especially low-capacity boilers, that are not surveyed or monitored in the Table 1 emissions databases. Combining the estimated count of non-reported boilers from our method using county-level fuel use and the reported boilers, the total number of conventional industrial boilers is estimated to be 38,537. Their distributions among manufacturing subsectors and by boiler capacity ranges is shown in Fig. 3. The total number of boilers is compared to the estimated count of industrial boilers from 2005 [13] and to the number of U.S. manufacturing establishments overtime [41] to assess the validity of our results. These and additional comparisons between our assessment and [13] are described further in the SI.

The food and chemicals subsectors have the highest estimated number of boilers with similar capacity distributions, where the majority of boilers falls into the low-capacity ranges (<10 MMBtu/hr and 10-50 MMBtu/hr). The large number of boilers in the food subsector reflects both the quantity of food manufacturing establishments – second most among all the manufacturing subsectors – and a high steam demand for a wide variety of process heating applications [42]. Its large portion of low-capacity boilers can be attributed to a high percentage of small-sized food manufacturing facilities – 80% of food manufacturing establishments have employment totals of less than 50 people [41]. According to U.S. DOE Industrial Assessment Centers (IAC) which provide technical assessments of manufacturing plants, energy usage is generally higher in plants with a larger employment size [43]. Similarly in the chemicals subsector, while commodity chemicals are produced in bulk in large-scale facilities, there are also numerous smaller and more differentiated facilities for specialty, agricultural, and consumer product chemicals that require various levels of steam demand, and thus, a high percentage of low-capacity boilers [44, 45]. The paper subsector has a considerably large number of boilers that are high-capacity (>250 MMBtu/hr) as pulp and paper mills tend to be large facilities, where nearly 50% of paper manufacturing establishments have employment totals of 50 or more people [41], with many steam-intensive processes [46].

The paper, chemicals, food, and refining subsectors have the largest overall installed capacity of industrial boilers. These four subsectors also

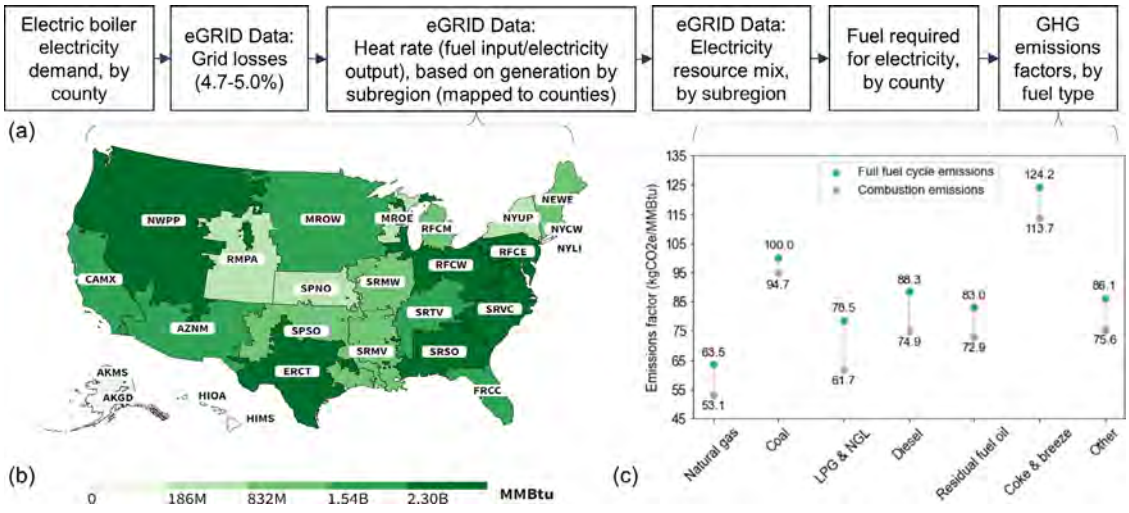


Fig. 2. **(a)** Flow diagram for calculating annual net change in GHG emissions of boiler electrification with **(b)** eGRID electricity heat rate data [37] and **(c)** GHG emissions factors for the full fuel cycle including emissions from combustion and upstream processing.

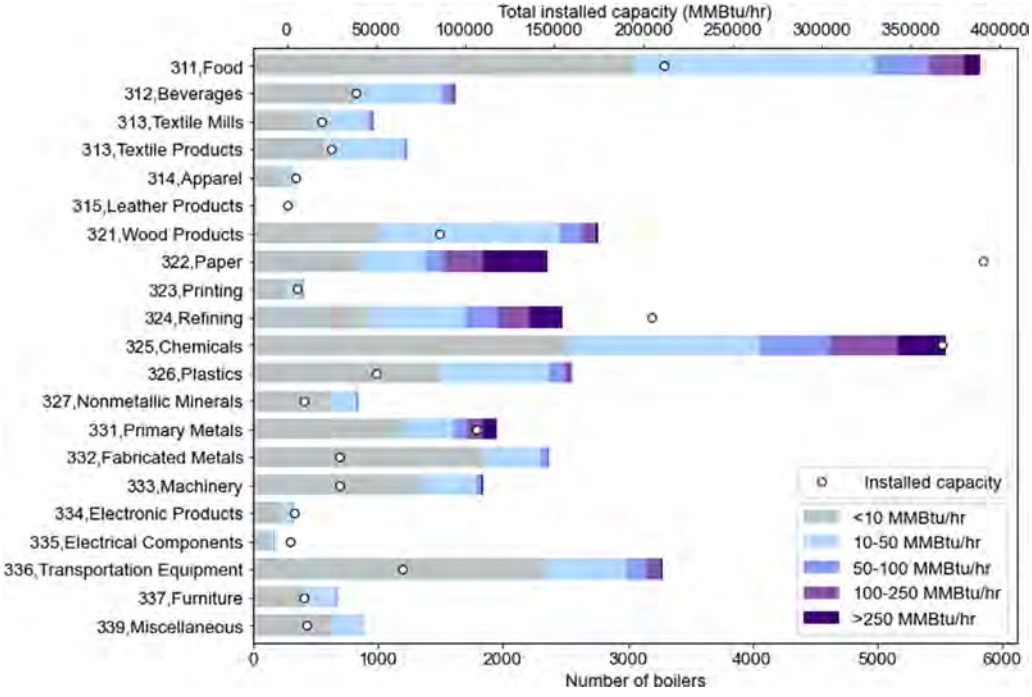


Fig. 3. Estimated distributions of industrial boilers by NAICS manufacturing subsectors and capacity range.

have the highest steam demand for process heating in U.S. manufacturing [42], as well as a large number of high-capacity boilers. However, operational parameters, such as boiler capacity utilization, which can differ by subsector and individual facilities, determine fuel consumption totals that ultimately affect potential for electrification and emissions reductions. Boiler fuel types likewise affect which boilers can be practically substituted with electric boilers as well as the net changes in emissions.

The fuels used in industrial boilers consist of natural gas, biomass, coal, oil products (fuel oil, diesel, LPG), and other fuels (still gas, waste gas, solid byproducts). The share of these fuels varies significantly among manufacturing subsectors (Fig. 4a) and depends on both regional fuel costs and the availability and utilization of byproducts from certain manufacturing processes. For example, the petroleum refining subsector uses still gas and petroleum coke as byproduct fuels for over 60% of its onsite fuel consumption [10]. Similarly, the wood and paper subsectors use black liquor, a biomass byproduct of the Kraft process for converting wood to pulp and paper [47], for 40% of its onsite fuel consumption [9]. In the iron and steel industry, blast furnace and coke oven gases make up 27% of fuel consumption [12], although fuel use for boilers and steam demand are comparatively small. The use of byproduct fuels complicates the feasibility of boiler electrification in certain subsectors because facilities would have the added cost of purchased electricity as well as selling or disposal costs for the stranded byproducts. In other sectors which use wastes as fuel, such as municipal solid waste in waste-to-energy applications, the electrification of boilers would similarly eliminate the co-benefits with waste reuse, and studies that investigate electric boilers in these sectors should account for these co-benefits.

As shown in Fig. 4b, natural gas is the predominant fuel among industrial boilers in both the total quantity of boilers and installed capacity. While the number of natural gas boilers is high, many of them are low-capacity boilers with an average installed capacity of 30 MMBtu/hr.

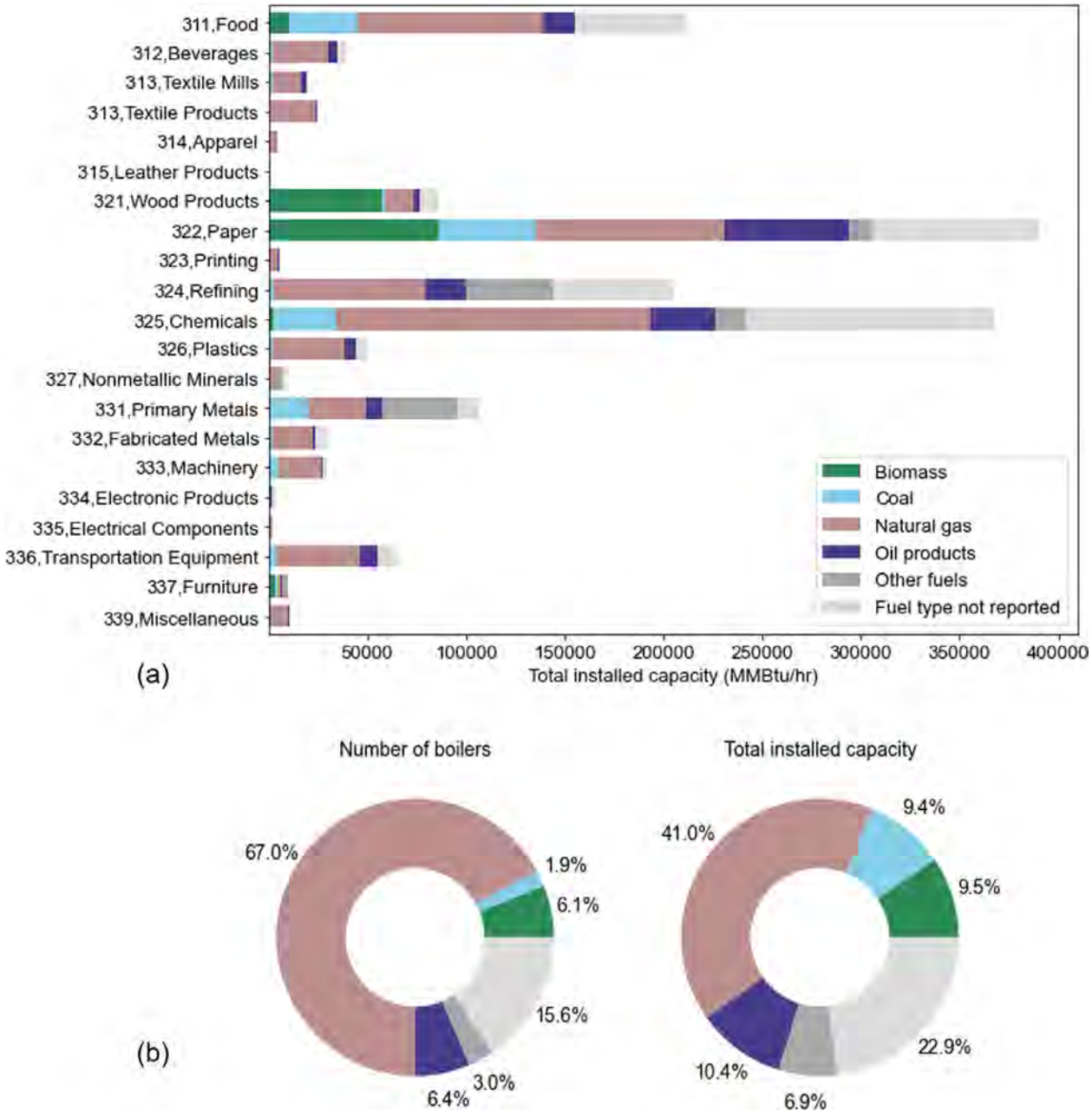


Fig. 4. **(a)** Estimated distributions of total boiler installed capacity by NAICS manufacturing subsectors and fuel type. "Other fuels" include still gas, waste gas, black liquor, among others listed in SI Table S1. Boilers from the EPA databases with a known installed capacity and subsector but without fuel type information are included above with "fuel type not reported." **(b)** Percentages of number of boilers and total installed capacity by fuel type.

Conversely, the number of GHG-intensive coal boilers is relatively low, but the majority of coal boilers have capacities over 100 MMBtu/hr, and these high-capacity coal boilers are mostly used in the following subsectors: paper, food (wet corn milling, sugar, and oilseed industries), chemicals, and metals (iron and steel industry). Like coal boilers, fuel oil and diesel boilers are still used in small numbers in the paper and chemicals subsectors and could be a target for electrification due to their high emissions intensity and small number of relatively high installed capacities.

The location of industrial boilers is significant for evaluating the GHG emissions implications of boiler electrification, where renewable resource availability and emissions impacts vary greatly by region. Fig. 5 shows the estimated numbers of boiler units and total installed capacities per county.

Many conventional industrial boilers are concentrated in California, the Midwest, and the Northeast, but still are present in almost all counties across the United States. Counties in Texas, Louisiana, Indiana, Pennsylvania, and Washington have the highest total installed capacities. In counties with a large total installed capacity, there is typically a large portion of high-capacity boilers. For example, in Harris County, Texas, where there is a large presence of chemicals and refining facilities, the average installed capacity of industrial boilers is 150 MMBtu/hr. Similarly in Cowlitz County, Washington, where 28 of the 44 industrial boilers are in the paper subsector, the average installed boiler capacity is 360 MMBtu/hr. With large industrial boilers, replacement with electric boilers may require multiple electric boilers to meet capacity needs, leading to more extensive capital investments, despite the generally lower capital cost of electric boilers [48].

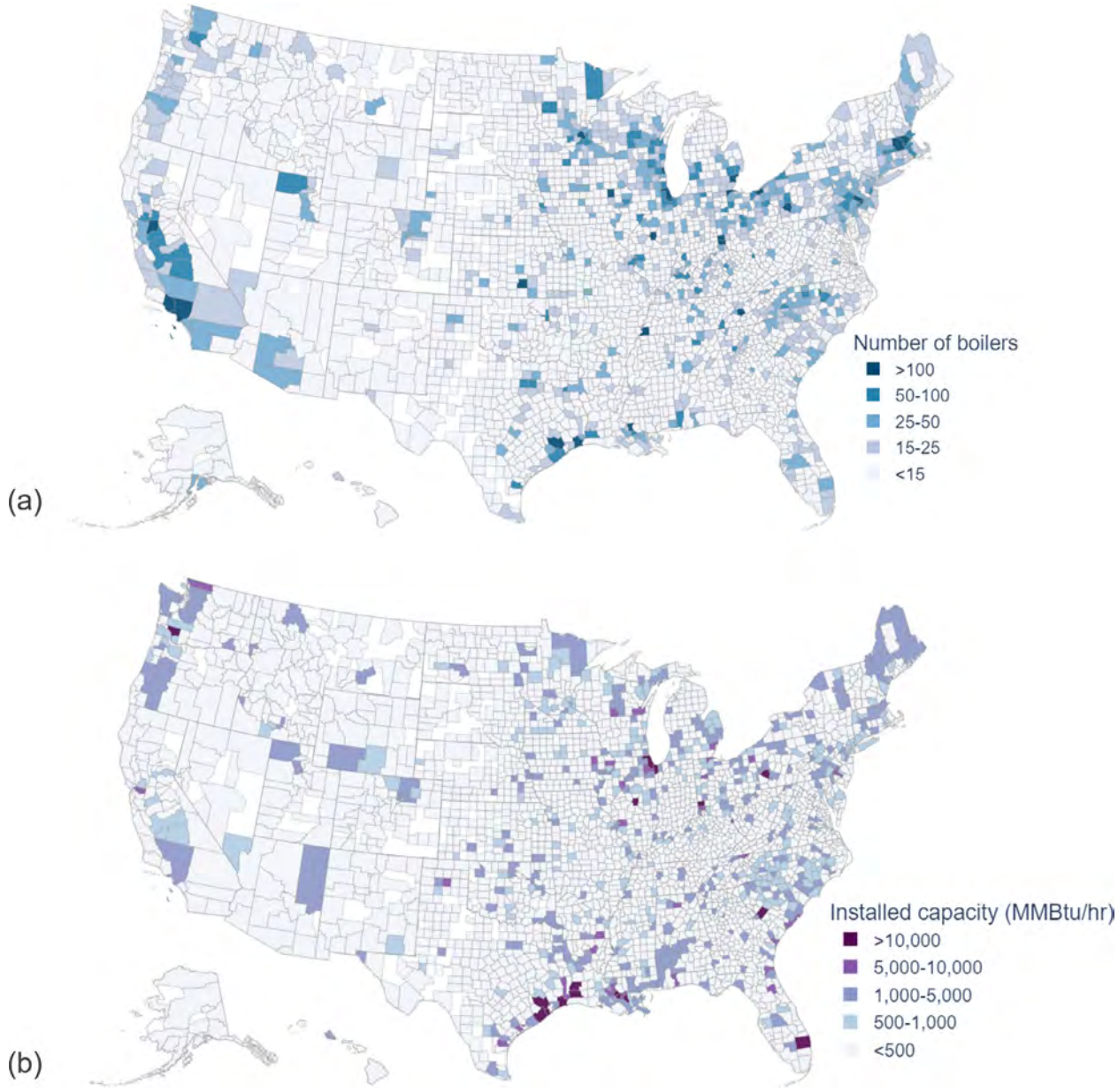


Fig. 5. U.S. county maps of **(a)** number of boilers and **(b)** total installed boiler capacity.

3.2. Electrification potential

While the characterization of industrial boilers by installed capacity, as shown in the previous section, illustrates the current stock of equipment, the electrification potential represents the energy associated with electrifying boilers. Specifically, the electrification potential depends on the boiler fuel consumption for steam demand in each subsector and county. Boiler fuel consumption, which differs from installed capacity due to differences in hours of operation and capacity utilization, is taken from the NREL manufacturing thermal energy use dataset that was used in our characterization of non-reported conventional boilers. Moreover, it should be noted that the fuel type categories in the NREL dataset and presented in this section vary slightly from those shown in Section 3.1 due to differences in fuel type classification between the Table 1 databases and MECS data (see Table S1 for more detail). Fig. 6 shows both estimated boiler fuel consumption by fuel type and the calculated electrification potential, totaled for each manufacturing subsector.

The petroleum refining, paper, chemicals, and food subsectors have the highest industrial boiler fuel use, but in refining, paper, and chemicals, a large percentage of boiler fuel consumption comes from fuels other than natural gas, coal, or oil products. In these subsectors and, to a smaller extent, in metals, food, and transportation equipment manufacturing, the use of byproduct fuels in conventional boilers is prevalent. Due to the complexity and added costs of replacing byproduct fuel use with electrification, the electrification potential is calculated for two cases: (1) all boiler fuel consumption is replaced with electrification, and (2) byproduct fuels are excluded from replacement, as marked by the light textured bars in Fig. 6. If all conventional boiler fuel use is replaced with electrification, the total electrification potential is 729,650 thousand MWh (2,490 TBtu), and if by byproduct fuels are excluded, the total electrification potential is 447,580 thousand MWh (1,527 TBtu). For reference, the total electricity demand in U.S. manufacturing in 2018 was 894,476 thousand MWh (3,052 TBtu) [49]. The electrification potential in both cases indicates a significant change to the energy mix of industrial manufacturing, nearly doubling the amount of electricity use

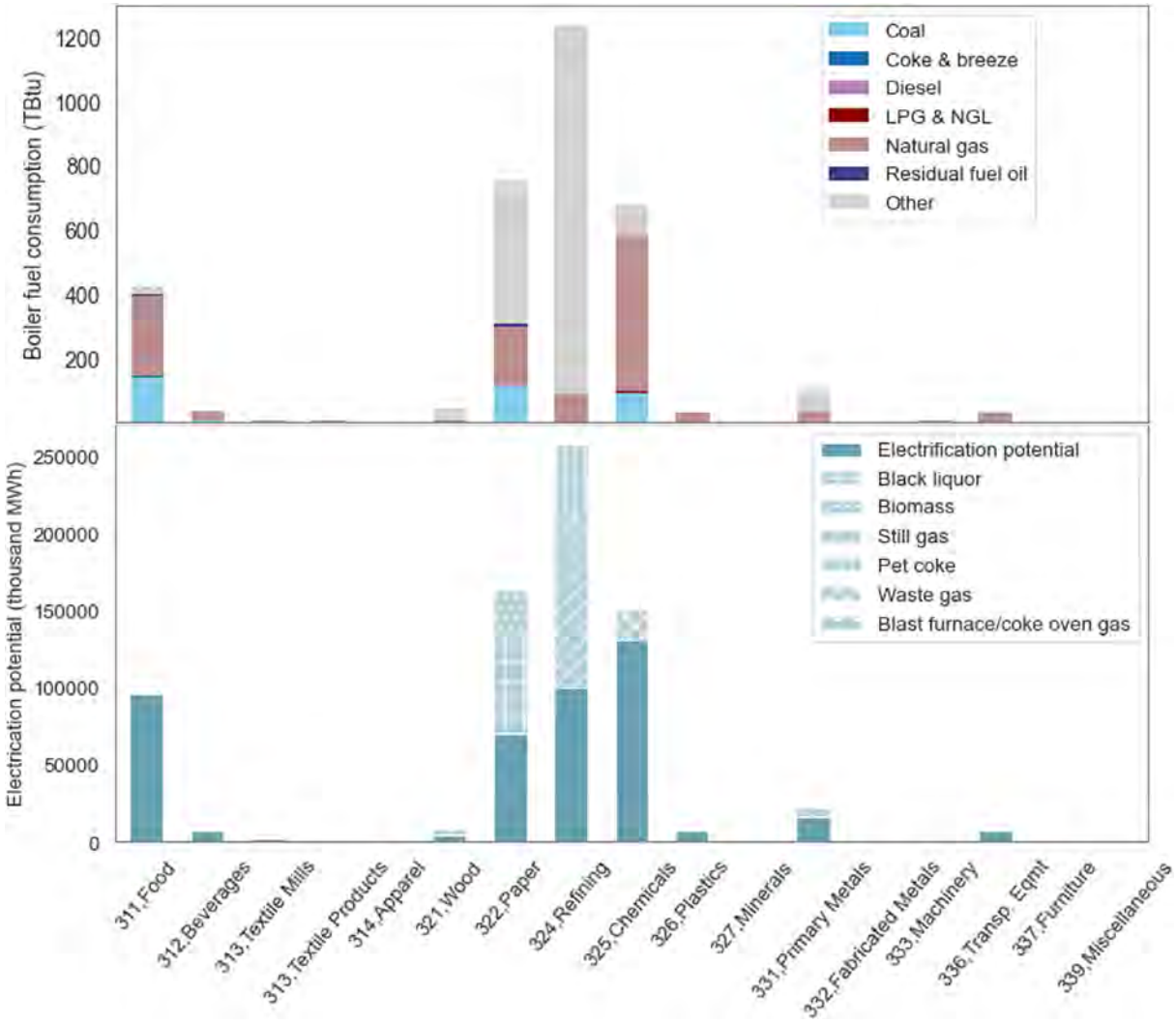


Fig. 6. Conventional boiler fuel consumption in 2014 by fuel type and NAICS manufacturing subsectors [8] (top) and electrification potential with the exclusion of specified byproduct fuels by NAICS manufacturing subsectors (bottom).

in manufacturing and increasing the amount of boiler electricity by two orders of magnitude [50].

3.3. Net changes in boiler fuel use and GHG emissions

To understand the net changes in overall fuel use associated with tapping the estimated electrification potential, we consider the resource mixes and power plant heat rates (fuel inputs per electric power output) of regional electric power grids in the U.S., according to eGRID 2019 data [51]. The fuels inputs necessary for the electricity required by electric boilers are compared to onsite fuel savings, or avoided fuels, from conventional boilers (Fig. 7). The fuel energy required to electrify boilers (4,275 TBtu) exceeds the fuel savings from replacing conventional boilers (3,337 TBtu) and leads to an increase in total national coal and natural gas consumption. This increase can be attributed to the low thermal efficiencies of coal and natural gas power plants and a sizable percentage of the electricity resource mix still met by these fossil fuels in counties with industrial boilers. Similarly, the net change in fuel use when byproduct fuels are excluded from electrification results in an additional fuel requirement of 619 TBtu and increased amounts of national coal and natural gas use. When byproduct fuels are excluded, there is an increased share of additional coal due to the location of facilities that use a large amount of byproduct fuels, especially in the Midwest, where there is a high percentage of coal in the electric grid mix.

The estimated net changes in fuel use shown above are based on the current U.S. electric grid mix, where the most recent eGRID data from 2019 details a combined U.S. grid mix of 38.4% natural gas, 23.3% coal, 19.6% nuclear, 17.6% renewables and <1% oil [51]. In the future, electricity generation from renewables is expected to increase as at least 20 U.S. states have passed either legislation or executive orders to achieve carbon-free electricity in the next 20 to 50 years [52]. To analyze the effects of electric grid makeups with a higher percentage of renewables, we evaluate two theoretical electric grid scenarios, based on the U.S. EIA Annual Energy Outlook (AEO) 2021 projections [53], and apply them to the current industrial boiler population. The first grid scenario is based on the AEO reference case in 2050, and the second grid scenario, on the low-cost renewables and low oil and gas supply cases in 2050 (see SI Section 4 for further details on electric grid scenarios and AEO projections). For each scenario, the electric grid mix by source is shown in Fig. 8a, and the percent change in electricity generation by source from current levels is shown in Fig. 8b. The high renewables scenario used in this analysis does not reflect the exact AEO 2050 grid mixes and does not reflect any specific policies.

Despite a considerable increase in renewables and a 40% decrease in coal-based electricity in the reference grid case, when applied to the current boiler population, the fuels required for electricity from boiler electrification still exceed the fuel savings from conventional boilers

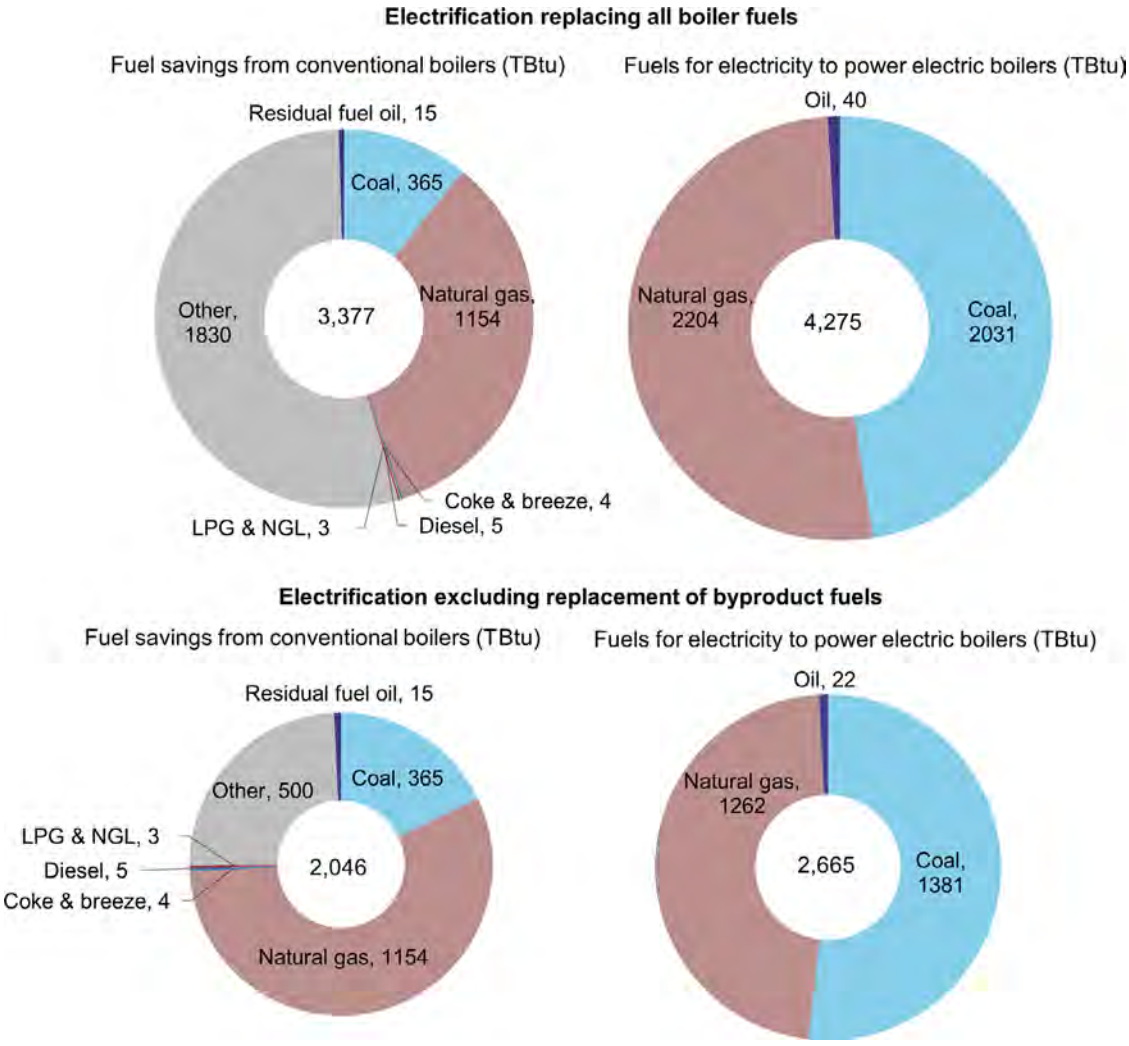


Fig. 7. Estimated changes in fuel use from boiler electrification if all boiler fuels are avoided (top) and if byproduct fuels are excluded from electrification (bottom). Based on eGRID 2019 electric power mix.

(Fig. 8b). Consequently, in this future reference case and under the current grid, there are more GHG emissions released at the nationwide level as a result of boiler electrification. GHG emissions would increase by 105 $MMmtCO_2e$ under the current grid and 37 $MMmtCO_2e$ under the future reference grid. The effects of increased fuel use and GHG emissions also occur under the current grid and future reference grid when boilers using byproduct fuels are excluded from electrification, although the additional required fuels and resulting GHG emissions are lower due to a portion of boiler energy demand being met by the existing byproduct fuels.

An overall reduction in fuel use and GHG emissions occurs only in the high renewables grid scenario, where electricity from coal and natural gas are reduced by 40% and 30%, respectively. In this case, GHG emissions savings are 19 MMmtCO2e, which amounts to 3% of onsite emissions from the current U.S. manufacturing sector (609 MMmtCO2e) [54]. Similarly, in the high renewables case, when byproduct fuels are excluded, there is an overall reduction in fuel use (8 TBtu) and GHG emissions (7 MMmtCO2e). The share of coal and natural gas in the electric grid mix contributes most to the disparate outcomes in GHG emissions, with the share of coal having a greater influence on GHG emissions due to its higher carbon intensity compared to natural gas.

While electrifying boilers would currently lead to an increase in GHG emissions overall under current grid assumptions, there are counties in the U.S. where the adoption of electric boilers would lead to reductions in GHG emissions today (Fig. 9). These counties are primarily in California, New York, and the Northeast, which represent the three subregions of the U.S. electric grid with the highest mix of clean electricity and lowest carbon intensity [55]. In some counties within these subregions, there are greater reductions in GHG emissions than others, which can be attributed to the level of boiler fuel use and fuel savings in the county. However, in most counties (2835 of the 3050 counties with boiler fuel use), boiler electrification would currently lead to an increase in GHG emissions. This analysis assumes average emissions factors for fuels based on regional electric power generation, but future work should consider marginal electricity generation and emissions rates and more detailed grid modeling.

In the future reference case grid, where there is a considerable decrease in electricity from coal and slight increase in electricity from natural gas, there are additional counties in the Northwest and Southeast that show reductions in GHG emissions (516 counties with GHG emissions reductions in total when electrification replaces all boiler fuels). For instance, in several counties in the Northwest and West, which rely less on natural gas and more on coal for electricity, the net GHG emissions become negative, indicating a reduction in emissions. With a reduced mix of both coal and natural gas in the high renewables case grid, more counties throughout the country are shown have GHG emissions reductions (1103 counties in total when electrification replaces all boiler fuels).

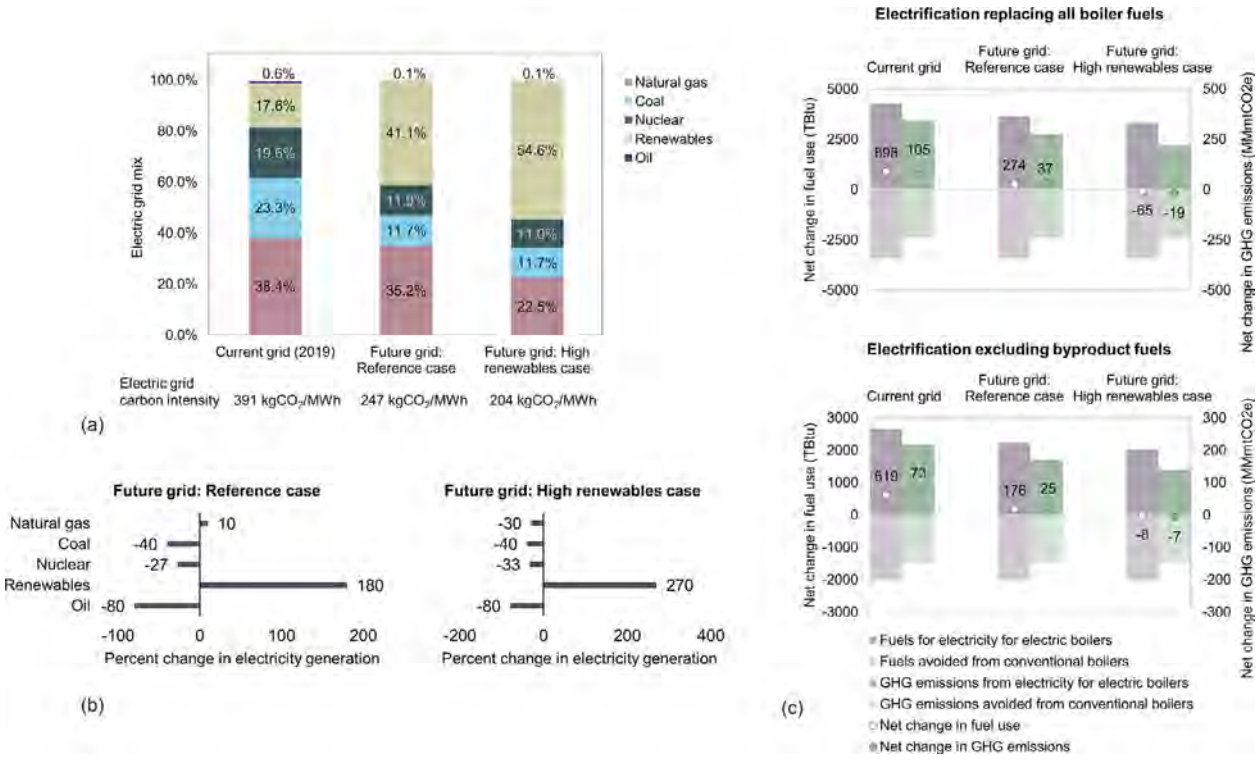


Fig. 8. **(a)** Electric grid mix (percentages) and carbon intensity ($kgCO_2$/MWh) for the current grid and future cases. **(b)** Percent change in electricity generation of two future grid scenarios: reference case and high renewables case (combination of low-cost renewables case and low oil and gas supply case). **(c)** Estimated net changes in fuel use and GHG emissions from electrifying the current boiler population under the current electric grid, reference case grid, and high renewables case grid.

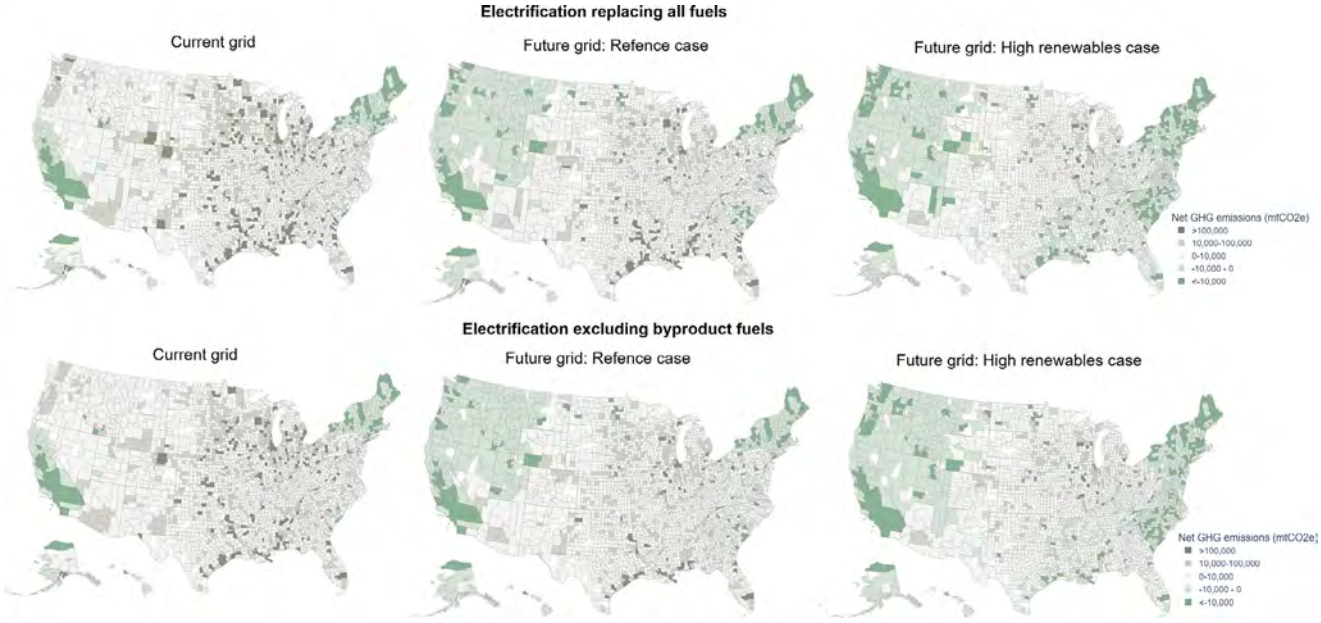


Fig. 9. U.S. county maps of net changes in GHG emissions from boiler electrification under the current electric grid, reference case grid, and high renewables case grid.

In this regard, our study is consistent with past work [19–22] but expands the focus in the U.S., considering the boiler population per county and the effects of the fuel mix in the grid on emissions. In particular, this work emphasizes the need for reducing emissions in the life cycle of electricity generation, such as upstream natural gas leakage [56], the adoption of clean generation technologies, including carbon capture and sequestration (CCS) in coal and natural gas power plants, and increasing the share of renewable and nuclear electricity generation. Furthermore, energy efficiency measures that reduce steam demand could make electrification more favorable and improve the overall investment economics considerably [57–59]. A facility-level economic analysis could incorporate the effects of efficiency gains and other non-energy benefits and expand on previous work that has demonstrated methods for calculating economic parity for electric boilers [60].

4. Conclusions

4.1. Summary of contributions

The electrification potential of industrial boilers and the GHG emissions impact of their electrification are affected significantly by the current population of boilers, county-level boiler fuel consumption, and the fuel mix of the electric grid. In this study, we developed an up-to-date industrial boiler dataset that characterizes boilers by county, manufacturing subsector, installed capacity, and fuel type. This comprehensive dataset integrates multiple national facility-level emissions databases, serves as an updated resource for the U.S. industrial boiler population, which prior to this study has not been updated in nearly twenty years, and provides characteristics of conventional boilers traced to individual units. In the second major contribution of this study, we quantified the county-level electrification potential and net changes in fuel use and GHG emissions for industrial boilers under multiple assumed national grid mixes. For these analyses, we calculated the steam demand of boilers based on conventional boiler fuel consumption and the required electrical energy for electric boilers, accounted for the use of byproduct fuels in the potential to electrify boilers, and considered the full fuel cycle GHG emissions.

Our results show that the largest electrification potential of industrial boilers is in the chemicals, refining, and paper subsectors, when electrifying all conventional boilers, and the chemicals, refining, and food subsectors, when excluding boilers using byproduct fuels from potential replacement with electrification. We find that electrifying boilers leads to an overall increase in national fuel use and GHG emissions based on the current national grid mix, but that in some U.S. counties where the regional electric grid has a low carbon intensity, boiler electrification would lead to a reduction in GHG emissions today. In the future reference grid scenario, where coal is reduced from the electric grid mix and natural gas is increased, overall fuel use and GHG emissions would still increase. In the high renewables grid scenario, where both the percentage of coal and natural gas in the electric grid mix decrease significantly, overall GHG emissions would be reduced.

This study uniquely contributes a more granular understanding of boiler electrification potential in the U.S. With consideration of county-level fuel consumption of boilers and the regional electric grid resource mixes, the GHG emissions impacts from changes in power generation can be shown by county and subsector. This detail could be used to inform policy makers who are interested in policy development that considers regional factors. Our scenario analysis demonstrated the sensitivity of results to coal and natural gas use in the electric grid and, more broadly, the importance of accelerating grid decarbonization for industrial electrification technologies to result in net GHG emissions reductions.

4.2. Future work

This research on industrial boiler technology, energy, and emissions data addressed knowledge gaps about the climate change mitigation potential of electric boilers but also revealed several areas for future research. First, future research could incorporate data from other non-standardized sources. As an example, data science methods could be employed to extract boiler unit data from state air permits. Using these data would address the limitations in national-level equipment and emissions databases. Furthermore, the inclusion of additional unit characteristics, such as year of installation, from these data sources would better predict long-term decarbonization potential. Second, future research could address the significant electricity load additions from industrial electrification and integrate grid modeling that considers both electrification load and grid generation mixes in more temporal detail (e.g., hourly) and quantifies the marginal emissions to meet electric boiler loads. Third, future work could consider heat pumps as an alternative electrified heating technology because they increase efficiency and could be enabled by the results of this study to assess the optimal deployment decisions for electric boilers and heat pumps. Finally, an economic analysis could investigate facility-level costs associated with the electrification of boilers, such as investment costs, operation and maintenance costs (e.g., regional fuel and electricity costs), and avoided mitigation costs.

Moreover, since our analysis showed that industrial boiler electrification may not lead to fuel and GHG emissions savings uniformly throughout the U.S., manufacturing facility decision makers and policy makers could consider the following points. First, for facilities and locations where fuel and emissions savings are not immediately apparent, reducing steam demand in plant processes through efficiency measures could reduce the needed replacement capacities and improve economic feasibility. Second, possible economic co-benefits of boiler electrification (e.g., reduced pollution abatement costs, smaller equipment footprints) could be accounted for, which could also improve the economics of electric boiler investments. Standardized best practice costing guidance could be provided to facility decision makers to capture these important co-benefits in investment analyses. Third, for boilers that are likely to continue using byproducts or residues as fuels, CCS could be implemented instead of stranding the byproducts, which may be combusted in another way. Industrial boiler electrification is one potential solution for a transition from fossil fuel-based technologies but is highly dependent on a decarbonized electric grid and further policy evaluation.

Author contributions

CS: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Coding; Visualization; Writing - original draft; Writing - review & editing. **JZ**: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Coding; Writing - original draft; Writing - review & editing. **CM**: Conceptualization; Methodology; Coding; Writing - review & editing. **JD**: Conceptualization; Methodology; Supervision; Writing - review & editing. **EM**: Conceptualization; Methodology; Supervision; Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

CS was supported by the National Science Foundation GRFP grant DGE-1842165.

This work was authored in part by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Office of Strategic Programs. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

Data and code availability

The industrial boiler dataset and all code is available at the following GitHub repository: https://github.com/carriescho/Electrification-of-Boilers. The dataset is an estimated inventory of industrial boilers in the U.S. with unit-level detail of boiler capacity (MMBtu/hr), boiler fuel type, county (FIPS code), and industrial subsector (three-digit NAICS code).

Appendix: supporting information

Document available for download.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.adapen.2022.100089.

References

[1] IPCC, "Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change," 2021. [Online]. Available: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Citation.pdf.

[2] International Energy Agency (IEA), "Net Zero by 2050 - A Roadmap for the Global Energy Sector," 2021. [Online]. Available: https://iea.blob.core.windows.net/assets/beceb956-0dcf-4d73-89fe-1310e3046d68/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

[3] International Energy Agency (IEA), "Energy Technology Perspectives 2020," 2020. [Online]. Available: https://iea.blob.core.windows.net/assets/7f8aed40-89af-4348-be19-c8a67df0b9ea/Energy_Technology_Perspectives_2020_PDF.pdf.

[4] International Energy Agency (IEA), "World Energy Balances, 2021. 'Industry consumption by sub-sector of top five countries by total final consumption, 2019.,'" 2021. [Online]. Available: https://www.iea.org/data-and-statistics/charts/industry-consumption-by-sub-sector-of-top-five-countries-by-total-final-consumption-2019.

[5] U.S. DOE, "Manufacturing Energy and Carbon Footprint: 2018 MECS. Sector: All Manufacturing (NAICS 31 33).," 2021. [Online]. Available: https://www.energy.gov/sites/default/files/2022-01/2018_mecs_all_manufacturing_energy_carbon_footprint.pdf.

[6] U.S. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2019. Table ES-4.," 2021. [Online]. Available: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019.

[7] U.S. DOE, "Quadrennial Technology Review 2015 Process Heating," 2015. [Online]. Available: https://www.energy.gov/sites/default/files/2016/06/f32/QTR2015-6I-Process-Heating.pdf.

[8] McMillan C. Manufacturing Thermal Energy Use in 2014. Natl. Renew. Energy Lab. 2019. [Online]. Available: https://data.nrel.gov/submissions/118 .

[9] U.S. DOE, "Manufacturing Energy and Carbon Footprint. 2014 MECS. Sector: Forest Products (NAICS 321, 322)," 2018.

[10] U.S. DOE, "Manufacturing Energy and Carbon Footprint. 2014 MECS. Sector: Petroleum Refining (NAICS 324110)," 2018.

[11] U.S. DOE, "Manufacturing Energy and Carbon Footprint. 2014 MECS. Sector: Chemicals (NAICS 325)," 2018.

[12] U.S. DOE, "Manufacturing Energy and Carbon Footprint. 2014 MECS. Sector: Iron and Steel (NAICS 331110, 3312)," 2018. [Online]. Available: https://www.energy.gov/sites/prod/files/2018/10/f56/2014_mecs_iron_steel_energy_footprint.pdf.

[13] Energy and Environmental Analysis, Inc., "Characterization of the U.S. Industrial/Commercial Boiler Population," U.S. DOE, Oak Ridge National Laboratory, 2005. [Online]. Available: https://www.energy.gov/sites/prod/files/2013/11/f4/characterization_industrial_commerical_boiler_population.pdf.

[14] E. Rightor, R. N. Elliot, and A. Whitlock, "Beneficial Electrification in Industry," American Council for an Energy Efficient Economy, 2020. [Online]. Available: https://www.aceee.org/sites/default/files/pdfs/ie2002.pdf.

[15] den Ouden B, Lintmeijer N, van Aken J. Electrification in the Dutch Process Industry. Berenschot 2017.

[16] M. Lord, "Zero carbon industry plan: electrifying industry," Beyond Zero Emissions, 2018. [Online]. Available: https://bze.org.au/wp-content/uploads/electrifying-industry-bze-report-2018.pdf.

[17] E. Larson et al., "Net Zero America: Potential Pathways, Infrastructure, and Impacts," 2020. [Online]. Available: https://netzeroamerica.princeton.edu/img/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf.

[18] Reimers, "Electric Boiler Advantages Over Gas and Diesel." https://www.reimersinc.com/blog-layout/benefits-of-an-electric-boiler (accessed May 26, 2021).

[19] D. Schuewer and C. Schneider, "Electrification of industrial process heat: long-term applications, potentials and impacts," *ECEEE INDUSTRIAL SUMMER STUDY PROCEEDINGS*, p. 12.

[20] Madeddu S, et al. The CO2 reduction potential for the European industry via direct electrification of heat supply (power-to-heat. Environ. Res. Lett. Nov. 2020;15(12):124004. doi:10.1088/1748-9326/abbd02.

[21] Mai TT, et al. Electrification futures study: Scenarios of electric technology adoption and power consumption for the United States. Natl. Renew. Energy Lab.(NREL), Golden, CO (United States) 2018.

[22] A. Hasanbeigi, L.A. Kirshbaum, B. Collison, and D. Gardiner, "Electrifying U.S. Industry:," Renewable Thermal Collaborative, 2021. [Online]. Available: https://www.renewablethermal.org/wp-content/uploads/2018/06/Electrifying-U.S.-Industry-2.1.21-1.pdf.

[23] U.S. EIA, "Manufacturing Energy Consumption Survey (MECS). Table 5.2. End Uses of Fuel Consumption, 2014.," 2017. [Online]. Available: https://www.eia.gov/consumption/manufacturing/data/2014/pdf/table5_2.pdf.

[24] C. McMillan et al., "Opportunities for Solar Industrial Process Heat in the United States," NREL/TP–6A20-77760, 1762440, MainId:30675, Jan. 2021. doi: 10.2172/1762440.

[25] U.S. EPA, "Greenhouse Gas Reporting Program (GHGRP)." [Online]. Available: https://www.epa.gov/ghgreporting.

[26] U.S. EPA, "Boiler Maximum Achievable Control Technologies (MACT) Draft Emissions and Survey Results Database," 2012. [Online]. Available: https://www.epa.gov/stationary-sources-air-pollution/industrial-commercial-and-institutional-boilers-and-process-heaters.

[27] U.S. EPA, "National Emissions Inventory (NEI)." [Online]. Available: https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei.

[28] U.S. EPA, "Fact sheet: Greenhouse Gases Reporting Program Implementation," 2013. [Online]. Available: https://www.epa.gov/sites/production/files/2014-09/documents/ghgfactsheet.pdf.

[29] U.S. EPAIndustrial, Commercial, and Institutional Boilers and Process Heaters: National Emission Standards for Hazardous Air Pollutants (NESHAP) for Major Sources. US EPA 2016. https://www.epa.gov/stationary-sources-air-pollution/industrial-commercial-and-institutional-boilers-and-process-heaters (accessed May 27, 2021).

[30] U.S. EPA, "U.S. EPA Region I Webinar: Understanding EPA's Major Source Boiler MACT Rule," Nov. 2013. [Online]. Available: https://www.epa.gov/sites/production/files/2016-09/documents/20131121webinar.pdf.

[31] U.S. EIA, "Form EIA-923 detailed data with previous form data (EIA-906/920)." https://www.eia.gov/electricity/data/eia923/ (accessed Oct. 07, 2021).

[32] New Zealand Energy Efficiency and Conservation Authority (EECA), "Electrode and Electric Resistance Steam Generators and Hot Water Heaters for low carbon process heating," 2019.

[33] Cleaver-Brooks, "Electric & Electrode Boilers." 2021. Online. Available: https://cleaverbrooks.com/Catalog/boilers/electric-and-electrode.

[34] Walker ME, Lv Z, Masanet E. Industrial Steam Systems and the Energy-Water Nexus. Environ. Sci. Technol. Nov. 2013;47(22):13060–7. doi:10.1021/es403715z.

[35] Wouter N, Van Wortswinkel L. Industrial Combustion Boilers. IEA - Energy Technol. Syst. Anal. Programme 2010. [Online]. Available: https://iea-etsap.org/E-TechDS/PDF/I01-ind_boilers-GS-AD-gct.pdf .

[36] Cleaver-Brooks, "BOILER EFFICIENCY GUIDE. Firetube boilers.," 2020. [Online]. Available: https://cleaverbrooks.com/Product/cble.

[37] U.S. EPA, "Emissions & Generation Resource Integrated Database (eGRID)," 2021. [Online]. Available: https://www.epa.gov/egrid.

[38] U.S. EPA, "Emission Factors for Greenhouse Gas Inventories," 2018. [Online]. Available: https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf.

[39] Argonne National Laboratory, *GREET 1, Version 2021*. 2021. [Online]. Available: https://greet.es.anl.gov/index.php.

[40] National Renewable Energy Laboratory, "Life Cycle Greenhouse Gas Emissions from Electricity Generation: Update," 2021. [Online]. Available: https://www.nrel.gov/docs/fy21osti/80580.pdf.

[41] U.S. Census Bureau, "County Business Patterns (CBP) Tables. Tables CB1900CBP (2019) and CBP/04-1 (2004).," 2021. [Online]. Available: https://www.census.gov/programs-surveys/cbp/data/tables.html.

[42] Schoeneberger CA, McMillan CA, Kurup P, Akar S, Margolis R, Masanet E. Solar for industrial process heat: A review of technologies, analysis approaches, and potential applications in the United States. Energy Sep. 2020;206:118083. doi:10.1016/j.energy.2020.118083.

[43] U.S. DOE EERE, "Industrial Assessment Center (IAC) Database," 2021. [Online]. Available: https://iac.university/#database.

[44] American Chemistry Council, "2020 Guide to the Business of Chemistry," 2020. [Online]. Available: https://www.americanchemistry.com/chemistry-in-america/data-industry-statistics/resources/2020-guide-to-the-business-of-chemistry.

[45] S. Brueske, C. Kramer, and A. Fisher, "Bandwidth Study on Energy Use and Potential Energy Saving Opportunities in U.S. Chemical Manufacturing," U.S. DOE. [Online]. Available: https://www.energy.gov/sites/prod/files/2015/08/f26/chemical_bandwidth_report.pdf.

[46] A. Wright L., F. Hart, R. Counts, and C. Russel, "Steam System Opportunity Assessment for the Pulp and Paper, Chemical Manufacturing, and Petroleum Refining Industries: Main Report," U.S. DOE, 2002. [Online]. Available: https://www.osti.gov/biblio/1215927.

[47] K.J. Kramer, E. Masanet, T. Xu, and E. Worrell, "Energy Efficiency Improvement and Cost Saving Opportunities for the Pulp and Paper Industry," 2009. [Online]. Available: https://www.energystar.gov/sites/default/files/buildings/tools/Pulp_and_Paper_Energy_Guide.pdf.

[48] Jadun P, McMillan C, Steinberg D, Muratori M, Vimmerstedt L, Mai T. Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050. Natl. Renew. Energy Lab. (NREL) 2017. [Online]. Available: https://www.nrel.gov/docs/fy18osti/70485.pdf .

[49] U.S. EIA, "Manufacturing Energy Consumption Survey (MECS) with net demand for electricity. Table 5.3. End Uses of Fuel Consumption, 2018.," 2021. [Online]. Available: https://www.eia.gov/consumption/manufacturing/data/2018/pdf/Table5_3.pdf.

[50] U.S. EIA, "Manufacturing Energy Consumption Survey (MECS) with net electricity. Table 5.2. End Uses of Fuel Consumption, 2018.," 2021. [Online]. Available: https://www.eia.gov/consumption/manufacturing/data/2018/pdf/Table5_2.pdf.

[51] U.S. EPA, "eGRID Summary Tables 2019," 2021. [Online]. Available: https://www.epa.gov/sites/default/files/2021-02/documents/egrid2019_summary_tables.pdf.

[52] Clean Energy States Alliance (CESA), "100% Clean Energy Collaborative - Table of 100% Clean Energy States," 2021. [Online]. Available: https://www.cesa.org/

projects/100-clean-energy-collaborative/guide/table-of-100-clean-energy-states/.
[53] U.S. EIA, "Annual Energy Outlook 2021. Electricity. U.S. electricity generation.," 2021. [Online]. Available: https://www.eia.gov/outlooks/aeo/pdf/04%20AEO2021%20Electricity.pdf.
[54] U.S. DOE, "Manufacturing Energy Footprint. 2014 MECS. All Manufacturing.," 2018. [Online]. Available: https://www.energy.gov/sites/prod/files/2019/06/f64/Manufacturing%20Energy%20Footprint-2014_Latest_compliant.pdf.
[55] U.S. EPA, "eGRID Power Profiler. 2019.," 2021. [Online]. Available: https://www.epa.gov/egrid/power-profiler#/.
[56] The White House Office of Domestic Climate Policy, "U.S. METHANE EMISSIONS REDUCTION ACTION PLAN," 2021. Accessed: Dec. 06, 2021. [Online]. Available: https://www.science.org/doi/10.1126/sciadv.abf4491.
[57] U.S. DOE EERE, "BestPractices: Steam," 2006. [Online]. Available: https://www.energy.gov/sites/prod/files/2014/05/f15/saveenergyinsteam.pdf.
[58] U.S. DOE EERE, "Boise Inc. St. Helens Paper Mill Achieves Significant Fuel Savings," 2008. [Online]. Available: https://www.energy.gov/sites/prod/files/2014/05/f16/boisecasestudy.pdf.
[59] U.S. DOE EERE, "Dow Chemical Company: Assessment Leads to Steam System Energy Savings in a Petrochemical Plant," 2007. [Online]. Available: https://www.energy.gov/sites/prod/files/2014/05/f16/dowassessmentsavings.pdf.
[60] McMillan C, et al. Evaluating the economic parity of solar for industrial process heat. Solar Energy Adv. 2021;1:100011. doi:10.1016/j.seja.2021.100011.

Exhibit 22

State of New Jersey
Department of Environmental Protection
Air Quality, Energy and Sustainability
Division of Air Quality
Bureau of Stationary Sources
401 E. State Street, 2nd Floor, P.O. Box 420, Mail Code 401-02
Trenton, NJ 08625-0420

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. McCABE
Commissioner

Air Pollution Control Operating Permit
Administrative Amendment

Permit Activity Number: BOP190001 **Program Interest Number: 07736**

Mailing Address	Plant Location
DAVID BLACKMORE FACILITY MANAGER COVANTA ESSEX CO 183 RAYMOND BLVD Newark, NJ 07105	COVANTA ESSEX CO 183 Raymond Blvd Newark Essex County

Initial Operating Permit Approval Date: **July 8, 2004**

Operating Permit Approval Date: **October 18, 2019**

Operating Permit Expiration Date: **October 27, 2018 (Operating under Application Shield)**

AUTHORITY AND APPLICABILITY

The New Jersey Department of Environmental Protection (Department) approves and issues this Air Pollution Control Operating Permit under the authority of Chapter 106, P.L. 1967 (N.J.S.A. 26:2C-9.2). This permit is issued in accordance with the air pollution control permit provisions promulgated at Title V of the Federal Clean Air Act, 40 CFR 70, Air Pollution Control Act codified at N.J.S.A. 26:2C and New Jersey State regulations promulgated at N.J.A.C. 7:27-22.

The Department approves this operating permit based on the evaluation of the certified information provided in the permit application that all equipment and air pollution control devices regulated in this permit comply with all applicable State and Federal regulations. The facility shall be operated in accordance with the conditions of this permit. This operating permit supersedes any previous Air Pollution Control Operating Permits issued to this facility by the Department including any general operating permits, renewals, significant modifications, minor modifications, seven-day notice changes or administrative amendments to the permit.

Changes made through this permit activity are provided in the Reason for Application.

PERMIT SHIELD

Equipment at the facility referenced by this modification **is not covered by** the permit shield, pursuant to the provisions of N.J.A.C. 7:27-22.17.

COMPLIANCE SCHEDULES

This operating permit does not include compliance schedules as part of the approved compliance plan.

COMPLIANCE CERTIFICATIONS AND DEVIATION REPORTS

The permittee shall submit to the Department and to United States Environmental Protection Agency (US EPA) periodic compliance certifications, in accordance with N.J.A.C. 7:27-22.19. **The annual compliance certification** is due to the Department and EPA within 60 days after the end of each calendar year during which this permit was in effect. **Semi-annual deviation reports** relating to compliance testing and monitoring are due to the Department within 30 days after the end of the semi-annual period. The schedule and additional details for these submittals are available in Subject Item - FC, of the Facility Specific Requirements of this permit.

ACCESSING PERMITS

The facility's current approved operating permit and any previously issued permits (e.g. superseded, expired, or terminated) are available for download in PDF format at: http://www.nj.gov/dep/aqpp. After accessing the website, click on "Approved Operating Permits" listed under "Reports" and then type in the Program Interest (PI) Number as instructed on the screen. If needed, the RADIUS file for your permit, containing Facility Specific Requirements (Compliance Plan), Inventories and Compliance Schedules can be obtained by contacting the Helpline number given below. RADIUS software, instructions, and help are available at the Department's website at http://www.nj.gov/dep/aqpp.

HELPLINE

The Operating Permit Helpline is available for any questions at (609) 633-8248 from 9:00 AM to 4:00 PM Monday to Friday.

RENEWING YOUR OPERATING PERMIT AND APPLICATION SHIELD

The permittee is responsible for submitting a timely and administratively complete operating permit renewal application pursuant to N.J.A.C. 7:27-22.30. Only applications which are timely and administratively complete are eligible for an application shield. The details on the contents of the renewal application, submittal schedule, and application shield are available in Section B - General Provisions and Authorities of this permit.

COMPLIANCE ASSURANCE MONITORING

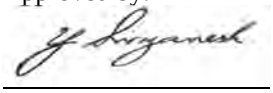
Facilities that are subject to Compliance Assurance Monitoring (CAM), pursuant to 40 CFR 64, shall develop a CAM Plan for modified equipment as well as existing sources. The rule and guidance on how to prepare a CAM Plan can be found at EPA's website: https://www.epa.gov/air-emissions-monitoring-knowledge-base/compliance-assurance-monitoring. In addition, CAM Plans must be included as part of the permit renewal application. Facilities that do not submit a CAM Plan may have their permit applications denied, pursuant to N.J.A.C. 7:27-22.3.

ADMINISTRATIVE HEARING REQUEST

If, in your judgment, the Department is imposing any unreasonable condition of approval, you may contest the Department's decision and request an adjudicatory hearing pursuant to N.J.S.A. 52:14B-1 et seq. and N.J.A.C. 7:27-22.32(a). All requests for an adjudicatory hearing must be received in writing by the Department within 20 calendar days of the date you receive this letter. The request must contain the information specified in N.J.A.C. 7:27-1.32 and the information on the NJ04 - Administrative Hearing Request Checklist and Tracking Form available at https://www.state.nj.us/dep/aqpp/applying.html.

If you have any questions regarding this permit approval, please call Ted Chleboski at (609) 777-0129.

Approved by:



Yaso Sivaganesh

Enclosure

CC: Suilin Chan, United States Environmental Protection Agency, Region 2

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

TABLE OF CONTENTS

Section A

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

POLLUTANT EMISSIONS SUMMARY

Table 1: Total emissions from all Significant Source Operations[1] at the facility.

Facility's Potential Emissions from all Significant Source Operations (tons per year)										
Source Categories	VOC (total)	NO_x	CO	SO_2	TSP (total)	PM_{10} (total)	$PM_{2.5}$[2] (total)	Pb	HAPs* (total)	CO_2e[3]
Emission Units Summary	83	1260	1260	996	136	134	304	NA	307	
Batch Process Summary	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Group Summary	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Total Emissions	83	1260	1260	996	136	134	304	NA	307	378,000

Table 2: Estimate of total emissions from all Insignificant Source Operations[1] and total emissions from Non-Source Fugitives at the facility.

Emissions from all Insignificant Source Operations and Non-Source Fugitive Emissions (tons per year)									
Source Categories	VOC (total)	NO_x	CO	SO_2	TSP (total)	PM_{10} (total)	$PM_{2.5}$[2] (total)	Pb	HAPs (total)
Insignificant Source Operations	NA	NA	NA	NA	NA	NA	NA	NA	NA
Non-Source Fugitive Emissions[4]	NA	NA	NA	NA	NA	NA	NA	NA	NA

VOC: Volatile Organic Compounds
NOx: Nitrogen Oxides
CO: Carbon Monoxide
SO_2: Sulfur Dioxide
TSP: Total Suspended Particulates
Other: Any other air contaminant regulated under the Federal CAA
PM_{10}: Particulates under 10 microns
$PM_{2.5}$: Particulates under 2.5 microns
Pb: Lead
HAPs: Hazardous Air Pollutants
CO_2e: Carbon Dioxide equivalent
N/A: Indicates the pollutant is not emitted or is emitted below the reporting threshold specified in N.J.A.C. 7:27-22, Appendix, Table A and N.J.A.C. 7:27-17.9(a).

*Emissions of individual HAPs are provided in Table 3 on the next page.
Emissions of "Other" air contaminants are provided in Table 4 on the next page.

[1] Significant Source Operations and Insignificant Source Operations are defined at N.J.A.C. 7:27-22.1.
[2] $PM_{2.5}$ has been included in air permitting rules as of December 9, 2017. Consequently, $PM_{2.5}$ totals in this section may not be up to date. The Department is in the process of updating these limits during each permit modification, and the entire permit will be updated at the time of permit renewal.
[3] Total CO_2e emissions for the facility that includes all Significant Source Operations (emission units, batch process, group) and Insignificant Source Operations.
[4] Non-Source Fugitive Emissions are defined at N.J.A.C. 7:27-22.1 and are included if the facility falls into one or more categories listed at N.J.A.C. 7:27-22.2(a)2.

Section A

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

POLLUTANT EMISSIONS SUMMARY

Table 3: Summary of Hazardous Air Pollutants (HAP) Emissions from Significant Source Operations [5]:

HAP	TPY
Arsenic	0.067
Beryllium	0.003
Cadmium	0.565
Chromium	0.158
Dioxin TCDD (2,3,7,8)	0.000131
Hydrogen Chloride	284
Hydrogen Fluoride	10.8
Lead	6.57
Mercury	0.14
Nickel	0.043
Polycyclic Organic Matter	3.81

Table 4: Summary of "Other" air contaminants emissions from Significant Source Operations:

Other Air Contaminant	TPY
Ammonia	133

[5] Do not sum the values below for the purpose of establishing a total HAP potential to emit. See previous page for the allowable total HAP emissions.

Section B

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

GENERAL PROVISIONS AND AUTHORITIES

1. No permittee shall allow any air contaminant, including an air contaminant detectable by the sense of smell, to be present in the outdoor atmosphere in a quantity and duration which is, or tends to be, injurious to human health or welfare, animal or plant life or property, or which would unreasonably interfere with the enjoyment of life or property. This shall not include an air contaminant that occurs only in areas over which the permittee has exclusive use or occupancy. Requirements relative only to nuisance situations, including odors, are not considered federally enforceable. [N.J.A.C. 7:27-22.16(g)8]

2. Any deviation from operating permit requirements which results in a release of air contaminants shall be reported to the Department as follows:

   a. If the air contaminants are released in a quantity or concentration which poses a potential threat to public health, welfare or the environment or which might reasonably result in citizen complaints, the permittee shall report the release to the Department:

      i. Immediately on the Department hotline at 1-(877) 927-6337, pursuant to N.J.S.A. 26:2C-19(e); and

      ii. As part of the compliance certification required in N.J.A.C. 7:27-22.19(f). However, if the deviation is identified through source emissions testing, it shall be reported through the source emissions testing and monitoring procedures at N.J.A.C. 7:27-22.18(e)3; or

   b. If the air contaminants are released in a quantity or concentration which poses no potential threat to public health, welfare or the environment and which will not likely result in citizen complaints, the permittee shall report the release to the Department as part of the compliance certification required in N.J.A.C. 7:27-22.19(f), except for deviations identified by source emissions testing reports, which shall be reported through the procedures at N.J.A.C. 7:27-22.18(e)3; or

   c. If the air contaminants are released in a quantity or concentration which poses no potential threat to public health, welfare or the environment and which will not likely result in citizen complaints, and the permittee intends to assert the affirmative defense afforded by N.J.A.C. 7:27-22.16(l), the violation shall be reported by 5:00 PM of the second full calendar day following the occurrence, or of becoming aware of the occurrence, consistent with N.J.A.C. 7:27-22.16(l). [N.J.A.C. 7:27-22.19(g)]

3. The permittee shall comply with all conditions of the operating permit including the approved compliance plan. Any non-compliance with a permit condition constitutes a violation of the New Jersey Air Pollution Control Act N.J.S.A. 26:2C-1 et seq., or the CAA, 42 U.S.C. §7401 et seq., or both, and is grounds for enforcement action; for termination, revocation and reissuance, or for modification of the operating permit; or for denial of an application for a renewal of the operating permit. [N.J.A.C. 7:27-22.16(g)1]

4. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of its operating permit. [N.J.A.C. 7:27-22.16(g)2]

5. This operating permit may be modified, terminated, or revoked for cause by the EPA pursuant to 40 CFR 70.7(g) and revoked or reopened and modified for cause by the Department pursuant to N.J.A.C. 7:27-22.25. [N.J.A.C. 7:27-22.16(g)3]

6. The permittee shall furnish to the Department, within a reasonable time, any information that the Department may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this operating permit; or to determine compliance with the operating permit. [N.J.A.C. 7:27-22.16(g)4]

7. The filing of an application for a modification of an operating permit, or of a notice of planned changes or anticipated non-compliance, does not stay any operating permit condition. [N.J.A.C. 7:27-22.16(g)5]

8. The operating permit does not convey any property rights of any sort, or any exclusive privilege. [N.J.A.C. 7:27-22.16(g)6]

9. Upon request, the permittee shall furnish to the Department copies of records required by the operating permit to be kept. [N.J.A.C. 7:27-22.16(g)7]

10. The Department and its authorized representatives shall have the right to enter and inspect any facility subject to N.J.A.C. 7:27-22, or portion thereof, pursuant to N.J.A.C. 7:27-1.31. [N.J.A.C. 7:27-22.16(g)9]

11. The permittee shall pay fees to the Department pursuant to N.J.A.C. 7:27. [N.J.A.C. 7:27-22.16(g)10]

12. Each permittee shall maintain records of all source emissions testing or monitoring performed at the facility and required by the operating permit in accordance with N.J.A.C. 7:27-22.19. Records shall be maintained, for at least five years from the date of each sample, measurement, or report. Each permittee shall maintain all other records required by this operating permit for a period of five years from the date each record is made. At a minimum, source emission testing or monitoring records shall contain the information specified at N.J.A.C. 7:27-22.19(b). [N.J.A.C. 7:27-22.19(a) and N.J.A.C. 7:27-22.19(b)]

13. a. For emergencies (as defined at 40 CFR 70.6(g)(1)) that result in non-compliance with any promulgated federal technology-based standard such as NSPS, NESHAPS, or MACT, a federal affirmative defense is available, pursuant to 40 CFR 70. To assert a federal affirmative defense, the permittee must use the procedures set forth in 40 CFR 70. The affirmative defense provisions described below may not be applied to any situation that caused the Facility to exceed any federally delegated regulation, including but not limited to NSPS, NESHAP, or MACT.

    b. For situations other than those covered above, an affirmative defense is available for a violation of a provision or condition of the operating permit only if:

        i. The violation occurred as a result of an equipment malfunction, an equipment startup or shutdown, or during the performance of necessary equipment maintenance; and

        ii. The affirmative defense is asserted and established as required by N.J.S.A. 26:2C-19.1 through 19.5 and any implementing rules. [N.J.A.C. 7:27-22.16(l)]

14. Each permittee shall meet all requirements of the approved source emissions testing and monitoring protocol during the term of the operating permit. Whenever the permittee makes a replacement, modification, change or repair of a certified CEMS or COMS that may significantly affect the ability of the system to accurately measure or record data, the permittee must recertify the CEMS or COMS in accordance with Section V.B. and Appendix E of Technical Manual 1005. The permittee is responsible for contacting the Emission Measurement Section to determine the need for recertification and/or to initiate the recertification process. The permittee is responsible for any downtime associated with the replacement, modification, change or repair of the CEMS or COMS. [N.J.A.C. 7:27-22.18(j)]

15. Each owner and each operator of any facility, source operation, or activity to which this permit applies is responsible for ensuring compliance with all requirements of N.J.A.C. 7:27-22. If the owner and operator are separate persons, or if there is more than one owner or operator, each owner and each operator is jointly and severally liable for any fees due under N.J.A.C. 7:27-22, and for any penalties for violation of N.J.A.C. 7:27-22. [N.J.A.C. 7:27-22.3]

16. In the event of a challenge to any part of this operating permit, all other parts of the permit shall continue to be valid. [N.J.A.C. 7:27-22.16(f)]

17. Unless specifically exempted from permitting, temporary mobile equipment for short-term activities may be periodically used at major facilities, on site for up to 90 days if the requirements listed below, (a) through (h) are satisfied.

    a. The permittee will ensure that the temporary mobile equipment will not be installed permanently or used permanently on site.

    b. The permittee will ensure that the temporary mobile equipment will not circumvent any State or Federal rules and regulations, even for a short period of time, and the subject equipment will comply with all applicable performance standards.

    c. The permittee cannot use temporary mobile equipment unless the owner or operator of the subject equipment has obtained and maintains an approved Air Pollution Control Permit, issued pursuant to N.J.A.C. 7:27-8 or 22, prior to bringing the temporary mobile equipment to operate at the major facility.

    d. The permittee is responsible for ensuring the temporary mobile equipment's compliance with the terms and conditions specified in its approved Air Pollution Control Permit when the temporary mobile equipment operates on the property of the permittee.

    e. The permittee will ensure that temporary mobile equipment utilized for short-term activities will not operate on site for more than a total of 90 days during any calendar year.

    f. The permittee will keep on site a list of temporary mobile equipment being used at the facility with the start date, end date, and record of the emissions from all such equipment (amount and type of each air contaminant) no later than 30 days after the temporary mobile equipment completed its job in accordance with N.J.A.C. 7:27-22.19(i)3.

    g. Emissions from the temporary mobile equipment must be included in the emission netting analysis required of the permittee by N.J.A.C. 7:27-18.7. This information is maintained on site by the permittee and provided to the Department upon request in accordance with existing applicable requirements in the FC Section of its Title V permit.

    h. Where short-term activities (employing temporary mobile equipment) will reoccur on at least an annual basis, the permittee is required to include such activities (and the associated equipment) within one year of the first use, in its Title V permit through the appropriate modification procedures.

18. The permittee shall ensure that no air contaminant is emitted from any significant source operation at a rate, calculated as the potential to emit, that exceeds the applicable threshold for reporting emissions set forth in the Appendix to N.J.A.C. 7:27-22 or 7:27-17.9(a), unless emission of the air contaminant is authorized by this operating permit. [N.J.A.C. 7:27-22.3(c)]

19. Consistent with the provisions of N.J.A.C. 7:27-22.3(e), the permittee shall ensure that all requirements of this operating permit are met. In the event that there are multiple emission limitations, monitoring, recordkeeping, and/or reporting requirements for a given source operation, the facility must comply with all requirements, including the most stringent.

20. Consistent with the provisions of N.J.A.C. 7:27-22.9(c), the permittee shall use monitoring of operating parameters, where required by the compliance plan, as a surrogate for direct emissions testing or monitoring, to demonstrate compliance with applicable requirements.

21. The permittee is responsible for submitting timely and administratively complete operating permit applications:

Administrative Amendments [N.J.A.C. 7:27-22.20(c)];
Seven-Day Notice changes [N.J.A.C. 7:27-22.22(e)];
Minor Modifications [N.J.A.C. 7:27-22.23(e)];
Significant Modifications [N.J.A.C. 7:27-22.24(e)]; and
Renewals [N.J.A.C. 7:27-22.30(b).

22. The operating permit renewal application consists of a RADIUS application and the application attachment available at the Department's website http://www.nj.gov/dep/aqpp/applying.html (Attachment to the RADIUS Operating Permit Renewal Application). Both the RADIUS application and the Application Attachment, along with any other supporting documents must be submitted using the Department's Portal at: http://njdeponline.com/. The application is considered timely if it is received at least 12 months before the expiration date of the operating permit. To be deemed administratively complete, the renewal application shall include all information required by the application form for the renewal and the information required pursuant to N.J.A.C. 7:27-22.30(d). However, consistent with N.J.A.C. 7:27-22.30(c), the permittee is encouraged to submit the renewal application at least 15 months prior to expiration of the operating permit, so that any deficiencies can be identified and addressed to ensure that the application is administratively complete by the renewal deadline. Only renewal applications which are timely and administratively complete are eligible for an application shield.

23. Except as allowed in Technical Manual 1005, or otherwise allowed by the Department in this permit or in written guidelines/ procedures issued or approved by the Department, process monitors required by the Compliance Plan included in this permit must be operated at all times when the associated process equipment is operating. The permittee must keep a service log to document any outage.

24. Consistent with the provisions of N.J.A.C. 7:27-22.3(s), Except as otherwise provided in this subchapter, the submittal of any information or application by a permittee including, but not limited to, an application or notice for any change to the operating permit, including any administrative amendment, any minor or significant modification, renewal, a notice of a seven-day notice change, a notice of past or anticipated noncompliance, does not stay any operating permit condition, nor relieve a permittee from the obligation to obtain other necessary permits and to comply with all applicable Federal, State, and local requirements.

25. For all source emissions testing performed at the facility, the phrase "worst case conditions without creating an unsafe condition" used in the enclosed compliance plan is consistent with EPA's National Stack Testing Guidance, dated April 27, 2009, where all source emission testing performed at the facility shall be under the representative (normal) conditions that:

    i. Represent the range of combined process and control measure conditions under which the facility expects to operate (regardless of the frequency of the conditions); and

    ii. Are likely to most challenge the emissions control measures of the facility with regard to meeting the applicable emission standards, but without creating an unsafe condition.

26. A Permittee may seek the approval of the Department for a delay in testing required pursuant to this permit by submitting a written request to the appropriate Regional Enforcement Office in accordance with N.J.A.C. 7:27-22.18(k). A Permittee may also seek advanced approval for a longer period for submittal of a source emissions test report required by the permit by submitting a request to the Department's Regional Enforcement Office in accordance with N.J.A.C. 7:27-22.19. [N.J.A.C. 7:27-22.18(k) and N.J.A.C. 7:27-22.19]

27. Applicable requirements derived from an existing or terminated consent decree with EPA will not be changed without advance consultation by the Department with EPA. N.J.A.C. 7:27-22.3(uu).

Section C

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

STATE-ONLY APPLICABLE REQUIREMENTS

N.J.A.C. 7:27-22.16(b)5 requires the Department to specifically designate as not being federally enforceable any permit conditions based only on applicable State requirements. The applicable State requirements to which this provision applies are listed in the table titled "State-Only Applicable Requirements."

STATE-ONLY APPLICABLE REQUIREMENTS

The following applicable requirements are not federally enforceable:

SECTION	SUBJECT ITEM	ITEM #	REF. #
B	---	1	---
B	---	13b	---
D	FC	---	3
D	FC	---	9

Section D

Facility Name: COVANTA ESSEX CO
Program Interest Number: 07736
Permit Activity Number: BOP190001

FACILITY SPECIFIC REQUIREMENTS AND INVENTORIES

FACILITY SPECIFIC REQUIREMENTS PAGE INDEX

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/201

New Jersey Department of Environmental Protection
Reason for Application

Permit Being Modified

Permit Class: BOP **Number:** 90003

Description of Modifications: This application is being submitted to change the facility manager designation to David Blackmore and to request that the Mailing Address information on the front page of the Title V permit be revised to reflect the new Facility Manager and Responsible Official for Covanta Essex Company, David Blackmore.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **FC**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	General Provisions: The permittee shall comply with all applicable provisions of N.J.A.C. 7:27-1. [N.J.A.C. 7:27- 1]	None.	None.	None.
2	Control and Prohibition of Open Burning: The permittee is prohibited from open burning of rubbish, garbage, trade waste, buildings, structures, leaves, other plant life and salvage. Open burning of infested plant life or dangerous material may only be performed with a permit from the Department. [N.J.A.C. 7:27- 2]	None.	None.	Obtain an approved permit: Prior to occurrence of event (prior to open burning). [N.J.A.C. 7:27- 2]
3	Prohibition of Air Pollution: The permittee shall not emit into the outdoor atmosphere substances in quantities that result in air pollution as defined at N.J.A.C. 7:27-5.1. [N.J.A.C. 7:27- 5]	None.	None.	None.
4	Prevention and Control of Air Pollution Control Emergencies: Any person responsible for the operation of a source of air contamination set forth in Table 1 of N.J.A.C. 7:27-12 is required to prepare a written Standby Plan, consistent with good industrial practice and safe operating procedures, and be prepared for reducing the emission of air contaminants during periods of an air pollution alert, warning, or emergency. Any person who operates a source not set forth in Table 1 of N.J.A.C. 7:27-12 is not required to prepare such a plan unless requested by the Department in writing. [N.J.A.C. 7:27-12]	None.	None.	Comply with the requirement: Upon occurrence of event. Upon proclamation by the Governor of an air pollution alert, warning, or emergency, the permittee shall put the Standby Plan into effect. In addition, the permittee shall ensure that all of the applicable emission reduction objectives of N.J.A.C. 7:27-12.4, Table I, II, and III are complied with whenever there is an air pollution alert, warning, or emergency. [N.J.A.C. 7:27-12]
5	Emission Offset Rules: The permittee shall comply with all applicable provisions of Emission Offset Rules. [N.J.A.C. 7:27-18]	None.	None.	None.
6	Emission Statements: The Permittee shall comply with all the applicable provisions of N.J.A.C. 7:27-21. [N.J.A.C. 7:27-21]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	Compliance Certification: The permittee shall submit an annual Compliance Certification for each applicable requirement, pursuant to N.J.A.C. 7:27-22.19(f). [N.J.A.C. 7:27-22]	None.	None.	Submit an Annual Compliance Certification: Annually to the Department and to EPA within 60 days after the end of each calendar year during which this permit was in effect. The Compliance Certification shall be certified pursuant to N.J.A.C. 7:27-1.39 by the responsible official and submitted electronically through the NJDEP online web portal. The certification should be printed for submission to EPA. The NJDEP online web portal can be accessed at: http://www.state.nj.us/dep/online/. The Compliance Certification forms and instructions for submitting to EPA are available by selecting Documents and Forms and then Periodic Compliance Certification. [N.J.A.C. 7:27-22]
8	Prevention of Air Pollution from Consumer Products and Architectural Coatings: The permittee shall comply with all applicable provisions of N.J.A.C. 7:27-24 and [N.J.A.C. 7:27-23]	None.	None.	None.
9	Any operation of equipment which causes off-property effects, including odors, or which might reasonably result in citizen's complaints shall be reported to the Department to the extent required by the Air Pollution Control Act, N.J.S.A. 26:2C-19(e). [N.J.S.A. 26: 2C-19(e)]	Other: Observation of plant operations. [N.J.S.A. 26: 2C-19(e)].	Other: Maintain a copy of all information submitted to the Department. [N.J.S.A. 26: 2C-19(e)].	Notify by phone: Upon occurrence of event. A person who causes a release of air contaminants in a quantity or concentration which poses a potential threat to public health, welfare or the environment or which might reasonably result in citizen complaints shall immediately notify the Department. Such notification shall be made by calling the Environmental Action Hotline at (877) 927-6337. [N.J.S.A. 26: 2C-19(e)]
10	Prevention of Significant Deterioration: The permittee shall comply with all applicable provisions of Prevention of Significant Deterioration (PSD). [40 CFR 52.21]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
11	The permittee shall comply with all applicable provisions of National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Asbestos, Subpart M. [40 CFR 61]	Other: Comply with 40 CFR 61.145 and 61.150 when conducting any renovation or demolition activities at the facility. [40 CFR 61].	Other: Comply with 40 CFR 61.153 when conducting any renovation or demolition activities at the facility. [40 CFR 61].	Comply with the requirement: Upon occurrence of event. The permittee shall comply with 40 CFR 61.153 when conducting any renovation or demolition activities at the facility. [40 CFR 61]
12	Protection of Stratospheric Ozone:1) If the permittee manufactures, transforms, destroys, imports, or exports a Class I or Class II substance, the permittee is subject to all the requirements as specified at 40 CFR 82, Subpart A; 2) If the permittee performs a service on motor "fleet" vehicles when this service involves an ozone depleting substance refrigerant (or regulated substance) in the motor vehicle air conditioner (MVAC), the permittee is subject to all the applicable requirements as specified at 40 CFR 82, Subpart B. 3) The permittee shall comply with the standards for labeling of products containing or manufactured with ozone depleting substances pursuant to 40 CFR 82, Subpart E. 4). The permittee shall comply with the standards for recycling and emission reductions of Class I and Class II refrigerants or a regulated substitute substance during the service, maintenance, repair, and disposal of appliances pursuant to 40 CFR 82, Subpart F, except as provided for motor vehicle air conditioners (MVACs) in Subpart B. 5) The permittee shall be allowed to switch from any ozone depleting substance to any alternative that is listed in the Significant New Alternative Program (SNAP) promulgated pursuant to 40 CFR 82, Subpart G. [40 CFR 82]	Other: Comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82].	Other: Comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82].	Comply with the requirement: Upon occurrence of event. The permittee shall comply with 40 CFR 82 Subparts A, B, E, F, and G. [40 CFR 82]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	Deviation Reports: The permittee shall submit to the Department a certified six-month Deviation Report relating to testing and monitoring required by the operating permit. [N.J.A.C. 7:27-22.19(d)3], [N.J.A.C.7:27-22.19(e)], and [N.J.A.C. 7:27-22.19(c)]	None.	Other: The permittee shall maintain deviation reports for a period of five years from the date each report is submitted to the Department. [N.J.A.C.7:27-22.19(a)] and [N.J.A.C. 7:27-22.19(e)].	Submit a report: As per the approved schedule. The six-month deviation reports for the period from January 1 through June 30 shall be submitted by July 30 of the same calendar year, and for the period from July 1 through December 31, shall be submitted by January 30 of the following calendar year. The annual compliance certification required by N.J.A.C.7:27-22.19(f) may also be considered as your six-month Deviation Report for the period from July 1 – December 31, if submitted by January 30 of the following calendar year. The reports shall be certified pursuant to N.J.A.C. 7:27-1.39 by the responsible official and submitted electronically through the NJDEP online web portal. The NJDEP online web portal can be accessed at: http://www.state.nj.us/dep/online/ . The Compliance Certification forms are available by selecting Documents and Forms and then Periodic Compliance Certification. [N.J.A.C. 7:27-22]
14	Used Oil Combustion: No person shall combust used oil except as authorized pursuant to N.J.A.C. 7:27-20. [N.J.A.C. 7:27-20.2]	None.	None.	Comply with the requirement: Prior to occurrence of event (prior to burning used oil) either register with the Department pursuant to N.J.A.C. 7:27-20.3 or obtain a permit issued by the Department pursuant to N.J.A.C. 7:27-8 or 7:27-22, whichever is applicable. [N.J.A.C. 7:27-20.2(d)]
15	Prevention of Accidental Releases: Facilities producing, processing, handling or storing a chemical, listed in the tables of 40 CFR Part 68.130, and present in a process in a quantity greater than the listed Threshold Quantity, shall comply with all applicable provisions of 40 CFR 68. [40 CFR 68]	Other: Comply with 40 CFR 68. [40 CFR 68].	Other: Comply with 40 CFR 68. [40 CFR 68].	Other (provide description): Other. Comply with 40 CFR 68 as described in the Applicable Requirement. [40 CFR 68]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **IS1 No. 2 Fuel Oil Tanks (<10,000 Gallons Capacity)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Sulfur Content in Fuel <= 2,000 ppmw (0.2 % by weight) for Zone 4 (Essex County). Effective through June 30, 2014. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
2	Sulfur Content in Fuel <= 500 ppmw (0.05% by weight). Effective July 1, 2014 through June 30, 2016. [N.J.A.C. 7:27-9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
3	Sulfur Content in Fuel <= 15 ppmw (0.0015% by weight). Effective July 1, 2016. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Fuel stored in New Jersey that met the applicable maximum sulfur content standard of Tables 1A or 1B of N.J.A.C. 7:27-9.2 at the time it was stored in New Jersey may be used in New Jersey after the operative date of the applicable standard in Table 1B. [N.J.A.C. 7:27- 9.2(b)]	None.	None.	None.
5	The vapor pressure of the liquid, excluding the vapor pressure of water, shall be less than 0.02 psia at the liquid's actual temperature or at 70 degrees F, whichever is higher. [N.J.A.C. 7:27-22.1]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **IS2 Fuel Oil Tank (>10,000 Gallons Capacity)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Sulfur Content in Fuel <= 2,000 ppmw (0.2 % by weight) for Zone 4 (Essex County). Effective through June 30, 2014. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
2	Sulfur Content in Fuel <= 500 ppmw (0.05% by weight). Effective July 1, 2014 through June 30, 2016. [N.J.A.C. 7:27-9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
3	Sulfur Content in Fuel <= 15 ppmw (0.0015% by weight). Effective July 1, 2016. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Fuel stored in New Jersey that met the applicable maximum sulfur content standard of Tables 1A or 1B of N.J.A.C. 7:27-9.2 at the time it was stored in New Jersey may be used in New Jersey after the operative date of the applicable standard in Table 1B. [N.J.A.C. 7:27- 9.2(b)]	None.	None.	None.
5	The operating temperature shall not be greater than 350 degrees F. [N.J.A.C. 7:27-22.1]	None.	None.	None.
6	The vapor pressure of the liquid, excluding the vapor pressure of water, shall be less than 0.02 psia at the liquid's actual temperature or at 70 degrees F, whichever is higher. [N.J.A.C. 7:27-22.1]	None.	None.	None.
7	The tank or vessel shall have no visible emissions, exclusive of water vapor, to the outdoor atmosphere. [N.J.A.C. 7:27-22.1]	None.	None.	None.
8	The tank or vessel shall not emit any air contaminants which may cause an odor detectable outside the property boundaries of the facility. [N.J.A.C. 7:27-22.1]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	The tank or vessel shall not be subject to any NESHAPS, MACT, or NSPS air pollution control standards, excluding the NSPS requirements to maintain a record of the contents of the tank or vessel, the period of storage of these contents, and the maximum true vapor pressure of the liquid stored. [N.J.A.C. 7:27-22.1]	None.	None.	None.
10	The tank's or vessel's potential to emit each TXS and each HAP does not exceed the de minimus reporting thresholds as specified in N.J.A.C. 7:27-22, Appendix. [N.J.A.C. 7:27-22.1]	None.	None.	None.
11	The percentage by weight of all HAPs collectively in the raw material stored in the tank, or mixed or blended in the vessel, is less than 1.0 percent. [N.J.A.C. 7:27-22.1]	None.	None.	None.
12	The owner or operator shall have readily available upon Department request a statement certified in accordance with N.J.A.C. 7-27-1.39, signed by the responsible official, as defined at N.J.A.C. 7:27-1.4, that: (1) specifies the contents of the tank; (2) affirms that the tank or vessel meets the applicable requirement and (3) attests that the tank or vessel is in compliance with all other applicable State or federal air pollution requirements. [N.J.A.C. 7:27-22.1]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Subject Item: **GR1 Equipment Subject to Federal NSPS Requirements**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	For equipment subject to NSPS (E1, E2, E3, E16 and E17), all requests, reports, applications, submittals, and other communications to the Administrator pursuant to Part 60 shall be submitted in duplicate to the Regional Office of US Environmental Protection Agency. Submit information to: Region II, Director, Air and Waste Management Division, US Environmental Protection Agency, 21st Floor, 290 Broadway, New York, NY 10007. [40 CFR 60.4(a)]	None.	None.	Submit a report: As per the approved schedule to EPA Region II as required by 40 CFR 60. [40 CFR 60.4(a)]
2	For equipment E1, E2, E3, E16 and E17, copies of all information submitted to EPA pursuant to 40 CFR Part 60, must also be submitted to the appropriate Regional Enforcement Office of NJDEP. [40 CFR 60.4(b)]	None.	None.	Submit a report: As per the approved schedule to the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60. [40 CFR 60.4(b)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	The owner or operator subject to the provisions of 40 CFR Part 60 (equipment E1, E2, E3, E16 and E17) shall furnish the Administrator written notification or, if acceptable to both the Administrator and the owner or operator of a source, electronic notification, of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change is specifically exempted under an applicable subpart or in section 60.14(e). The notification shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of facility before and after the change and the expected completion date of the change. Notification shall be postmarked within 60 days or as soon as practicable before any change is commenced. The Administrator may request additional relevant information subsequent to this notice. [40 CFR 60.7(a)(4)]	None.	None.	Submit notification: Upon occurrence of event to EPA Region II and the appropriate Regional Enforcement Office of NJDEP as required by 40 CFR 60.7 [40 CFR 60.7(a)(4)]
4	For equipment E1, E2, E3, E16 and E17, the owner or operator shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility, any malfunction of air pollution control equipment or any periods during which continuous monitoring system or monitoring device is inoperative. [40 CFR 60.7(b)]	None.	Recordkeeping by data acquisition system (DAS) / electronic data storage upon occurrence of event , or manually in a permanently bound logbook. The records should be kept in a permanent form suitable for inspections. [40 CFR 60.7(b)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	For equipment E1, E2 and E3, each owner or operator required to install a continuous monitoring device shall submit an excess emissions and monitoring systems performance report (excess emissions are defined in applicable subparts) and/or a summary report form (see section 60.7(d)) to the Administrator semiannually, except when: more frequent reporting is specifically required by an applicable subpart; or the Administrator, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. All reports shall be postmarked by the 30th day following the end of each six-month period. [40 CFR 60.7(c)]	None.	Other: Written records of excess emissions shall include the following information: (1) The magnitude of excess emissions computed in accordance with section 60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period and excess emissions. The process operating time during the reporting period. (2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted. (3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments. (4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.[40 CFR 60.7(c)].	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): Semi-annually on January 31 and July 31 of each year. Additionally, the report shall be submitted to the EPA Region II Administrator and be in the format specified at 40 CFR 60.7(c) and 40 CFR 60.7(d). Written reports of excess emissions shall include all the information included in the written records listed under recordkeeping requirement of this applicable requirement. [40 CFR 60.7(c)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	For equipment subject to NSPS CMS requirements (E1, E2 and E3): Each owner or operator required to install a continuous monitoring device shall submit an excess emissions and monitoring systems performance report (excess emissions are defined in applicable subparts) and/or a summary report form (see section 60.7(d)) to the Administrator semiannually, except when: more frequent reporting is specifically required by an applicable subpart; or the Administrator, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. All reports shall be postmarked by the 30th day following the end of each six-month period. [40 CFR 60.7(c)]	None.	Other: Written records of excess emissions shall include the following information: (1) The magnitude of excess emissions computed in accordance with section 60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period and excess emissions. The process operating time during the reporting period. (2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted. (3) The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments. (4) When no excess emissions have occurred or the continuous monitoring system(s) have not been inoperative, repaired, or adjusted, such information shall be stated in the report.[40 CFR 60.7(c)].	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): Semi-annually beginning on the 30th day of the 6th month following initial performance tests. The report shall be postmarked by the 30th day following the end of each six-month period. The report shall be submitted to the EPA Region II Administrator and the Regional Enforcement Office of NJDEP and be in the format specified at 40 CFR Part 60.7(c) and 40 CFR Part 60.7(d). Written reports of excess emissions shall include all the information included in the written records listed under recordkeeping requirement of this applicable requirement. [40 CFR 60.7(c)]
7	For equipment E1, E2 and E3, the owner or operator shall conduct performance tests and data reduction in accordance with the test methods and procedures contained in each applicable subpart, unless otherwise specified and approved by the Administrator. [40 CFR 60.8(b)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	For equipment E1, E2 and E3, performance tests shall be conducted under conditions the Administrator specifies to the plant operator based on representative performance of the affected facility. Operations during periods of startup, shutdown and malfunction shall not constitute representative conditions for the purpose of the performance test nor shall emissions in excess of the level of the applicable emission limit be considered a violation of the applicable emission limit unless otherwise specified in the applicable standard. [40 CFR 60.8(c)]	None.	None.	None.
9	For equipment E1, E2 and E3, the owner or operator shall provide the Administrator at least 30 days prior notice of any performance test and shall provide adequate performance testing facilities as specified in 40 CFR Part 60.8(e). [40 CFR 60.8(d)]	None.	None.	None.
10	For equipment E1, E2 and E3, unless otherwise specified in the applicable subpart, each performance test shall consist of three separate runs using the applicable test method. [40 CFR 60.8(f)]	None.	None.	None.
11	For equipment E1, E2 and E3, compliance with NSPS standards specified in this permit, other than opacity, shall be determined only by performance tests established by 40 CFR 60.8, unless otherwise specified in NSPS. [40 CFR 60.11(a)]	None.	None.	None.
12	For equipment subject to the NSPS COM requirement (E1, E2, and E3), the owner or operator shall demonstrate compliance with NSPS opacity standards specified in 40 CFR Part 60. [40 CFR 60.11(b)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	For equipment required to conduct visual opacity tests (E16 and E17): The owner or operator shall demonstrate compliance with NSPS opacity standards specified in 40 CFR Part 60, unless otherwise specified and approved by the Administrator. [40 CFR 60.11(b)]	Monitored by visual determination annually, based on 6 minute blocks. Compliance with fugitive ash emission limits shall be based on a series of three one hour observations, performed annually, using EPA Reference Method 22. This is based on the requirement at 40 CFR 60.58b(k). [40 CFR 60.39b(d)]&. [40 CFR 60.11(b)]	Recordkeeping by data acquisition system (DAS) / electronic data storage annually , or manually in a permanently bound logbook. The owner or operator shall maintain records of opacity of emissions based on Method 9 observations. [40 CFR 60.13(h)]	Submit a report: Annually. The owner or operator shall submit results of Method 9 observation data to the Administrator. [40 CFR 60.11(e)(2)]
14	For equipment E1, E2, E3, E16 and E17, the NSPS opacity standard shall apply at all times except during periods of startup, shutdown, malfunctions and as otherwise specified in this permit. [40 CFR 60.11(c)]	None.	None.	None.
15	At all times, including periods of start-up, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility (equipment E1, E2, and E3), including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operation and maintenance procedures, and inspection of the source. [40 CFR 60.11(d)]	None.	None.	None.
16	No owner or operator subject to NSPS standards in Part 60, shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere. [40 CFR 60.12]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
17	Opacity: For equipment E1, E2, and E3, the owners and operators of a COMS installed in accordance with the provisions of 40 CFR 60, must automatically, intrinsic to the opacity monitor, check the zero and upscale (span) calibration drifts at least once daily. For a particular COMS, the acceptable range of zero and upscale calibration materials is as defined in the applicable version of PS-1 in appendix B of this part. For a COMS, the optical surfaces, exposed to the effluent gases, must be cleaned before performing the zero and upscale drift adjustments, except for systems using automatic zero adjustments. The optical surfaces must be cleaned when the cumulative automatic zero compensation exceeds 4 percent opacity. [40 CFR 60.13(d)(1)]	None.	Other: Maintain records in accordance with 40 CFR 60.7(f).[40 CFR 60.13(d)].	None.
18	Opacity: Unless otherwise approved by the Administrator, the following procedures must be followed for a COMS. Minimum procedures must include an automated method for producing a simulated zero opacity condition and an upscale opacity condition using a certified neutral density filter or other related technique to produce a known obstruction of the light beam. Such procedures must provide a system check of all active analyzer internal optics with power or curvature, all active electronic circuitry including the light source and photodetector assembly, and electronic or electro-mechanical systems and hardware and or software used during normal measurement operation. [40 CFR 60.13(d)(2)]	None.	Other: Maintain records in accordance with 40 CFR 60.7(f).[40 CFR 60.13(d)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Except for system breakdowns, repairs, calibration checks, and zero and span adjustments, all continuous opacity monitoring systems shall be in continuous operation for equipment E1, E2, and E3. They shall complete a minimum of one cycle of sampling and analyzing for each successive 10-second period and one cycle of data recording for each successive 6-minute period. [40 CFR 60.13(e)(1)]	Other: See Applicable Requirement. [40 CFR 60.13(e)(1)].	Other: See Applicable Requirement. [40 CFR 60.13(e)(1)].	None.
20	Except for system breakdowns, repairs, calibration checks, and zero and span adjustments, all continuous monitoring systems measuring emissions except opacity shall be in continuous operation for equipment E1, E2, and E3. They shall complete a minimum of one cycle of operation (sampling, analyzing and data recording) for each successive 15-minute period. [40 CFR 60.13(e)(2)]	Other: See Applicable Requirement. [40 CFR 60.13(e)(2)].	Other: See Applicable Requirement. [40 CFR 60.13(e)(2)].	None.
21	All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions or process parameters from the affected facility (equipment E1, E2, and E3) are obtained. Procedures for location of continuous monitoring systems contained in the applicable Performance Specifications of Appendix B of 40 CFR Part 60 shall be used. [40 CFR 60.13(f)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
22	For equipment E1, E2, and E3, the owner or operator shall reduce all continuous monitoring systems for measuring opacity data to 6-minute averages which shall be calculated from 36 or more data points equally spaced over each 6-minute period. Data recorded during periods of continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages computed under this paragraph. For owners and operators complying with the requirements in 40 CFR 60.7(f)(1) or (2), data averages must include any data recorded during periods of monitor breakdown or malfunction. An arithmetic or integrated average of all data may be used. The data may be recorded in reduced or nonreduced form (e.g., ppm pollutant and percent O2 or ng of pollutant per J of heat input). All excess emissions shall be converted into units of the standard using the applicable conversion procedures specified in subparts. After conversion into units of the standard, the data may be rounded to the same number of significant digits as used in the applicable subparts to specify the emission limit (e.g. rounded to the nearest 1 percent opacity). [40 CFR 60.13(h)]	None.	Other: See Applicable Requirement. [40 CFR 60.13(h)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
23	For equipment E1, E2, and E3, the owner or operator shall reduce all continuous monitoring systems (other than opacity) data to 1-hour averages which shall be computed from four or more data points equally spaced over each 1-hour period. Data recorded during periods of continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages computed under this paragraph. For owners and operators complying with the requirements in 40 CFR 60.7(f)(1) or (2), data averages must include any data recorded during periods of monitor breakdown or malfunction. An arithmetic or integrated average of all data may be used. The data may be recorded in reduced or nonreduced form (e.g., ppm pollutant and percent O2 or ng of pollutant per J of heat input). All excess emissions shall be converted into units of the standard using the applicable conversion procedures specified in subparts. After conversion into units of the standard, the data may be rounded to the same number of significant digits as used in the applicable subparts to specify the emission limit (e.g. rounded to the nearest 1 percent opacity). [40 CFR 60.13(h)]	None.	Other: See Applicable Requirement. [40 CFR 60.13(h)].	None.
24	Changes in time periods for submittal of information and postmark deadlines set forth in this subpart, may be made only upon approval by the Administrator and shall follow procedures outlined in 40 CFR Part 60.19. [40 CFR 60.19]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	STACK TESTING SUMMARY The permittee shall conduct stack tests using an approved protocol to demonstrate compliance with emission limits for pollutants named and at the frequency specified in the following applicable requirements. Testing must be conducted at worst-case permitted operating conditions with regard to meeting the applicable emission standards, but without creating an unsafe condition. The permittee may propose, in the stack test protocol, to use CEMS data to satisfy the stack testing requirements, for NOx, CO or SO2, with BTS approval. In order for BTS to approve using CEMS data at the time of the stack test, the CEMS must be certified and be in compliance with all daily, quarterly and annual quality assurance requirements. The CEMS shall monitor and record emissions in units identical to those required by the applicable stack testing conditions of this permit. CEMS data, if allowed by this permit, shall be taken at the same worst case conditions as described above. [N.J.A.C. 7:27-22.16(a)]	Other: Monitoring as required by this OS Summary or under the applicable operating scenario(s).[N.J.A.C. 7:27-22.16(o)].	Recordkeeping by stack test results upon occurrence of event. Recordkeeping as required by this OS Summary or under the applicable operating scenario(s). [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule , i.e., as required by the OS Summary or Operating Scenario conditions elsewhere in this permit. [N.J.A.C. 7:27-22.16(o)]
2	STACK TESTING REQUIREMENTS: For facilities demonstrating compliance with 40 CFR 62, Subpart FFF standards, the owner or operator shall conduct annual performance tests no less than 9 calendar months and no more than 15 calendar months following the previous performance test; and must complete 5 performance tests in each 5-year calendar period. From BOP090003. [40 CFR 62.14109(a)] & [40 CFR 60.58(b)]	Monitored by stack emission testing annually, based on each of three Department validated stack test runs. [40 CFR 60.58(b)(c)]	Recordkeeping by stack test results annually. [40 CFR 60.59(b)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule Stack test report must be submitted within 60 days afterperforming the test. [40 CFR 60.58(b)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	STACK TESTING REQUIREMENTS: Conduct annual stack tests on each municipal solid waste combustor to demonstrate compliance with the lead and cadmium emission limits. Stack testing is as required at 40 CFR 60.58b(d). [N.J.A.C. 7:27-22.16 (o)], [40 CFR 60.39b(d) & (f)] & [40 CFR 62.14109(b)]	Monitored by stack emission testing annually, based on the average of three tests (as a minimum.) Stack testing for lead and cadmium (using EPA Method 29) shall be as required at 40 CFR 60.58b(d)(1). [N.J.A.C. 22.16(o)], [40 CFR 60.39b(d) & (f)] &. [40 CFR 62.14109(b)]	Recordkeeping by stack test results upon occurrence of event. All records shall be maintained onsite in either paper copy or computer-readable format. This is as indicated in 40 CFR 60.59b(d)(9)(i) and 40 CFR 60.59b(d)(k). [N.J.A.C. 7:27-22.16(o)], [40 CFR 60.39b(d) & (f)] &. [40 CFR 62.14109(a)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than 15 months after the previous test. Stack test reports must be submitted to BTS within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, lbs/MM Btu, ppm (as needed). As indicated in 40 CFR 59b(g)(1), a list of the emission levels achieved during performance tests shall be included in the semi annual report submitted pursuant to 40 CFR 60.39b(d), 40 CFR 60.39b(f), and 40 CFR 14109(a). [N.J.A.C. 7:27-22.18(e)], [N.J.A.C. 7:27-22.18(h)], [40 CFR 60.39b(d) & (f)], &. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
4	STACK TESTING REQUIREMENTS: Conduct annual stack tests on each municipal solid waste combustor to determine compliance with HCl emission limits. [N.J.A.C. 7:27-22.16(e)], [40 CFR 60.39b(f)] & [40 CFR 62.14109(b)]	Monitored by stack emission testing annually, based on the average of three Department validated stack test runs to determine compliance with emission limits pursuant to N.J.A.C. 7:27-22.16(e), and the average of a mimimum of three tests to determine compliance with emission limits pursuant to 40 CFR 60.39b(f) and 40 CFR 62.14103(b)(2). Stack testing for HCl (using EPA Method 26 or 26A) shall satisfy the requirements at 40 CFR 60.58b(f). [N.J.A.C. 7:27-22.16(e)], 40 CFR 60.39b(f), &. [40 CFR 62.14109(b)]	Recordkeeping by stack test results upon occurrence of event. All records shall be maintained onsite in either paper copy or computer-readable format. This is as indicated in 40 CFR 60.59b(d)(9)(i) and 40 CFR 60.59b(d)(k). [N.J.A.C. 7:27-22.16(o)], [40 CFR 60.39b(f)] &. [40 CFR 62.14109(a)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than 15 months after the previous test. A full stack test report must be submitted to BTS and a certified summary test report, as described in the protocol, must be submitted to the Regional Enforcement Office within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, lbs/MM Btu, ppm (as needed). As indicated in 40 CFR 59b(g)(1), a list of the emission levels achieved during performance tests shall be included in the semi annual report submitted pursuant to 40 CFR 60.39b(f) and 40 CFR 14109(a). [N.J.A.C. 7:27-22.18(e)], [N.J.A.C. 7:27-22.18(h)], [40 CFR 60.39b(f)], &. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	STACK TESTING REQUIREMENTS: Conduct annual stack tests for dioxins/furans. Total polychlorinated dibenzodioxins emissions and total polychlorinated dibenzofurans (dioxins/furans) must be measured using EPA Reference Method 23. This is as indicated at 40 CFR 60.59b(g)(3). [N.J.A.C. 7:27-22.16(o)], [40 CFR 60.39b(d)]& [40 CFR 62.14109(b)]	Monitored by stack emission testing annually, based on the average of three tests. Minumum sample time shall be 4 hours per run, using EPA Test Method 23 specified at 40 CFR 60.58b(g)(3) & (5), except that: Where all performance tests over a 2-year period indicate that dioxin/furan emissions are <= 15 ng/dscm corrected to 7% O2 (total mass) for all units, the facility may elect to conduct annual performance tests in one unit per year. At a minimum, a performance test for dioxin/furan emissions shall be conducted annually (no more than 12 months following the previous performance test) on one unit. Each year a different unit shall be tested, and the units shall be tested in sequence (e.g., unit 1, unit 2, unit 3) as long as each test indicates an emission level less than or equal to 15 ng/dscm (total mass). If test indicates a dioxin/furan emission level greater than 15 ng/dscm corrected to 7% O2 (total mass), performance tests thereafter shall be conducted annually on all units until and unless all annual performance tests for all units over a 2-year period indicate a dioxin/furan emission level less than or equal to 15 ng/dscm corrected to 7% O2 (total mass). [N.J.A.C. 7:27-22.16(o)], [40 CFR 60.39b(d)], [40 CFR 62.14109(b)] &. [40 CFR 62.14109(d)(1)]	Recordkeeping by stack test results upon occurrence of event. All records shall be maintained onsite in either paper copy or computer-readable format. This is as specified at 40 CFR 60.59b(d)(9)(i) and 40 CFR 60.59b(k). [N.J.A.C. 22.16(o)], [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than 15 months after the previous test. A full stack test report must be submitted to BTS and a certified summary test report, as described in the protocol, must be submitted to the Regional Enforcement Office within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, lbs/MM Btu, ppm, ng/dscm (as needed). Emission rates of each congener which contains 4 or more chlorine atoms shall be reported. As indicated in 40 CFR 59b(g)(1), a list of the emission levels achieved during performance tests shall be included in the semi annual report submitted pursuant to 40 CFR 60.39b(d), 40 CFR 60.39b(f), and 40 CFR 14109(a). [N.J.A.C. 7:27-22.16(o)], [N.J.A.C. 7:27-22.18(e)], [N.J.A.C. 7:27-22.18(h)], [40 CFR 60.39b(d)], [40 CFR 60.39b(f)], &. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
6	STACK TESTING REQUIREMENTS: Conduct annual stack tests on each municipal solid waste combustor to demonstrate compliance with the particulate emission limits, by: i. Three test runs to determine TSP; ii. Three test runs for PM-10 and PM 2.5 (including back half condensibles). [N.J.A.C. 7:27-22.16(a)], [N.J.A.C. 7:27-22.16(e)], [40 CFR 60.39b(d)]& [40 CFR 62.14109(b)]	Monitored by stack emission testing annually, based on the average of three Department validated stack test runs conducted successively. Compliance with all TSP emission limits (except for the limit which stipuates boiler soot blowing) pursuant to N.J.A.C. 7:27-22.16(e) and 40 CFR 62.14103(a)(1) shall be determined by each of three EPA Method 5 test runs indicated in (i) of the applicable requirement, as required in the preconstruction permit and 40 CFR 60.58b(c). Compliance with the emission limit pusuant to N.J.A.C. 7:27-11 shall be determined from the worst-case run indicated in (ii) of the applicable requirement. Compliance with the PM-10 limits stipulated under N.J.A.C. 7:27-22.16(e) will be determined from the front and back-half of the PM-10 train by the average of the three EPA method 201A and 202 test runs indicated in (iii) of the applicable requirement. PM 2.5 shall be determined with the same methods. [N.J.A.C. 7:27-22.16(o)], [N.J.A.C. 7:27-22.16(e)], [40 CFR 60.39b(d)] and. [40 CFR 62.14109(b)]	Recordkeeping by stack test results upon occurrence of event. All records shall be maintained onsite in either paper copy or computer-readable format. This is as specified at 40 CFR 60.59b(d)(9)(i) and 40 CFR 60.59b(k). [N.J.A.C. 22.16(e)], [40 CFR 60.39b(d)] and. [40 CFR 62.14109(a)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than 15 months after the previous test. Stack test reports must be submitted to BTS within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a New Jersey licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, gr/dscf, ppm (as needed). As indicated in 40 CFR 60.59b(g)(1), a list of the emission levels achieved during performance tests shall be included in the semi annual report submitted pursuant to 40 CFR 60.39b(d), 40 CFR 60.39b(f), and 40 CFR 14109(a). [N.J.A.C. 7:27-22.16(o)], [N.J.A.C. 7:27-22.18(e)], [N.J.A.C. 7:27-22.18(h)], [40 CFR 60.39b(d)], [40 CFR 60.39b(f)], and. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
7	STACK TESTING REQUIREMENTS: The permittee shall conduct annual stack emission testing for mercury on each municipal solid waste combustor at the inlet and outlet simultaneously to satisfy the requirements under N.J.A.C. 7:27-22.16(e), N.J.A.C. 7:27-27.4 and 40 CFR 60.58b(d)(2). [N.J.A.C. 7:27-22.16(e)], [N.J.A.C. 7:27-27.4], [40 CFR 60.39b(d)], & [40 CFR 62.14109(b)]	Monitored by stack emission testing annually, based on the average of three Department validated stack test runs using EPA Reference Method 29. The tests for mercury shall consist of a minimum of three source emission tests to measure mercury in the gas stream at the inlet of the air pollution control apparatus serving each combustion unit, and simultaneously perform three source emission tests to measure mercury in the gas stream at the exit of the control apparatus. If source emission testing fails to demonstrate compliance with the applicable requirement, then the frequency of source testing shall increase to three source emission tests quarterly. In this case, there shall be at least a 45 calendar day interval between the testing performed for a given quarter and the testing performed for the preceding quarter, unless a shorter period is approved by the Department. If compliance with the applicable requirement is then achieved and maintained during two consecutive years, the permittee may again reduce the frequency of source emission testing from three source emission tests performed quarterly to three source emission tests performed annually, not necessarily in the first quarter of each calendar year (from modification BOP080002.) Testing shall also satisfy the requirements at 40 CFR 60. 58b(d)(2), which requires annual testing. [N.J.A.C. 7:27-27.4(c)], [40 CFR 60.39b(d)]&. [40 CFR 62.14109(b)]	Recordkeeping by stack test results upon occurrence of event. All records shall be maintained onsite in either paper copy or computer-readable format. This is as indicated in 40 CFR 60.59b(d)(9)(i) and 40 CFR 60.59b(d)(k). [N.J.A.C. 7:27-22.16(o)], [40 CFR 60.39b(d)], [40 CFR 60.39b(f)] &. [40 CFR 62.14109(a)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than 15 months after the previous test. A full stack test report must be submitted to BTS and a certified summary test report, as described in the protocol, must be submitted to the Regional Enforcement Office within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, ug/dscm, as needed. As indicated in 40 CFR 59b(g)(1), a list of the emission levels achieved during performance tests shall be included in the semi annual report submitted pursuant to 40 CFR 60.39b(d), 40 CFR 60.39b(f), and 40 CFR 14109(a). [N.J.A.C. 7:27-22.16(o)], [N.J.A.C. 7:27-22.18(e)], [N.J.A.C. 7:27-22.18(h)], [40 CFR 60.39b(d)], [40 CFR 60.39b(f)], &. [N.J.A.C. 7:27-27.4(f)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	STACK TESTING REQUIREMENTS: The permittee shall conduct stack tests on each municipal solid waste combustor using an approved protocol within one year prior to the expiration of the renewed operating permit to demonstrate compliance with the SO2, nitrogen oxides, SO3 + H2SO4 (as converted and expressed as H2SO4), Volatile Organic Compounds (VOC), Arsenic, Beryllium, Chromium, Nickel, Ammonia, and TCDD (2,3,7,8-) emission limits. In addition, tests for polycyclic aromatic hydrocarbons (or polycyclic organic matter), Benzo (A) Pyrene, carbon tetrachloride, formaldehyde, perchloroethylene (tetrachloroethylene), trichloroethylene and vinyl chloride emissions must be conducted. [From modification BOP080002.] [N.J.A.C. 7:27-22.16(a)]	Monitored by stack emission testing prior to permit renewal, based on the average of three Department validated stack test runs. Stack test shall be conducted for SO2, nitrogen oxides, SO3+H2SO4 (as converted and expressed as H2SO4), VOC, Ammonia, Arsenic, Beryllium, Chromium, Nickel, and TCDD (2,3,7,8-) emission limits. In addition, tests for polycyclic aromatic hydrocarbons (or polycyclic organic matter), Benzo (A) Pyrene, carbon tetrachloride, formaldehyde, perchloroethylene (tetrachloroethylene), trichloroethylene and vinyl chloride emissions must be conducted. This is based on the preconstruction permit. [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by stack test results upon occurrence of event based on the preconstruction permit. [N.J.A.C. 7:27-22.16(e)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule (before one year prior to renewal of this operating permit.) Stack testing shall be performed using approved protocols. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than five years after the previous test. A full stack test report must be submitted to BTS and a certified summary test report, as described in the protocol, must be submitted to the Regional Enforcement Office within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, lbs/MM Btu, ppm (as needed) [N.J.A.C. 7:27-22.18(e)] &. [N.J.A.C. 7:27-22.18(h)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	STACK TESTING REQUIREMENTS: The permittee shall conduct stack tests on each municipal solid waste combustor using an approved protocol within one year prior to the expiration of the renewed operating permit to demonstrate compliance with the 1-hour CO and HF emission limits. [From modification BOP080002.] [N.J.A.C. 7:27-22.16(a)]	Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs using EPA Method 10 for CO and EPA Method 13A for HF, or methods approved by the Department and EPA, based on the preconstruction permit. [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by stack test results upon occurrence of event based on the preconstruction permit. [N.J.A.C. 7:27-22.16(e)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule (before one year prior to renewal of this operating permit.) Stack testing shall be performed using approved protocols. For all tests, the permittee must contact BTS at 609-530-4041 to schedule a mutually acceptable test date which shall be no later than five years after the previous test. A full stack test report must be submitted to BTS and a certified summary test report, as described in the protocol, must be submitted to the Regional Enforcement Office within 60 days after performing the stack test pursuant to N.J.A.C. 7:27-22.19(d). The test results must be certified by a licensed professional engineer or certified industrial hygienist. Test results shall report lbs/hour, lbs/MM Btu, ppm (as needed) [N.J.A.C. 7:27-22.18(e)] &. [N.J.A.C. 7:27-22.18(h)]
10	These municipal waste incinerators are each subject to the 40 CFR 60 Subpart Cb Emission Guidelines and Compliance Times for Large Municipal Waste Combustors that were Constructed on or Before September 20, 1994. Compliance with all applicable portions of this regulation is required. [40 CFR 60.32(b)]	None.	None.	None.
11	The operating practices in this OP shall be at least as protective as those requirements listed in 40 CFR 60.53b(b) and (c) of subpart Eb [40 CFR 60.35b]	None.	None.	None.
12	The municipal waste combustor operator training and certification shal be at least as protective as those requirements listed in 40 CFR 60.54b of subpart Eb. The compliance with these requirements shall be according to the schedule specified in 40 CFR 60.39b(c)(4). [40 CFR 60.35b]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	Municipal waste combustor fugitive ash emissions shall be at least as protective as those requirements listed in 40 CFR 60.55b of subpart Eb. [40 CFR 60.36b]	None.	None.	None.
14	This OP shall include performance testing methods listed in 40 CFR 60.58b subpart Eb, as applicable, except as provided for under 40 CFR 60.24(b)(2) of subpart B and paragraphs 38b(b). Reporting and recordkeeping provisions listed in 40 CFR 60.59b of subpart Eb, as applicable, except for the siting requirements under 40 CFR 60.59b(a), (b)(5), and (d)(11) of subpart Eb. [40 CFR 60.38b(a)]	None.	None.	None.
15	This OP shall continue to require meeting the revised April 28, 2009 emission limits in 40 CFR 60.33b(a), (c), and (d) and the revised testing provisions in 40 CFR 60.38b(b) [Where all performance tests over a 2-year period indicate that dioxin/furan emissions are less than or equal to 15 nanograms per dry standard cubic meter (total mass) for all affected facilities located within a municipal waste combustor plant] [40 CFR 60.39b(g)]	None.	None.	None.
16	The facility is not subject to the nitrogen oxide standards in the NSPS for industrial boilers (40 CFR, Part 60, Subpart Db) since any facility covered by an EPA approved State or Federal section 111(d)/129 plan implementing Subpart Cb or subpart BBBB of this part is not covered by subpart Db. [40 CFR 60.40b(l)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
17	These municipal waste incinerators meeting the applicability requirements under section 40 CFR 60.32b are not subject to subpart E of 40 CFR 60 in accordance with the final rule (Subpart Cb) dated May 10, 2006 (at 71 FR 27333.) [40 CFR 60.32b(n)]	None.	None.	None.
18	The facility is not subject to the NESHAP for beryllium (40 CFR Part 61, Subpart C), and shall not accept any beryllium containing waste as defined in 40 CFR 61.31(g). [N.J.A.C. 7:27-22.16(e)]	Other: Waste contents. Per delivery. [N.J.A.C. 7:27-22.16(a)].	Other: Waste manifests. Per Delivery. [N.J.A.C. 7:27-22.16(o)].	None.
19	The three municipal solid waste units are subject to the emission guidelines codified at 40 CFR 62 Subpart FFF, Federal Plan Requirements for Large Municipal Waste Combustors Constructed on or Before September 20, 1994. Compliance with all applicable portions of these Subparts is required. [40 CFR 62.14100]	None.	None.	None.
20	Particulate Emissions <= 42.3 lb/hr. Maximum emission rate for each MWC from the table at N.J.A.C. 7:27-4.2(a), based on the Maximum Gross Heat input. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-4.2(a)]	None.	None.	None.
21	SO2 <= 2,000 ppmv at standard conditions. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-7.2(b)1]	None.	None.	None.
22	SO2 <= 1,100 lb/hr for each MWC (in any 60-minute period), based on the calculation procedure at N.J.A.C. 7:27-7.2(r). Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27- 7.2(b)2]	None.	None.	None.
23	SO2 <= 2,200 lb/hr for each MWC at any instant, based on the calculation procedure at N.J.A.C. 7:27-7.2(r). Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27- 7.2(b)2]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
24	SO3 and H2SO4, as converted and expressed as H2SO4 <= 10 mg/ft^3 at standard conditions. Emission limit applies for each MWC at all times, including startup and shutdown. [N.J.A.C. 7:27- 7.2(g)1]	None.	None.	None.
25	SO3 and H2SO4, as converted and expressed as H2SO4 <= 260 lb/hr in any 60-minute period, based on the calculation procedure at N.J.A.C. 7:27-7.2(r). Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27- 7.2(g)2]	None.	None.	None.
26	SO3 and H2SO4, as converted and expressed as H2SO4 <= 520 lb/hr at any instant, based on the calculation procedure at N.J.A.C. 7:27-7.2(r). Emission limit applies at all times for each MWC, including startup and shutdown. [N.J.A.C. 7:27- 7.2(g)2]	None.	None.	None.
27	SO2 <= 1.2 lb/MMBTU gross heat input determined as a 30-day rolling average. No person shall expand or reconstruct an existing solid fuel-fired steam generating unit or construct a new solid fuel-fired steam generating unit having a rated hourly capacity that exceeds, or would exceed, as a result of expansion, construction, and/or reconstruction, 250,000,000 British Thermal Units (BTU) gross heat input unless the sulfur dioxide emissions, if the unit is a resource recovery facility, do not exceed the above limit. This limit applies to eligible resource recovery units. Emission limit applies for each MWC at all times, including startup and shutdown. [N.J.A.C. 7:27-10.3(a)3]	SO2: Monitored by continuous emission monitoring system continuously, based on a 1 hour block average. Stack test shall demonstrate that standard is assured by continuous emission monitoring of SO2 in ppmvd. [From Renewal BOP0800001.] Compliance with the standard shall be determined in accordance with the provisions of 40 CFR Part 60 Subpart Da, noted below: For affected facilities for which construction, modification, or reconstruction commenced before May 4, 2011, compliance with applicable 30-boiler operating day rolling average SO2 emissions limits is determined by calculating the arithmetic average of all hourly emission rates for SO2 for the 30 successive boiler operating days, except for data obtained during startup, shutdown, or malfunction. [40 CFR 60.48Da(d)] &. [N.J.A.C. 7:27-10.3(b)]	SO2: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously for daily compliance and by stack test records upon occurrence of event. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
28	Particulate Emissions <= 0.1 gr/dscf @ 12% CO2 (including ash, excluding the contribution of auxiliary fuel). Emission limit applies for each MWC at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(a)4]	Particulate Emissions: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]
29	Opacity <= 1 Ringlemann Smoke Chart. Emission limit applies for each MWC at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(b)2ii]	Opacity: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-11.3]	Opacity: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-11.3]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-11.3]
30	The provisions of 7:27-11.3(b)(2) shall not apply to: 1. Smoke emitted during the building of a new fire, the shade or appearance of which is not greater than Number 2 of the Ringelmann smoke chart for a period of three consecutive minutes; or ii. Emissions of such opacity within a stack or chimney to a degree greater than the emission designated as Number 2 of the Ringelmann smoke chart for a period not greater than three consecutive minutes. [N.J.A.C. 7:27-11.3(b)3]	None.	None.	None.
31	No person shall cause, suffer, allow or permit the emission of particles of unburned waste or ash from any common incinerator or from any special incinerator which are individually large enough to be visible while suspended in the atmosphere. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(c)]	None.	None.	None.
32	Odor: No person shall construct, install, use or cause to be used any common incinerator or any special incinerator which will result in odors being detectable by sense of smell in any area of human use or occupancy. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(d)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
33	Any person responsible for the use of an incinerator shall when ordered by the Department, provide the facilities and necessary equipment for determining the density of smoke being discharged from a stack or chimney and shall conduct such smoke tests using methods approved by the Department. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(e)1]	None.	Other: All smoke test data shall be recorded in a permanent log at such time intervals as specified by the Department. Data shall be maintained for a period of not less than one year and shall be available for review by the Department.[N.J.A.C. 7:27-11.3(e)1].	None.
34	Any person responsible for the use of an existing incinerator shall upon request of the Department provide such sampling facilities and testing facilities exclusive of instruments and sensing devices as may be necessary for the Department to determine the nature and quantity of emissions from such incinerators and shall during such testing operate the incinerator at a charging rate of waste no less than the designed capacity of the incinerator using materials representative of the types of wastes normally burned. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-11.3(e)]	None.	None.	None.
35	No person shall use or cause to be used any incinerator unless all components connected, or attached to, or serving the incinerator, including control apparatus are functioning properly and are in use, in accordance with the permit to construct, and the certificate to operate. Emission limit applies at all times, including startup and shutdown. [N.J.A.C. 7:27-11.5(c)]	None.	None.	None.
36	VOC (Total) <= 82.8 tons/yr based on Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
37	NOx (Total) <= 1,248 tons/yr based on Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
38	CO <= 1,656 tons/yr based on Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
39	SO2 <= 996 tons/yr based on Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
40	TSP <= 129 tons/yr based on Preconstruction Permits (Total for three MWCs). Upon completion of the baghouse project, TSP shall be less than or equal to 53 TPY (from modification BOP090003), based on concentration limit of 12 mg/dscm @ 7% O2. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
41	PM-10 (Total) <= 299 tons/yr based on modification BOP090001 (Total for three MWCs). Upon completion of the baghouse project, PM-10 shall be less than or equal to 203 TPY (from modification BOP090003). [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
42	PM-2.5 (Total) <= 203 tons/yr from renewal/modification BOP090003, total for three MWCs upon completion of the baghouse project. PM-2.5 is assumed by the facility to be equal to PM-10. PM-2.5 limit prior to completion shall be equal to PM-10 limit above. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
43	No person shall cause, suffer, allow, or permit the emission of particles of unburned waste or ash which are individually large enough to be visible while suspended in the atmosphere. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
44	HAPs (Total) <= 306 tons/yr from Preconstruction Permits (Total for three MWCs). Upon completion of the baghouse project, modification BOP090003, Total HAPs shall be <= 299 TPY. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
45	Arsenic compounds <= 0.067 tons/yr from Preconstruction Permits (Total for three MWCs). Upon completion of the baghouse project, modification BOP090003, Arsenic emissions shall be <= 0.044 TPY. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
46	Beryllium compounds <= 0.003 tons/yr from Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
47	Cadmium compounds <= 0.565 tons/yr from Preconstruction Permits (Total for three MWCs). Upon completion of the baghouse project, modification BOP090003, Cadmium emissions shall be <= 0.044 TPY based on concentration limit of 10 ug/dscm @ 7% O2. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
48	Chromium compounds <= 0.143 tons/yr (Total for three MWCs) from modification BOP090003. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
49	HCl Emissions <= 284 tons/yr from Preconstruction Permit (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
50	Hydrogen fluoride <= 10.8 tons/yr from Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
51	Lead compounds <= 6.57 tons/yr from Preconstruction Permits (Total for three MWCs). Upon completion of the baghouse project, modification BOP090003, Lead emissions shall be <= 0.44 TPY based on concentration limit of 100 ug/dscm @ 7% O2. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
52	Mercury compounds <= 0.14 tons per calendar year (Total for three MWCs), or the facility shall have demonstrated during the calendar year that a minimum of 95% removal (revised by OP modification BOP090003) of mercury compounds had been achieved for each quarterly average of all stack tests conducted for each combustor required in this Subject Item U1, OS Summary. This limit is based on the concentration limit specified in N.J.A.C. 7:27-27.4(a). Upon completion of the baghouse project, modification BOP090003, mercury emissions shall be <= 0.12 TPY based on concentration limit of 28 ug/dscm @ 7% O2. [N.J.A.C. 7:27-22.16(a)]	Mercury compounds: Monitored by calculations at the approved frequency using the following formula (using EPA F-Factor 14,389 dscf @ 7% O2): Hg (tons per year) = X times 1 m3/35.3 ft3 x 14389 dscf/MMBTU x 423 10E6 Btu/hr/unit x 8760 hrs/yr x (1 gram/10E6 ug) x (1 lb/454 grams) x 1 ton/2000 lb x 3 (for 3 MWCs), where X equals the average of all stack test results for the calendar year expressed in ug/dscm. [N.J.A.C. 7:27-22.16(o)]	Mercury compounds: Recordkeeping by manual logging of parameter annually or quarterly (as appropriate.) Record calculations each quarter and/or annually, showing the running total for each calendar year. [N.J.A.C. 7:27-22.16(o)]	None.
53	Nickel compounds <= 0.043 tons/yr (Total for three MWCs.) Upon completion of the baghouse project, modification BOP090003, nickel emissions shall be <= 0.039 TPY from modification BOP090003. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
54	Polycyclic organic matter <= 3.81 tons/yr from Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
55	Dioxins/Furans (Total) <= 0.00013 tons/yr upon completion of the baghouse project, modification BOP090003, for three MWCs based on lower federal concentration limit of 30 ng/dscm @ 7% O2 for a baghouse. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
56	TCDD Emissions (2,3,7,8-) <= 0.000131 tons/yr from Preconstruction Permits (Total for three MWCs.) Upon completion of the baghouse project, modification BOP090003, TCDD emissions shall be <= 0.000119 TPY. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
57	Ammonia <= 133 tons/yr based on Preconstruction Permits (Total for three MWCs). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
58	Maximum Gross Heat Input <= 423 MMBTU/hr (HHV) (each combustor) while firing municipal solid waste (MSW) and <= 109 MMBTU/hr while firing No. 2 fuel oil. [N.J.A.C. 7:27-22.16(a)]	Maximum Gross Heat Input: Monitored by calculations once initially. Calculations contained in letter dated October 30, 2001. [N.J.A.C. 7:27-22.16(e)]	Other: Retain calculations in permanent file.[N.J.A.C. 7:27-22.16(o)].	None.
59	The permitted maximum steam production rate for each boiler is 247,500 pounds per hour at 650 psia and 752 degrees F (nominal). [N.J.A.C. 7:27-22.16(e)]	Monitored by integrated steam flow monitor continuously , based on a 4 hour block average. [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	None.
60	The emission limits specified in PSD permit and included herein at Subject Item U1, OS Summary, Refs #36-40, 45-54 & 56-57 and at OS1 & 10, Refs #2-6, 8-17 & #20-32 shall remain not applicable during the start-up period. Clarification by modification BOP090003. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
61	Start-up Period: commences when the affected incinerator begins the combustion of municipal waste, including continuous, semicontinuous, or batch feeding of municipal solid waste to the furnace. The start-up period does not include any warm-up period when the affected unit is combusting only auxiliary fuel (fuel oil) and no municipal solid waste is being combusted. The duration of exemption from emission limits during the start-up period shall not exceed three hours. [N.J.A.C. 7:27-22.16(e)]	Start-up Period: Monitored by waste feed/charge rate monitoring (solid) continuously. [N.J.A.C. 7:27-22.16(o)]	Start-up Period: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(o)]	None.
62	To obtain start-up allowances, the facility must: a. Maintain the equipment; b. Operate the equipment properly; c. Take steps to minimize emissions during start-up periods. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
63	Start-up Period: Any visible emissions caused by start-up shall not exceed an average of 10% opacity in any 6 minute block period. [N.J.A.C. 7:27-22.16(e)]	Start-up Period: Monitored by continuous opacity monitoring system continuously, based on 6 minute blocks , using USEPA referenced Method 9, or an equivalent method approved by USEPA and the Department. [N.J.A.C. 7:27-22.16(e)]	Start-up Period: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
64	The owner or operator shall develop a QA/QC plan for all CEMS/COMS required by this permit prepared in accordance with the NJDEP Technical Manual 1005 posted on the AQPP webpage at http://www.state.nj.us/dep/aqpp. [N.J.A.C. 7:27-22.16(a)]	Other: The QA/QC coordinator shall be responsible for reviewing the QA/QC plan on an annual basis. [N.J.A.C. 7:27-22.16(o)].	Other: Maintain readily accessible records of the QA/QC plan including QA date and quarterly reports. [N.J.A.C. 7:27-22.16(o)].	None.
65	Shutdown Period: commences when the feeding of municipal solid waste to the hopper is terminated as a result of a scheduled shutdown or malfunction. The shutdown period ends when municipal solid waste is no longer combusting on the grate. The duration of exemption from emission limits during the shutdown period shall not exceed three hours. Malfunction resulting in shutdown of a unit shall be considered a shutdown, unless operation of the affected unit is resumed before the shutdown is complete. Resuming the operation of a unit before shutdown is completed, if the shutdown is the result of malfunction, shall be considered a malfunction. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
66	To obtain shutdown allowances, the facility must: a. Maintain the equipment; b. Operate the equipment properly; c. Take steps to minimize emissions during shutdown periods. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
67	Shutdown Period: Any visible emissions caused by shutdown shall not exceed an average of 10% opacity in any 6 minute block period. [N.J.A.C. 7:27-22.16(e)]	Shutdown Period: Monitored by continuous opacity monitoring system continuously, based on 6 minute blocks , using USEPA Referenced Method 9, or an equivalent method approved by USEPA and the Department. [N.J.A.C. 7:27-22.16(e)]	Shutdown Period: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit a report: As per the approved schedule. [N.J.A.C. 7:27-22.16(e)]
68	Temperature in the Exit Gas Stream: Upon start-up of a unit, no solid waste may be introduced into the furnace unless the temperature 0.3 seconds downstream of secondary air injection is 938 degrees F as recorded by the permanent thermocouples located at the 116' 4" elevation. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Monitored by temperature instrument upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Recordkeeping by strip chart or data acquisition (DAS) system continuously or by manual logging upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	None.
69	Temperature in the Exit Gas Stream: Within one hour after waste has been introduced into any furnace, the temperature one second downstream of secondary air injection must be no less than 1,136 degrees F as recorded by the permanent thermocouples located at 116' 4" elevation. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Monitored by temperature instrument continuously. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Recordkeeping by strip chart or data acquisition (DAS) system continuously or by manual logging.upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	None.
70	Temperature in the Exit Gas Stream >= 1,212 degrees F. The temperature one second downstream of secondary air injection at which each furnace must operate at least 90% of the time when waste is being burned, must be no less than 1,212 degrees F as recorded by the permanent thermocouples located at the 116' 4" elevation. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Monitored by temperature instrument continuously. Operator shall ensure compliance with operation time at or above minimum temperature limit >= 90% at least quarterly. [BOP090003.]. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Recordkeeping by strip chart or data acquisition (DAS) system continuously or by manual logging.upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
71	Temperature in the Exit Gas Stream: The auxilliary burner shall be placed into position and operated if the temperature one second downstream of secondary air injection in any furnace drops below 1,212 degrees F on a 4-hour block average basis as recorded by the permanent thermocouples located at the 116' 4" elevation during the combustion of waste. [N.J.A.C. 7:27-22.16(a)]	Temperature in the Exit Gas Stream: Monitored by temperature instrument continuously. [N.J.A.C. 7:27-22.16(e)]	Temperature in the Exit Gas Stream: Recordkeeping by strip chart or data acquisition (DAS) system continuously or by manual logging.upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	None.
72	Oxygen: The average concentration of oxygen in the flue gas at each furnace's exit shall not be less than 3% by volume measured on a dry basis (3.5% by volume measured on a wet basis). [N.J.A.C. 7:27-22.16(e)]	Oxygen: Monitored by continuous emission monitor continuously based on any 5 minute averaging period. [N.J.A.C. 7:27-22.16(e)]	Oxygen: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	None.
73	If the five (5) minute average oxygen concentration in the flue gas at any furnace's exit drops below 3.0% by volume on a dry basis (3.5% on a wet basis), waste charging to the affected furnace shall cease within thirty (30) minutes from the determination of the low oxygen level. [N.J.A.C. 7:27-22.16(a)]	Monitored by waste feed/charge rate monitoring (solid) continuously. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	None.
74	The Permittee shall monitor incoming waste trucks to determine whether they contain large quantities of easily discernible yard wastes, such as grass clippings, leaves, tree trimmings, bushes and shrubs and prevent bulk quantity of these wastes from being charged to the incinerators. {PSD permit, Attachment 1, Section J.) [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
75	Each unit shall be equipped with continuous monitors and continuous recorders which shall be operated to accurately maintain the following operating records: a. temperature at the top of radiation section (elevation 116' 4") b. scrubber slurry flow rate; c. secondary voltage, secondary current and spark rate for each field of each electrostatic precipitator; and d. steam prodution rate/flow, steam pressure and steam temperature of each boiler. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
76	Operating Log: Log books shall be kept for each unit to accurately maintain records. [N.J.A.C. 7:27-22.16(e)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system daily. For each unit, maintain the following records: a. the specific times of operation of each furnace; b. the specific times of operation of the auxiliary burners; c. incidents of low oxygen concentration (below 3%) as specified in this permit; d. incidents of malfunctions (failures) of electrostatic precipitator, scrubber or SNCR system; e. failure to maintain at least 1136 degress F at the 116' 4" elevation, and f. exceedances of emission standards determined by continuous monitoring. [N.J.A.C. 7:27-22.16(a)]	None.
77	MERCURY CONTROL SYSTEM: The permittee shall install and operate mercury emissions control apparatus (activated carbon injection system) designed to reduce at a minimum 80 percent of the emissions of mercury from each MSW incinerator. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
78	Mercury Emissions<=28 ug/dscm, based on an annual average and with each test run corrected to seven percent oxygen, as tested in accordance with a test protocol approved pursuant to N.J.A.C. 7:27-27.8 (a) and (b), or: The reduction efficiency for control of mercury emissions of the air pollution control apparatus of any MSW incinerator shall be at least 95 percent on and after January 3, 2012 based on the annual average of all valid tests performed for each four consecutive quarters (from N.J.A.C. 7:27-27.4(a)(2)(iii)) . [From modification BOP090003.] The company must meet 28 ug/m3 or 95% control and also never exceed 464 lbs per year. [N.J.A.C. 7:27-27.4(a)]	Other: See stack testing requirements in U1 OS0.[N.J.A.C. 7:27-27.4(c)].	Other: See stack testing requirements in U1 OS0.[N.J.A.C. 7:27-22.16(o)].	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-27.8(a)]
79	The owner or operator of a MSW incinerator served by a control apparatus shall perform compliance testing every quarter to measure mercury in the gas stream at the inlet of the air pollution control apparatus serving each incinerator and simultaneously perform compliance testing every quarter to measure mercury in the gas stream at the exit of the control device. There shall be at least a 45 calendar day interval between the testing performed for a given quarter and the testing performed for the preceding quarter unless otherwise approved by the Department. [N.J.A.C. 7:27-27.4(b)]	Other: See stack testing requirements in U1 OS0.[N.J.A.C. 7:27-27.4(d)].	Other: See stack testing requirements in U1 OS0.[N.J.A.C. 7:27-27.4(d)].	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-27.4(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
80	Any person who achieves and maintains compliance with the preceding mercury testing requirements during two consecutive years may reduce the frequency of mercury testing from each quarter to compliance testing performed only once per year, not necessarily in the first quarter of each year. Testing shall be not less than 9 months nor more than 15 months after previous test test and at "worst case" conditions (See Ref #1.) Also facility shall conduct no less than 5 tests during 5-year permit term. [From modification BOP080002.] However if subsequent testing fails to demonstrate compliance with the mercury testing requirements, then the frequency of mercury testing shall revert back to the quarterly requirement. [N.J.A.C. 7:27-22.16(a), (e)] & [N.J.A.C. 7:27-27.4(c)]	Monitored by stack emission testing annually not less than 9 months nor more than 15 months after previous test. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-27.4(c)]	Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-27.9(c)]	Submit a stack test report: Within 60 days of stack testing or by February 28 of the following calendar year to the Northern regional enforcement office and to the Chief, Bureau of Technical Services. Report of stack emission testing, including all test runs, shall be reviewed prior to submission and certified by a licensed professional engineer or an industrial hygienist certified by the American Board of Industrial Hygiene. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-27.9(c) &. [N.J.A.C. 7:27-27.9(d)]
81	Mercury Emissions: The owner or operator of any MSW incinerator that has a reagent based mercury emision control system shall operate each MSW incinerator at, or above, the optimized reagent feed rate established in the optimization tests and approved by the Department. [N.J.A.C. 7:27-27.8(d)]	None.	None.	None.
82	Any owner or operator of a MSW incinerator that submits to the Department a report of compliance testing, including all test runs for a MSW incinerator shall have such report reviewed prior to submission and certified by a registered professional engineer or an industrial hygenist certified by the American Board of Industrial Hygiene. [N.J.A.C. 7:27-27.9(d)]	None.	None.	None.
83	Any owner or operator of a MSW incinerator who submits to the Department a report of compliance testing, including all test runs, shall certify that report. [N.J.A.C. 7:27-27.9(f)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
84	The owner or operator shall make any record made pursuant to N.J.A.C. 7:27-27.9 (e), i.e. the required mercury stack test records, available to the Department, or its authorized representatives, for inspection for a period of five years after the date the record is made. [N.J.A.C. 7:27-27.9(g)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. The owner or operator shall make any record made available to the Department, or its authorized representatives, for inspection for a period of five years after the date the record is made. [N.J.A.C. 7:27-22.16(o)]	None.
85	The carbon injection system shall be operated and maintained in accordance with the facilitiy's Air Pollution Control Maintenance Plan and the manufacturer's recommendations. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
86	The Permittee shall, in accordance with N.J.A.C. 7:27-27.8(d), conduct optimization tests on any single unit to determine the optimized activated carbon feed rate for mercury emission control. The resultant optimum feed rate from the optimization test shall be applied to all three of the carbon injection units. The Permittee shall set the optimum carbon feed rate at a level, above which, there will be no appreciable reduction in mercury emissions relative to the amount of activated carbon added. The Permittee shall operate each carbon injection unit at, or above, the optimized carbon feed rate approved by the Department. The carbon injection mercury control system shall be operated at all times while solid waste is being combusted in the incinerator. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
87	The rate of carbon injection, from the operating permit application, through CD1010, 1011 & 1012 shall be greater than or equal to 34 lb/hr in accordance with the approval letter dated March 8, 2001. [N.J.A.C. 7:27-22.16(e)]	Other: Carbon feed auger shall be continuously monitored. In addition, Hopper Fill Cycle Rate shall be 2.0 hours or less and shall also be continuously monitored.[N.J.A.C. 7:27-22.16(e)].	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. All alarms indicating problems with auger operation and/or speed, or with Hopper Fill Cycle Rate shall be recorded. [N.J.A.C. 7:27-22.16(e)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
88	The actual total quantity of carbon used at the facility must equal or exceed the minimum required quarterly carbon usage (Qmin = R, carbon pounds per hour, multiplied by the total hours of waste feed to all three units during a calendar quarter.) [N.J.A.C. 7:27-22.16(e)]	Monitored by material balance quarterly: once per quarter; quarters shall begin on January 1, April 1, July 1, and October 1 of each year. Material balance shall be based on bulk deliveries of carbon and storage silo inventories. As an alternative, hopper fills, which are recorded during each shift, may be used to determine quarterly carbon usage. [From modification BOP080002.]. [N.J.A.C. 7:27-22.16(a)]	Recordkeeping by data acquisition system (DAS) / electronic data storage each month during operation , or manually in a permanently bound logbook to include the total hours of waste feed to each unit, the total combined hours, total minimum combined quantity of carbon required, and total combined amount of carbon actually used per quarter. Hopper fills also may be recorded. [N.J.A.C. 7:27-22.16(o)]	Submit a report: On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
89	The carbon feed auger speed for each consecutive three hour period (12 to 3, 3 to 6, etc) must be maintained at or above the speed that has been determined, by actual measurement during calibration, to deliver the minimum required carbon feed rate. If the auger or M-drive malfunctions where carbon is not being recorded by the DCS, hopper fills may be used to demonstrate compliance with continuous carbon feed. [From modification BOP080002.] [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
90	The operation below the minimum allowable carbon feed rate as indicated by the auger speed is a permit violation unless within three hours the condition that causes the excursion is corrected, the proper rate is restored, or the waste charging to the hopper of the affected furnace must cease until carbon feed is again at the minimum allowable rate. As an alternate, hopper fills may be used to demonstrate that the minimum allowable carbon feed is being maintained. [From modification BOP080002.] The total time of all such excursions for each unit in a calendar quarter must not exceed 2% of the total operating time for the quarter. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
91	The carbon feed auger speed, versus actual carbon delivery rate, shall be calibrated at least once per quarter by actual measurements (collecting and weighing the carbon delivered by the feeder) for each unit. a. The maximum time between calibrations shall not be more than 120 days. b. The date and time of each calibration and the results of the actual carbon delivery rates must be recorded and must be made available upon request by the Department personnel. c. Temporary diversions of carbon during calibrations of carbon feed auger speeds, or calibrations of the carbon feed hoppers, for up to one (1) hour in any calendar day, do not apply to the preceding condition in accordance with the approval letter dated November 18, 1998. [N.J.A.C. 7:27-22.16(e)]	Other: Conduct weigh-out test on carbon injection auger for one combustor every 120 days.[N.J.A.C. 7:27-22.16(e)].	Other: Retain records of carbon weigh-out procedure. Upon occurence of event. [N.J.A.C. 7:27-22.16(e)].	None.
92	During operation, the carbon injection system operating parameter(s) that are the primary indicator(s) of the carbon mass feed rate (e.g., screw feeder setting) must equal or exceed the level established during performance tests for mercury emissions. This is as required by 40 CFR 60.58b(m)(2). [40 CFR 60.39b(d)] & [40 CFR 62.14109(b)]	Other: Monitored by carbon feed rate, as required at 40 CFR 60.58b(m)(2). [40 CFR 60.39b(d)]&[40 CFR 62.14109(b)].	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously The facility shall record the average carbon mass feed rate (in kg/hr or lb/hr) estimated for each hour of operation. This is as required at 40 CFR 60.59b(d)(4)(iii). Also, as required at 40 CFR 60.59b(d)(15), the facility shall record the dates where the carbon feed rate is less than the levels established by the performance tests for mercury and dioxins/furans. [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]	None.
93	ACID GAS SCRUBBER: Each scrubber shall be operated and maintained in accordance with the facility's Air Pollution Control Maintenance Plan and the manufacturer's recommendations. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
94	Lime slurry shall be used as scrubbing chemical additive. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
95	SO2 <= 94 ppmvd corrected to 7% O2 concentration in the flue gas , average SO2 concentration in the stack gas or SO2 reduced to <= 30% of the concentration (ppmvd @ 7% O2) at the inlet of the scrubber. The limit of 94 ppmvd shall not apply for 1-hour block periods during which the average concentration of SO2 (ppmvd @ 7% O2) in the stack gas is less than 30% of the average concentration of SO2 (ppmvd @ 7% O2) at the inlet to the acid gas control equipment. [N.J.A.C. 7:27-22.16(e)]	SO2: Monitored by continuous emission monitoring system continuously, based on a 1 hour block average , beginning and ending on the hour. Monitor shall assure that acid gas absorber system is operating correctly. [N.J.A.C. 7:27-22.16(a)]	SO2: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
96	Hydrogen chloride <= 47 ppmvd @ 7% O2 , average HCl concentration in the stack gas or reduced to <= 10% of the HCl concentration (ppmvd @ 7% O2) at the inlet of the scrubber. The limit of 47 ppmvd shall not apply for 1-hour block periods during which the average concentration of HCl (ppmvd @ 7% O2) in the stack gas is less than 10% of the average concentration of HCl (ppmvd @ 7% O2) at the inlet to the acid gas control equipment. [N.J.A.C. 7:27-22.16(a)]	Hydrogen chloride: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]	Hydrogen chloride: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
97	ELECTROSTATIC PRECIPITATOR: The electrostatic precipitator shall be operated and maintained in accordance with the facility's Air Pollution Control Maintenance Plan and the manufacturer's recommendations. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
98	The permittee shall continue to conduct performance improvement and maintenance activities on the electrostatic precipitators (ESPs) of each of the three Boiler/Incinerator Units during each calendar year and submit a report detailing actions taken and their results. This annual report shall include the information regarding the Electrostatic Precipitator Performance Activities detailed below. AIRFLOW PATTERNS 1) Inspect and verify the uniform and consistent gas flow through the ESP. 2) Inspect grids and plates to insure optimal functionality and that they are clean. 3) Inspect grids and plates to insure no gaps were apparent that would allow gas flow to pass around the plates. 4) Inspect and clean ducts leading to ESP to insure that material is not built up that could restrict airflow. 5) Study gas flow into the ESP to minimize re-entrainment of particulate and to maximize adherence to the collector plates. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Keep records of all maintenance activities and include in the annual report. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
99	(Continued from previous requirement) MECHANICAL and ELECTRICAL SYSTEMS 1) Inspect bolts (repair or replace) that secure the electrodes. 2) Inspect bolts (repair or replace) that secure the collector plates. 3) Inspect (repair or replace) worn rapper boots. 4) Inspect (repair or replace) worn rapper insulators. 5) Inspect (repair or replace) worn transformer-rectifier bushings. 6) Review rapping and voltage regulation (controls collector plate rapper sequencing and field voltage). 7) Review Automatic Voltage Controller for improvements during unsteady conditions when arcing co-occurs. 8) Study various different voltages and rapping sequences on ESP performance to find optimal combination to maximize ESPs removal efficiency. SEALS 1) Inspect seals at all connection points along gas flow path and all access doors to the ESP. 2) Repair, replace or adjust the seals that prevent infiltration of moisture and atmospheric air. PERIODIC MAINTENANCE Provide information on the periodic maintenance that is performed on the ESP to insure that their performance does not deteriorate. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
100	The permittee shall continuously monitor and record the secondary voltage, secondary current and spark rate for each field of each ESP. [N.J.A.C. 7:27-22.16(e)]	None.	Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
101	The temperature at the particulate control device inlet shall not exceed the maximum demonstrated particulate matter control device temperature as defined in 40 CFR 60.51b by more than 17 degrees Celsius (or 31 degrees Fahrenheit), except: (1) During the annual dioxin/furan performance test the 2 weeks preceding the annual dioxin/furan performance test, no particulate matter control device temperature limitations are applicable; (2) The particulate matter control device temperature limits may be waived in accordance with permission granted by the Administrator or delegated State regulatory authority for the purpose of evaluation system performance, testing new technology or control technologies, diagnostic testing, or related activities for the purpose of improving facility performance or advancing the state-of the-art for controlling facility emissions. This is based on the requirement at 40 CFR 60.53b(c). [40 CFR 60.39b(d)] & [40 CFR 62.14104(b)]	Monitored by temperature instrument continuously, based on a 1 hour block average which shall be used to calculate 4-hour block arthithmetic avarages, based on the requirement at 40 CFR 60.58b(i)(7). [40 CFR 60.39b(d)] &. [40 CFR 62.14109(b)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. All 4-hour block arithmetic temperature averages shall be computed and recorded and be available for submittal to the Administrator or review onsite by an inspector. This is as stated at 40 CFR 60.59b(d)(2)(ii). [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]	None.
102	BAGHOUSE SYSTEM Temperature of the flue gas at the inlet of the particulate control device, shall not exceed 30 degrees F above the maximum four-hour block average temperature during the most recent dioxin/furan compliance stack emission tests. [40 CFR 60.51a] & [40 CFR 60.56a(c)]	Monitored by temperature instrument continuously, based on a 4 hour rolling average based on a 1 hour block average. [40 CFR 60.58a(h)(7)]	Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	None.
103	Particulates Control Efficiency >= 99 %. Minimum control efficiency for each baghouse (CD1023, CD1024 and CD1025) from the operating permit modification application. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
104	The permittee shall conduct bag cleaning, maintenance and replacement in each baghouse on a schedule necessary to achieve the required particulate removal efficiency as specified by the manufacturer. [N.J.A.C. 7:27-22.16(a)]	Monitored by visual determination annually during the annual boiler outage and at other times necessary to achieve the required particulate matter removal efficiency based on baghouse differential pressure and COMS data to determine the condition of each bag. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Maintain all baghouse maintenance and replacement records. [N.J.A.C. 7:27-22.16(o)]	None.
105	Baghouse construction schedule The proposed baghouses will be installed in accordance with a phased construction schedule as indicated in the modification application BOP090003, as follows: construction of the first baghouse to commence in 2014, and all three (3) baghouses shall be installed and operational by December 31, 2016. [N.J.A.C. 7:27-22.16(a)]	None.	Other: Maintain documentation of construction.[N.J.A.C. 7:27-22.16(o)].	None.
106	Upon completion of the baghouse project, BOP090003, each unit shall be equipped with continuous monitors and continuous recorders which shall be operated to accurately maintain the following operating records: a. Scrubber slurry flow rate; b. Steam production rate/flow, steam pressure and steam temperature of each boiler; and c. Temperature at the baghouse inlet. [Modification BOP090003] [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
107	THERMAL DeNOx SYSTEM: The SNCR shall be operated and maintained in accordance with the facility's Air Pollution Control Maintenance Plan and the manufacturer's recommendations. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
108	See GR1 for applicable requirements from NSPS Subpart A, General Provisions. [40 CFR 60]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
109	The facility is not subject to the nitrogen oxide standards in the NSPS for industrial boilers (40 CFR 60, Subpart Db) as revised June 13, 2007, restated below: (k) Any affected facility that meets the applicability requirements and is subject to an EPA approved State or Federal section 111(d)/129 plan implementing subpart Cb or subpart BBBB of this part is not covered by this subpart. [40 CFR 60.40b(k)]	None.	None.	None.
110	The standards under 40 CFR 62, Subpart FFF apply at all times except during periods of startup, shutdown, or malfunction. Duration of startup, shutdown, or malfunction periods are limited to 3 hours per occurrence. The startup period commences when the affected facility begins the continuous burning of municipal solid waste and does not include any warmup period when the affected facility is combusting fossil fuel or other nonmunicipal solid waste fuel, and no municipal solid waste is being fed to the combustor. Continuous burning is the continuous, semicontinuous, or batch feeding of municipal solid waste for purposes of waste disposal, energy production, or providing heat to the combustion system in preparation for waste disposal or energy production. The use of municipal solid waste solely to provide thermal protection of the grate or hearth during the startup period when municipal solid waste is not being fed to the grate is not considered to be continuous burning. This is based on the requirement at 40 CFR 60.58b(a)(1). 40 CFR 60.39b(d) & [40 CFR 62.14109(b)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
111	Opacity <= 10 % (6-minute average), emission limit for opacity exhibited by the gases discharged to the atmosphere from a designated facility except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b) and 40 CFR 60.58b(a)(1). [40 CFR 60.33b(a)(1)(iii)] &. [40 CFR 62.14103(a)(1)]	Opacity: Monitored by continuous opacity monitoring system continuously, based on 6 minute blocks. The continuous opacity monitoring system shall conform to Perormance Specification 1 in 40 CFR 60, appendix B. This is as required at 40 CFR 60.58b(c)(8). See stack testing requirements in U1 OS0. 40 CFR 60.58b(c)(11). [40 CFR 62.14109(b)]	Opacity: Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. All 6-minute opacity levels shall be available for submittal or review onsite by an inspector, as required at 40 CFR 60.59b(d)(i)(A). . See stack testing requirements in U1 OS0. Recordkeeping for stack testing is as required at 40 CFR 60.59b(d)(9). [40 CFR 62.14109(a)]	None.
112	Particulate Emissions <= 25 mg/dscm @ 7% O2 from each MWC on and after April 28, 2009, except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). [40 CFR 60.33b(a)(1)(i)] &. [40 CFR 62.14103(a)(1)]	Particulate Emissions: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring is based on the requirements at 40 CFR 60.58b(c)(9). [40 CFR 62.14109(b)]	Particulate Emissions: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. Recordkeeping is based on the requirements at 40 CFR 60.59b(d)(9). [40 CFR 62.14109(a)]	None.
113	Nitrogen oxides (NOx) <= 205 ppmvd @ 7% O2 , 24-hour daily arithmetic average (midnight to midnight) from each MWC except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). 40 CFR 60.33b(d) &. [40 CFR 62.14103(d)]	Nitrogen oxides (NOx): Monitored by continuous emission monitoring system continuously, based on a 1 hour block average. Monitor as specified at 40 CFR 60.58b(h)(5). EPA Reference Method 19, section 4.1, shall be used for determining the 24-hour daily arithmetic average nitrogen oxides emission concentration. [40 CFR 62.14109(b)]	Nitrogen oxides (NOx): Recordkeeping by strip chart or data acquisition (DAS) system continuously. All 1-hour average nitrogen oxide concentrations shall be recorded and be available for submittal or review onsite by an inspector. This is as specified at 40 CFR 60.59b(d)(2)(i)(C). [40 CFR 62.15109(a)]	None.
114	CO <= 100 ppmvd @ 7% O2 from each MWC except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b), 40 CFR 60.34b(a) and 40 CFR 60.58b(a)(1). [40 CFR 62.14104(a)]	CO: Monitored by continuous emission monitoring system continuously, based on a 1 hour block average which shall be used to calcuate a 4-hour block average. The continuous emission monitoring system shall be operated according to Performance Specification 4A in 40 CFR 60, appendix B. Monitoring is as specified at 40 CFR 60.58b(i)(1), 40 CFR 60.58b(i)(3), and 40 CFR 60.58b(i)(4). [40 CFR 62.14109(b)]	CO: Recordkeeping by strip chart or data acquisition (DAS) system continuously. All 1-hour average CO concentrations shall be recorded and available for submittal to the administrator or review onsite by an inspector. This is as stated at 40 CFR 60.59b(d)(2)(i)(D). [40 CFR 62.14109(a)(1)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
115	Lead Emissions <= 0.4 mg/dscm @ 7% O2 from each MWC on and after April 28, 2009, except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). 40 CFR 60.33b(a)(4) &. [40 CFR 62.14103(a)(2)]	Lead Emissions: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring is based on the Method 29 requirements at 40 CFR 60.58b(d)(1). [40 CFR 62.14109(b)]	Lead Emissions: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. Recordkeeping is based on the requirements at 40 CFR 60.59b(d)(9). [40 CFR 62.14109(a)]	None.
116	Cadmium Emissions <= 0.035 mg/dscm @ 7% O2 from each MWC on and after April 28, 2009 except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). [40 CFR 60.33b(a)(2)(i) &. [40 CFR 62.14103(a)(2)]	Cadmium Emissions: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring requirements are based on the requirements at 40 CFR 60.58b(d)(1). [40 CFR 62.14109(b)]	Cadmium Emissions: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. Recordkeeping is based on the requirements at 40 CFR 60.59b(d)(9). [40 CFR 62.14109(a)]	None.
117	Mercury Emissions <= 0.05 mg/dscm @ 7% O2 or 15 percent of the potential mercury emission concentration (85-percent reduction by weight), corrected to 7% oxygen, whichever is less stringent, from each MWC on and after April 28, 2009 except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). [40 CFR 60.33b(a)(3)] &. [40 CFR 62.14103(a)(3)]	Mercury Emissions: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring is based on the requirements of 40 CFR 60.58b(d)(2). [40 CFR 62.14109(b)]	Mercury Emissions: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0.. Recordkeeping is based on the requirements at 40 CFR 60.59b(d)(9)(i). [40 CFR 62.14109(a)]	None.
118	SO2 <= 29 ppmvd @ 7% O2 , or 25% of the potential sulfur dioxide emission concentration (75 percent reduction by weight or volume) whichever is less stringent, from each MWC except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). Compliance with this emission limit is based on a 24-hour daily geometric mean. [40 CFR 60.33b(b)(3)(i)] &. [40 CFR 62.14103(b)(1)]	SO2: Monitored by continuous emission monitoring system continuously, based on a daily average (a 24-hour daily geometric average), or a daily geometric average percent reduction using EPA Reference Method 19. This is based on the requirement at 40 CFR 60.58b(e)(4). [40 CFR 62.14109(b)]	SO2: Recordkeeping by strip chart or data acquisition (DAS) system continuously. The owner or operator shall maintain records of all 1-hour average sulfur dioxide emission concentrations. This is as specified at 40 CFR 60.59b(d)(2)(i)(B). [40 CFR 61.14109(a)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
119	HCl Emissions <= 29 ppmvd @ 7% O2 or 5% of the potential hydrogen chloride emission concentration (95 percent reduction by weight or volume) whichever is less stringent, from each MWC except during periods of startup, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b). [40 CFR 60.33b(b)(3)(i)] &. [40 CFR 62.14103(b)(2)]	HCl Emissions: Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring, including detemining % reduction, is based on the requirements at 40 CFR 60.58b(f). [40 CFR 62.14109(b)]	HCl Emissions: Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. Recordkeeping is based on the requirements at 40 CFR 60.59b(d)(9). [40 CFR 62.14109(a)]	None.
120	Dioxins/Furans (Total) <= 35 ng/dscm @ 7% O2. On and after April 28, 2009, the emission limit for designated facilities that employ an electrostatic precipitator-based emission control system is 35 nanograms per dry standard cubic meter (total mass), corrected to 7 percent oxygen. [40 CFR 60.33b(c)(1)(ii)]	Dioxins/Furans (Total): Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring is as required at 40 CFR 60.58b(h)(5), except as specified at 40 CFR 62.14109(d)(1). [40 CFR 62.14109(b)] &. [40 CFR 62.14109(d)(1)]	Dioxins/Furans (Total): Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. This is as specified at 40 CFR 60.59b(d)(9)(i). [40 CFR 62.14109(a)]	None.
121	Dioxins/Furans (Total) <= 30 ng/dscm @ 7% O2 , except during periods of start-up, shutdown, and malfunction. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b) and 40 CFR 60.58b(a)(1). This limitation applies after completion of the baghouse project, modification BOP090003. 40 CFR 60.39b(d), 40 CFR 60.53a(b) &. [40 CFR 62.14103(c)(2)]	Dioxins/Furans (Total): Monitored by stack emission testing annually, based on the average of three 1-hour tests. See stack testing requirements in U1 OS0. Monitoring is as required at 40 CFR 60.58b(h)(5), except as specified at 40 CFR 62.14109(d)(1). [40 CFR 62.14109(b)] &. [40 CFR 62.14109(d)(1)]	Dioxins/Furans (Total): Recordkeeping by stack test results annually. See stack testing requirements in U1 OS0. This is as specified at 40 CFR 60.59b(d)(9)(i). [40 CFR 62.14109(a)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
122	No owner or operator of an affected facility shall cause it to operate at a load level greater than 110 percent of the maximum demonstrated municipal waste combustor unit load as defined in 40 CFR 60.51b, except: (1) During he annual dioxin/furan performance test and the 2 weeks preceding that test, no municipal waste combustor unit load limit is applicable; (2)The municipal waste combustor unit load limit may be waived in accordance with permission granted by the Administrator or delegated State regulatory authority for the purpose of evaluating system performance, testing new technology or control technologies, diagnostic testing, or related activities for the purpose of improving facility performance or advancing the state-of-the art for controlling facility emissions. This is as stated at 40 CFR 60.53b(b). [40 CFR 60.39b(d)]& [40 CFR 62.14104(b)]	Other: The owner or operator shall operate a steam or feedwater flow meter on a continuous basis, as required at 40 CFR 60.58(i)(6)(i). Steam (or feed water flow) flow calculations as required under 40 CFR 60.58(i)(6)(i) shall be in accordance with ASME PTC 4.1-1964 (Reaffirmed 1991), Power test codes : Test Code for Steam Generating Units (with 1968 and 1969 Addenda). For design, construction, installation, calibration, and use of nozzles and orifices required in 40 CFR 60.58(i)(6)(ii), proceed in accordance with the recommendations in ASME Interim Supplement 19.5 on Instruments and Apparatus: Application, Part II of Fluid Meters, 6th Edition (1971). Measurement devices such as flow nozzles and orifices are not required to be recalibrated after they are installed, as stipulated at 40 CFR 58b(i)(6)(iii). Also, as stipulated at 40 CFR 58b(i)(6)(iv), all signal conversion elements associated with steam (or feedwater flow) measurements must be calibrated according to the manufacturer's instructions before each dioxin/furan performance test, and at least once per year. [40 CFR 60.39b(d)] &[40 CFR 62.14104(b)].	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously based on the requirment at 40 CFR 60.58(i)(6)(i). [40 CFR 60.39b(d)] &. [40 CFR 62.14104(b)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
123	Each chief facility operator and shift supervisor must obtain and maintain a current provisional operator certification from either the American Society of Mechanical Engineers (QRO-1-1994) or a State certification program. [40 CFR 60.35b, 40 CFR 60.39b(d), 40 CFR 60.54b] & [40 CFR 62.14105(a)]	None.	Other: The facility shall maintain the following records for a period of five years: Records showing the names of the municipal waste combustor chief facility operator, shift supervisors and control room operators who have been fully certified or who are provisionally certified by the American Society of Mechanical Engineers (ASME) or an equivalent State approved certification program, including the dates of initial and renewal certifications and documentation of current certification. Records showing the names of the municipal waste combustor chief facility operator, shift supervisors and control room operators who have completed the EPA municipal waste combustor operator training course or a State approved equivalent course including documentation of training completion. This is based on the recordkeeping requirements at 40 CFR 60.59b(d)(12) [40 CFR 62.14105(a)].	None.
124	Each chief facility operator and shift supervisor must complete full certification or must have scheduled a full certification exam with either the American Society of Mechanical Engineers (QRO-1-1994) or a State certification program. 40 CFR 60.39b(d)& [40 CFR 62.14105(b)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
125	The facility must not be operated unless one of the following persons is on duty: - a fully certified chief facility operator; - a provisionally certified chief facility operator who is scheduled to take the full certification exam no later than 12 months after the effective date of 40 CFR 62 Subpart FFF; - a fully certified shift supervisor; or - a provisionally certified shift supervisor who is scheduled to take the full certification exam no later than 12 months after the effective date of 40 CFR 62 Subpart FFF. If one of the persons listed above must leave the facility during their operating shift, a provisionally certified control room operator who is onsite may fulfill this requirement. [40 CFR 60.39b(d), 40 CFR 60.54b(i)] & [40 CFR 62.14105(c)]	None.	None.	None.
126	As further clarification to the preceding "Stand-in" Provisions, a provisionally certified control room operator can stand-in for a certified plant or shift supervisor when they are off site for periods of up to eight hours without notification of EPA, for periods up to two weeks if EPA is notified in writing, and case by case with enforcement discretion for periods longer than two weeks if EPA is notified in writing with adequate detail of the reasons for the situation and if the MWC owner demonstrates to EPA that a good faith effort is being made to correct the problem. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
127	Each chief facility operator, shift supervisor and control room operator at an affected facility must complete the EPA municipal waste combustor operator training course or the State municipal waste operator training course, except for chief facility operators, shift supervisors, and control room operators who have obtained full certification from the ASME on or before the effective date of 40 CFR 62 Subpart FFF. [40 CFR 60.39b(d), 40 CFR 60.54b] &. [40 CFR 62.14105(d)]	None.	None.	None.
128	OPERATING MANUAL: The facility must develop and update on a yearly basis a manual that must, at a minimum, address the following elements of municipal waste combustor unit operation: - A summary of the applicable standards of 40 CFR 62 Subpart FFF; - A description of basic combustion theory applicable to a MWC unit; - Procedures for receiving, handling and feeding MSW; - Procedures for MWC unit startup, shutdown and malfunction; - Procedures for maintaining proper combustion air supply levels; - Procedures for operating the MWC unit within the standards established under 40 CFR 62 Subpart FFF; - Procedures for responding to periodic upset or off-specification conditions; - Procedures for minimizing particulate matter carryover; - Procedures for handling ash; - Procedures for monitoring MWC unit emissions; - Reporting and Recordkeeping procedures. [40 CFR 60.39b(d), 40 CFR 60.54b(e)] & [40 CFR 62.14105(e)]	None.	Other: The operating manual and records of training must be available for inspection by USEPA or the Department upon request. [40 CFR 60.39b(d)] &[40 CFR 62.14105(g)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
129	TRAINING FOR OPERATING MANUAL REVIEW: - The facility must establish a training program to review the operating manual according to the schedule specified below with each person who has responsibilities affecting the operation of the facility, including but not limited to, chief facility operators, shift supervisors, control room operators, ash handlers, maintenance personnel and crane/load handlers. Each person undergoing the manual review training shall do so no later than the dates specified below, whichever is later: - The date prior to the day the person assumes responsibilities affecting MWC unit operation; or - The date 12 months after the effective date of 40 CFR 62 Subpart FFF; or - Annually following the initial review. ACCESS TO OPERATING MANUAL: The operating manual must be kept in a location readily accessible to each person required to undergo training. [40 CFR 60.39b(d), 40 CFR 60.54b(f) & (g)] & [40 CFR 62.14105(f)]	None.	Other: The facility shall maintain records showing the names of persons who have completed a review of the operating manual including the date of initial review and subsequent annual reviews. This is based on the recordkeeping requirement at 40 CFR 50.59b(d)(13). [40 CFR 60.39b(d)] &[40 CFR 62.14105(a)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
130	SEMI-ANNUAL REPORT: The facility shall submit a semi-annual report which shall include the following: - Information recorded which indicates the average sulfur dioxide, nitrogen oxides, carbon monoxide, municipal waste combustor unit load level, particulate matter control device inlet temperature or opacity data were above the applicable limits with reasons for such exceedances and a description of the corrective action taken. - A copy of the annual test report documenting the emissions level and the corrective action taken if the test report indicates any particulate matter, opacity, cadmium, lead, mercury, dioxins/furans, hydrogen chloride or fugitive ash emission levels that were above applicable pollutant limits. - Identification of the calendar dates when the average hourly carbon feed rate was below the required feed rate with reasons for such occurrences and a description of corrective action taken. - Identification of the calendar dates when the average hourly carbon feed rate is not operational, with reasons for such occurrences and a description of corrective action taken. This is as stated at 40 CFR 60.59b(h). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: All semi-annual reports must be maintained on site as a paper copy for a minimum of 5 years. This is as stated at 40 CFR 60.59b(j). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	Submit a report: As per the approved schedule that follows to EPA Region II and the appropriate Regional Enforcement Office of NJDEP. The report for the first half of the calendar year must be submitted by August 1 of the same year. The report for the second half of the calendar year must be submitted by February 1 of the following year. This is as stated at 40 CFR 50.59(h). [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
131	SEMI-ANNUAL REPORT (continued): Upon issuance of the operating permit, the semi-annual report shall include the following: - A list of the particulate matter, opacity, cadmium, lead, mercury, dioxins/furans, hydrogen chloride and fugitive ash emission levels achieved during performance tests - A list of the highest emission level recorded for sulfur dioxide, nitrogen dioxides, carbon monoxide, municipal waste combustor load level and particulate matter control device inlet temperature. - A list of the highest opacity level measured - The total number of days that the minimum number of hours of data for sulfur dioxide, nitrogen oxides, carbon monoxide, municipal waste combustor unit load level and particulate matter control device inlet temperature were not obtained for the calculation of the average emissions concentrations or parameters. - The total number of hours that data for sulfur dioxide, nitrogen oxides, carbon monoxide, municipal waste combustor unit load and particulate matter control device inlet temperature were excluded from the calculation of average emissions concentrations or parameters. This is based on the requirements of 40 CFR 59b(g)(1). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: All semi-annual reports must be maintained on site as a paper copy for a minimum of 5 years. This is as stated at 40 CFR 60.59b(j). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	Submit a report: As per the approved schedule that follows to EPA Region II and the appropriate Regional Enforcement Office of NJDEP. The report for the first half of the calendar year must be submitted by August 1 of the same year. The report for the second half of the calendar year must be submitted by February 1 of the following year. This is based on the requirments at 40 CFR 60.59b(g). [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
132	SEMI-ANNUAL REPORT (continued): -The facility shall also provide a summary report with the same data specified in the semi-annual reports for the preceding year in order to provide the Administrator with a summary of the performance of the facility over a 2 year period. This summary report shall highlight any emission or parameter level that did not achieve the required emission or parameter limits. - The facility will also include a notification of intent to begin reduced dioxin/furan performance testing schedule as allowed in 40 CFR 60.58(g)(5)(iii), i.e. NSPS Subpart Eb. These are based on the requirements of 40 CFR 60.59b(g). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: All semi-annual reports must be maintained on site as a paper copy for a minimum of 5 years. This is as stated at 40 CFR 60.59b(j). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	Submit a report: As per the approved schedule that follows to EPA Region II and the appropriate Regional Enforcement Office of NJDEP. The report for the first half of the calendar year must be submitted by August 1 of the same year. The report for the second half of the calendar year must be submitted by February 1 of the following year. This is based on the requrements at 40 CFR 60.59b(g). [40 CFR 60.39b(d)] &. [40 CFR 62.14109(a)]
133	REPORTING/RECORDKEEPING: The facility shall maintain the following records for a period of at least five years: Identification of the calendar dates when any of the average emission concentrations, percent reductions, operating parameters or opacity levels are above applicable limits, with reasons for such exceedances and a description of corrective action taken. This is as stated at 40 CFR 60.59b(d)(3). [40 CFR 60.39b(d)]& [40 CFR 62.14109(a)]	None.	Other: Maintain records on paper copy or a computer readable format for a period of at least 5 years from the date of record. This is as stated at 40 CFR 60.59b(d) and 40 CFR 60.59b(k). [40 CFR 60.39b(d)] &[40 CFR 62.14109].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
134	REPORTING/RECORDKEEPING: The facility shall maintain the following records for a period of at least five years: Identification of the calendar dates for which the minimum number of hours of the data specified below have not been obtained and the reasons for not obtaining sufficient data and a description of the corrective action taken: - Sulfur Dioxide emissions data - Nitrogen Oxides emissions data - Carbon Monoxide emissions data - Municipal waste combustor unit load data - Particulate matter control device temperature data This is as stated at 40 CFR 60.59b(d)(6). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: Maintain records on paper copy or a computer readable format for a period of at least 5 years from the date of record. This is as stated at 40 CFR 60.59b(d) and 40 CFR 60.59b(k). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	None.
135	REPORTING/RECORDKEEPING: The facility shall maintain the following records for a period of at least five years: Identification of each occurrence that sulfur dioxide emissions data, nitrogen oxides emissions data or operational data (i.e. carbon monoxide emissions, unit load and particulate matter control device temperature) have been excluded from the calculation of average emission concentration or parameters, and the reasons for excluding the data. This is as stated at 40 CFR 60.59b(d)(7). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: Maintain records on paper copy or a computer readable format for a period of at least 5 years from the date of record. This is as stated at 40 CFR 60.59b(d) and 40 CFR 60.59b(k). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	None.
136	REPORTING/RECORDKEEPING: The facility shall maintain the following records for a period of at least five years: The results of daily drift test and quarterly accuracy determinations for sulfur dioxide, nitrogen oxides and carbon monoxide continuous emission monitoring systems as required under 40 CFR Part 60 Appendix F, Procedure 1. This is based on the requirements at 40 CFR 60.59b(d)(8). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: Maintain records on paper copy or a computer readable format for a period of at least 5 years from the date of record. This is as stated at 40 CFR 60.59b(d) and 40 CFR 60.59b(k). [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
137	REPORTING/RECORDKEEPING OF ANNUAL PERFORMANCE TESTS: The facility shall maintain the following records for a period of at least five years: The test reports documenting the results of all annual performance tests shall be recorded along with supporting calculations specifically as follows: - The results of all annual performance tests conducted to determine compliance with particulate matter, opacity, cadmium, lead, dioxin/furans, hydrogen chloride and fugitive ash emission limits. - The maximum demonstrated municipal waste combustor unit load and maximum demonstrated particulate matter control device temperature during dioxin/furan performance tests. This condition is based on the requirements at 40 CFR 60.59b(d)(9). [40 CFR 60.39b(d)] & [40 CFR 62.14109(a)]	None.	Other: Maintain records for a period of at least 5 years from the date of record. [40 CFR 60.39b(d)] &[40 CFR 62.14109(a)].	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)**

Operating Scenario: **OS1 Operation of MWC #1 at Maximum Input (423 MMBtu/hr)., OS3 Operation of MWC #2 at Maximum Input (423 MMBtu/hr) , OS5 Operation of MWC #3 at Maximum Input (423 MMBtu/hr)**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Unless otherwise specified, the emission limits specified under this operating scenario shall apply at all times, except for start-up and shutdown periods. These shall remain in force until the ESP has been replaced by a new control (Baghouse filter.) See operating scenario applicable to baghouse operation. [From modification BOP090003.] [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
2	Maximum emission rate of Non-Methane Hydrocarbons as Methane, VOC (Total) <= 6.3 lb/hr. [N.J.A.C. 7:27-22.16(e)]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
3	Maximum concentration of Non-Methane Hydrocarbons as Methane, VOC (Total) <= 66 ppmvd @ 7% O2. [N.J.A.C. 7:27-22.16(e)]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
4	NOx (Total) <= 95 lb/hr from preconstruction permit. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three 1-hour tests. Three test runs must be conducted on each unit, with ammonia injection, to determine compliance. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Recordkeeping by stack test results every 5 years. [N.J.A.C. 7:27-22.16(e)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	NOx (Total) <= 300 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by continuous emission monitor continuously, based on a 1 hour block average , beginning and ending on the hour. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal . [N.J.A.C. 7:27-22.16(o)]
6	NOx (Total) <= 155 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by continuous emission monitor continuously, based on a 24 hour period block, beginning and ending at midnight. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
7	NOx (Total) <= 150 ppmvd @ 7% O2. The owner or operator of a MSW incinerator of any size shall cause it to emit NOx at a maximum allowable emission concentration of 150 ppmvd at seven percent oxygen based on a calendar day average. [N.J.A.C. 7:27-19.12(a)1]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on one calendar day based on 1-hour block averages. The owner or operator shall install a NOx continuous emissions monitoring (CEM) system on the MSW incinerator satisfying the requirements of N.J.A.C. 7:27-19.18 and shall demonstrate compliance using the NOx CEM. [N.J.A.C. 7:27-19.12(c)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously and calculating the average each calendar day. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
8	CO <= 126 lb/hr from preconstruction permit. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	CO <= 400 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by continuous emission monitor continuously, based on a 1 hour block average , beginning and ending on the hour. [N.J.A.C. 7:27-22.16(e)]	CO: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
10	CO <= 100 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by continuous emission monitor continuously, based on a 96 hour rolling average based on a 1 hour block average beginning and ending on the hour. [N.J.A.C. 7:27-22.16(e)]	CO: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(e)]
11	The CO and NOx emission limits specified in permit condition, for normal steady state operation shall not apply during periods, including warm-up periods, when no waste is burned and fossil fuel is being combusted. Only auxiliary fuel (fuel oil) shall be combusted during warm-up periods, and no municipal solid waste shall combusted. The warm-up period begins upon initiation of auxiliary fuel (fuel oil) combustion in the furnace. The duration of exemption from emission limits during these periods shall not exceed 10 consecutive hours per warm-up period. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
12	SO2 <= 75.8 lb/hr. [N.J.A.C. 7:27-22.16(e)]	SO2: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs [From BOP080001.]. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by stack test results upon occurrence of event [From BOP080001.]. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	SO3 and H2SO4, as converted and expressed as H2SO4 <= 4 lb/hr. [N.J.A.C. 7:27-22.16(e)]	SO3 and H2SO4, as converted and expressed as H2SO4: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	SO3 and H2SO4, as converted and expressed as H2SO4: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
14	Particulate Emissions <= 9.8 lb/hr from preconstruction permit. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	Particulate Emissions: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
15	Particulate Emissions <= 0.014 gr/dscf @ 7% O2. [N.J.A.C. 7:27-22.16(e)]	Particulate Emissions: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
16	Particulate Emissions <= 0.028 gr/dscf @ 7% O2 for each individual test run during which soot blowing is performed. [N.J.A.C. 7:27-22.16(e)]	Particulate Emissions: Monitored by stack emission testing annually based on a Department validated stack run. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
17	PM-10 (Total) <= 22.8 lb/hr Hourly emission rate established from stack test(s) results. [Modification BOP090001]. [N.J.A.C. 7:27-22.16(a)]	PM-10 (Total): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]
18	PM-2.5 (Total) <= 22.8 lb/hr Hourly emission rate established from stack test(s) results. PM-2.5 is assumed by the facility to be equal to PM-10. [Modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: As per the approved schedule. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Any visible emissions shall not exceed an average Opacity <= 10 %. [N.J.A.C. 7:27-22.16(e)]	Opacity: Monitored by continuous opacity monitoring system continuously, based on 6 minute blocks. The discrete block average will begin on the hour. [N.J.A.C. 7:27-22.16(e)]	Opacity: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
20	Arsenic compounds <= 0.0051 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Arsenic compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Arsenic compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
21	Beryllium Compounds <= 0.00025 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Beryllium compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Beryllium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
22	Cadmium compounds <= 0.043 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Cadmium compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Cadmium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
23	Chromium compounds <= 0.012 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Chromium compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Chromium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
24	HCl Emissions <= 21.6 lb/hr. [N.J.A.C. 7:27-22.16(e)]	HCl Emissions: Monitored by stack emission testing annually, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	HCl Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
25	Hydrogen fluoride <= 0.82 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Hydrogen fluoride: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Hydrogen fluoride: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
26	Lead compounds <= 0.5 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Lead compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Lead compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
27	Mercury compounds <= 0.053 lb/hr in accordance with the July 27, 1997 preconstruction permit and confirming letter dated August 27, 2002. [N.J.A.C. 7:27-22.16(e)]	Mercury compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Mercury compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
28	Nickel compounds <= 0.0033 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Nickel compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Nickel compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
29	TCDD Emissions (2,3,7,8-) <= 0.00001 lb/hr. [N.J.A.C. 7:27-22.16(e)]	TCDD Emissions (2,3,7,8-): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	TCDD Emissions (2,3,7,8-): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
30	Polycyclic aromatic hydrocarbons, or Polycyclic organic matter <= 0.29 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Polycyclic organic matter: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
31	Emissions of benzo(a) pyrene, carbon tetrachloride, formaldehyde, perchloroethylene (tetrachloroethylene), trichloroethylene and vinyl chloride shall be below the reporting threshold of N.J.A.C. 7:27-22, Tables A & B and must be measured using methods approved by DEP. [N.J.A.C. 7:27-22.16(e)]	Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
32	Ammonia <= 10.1 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Ammonia: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Ammonia: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS0. [N.J.A.C. 7:27-22.16(e)]
33	Operating Control Efficiency >= 70 % control. Permittee shall equip and operate the facility with a vapor control system that reduces the total acid gas emissions to the outdoor atmosphere by no less than 70 percent by weight. This equipment shall be in operation at any time waste is being charged to the combustor. [N.J.A.C. 7:27-22.16(e)]	Operating Control Efficiency: Monitored by stack emission testing upon request of the Department, based on the average of three 1-hour tests. [N.J.A.C. 7:27-22.16(o)]	Operating Control Efficiency: Recordkeeping by stack test results upon occurrence of event. [N.J.A.C. 7:27-22.16(e)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. Refer to stack testing requirements specified in this permit. [N.J.A.C. 7:27-22.16(o)]
34	Scrubbing Medium Inlet Pressure <= 3,600 inches. [N.J.A.C. 7:27-22.16(a)]	Scrubbing Medium Inlet Pressure: Monitored by pressure measurement device each week during operation when in operation. [N.J.A.C. 7:27-22.16(o)]	Scrubbing Medium Inlet Pressure: Recordkeeping by manual logging of parameter daily. Records shall be kept in a permanently bound logbook or in readily available computer files. [N.J.A.C. 7:27-22.16(o)]	None.
35	SO2: monitor shall assure that acid gas absorber system is operating correctly. [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by continuous emission monitoring system continuously. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each week during operation. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
36	Particulate Emissions: Continuous opacity monitor shall assure that electrostatic precipitator system is operating correctly. [N.J.A.C. 7:27-22.16(a)]	Particulate Emissions: Monitored by continuous opacity monitoring system continuously. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by manual logging of parameter or storing data in a computer data system each week during operation. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)**

Operating Scenario: **OS2 Operation of MWC #1 under Malfunction conditions, OS4 Operation of MWC #2 under Malfunction conditions, OS6 Operation of MWC #3 under Malfunction conditions**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	EMERGENCY MALFUNCTION: An emergency malfunction means any sudden and unavoidable failure to the equipment or control apparatus to operate in a normal manner. Malfunctions that are caused entirely or in part by improperly designed equipment, lack of preventative maintenance, careless or improper operation, operator error, or any preventable upset condition or preventable equipment or control apparatus breakdown shall not be considered emergency malfunctions. In any enforcement proceeding the Permittee seeking to establish the occurrence of an emergency malfunction has the burden of proof. [N.J.A.C. 7:27-22.16(e)]	None.	None.	Submit a report: As per the approved schedule. For a permittee to claim an emission limit exceedance is due to an emergency malfunction the Permittee must submit a written written preliminary notice to the Department by 5:00 pm of the second full working day following the incident. This preliminary notice must include: A description of the malfunction and how it resulted in a contravention. A description of the measures taken to correct the conditions causing the contravention. A description of the measures taken to minimize the excess emissions including curtailment or shutdown of the combustor. This provision does not relieve the Permittee from immediately notifying the Department of any release of air contaminants in a quantity or concentration which poses a potential threat to public health.wealth, or the environment, or which might result in citizen complaints, pursuant to N.J.S.A. 26:2C-19(e). [N.J.A.C. 7:27-22.16(e)]
2	EMERGENCY MALFUNCTION: The Department will review the Emergency Malfunction asserted by the facility. If the Department deems that any Emergency Malfuntion was asserted incorrectly, the Department will reject the claim and take appropriate enforcement action. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
3	EMERGENCY MALFUNCTION: To obtain malfunction allowances, the facility must: a. Maintain the equipment; b. Operate the equipment properly; c. Take steps to minimize emissions during malfunction periods; d. Identify and take steps to prevent malfunctions from occuring in future; and e. Report malfunctions in accordance with the reporting requirements of this permit. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
4	EMERGENCY MALFUNCTION: Within thirty days of an emergency malfunction, the Permittee shall submit to the Department certified information which identifies the contravention and includes the following: Copies of relevant operating data including but not limited to continuous monitoring data or portions of logbooks that show the malfunction to be sudden and unavoidable. Relevant data shall include at a minimum data recorded one hour before, during, and one hour after the malfunction. List of the actions taken to prevent the potential for the malfunction from occuring in the future. Certification in accordance with N.J.A.C. 7:27-1.39 that the malfunction did not occur as a result of: improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error, and certification that the information contained in the preliminary notice is correct. If the information submitted in the preliminary notice is inaccurate, a certified revision of the notice shall be submitted. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	EMERGENCY MALFUNCTION: The duration of emission excursions caused by malfunctions shall not exceed the following limits per occurence and percent of operating time: SO2 180min. 2% CO 60min 0.2% NOx 180min 2% [N.J.A.C. 7:27-22.16(e)]	Monitored by continuous emission monitor upon occurrence of event (and hour time monitor). [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by data acquisition system (DAS) / electronic data storage upon occurrence of event. Data may be periodically printed and maintained reliably in a log book on site. [N.J.A.C. 7:27-22.16(o)]	None.
6	EMERGENCY MALFUNCTION: The duration of operating requirement excursions caused by malfunctions shall not exceed the following limits per occurence and percent of operating time: Temperature 60min. 0.1% [N.J.A.C. 7:27-22.16(e)]	Monitored by parametric monitoring system upon occurrence of event (temperature monitor and hour time monitor). [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by data acquisition system (DAS) / electronic data storage upon occurrence of event. Data may be periodically printed and maintained reliably in a log book on site. [N.J.A.C. 7:27-22.16(o)]	None.
7	EMERGENCY MALFUNCTION: Neither the time , nor the emissions, during the periods of emergency malfunctions meeting the above criteria shall be used in the calculation of emission levels for comparison to allowable emission limits. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
8	EMERGENCY MALFUNCTION: Malfunctions resulting in an excursion of an emission limit with an averaging time of less than or equal to one hour shall be deemed to have occured during the entire applicable averaging time of that emission limit. Malfunction resulting in an excursion of an emission limit with an averaging time of greater than one hour shall be deemed to have occured only during the hours of the malfunction. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	EMERGENCY MALFUNCTION: Any visible emission caused by a malfunction shall not exceed an average of 10% opacity in any 6 minute block period, as determined by the continuous emission monitoring equipment or USEPA Reference Method 9. [N.J.A.C. 7:27-22.16(e)]	Monitored by continuous opacity monitor upon occurrence of event, based on 6 minute blocks. [N.J.A.C. 7:27-22.16(e)]	Recordkeeping by data acquisition system (DAS) / electronic data storage continuously. [N.J.A.C. 7:27-22.16(e)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U1 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)**

Operating Scenario: **OS10 Operation of MWC #1 at Maximum Input (423 MMBtu/hr) with Baghouse, OS11 Operation of MWC #2 at Maximum Input (423 MMBtu/hr) with Baghouse, OS12 Operation of MWC #3 at Maximum Input (423 MMBtu/hr) with Baghouse**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Unless otherwise specified, the emission limits specified under this operating scenario shall apply at all times, except for start-up and shutdown periods. Requirements in this operating scenario are applicable after installation of the baghouse controlling this emission unit (MWC) [From modification BOP090003, Construction period 2014 to 2016.] [N.J.A.C. 7:27-22.16(a)]	None.	None.	Submit the required air permit application(s): Upon occurrence of event (i.e., after installation of baghouse for this emission unit.) Application shall request removal of conditions in the operating scenarios for which use of ESPs is required and removal of all inventory data related to them. From modification BOP090003. [N.J.A.C. 7:27-22.16(o)]
2	Maximum emission rate of Non-Methane Hydrocarbons as Methane, Non-Methane Hydrocarbons <= 6.3 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Non-Methane Hydrocarbons: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Non-Methane Hydrocarbons: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(e)]
3	Maximum concentration of Non-Methane Hydrocarbons as Methane, VOC (Total) <= 66 ppmvd @ 7% O2. [N.J.A.C. 7:27-22.16(e)]	VOC (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	VOC (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
4	NOx (Total) <= 95 lb/hr from preconstruction permit. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by stack emission testing prior to permit expiration date, based on the average of three 1-hour tests. Three test runs must be conducted on each unit, with ammonia injection, to determine compliance. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by stack test results prior to permit expiration date. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
5	NOx (Total) <= 300 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 1 hour block average , beginning and ending on the hour. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
6	NOx (Total) <= 155 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on a 24 hour period block, beginning and ending at midnight. [N.J.A.C. 7:27-22.16(o)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
7	NOx (Total) <= 150 ppmvd @ 7% O2. The owner or operator of a MSW incinerator of any size shall cause it to emit NOx at a maximum allowable emission concentration of 150 ppmvd at seven percent oxygen based on a calendar day average. [N.J.A.C. 7:27-19.12(a)1]	NOx (Total): Monitored by continuous emission monitoring system continuously, based on one calendar day based on 1-hour block averages. The owner or operator shall install a NOx continuous emissions monitoring (CEM) system on the MSW incinerator satisfying the requirements of N.J.A.C. 7:27-19.18 and shall demonstrate compliance using the NOx CEM. [N.J.A.C. 7:27-19.12(c)]	NOx (Total): Recordkeeping by strip chart or data acquisition (DAS) system continuously and calculating the average each calendar day. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
8	CO <= 126 lb/hr from preconstruction permit. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	CO <= 400 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by continuous emission monitoring system continuously, based on a 1 hour block average , beginning and ending on the hour. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
10	CO <= 100 ppmvd @ 7% O2. The emission limitation shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(e)]	CO: Monitored by continuous emission monitoring system continuously, based on a 96 hour rolling average based on a 1 hour block average beginning and ending on the hour. [N.J.A.C. 7:27-22.16(o)]	CO: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]
11	The CO and NOx emission limits specified in permit condition, for normal steady state operation shall not apply during periods, including warm-up periods, when no waste is burned and fossil fuel is being combusted. Only auxiliary fuel (fuel oil) shall be combusted during warm-up periods, and no municipal solid waste shall be combusted. The warm-up period begins upon initiation of auxiliary fuel (fuel oil) combustion in the furnace. The duration of exemption from emission limits during these periods shall not exceed 10 consecutive hours per warm-up period. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
12	SO2 <= 75.8 lb/hr. [N.J.A.C. 7:27-22.16(e)]	SO2: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [From BOP080001]. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [From BOP080001]. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
13	SO3 and H2SO4, as converted and expressed as H2SO4 <= 4 lb/hr. [N.J.A.C. 7:27-22.16(e)]	SO3 and H2SO4, as converted and expressed as H2SO4: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	SO3 and H2SO4, as converted and expressed as H2SO4: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
14	TSP <= 4.4 lb/hr from modification application BOP120003. The emission limitations shall apply at all times when MSW is being combusted, except during start-up and shutdown as defined in this operating permit. [N.J.A.C. 7:27-22.16(a)]	TSP: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	TSP: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
15	Particulate Emissions <= 12 mg/dscm @ 7% O2. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Particulate Emissions: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
16	Particulate Emissions <= 12 mg/dscm @ 7% O2 for average of 3 individual test runs when including a test run during which soot blowing is performed. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Particulate Emissions: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
17	PM-10 (Total) <= 17 lb/hr. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	PM-10 (Total): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-10 (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
18	PM-2.5 (Total) <= 17 lb/hr. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	PM-2.5 (Total): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	PM-2.5 (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
19	Any visible emissions shall not exceed an average Opacity <= 10 %. [N.J.A.C. 7:27-22.16(e)]	Opacity: Monitored by continuous opacity monitoring system continuously, based on 6 minute blocks. The discrete block average will begin on the hour. [N.J.A.C. 7:27-22.16(e)]	Opacity: Recordkeeping by strip chart or data acquisition (DAS) system continuously. [N.J.A.C. 7:27-22.16(e)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. Any non-compliance shall be reported. [N.J.A.C. 7:27-22.16(o)]
20	Arsenic compounds <= 0.0037 lb/hr. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Arsenic compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Arsenic compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
21	Beryllium compounds <= 0.00025 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Beryllium compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Beryllium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
22	Cadmium compounds <= 0.0037 lb/hr. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Cadmium compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Cadmium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
23	Chromium compounds <= 0.012 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Chromium compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Chromium compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
24	HCl Emissions <= 21.6 lb/hr. [N.J.A.C. 7:27-22.16(e)]	HCl Emissions: Monitored by stack emission testing annually, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	HCl Emissions: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
25	Hydrogen fluoride <= 0.82 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Hydrogen fluoride: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Hydrogen fluoride: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
26	Lead compounds <= 0.037 lb/hr. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Lead compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Lead compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
27	Mercury compounds <= 0.01 lb/hr based on concentration limit of 28 ugms/dscm. [From modification BOP090003]. [N.J.A.C. 7:27-22.16(a)]	Mercury compounds: Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Mercury compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
28	Nickel compounds <= 0.0033 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Nickel compounds: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Nickel compounds: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
29	Dioxins/Furans (Total) <= 0.000011 lb/hr from modification BOP090003, based on federal concentration limit of 30 ng/dscm @ 7% O2. [N.J.A.C. 7:27-22.16(a)]	Dioxins/Furans (Total): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Dioxins/Furans (Total): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
30	TCDD Emissions (2,3,7,8-) <= 0.00001 lb/hr. [N.J.A.C. 7:27-22.16(e)]	TCDD Emissions (2,3,7,8-): Monitored by stack emission testing annually, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	TCDD Emissions (2,3,7,8-): Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
31	Polycyclic aromatic hydrocarbons, or Polycyclic organic matter <= 0.29 lb/hr. [N.J.A.C. 7:27-22.16(a)]	Polycyclic organic matter: Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Polycyclic organic matter: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
32	Emissions of benzo(a) pyrene, carbon tetrachloride, formaldehyde, perchloroethylene (tetrachloroethylene), trichloroethylene and vinyl chloride shall be below the reporting threshold of N.J.A.C. 7:27-22, Tables A & B and must be measured using methods approved by DEP. [N.J.A.C. 7:27-22.16(e)]	Monitored by stack emission testing prior to permit expiration date, based on the average of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
33	Ammonia <= 10.1 lb/hr. [N.J.A.C. 7:27-22.16(e)]	Ammonia: Monitored by stack emission testing prior to permit expiration date, based on each of three Department validated stack test runs. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Ammonia: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
34	Operating Control Efficiency >= 70 % control. Permittee shall equip and operate the facility with a vapor control system that reduces the total acid gas emissions to the outdoor atmosphere by no less than 70 percent by weight. This equipment shall be in operation at any time waste is being charged to the combustor. [N.J.A.C. 7:27-22.16(e)]	Operating Control Efficiency: Monitored by stack emission testing upon request of the Department, based on the average of three 1-hour tests. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Operating Control Efficiency: Recordkeeping by stack test results upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]	Stack Test - Submit protocol, conduct test and submit results: Upon occurrence of event. See stack testing requirements in U1 OS Summary. [N.J.A.C. 7:27-22.16(o)]
35	Scrubbing Medium Inlet Pressure <= 3,600 inches. [N.J.A.C. 7:27-22.16(a)]	Scrubbing Medium Inlet Pressure: Monitored by pressure measurement device daily when in operation. [N.J.A.C. 7:27-22.16(o)]	Scrubbing Medium Inlet Pressure: Recordkeeping by manual logging of parameter or storing data in a computer data system daily. Records shall be kept in a logbook or in readily available computer files. [N.J.A.C. 7:27-22.16(o)]	None.
36	SO2: monitor shall assure that acid gas absorber system is operating correctly. [N.J.A.C. 7:27-22.16(a)]	SO2: Monitored by continuous emission monitoring system continuously. [N.J.A.C. 7:27-22.16(o)]	SO2: Recordkeeping by manual logging of parameter or storing data in a computer data system each week during operation. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
37	Particulate Emissions: Continuous opacity monitor shall assure that the baghouse is operating correctly. [N.J.A.C. 7:27-22.16(a)]	Particulate Emissions: Monitored by continuous opacity monitoring system continuously. [N.J.A.C. 7:27-22.16(o)]	Particulate Emissions: Recordkeeping by manual logging of parameter or storing data in a computer data system each week during operation. [N.J.A.C. 7:27-22.16(o)]	Submit an Excess Emissions and Monitoring Systems Performance Report (EEMPR): On or before every April 30, July 30, October 30, and January 30 for the preceding quarter year (the quarter years begin on January 1, April 1, July 1, and October 1) electronically through the NJDEP online EEMPR web portal. [N.J.A.C. 7:27-22.16(o)]

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U6 Lime Storage Silo A (E4), U7 Lime Storage Silo B (E5), U8 Lime Storage Silo C (E6)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Maximum allowable particulate emission rate from PT4 based on 0.02 grains per SCF. Particulate Emissions <= 0.5 lb/hr. [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
2	The owner or operator shall not use this emission unit in a manner which will cause visible emissions greater than 20 percent opacity, exclusive of condensed water vapor, for a period longer than three minutes in any consecutive 30-minute period. [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27-6.2(e)]	None.	None.	None.
3	The permittee shall not use the equipment in a manner which will cause visible emissions, exclusive of condensed water vapor. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
4	Annual emission limit from the preconstruction permit. TSP <= 0.876 tons/yr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
5	Annual emission limit from the operating permit. application. PM-10 (Total) <= 0.876 tons/yr. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
6	Maximum emission rate imposed from preconstruction permit. TSP <= 0.2 lb/hr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
7	PM-10 (Total) <= 0.2 lb/hr Maximum emission rate from operating permit application. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
8	All particulate emissions from each emission unit shall be exhausted through a dust collector (CD1013, CD1014, or CD1015, as appropriate.) [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	The owner or operator shall inspect and maintain the dust collector and replace the filter media on a schedule necessary to achieve the required particulate control effeciency as specified by the manufacturer. [N.J.A.C. 7:27-22.16(a)]	Monitored by visual determination once every 2 weeks. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by data acquisition system (DAS) / electronic data storage upon occurrence of event , or manually in a permanently bound logbook. Record each inspection and maintenance event in a permanently bound logbook or readily accessible computer memory. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U9 Lime Slaker Vent A (E9), U10 Lime Slaker Vent B (E10)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Maximum allowable particulate emission rate from PT9 based on 0.02 grains per SCF. Particulate Emissions <= 0.5 lb/hr. [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
2	The owner or operator shall not use this emission unit in a manner which will cause visible emissions greater than 20 percent opacity, exclusive of condensed water vapor, for a period longer than three minutes in any consecutive 30-minute period. [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27-6.2(e)]	None.	None.	None.
3	The permittee shall not use the equipment in a manner which will cause visible emissions, exclusive of condensed water vapor. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
4	Annual emission limit from the preconstruction permit. TSP <= 0.027 tons/yr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
5	Annual emission limit from the operating permit. application. PM-10 (Total) <= 0.027 tons/yr. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
6	Maximum emission rate imposed from preconstruction permit. Particulate Emissions <= 0.0063 lb/hr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
7	PM-10 (Total) <= 0.0063 lb/hr Maximum emission rate from operating permit application. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U11 Activated Carbon Storage Silo (E14)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Particulate Emissions <= 0.5 lb/hr. Maximum allowable particulate emission rate from source emission point based on 99% efficiency of collection or based on 0.02 grains per SCF of stack gas flow as determined in the Table at N.J.A.C. 7:27-6.2(a). [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
2	The owner or operator shall not use this emission unit in a manner which will cause visible emissions greater than 20 percent opacity, exclusive of condensed water vapor, for a period longer than three minutes in any consecutive 30-minute period. [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27-6.2(e)]	None.	None.	None.
3	The permittee shall not use the equipment in a manner which will cause visible emissions, exclusive of condensed water vapor. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
4	Annual emission limit from the preconstruction permit. TSP <= 0.9 tons/yr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
5	Annual emission limit from the operating permit. application. PM-10 (Total) <= 0.9 tons/yr. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
6	Maximum emission rate imposed from preconstruction permit. TSP <= 0.2 lb/hr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
7	Maximum emission rate from operating permit application. PM-10 (Total) <= 0.2 lb/hr. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
8	All particulate emissions from this emission unit shall be exhausted through a dust collector (CD1020). [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	The owner or operator shall inspect and maintain the dust collector and replace the filter media on a schedule necessary to achieve the required particulate control effeciency as specified by the manufacturer. [N.J.A.C. 7:27-22.16(a)]	Monitored by visual determination once every 2 weeks. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by data acquisition system (DAS) / electronic data storage upon occurrence of event , or manually in a permanently bound logbook. Record each inspection and maintenance event. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U12 Flyash Conditioning Room (E12,E13)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Maximum allowable particulate emission rate from source emission point based on 99% efficiency of collection or based on 0.02 grains per SCF of stack gas flow as determined in the Table at N.J.A.C. 7:27-6.2(a). Particulate Emissions <= 0.5 lb/hr. [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
2	The owner or operator shall not use this emission unit in a manner which will cause visible emissions greater than 20 percent opacity, exclusive of condensed water vapor, for a period longer than three minutes in any consecutive 30-minute period. [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27-6.2(e)]	None.	None.	None.
3	Annual emission limit from the preconstruction permit. TSP <= 0.131 tons/yr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
4	Annual emission limit from the operating permit. application. PM-10 (Total) <= 0.15 tons/yr. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
5	Maximum emission rate imposed from preconstruction permit. Particulate Emissions <= 0.015 lb/hr. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.
6	PM-10 (Total) <= 0.015 lb/hr Maximum emission rate from operating permit application. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
7	All particulate emissions from this emission unit shall be exhausted through dust collectors CD1017 or CD1018 and then exhaust the building through CD1019. [N.J.A.C. 7:27-22.16(e)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	The owner or operator shall inspect and maintain the dust collectors and replace the filter media on a schedule necessary to achieve the required particulate control effeciency as specified by the manufacturer. [N.J.A.C. 7:27-22.16(a)]	Monitored by visual determination once every 2 weeks. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter upon occurrence of event. Record each inspection and maintenance event in a permanently bound logbook or readily accessible computer memory. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U13 7.4 MMBtu/hr, 740 KW Diesel Engine-Driven Emergency Generator (E7)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 % , exclusive of visible condensed water vapor, except for a period of not longer than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Particulate Emissions <= 4.2 lb/hr. Particulate emission limit from the combustion of fuel based on rated heat input of source. [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
3	Sulfur Content in Fuel <= 2,000 ppmw (0.2 % by weight) for Zone 4 (Essex County). Effective through June 30, 2014. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Sulfur Content in Fuel <= 500 ppmw (0.05% by weight). Effective July 1, 2014 through June 30, 2016. [N.J.A.C. 7:27-9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
5	Sulfur Content in Fuel <= 15 ppmw (0.0015% by weight). Effective July 1, 2016. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
6	Fuel stored in New Jersey that met the applicable maximum sulfur content standard of Tables 1A or 1B of N.J.A.C. 7:27-9.2 at the time it was stored in New Jersey may be used in New Jersey after the operative date of the applicable standard in Table 1B. [N.J.A.C. 7:27- 9.2(b)]	None.	None.	None.
7	Generator fuel limited to natural gas, # 2 fuel oil or diesel fuel. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	Each emergency generator shall be located at the facility and produce mechanical or thermal energy, or electrical power exclusively for use at the facility. Each emergency generator shall be operated only: 1. During the performance of normal testing and maintenance procedures, as recommended in writing by the manufacturer and/or as required in writing by a Federal or State law or regulation, 2. When there is power outage or the primary source of mechanical or thermal energy fails because of an emergency, or 3. When there is a voltage reduction issued by PJM and posted on the PJM internet website (www.pjm.com) under the "emergency procedures" menu. [N.J.A.C. 7:27-19.1]	Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. The owner or operator shall maintain on site and record in a logbook or computer data system, the following information: 1. Once per month, the total operating time from the generator's hour meter. 2. For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator; and 3. If a voltage reduction is the reason for the use of the emergency generator, a copy of the voltage reduction notification from PJM or other documentation of the voltage reduction. The owner or operator of an emergency generator shall maintain the above records for a period no less than five years after the record was made and shall make the records readily available to the Department or the EPA upon request. [N.J.A.C. 7:27-19.11(a)] and [N.J.A.C. 7:27-19.11(b)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	This emergency generator shall not be used: 1. For normal testing and maintenance on days when the Department forecasts air quality anywhere in New Jersey to be "unhealthy for sensitive groups," "unhealthy," or "very unhealthy" as defined in the EPA's Air Quality Index at http://airnow.gov/, as supplemented or amended and incorporated herein by reference, unless required in writing by a Federal or State law or regulation. Procedures for determining the air quality forecasts for New Jersey are available at the Department's air quality permitting web site at http://www.state.nj.us/dep/aqpp/aqforecast; and 2. As a source of energy or power after the primary energy or power source has become operable again. If the primary energy or power source is under the control of the owner or operator of the emergency generator, the owner or operator shall make a reasonable, timely effort to repair the primary energy or power source. [N.J.A.C. 7:27-19.2(d)]	None.	None.	None.
10	Hours of Operation <= 100 hr/yr for testing and maintenance. The limit on the allowable hours for testing and maintenance in accordance with the documentation from manufacturer, the vendor, or the insurance company associated with the engine. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator shall maintain onsite and record in a logbook or computer data system the total operating time for testing and maintenance from the generator's hour meter. The total hours of operation limit shall be for purposes of establishing potential to emit. [N.J.A.C. 7:27-19.11]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
11	Hours of Operation <= 400 hr/yr for emergency operation only. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator shall calculate hours for emergency operation by deducting hours for testing and maintenance from the total operating time from the generator's hour meter. The total hours of operation limit shall be for purposes of establishing potential to emit. [N.J.A.C. 7:27-19.11]	Submit notification: Upon occurrence of event. The Permittee shall contact the Regional Enforcement Office (REO) if the actual hours of emergency operation exceed the total time allowed for emergencies under this permit. The Permittee shall call the appropriate REO within 24 hours of the occurrence of excess emergency operation and submit written notification of the excess emergency operation within 72 hours of the occurrence and may request additional operational hours for situations meeting the definition of an emergency as defined at N.J.A.C. 7:27-22. [N.J.A.C. 7:27-22.16(o)]
12	Maximum Gross Heat Input <= 7.4 MMBTU/hr (HHV). [N.J.A.C. 7:27-22.16(a)]	Other: Engine Rated Capacity. [N.J.A.C. 7:27-22.16(o)].	None.	None.
13	VOC (Total) <= 0.183 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
14	NOx (Total) <= 6.53 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
15	CO <= 1.7 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
16	SO2 <= 0.392 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
17	TSP <= 0.653 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
18	PM-10 (Total) <= 0.653 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U14 1.59 MMBtu/hr Emergency Diesel Engine-Driven Fire Pump (E8)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Opacity <= 20 % , exclusive of visible condensed water vapor, except for a period of not longer than 10 consecutive seconds. [N.J.A.C. 7:27- 3.5]	None.	None.	None.
2	Particulate Emissions <= 4.2 lb/hr. Particulate emission limit from the combustion of fuel based on rated heat input of source. [N.J.A.C. 7:27- 4.2(a)]	None.	None.	None.
3	Sulfur Content in Fuel <= 2,000 ppmw (0.2 % by weight) for Zone 4 (Essex County). Effective through June 30, 2014. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
4	Sulfur Content in Fuel <= 500 ppmw (0.05% by weight). Effective July 1, 2014 through June 30, 2016. [N.J.A.C. 7:27-9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
5	Sulfur Content in Fuel <= 15 ppmw (0.0015% by weight). Effective July 1, 2016. [N.J.A.C. 7:27- 9.2(b)]	Sulfur Content in Fuel: Monitored by review of fuel delivery records per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	Sulfur Content in Fuel: Recordkeeping by invoices / bills of lading / certificate of analysis per delivery showing fuel sulfur content. [N.J.A.C. 7:27-22.16(o)]	None.
6	Fuel stored in New Jersey that met the applicable maximum sulfur content standard of Tables 1A or 1B of N.J.A.C. 7:27-9.2 at the time it was stored in New Jersey may be used in New Jersey after the operative date of the applicable standard in Table 1B. [N.J.A.C. 7:27- 9.2(b)]	None.	None.	None.
7	Generator fuel limited to natural gas, # 2 fuel oil or diesel fuel. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	Each emergency generator shall be located at the facility and produce mechanical or thermal energy, or electrical power exclusively for use at the facility. Each emergency generator shall be operated only: 1. During the performance of normal testing and maintenance procedures, including other fire protection equipment, as recommended in writing by the fire pump or fire protection system manufacturer and/or as required in writing by a Federal or State law or regulation, 2. When there is power outage or the primary source of mechanical or thermal energy fails because of an emergency, or 3. When there is a voltage reduction issued by PJM and posted on the PJM internet website (www.pjm.com) under the "emergency procedures" menu. [N.J.A.C. 7:27-22.16(a)] and [N.J.A.C. 7:27-19.1]	Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Recordkeeping by manual logging of parameter or storing data in a computer data system at the approved frequency. The owner or operator shall maintain on site and record in a logbook or computer data system, the following information: 1. Once per month, the total operating time from the generator's hour meter. 2. For each time the emergency generator is specifically operated for testing or maintenance: i. The reason for its operation; ii. The date(s) of operation and the start up and shut down time; iii. The total operating time for testing or maintenance based on the generator's hour meter; and iv. The name of the operator; and 3. If a voltage reduction is the reason for the use of the emergency generator, a copy of the voltage reduction notification from PJM or other documentation of the voltage reduction. The owner or operator of an emergency generator shall maintain the above records for a period no less than five years after the record was made and shall make the records readily available to the Department or the EPA upon request. [N.J.A.C. 7:27-19.11(a)] and [N.J.A.C. 7:27-19.11(b)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
9	This emergency generator shall not be used: 1. For normal testing and maintenance on days when the Department forecasts air quality anywhere in New Jersey to be "unhealthy for sensitive groups," "unhealthy," or "very unhealthy" as defined in the EPA's Air Quality Index at http://airnow.gov/, as supplemented or amended and incorporated herein by reference, unless required in writing by a Federal or State law or regulation. Procedures for determining the air quality forecasts for New Jersey are available at the Department's air quality permitting web site at http://www.state.nj.us/dep/aqpp/aqforecast; and 2. As a source of energy or power after the primary energy or power source has become operable again. If the primary energy or power source is under the control of the owner or operator of the emergency generator, the owner or operator shall make a reasonable, timely effort to repair the primary energy or power source. [N.J.A.C. 7:27-19.2(d)]	None.	None.	None.
10	Hours of Operation <= 50 hr/yr for testing and maintenance. The limit on the allowable hours for testing and maintenance in accordance with the documentation from manufacturer, the vendor, or the insurance company associated with the engine. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator shall maintain onsite and record in a logbook or computer data system the total operating time for testing and maintenance from the generator's hour meter. The total hours of operation limit shall be for purposes of establishing potential to emit. [N.J.A.C. 7:27-19.11]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
11	Hours of Operation <= 450 hr/yr for emergency operation only. [N.J.A.C. 7:27-22.16(a)]	Hours of Operation: Monitored by hour/time monitor continuously. [N.J.A.C. 7:27-22.16(o)]	Hours of Operation: Recordkeeping by manual logging of parameter or storing data in a computer data system each month during operation. The owner or operator shall calculate hours for emergency operation by deducting hours for testing and maintenance from the total operating time from the generator's hour meter. The total hours of operation limit shall be for purposes of establishing potential to emit. [N.J.A.C. 7:27-19.11]	Submit notification: Upon occurrence of event. The Permittee shall contact the Regional Enforcement Office (REO) if the actual hours of emergency operation exceed the total time allowed for emergencies under this permit. The Permittee shall call the appropriate REO within 24 hours of the occurrence of excess emergency operation and submit written notification of the excess emergency operation within 72 hours of the occurrence and may request additional operational hours for situations meeting the definition of an emergency as defined at N.J.A.C. 7:27-22. [N.J.A.C. 7:27-22.16(o)]
12	Maximum Gross Heat Input <= 1.59 MMBTU/hr (HHV). [N.J.A.C. 7:27-22.16(a)]	Other: Engine Rated Capacity. [N.J.A.C. 7:27-22.16(o)].	None.	None.
13	VOC (Total) <= 0.105 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
14	NOx (Total) <= 1.3 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
15	CO <= 0.286 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
16	SO2 <= 0.087 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
17	TSP <= 0.094 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
18	PM-10 (Total) <= 0.094 tons/yr. Annual emission limit based on total permitted hours per year of operation. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Emission Unit: **U15 Ash and Metals Recovery System (E16, E17, E21-E30)**
Operating Scenario: **OS Summary**

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
1	Particulate Emissions < 0.5 lb/hr. Maximum allowable particulate emission rate from source emission point based on 99% efficiency of collection. [N.J.A.C. 7:27- 6.2(a)]	None.	None.	None.
2	The owner or operator shall not use this emission unit in a manner which will cause visible emissions greater than 20 percent opacity, exclusive of condensed water vapor, for a period longer than three minutes in any consecutive 30-minute period. [N.J.A.C. 7:27-6.2(d)] and [N.J.A.C. 7:27-6.2(e)]	None.	None.	None.
3	The permittee shall not use the equipment in a manner which will cause visible emissions, exclusive of condensed water vapor. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
4	TSP <= 0.05 lb/hr (from all scenarios combined.) Emission limit from the operating permit modification BOP120001. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
5	PM-10 (Total) <= 0.05 lb/hr (from all scenarios combined.) Emission limit from the operating permit modification BOP120001. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
6	All particulate emissions from this emission unit shall be exhausted through dust collector CD1022. [N.J.A.C. 7:27-22.16(a)]	None.	None.	None.
7	Total Material Transferred <= 25.5 tons/hr of bottom ash to metals recovery (Design capacity) for this scenario. This includes re-feed ash flow. Similarly, combined design capacity for both fly ash and bottom ash = 31 tons per hour. [Modification BOP120001]. [N.J.A.C. 7:27-22.16(a)]	Total Material Transferred: Monitored by documentation of construction once initially. [N.J.A.C. 7:27-22.16(o)]	Total Material Transferred: Recordkeeping by manual logging of parameter or storing data in a computer data system once initially. Retain original design specifications and emission calculations in file. From Minor Modification BOP120001. [N.J.A.C. 7:27-22.16(o)]	None.

New Jersey Department of Environmental Protection
Facility Specific Requirements

Ref.#	Applicable Requirement	Monitoring Requirement	Recordkeeping Requirement	Submittal/Action Requirement
8	The owner or operator shall inspect and maintain the dust collectors and replace the filter media on a schedule necessary to achieve the required particulate control effeciency as specified by the manufacturer. [N.J.A.C. 7:27-22.16(a)]	None.	Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record each inspection and maintenance event. The filter will be maintained in accordance with manufacturer's recommendations. [N.J.A.C. 7:27-22.16(o)]	None.
9	Pressure Drop >= 1 and Pressure Drop <= 6 inches w.c. (across the filter.). [N.J.A.C. 7:27-22.16(a)]	Pressure Drop: Monitored by pressure drop instrument once every 2 weeks. [N.J.A.C. 7:27-22.16(o)]	Pressure Drop: Recordkeeping by manual logging of parameter or storing data in a computer data system upon occurrence of event. Record observed pressure drop. [N.J.A.C. 7:27-22.16(o)]	None.
10	FUGITIVE ASH EMISSIONS -The facility must not cause to be discharged to the atmosphere visible emissions of combustion ash from an ash conveying system (including conveyor transfer points) in excess of 5 percent of the observation period (i.e., 9-min. per 3-hour period), except during periods of startup, shutdown, and malfunction and as provided below. Startup, shutdown, and malfunction exception is specified by 40 CFR 62.14109(b) and 40 CFR 60.58b(a)(1). - The emission limit specified above does not cover visible emissions discharged inside buildings or enclosures of ash conveying systems; however, the emission limit specified above does cover visible emissions discharged to the atmosphere from buildings or enclosures of ash conveying systems. - The provisions specified above do not apply during maintenance and repair of ash conveying systems. 40 CFR 60.39b(d)& [40 CFR 62.14106(a)]	Monitored by visual determination annually, based on the average of three tests. Compliance with fugitive ash emission limits shall be based on a series of three one hour observations, performed annually, using EPA Reference Method 22. This is based on the requirement at 40 CFR 60.58b(k). [40 CFR 60.39b(d)]&. [40 CFR 62.14106(a)]	Other: Maintain records of annual method 22 results along with all supporting calculations. This is as specified at 40 CFR 60.59b(d)(9). [40 CFR 60.39b(d)]&[40 CFR 62.14109(a)].	None.

COVANTA ESSEX CO (07736)
BOP190001

New Jersey Department of Environmental Protection
Facility Profile (General)

Facility Name (AIMS): Covanta Essex Company

Facility ID (AIMS): 07736

Street Address: 183 RAYMOND BLVD
NEWARK NJ 07105
NEWARK, NJ 07105-4798

Mailing Address: 183 RAYMOND BLVD
NEWARK NJ 07105
NEWARK, NJ 07105-4798

State Plane Coordinates:

X-Coordinate:	574
Y-Coordinate:	4,510
Units:	UTM Zone 18N - Meters
Datum:	Unknown
Source Org.:	Other/Unknown
Source Type:	Other/Unknown

County: Essex

Location Description: Municipal Waste Combustion using mass-burn waterwall furnace and boiler that generates electricity.

Industry:

Primary SIC:	4953
Secondary SIC:	4939
NAICS:	562213

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Air Permit Information Contact

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Patricia Earls
NJ EIN: 75611300000
Title: NJ Regional Environmental Manager
Phone: (973) 817-7322 x
Fax: (973) 344-4999 x
Other: (201) 621-1845 x
Type: Mobile
Email: pearls@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

Contact Type: BOP - Operating Permits

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Patricia Earls
NJ EIN: 75611300000
Title: NJ Regional Environmental Manager
Phone: (973) 817-7322 x
Fax: (973) 344-4999 x
Other: (201) 621-1845 x
Type: Mobile
Email: pearls@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

Contact Type: Environmental Officer

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Patricia Earls
NJ EIN: 75611300000
Title: NJ Regional Environmental Manager
Phone: (973) 817-7322 x
Fax: (973) 344-4999 x
Other: (201) 621-1845 x
Type: Mobile
Email: pearls@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Fees/Billing Contact

Organization: Covanta Essex Company
Org. Type: Corporation
Name: Patricia Earls
NJ EIN: 75611300000
Title: Environmental Engineer
Phone: (973) 817-7322 x
Fax: ( ) - x
Other: ( ) - x
Type:
Email: pearls@covantaenergy.com
Mailing Address: 183 Raymond Blvd
Newark, NJ 07105-4798

Contact Type: General Contact

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Patricia Earls
NJ EIN: 75611300000
Title: NJ Regional Environmental Manager
Phone: (973) 817-7322 x
Fax: (973) 344-4999 x
Other: (201) 621-1845 x
Type: Mobile
Email: pearls@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

Contact Type: On-Site Manager

Organization: Covanta Essex Company
Org. Type: Partnership
Name: David Blackmore
NJ EIN: 75611300000
Title: Facility Manager
Phone: (973) 817-7228 x
Fax: (973) 344-4999 x
Other: (240) 308-5025 x
Type: Mobile
Email: dblackmore@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

New Jersey Department of Environmental Protection
Facility Profile (General)

Contact Type: Operator

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Covanta Essex Company
NJ EIN: 75611300000
Title: NA
Phone: (973) 344-0900 x
Fax: (973) 344-4999 x
Other: ( ) - x
Type:
Email: pearls@covanta.com; dblackmore@covanta.com
Mailing Address:

Contact Type: Owner (Current Primary)

Organization: Covanta Essex Company
Org. Type: Partnership
Name: Covanta Essex Company
NJ EIN: 75611300000
Title: NA
Phone: (973) 344-0900 x
Fax: (973) 344-4999 x
Other: ( ) - x
Type:
Email: pearls@covanta.com; dblackmore@covanta.com
Mailing Address:

Contact Type: Responsible Official

Organization: Covanta Essex Company
Org. Type: Partnership
Name: David Blackmore
NJ EIN: 75611300000
Title: Facility Manager
Phone: (973) 817-7228 x
Fax: (973) 344-4999 x
Other: (240) 308-5025 x
Type: Mobile
Email: dblackmore@covanta.com
Mailing Address: 183 Raymond Boulevard
Newark, NJ 07105

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Insignificant Source Emissions

IS NJID	Source/Group Description	Equipment Type	Location Description	Estimate of Emissions (tpy)								
				VOC (Total)	NOx	CO	SO	TSP	PM-10	Pb	HAPS (Total)	Other (Total)
IS1	No. 2 Fuel Oil Tanks (<10,000 Gallons Capacity)	Storage Vessel										
IS2	Fuel Oil Tank (>10,000 Gallons Capacity)	Storage Vessel										
Total				0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00000000	0.000

COVANTA ESSEX CO (07736) Date: 10/18/2019
BOP190001

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E1	1	MSW Boiler #1	Incinerator	PCP960005	11/3/1990	No	7/29/1997	
E2	2	MSW Boiler #2	Incinerator	PCP960005	11/26/1990	No	7/29/1997	
E3	3	MSW Boiler #3	Incinerator	PCP960005	12/17/1990	No	7/29/1997	
E4	4	Lime Silo A	Manufacturing and Materials Handling Equipment	PCP960001	11/1/1990	No		
E5	5	Lime Silo B	Manufacturing and Materials Handling Equipment	PCP960002	11/1/1990	No		
E6	6	Lime Silo C	Manufacturing and Materials Handling Equipment	PCP960003	11/1/1990	No		
E7	7	Diesel Generator	Emergency Generator	PCP960006	11/1/1990	No		
E8	8	Diesel Fire Pump	Emergency Generator	PCP960007	11/1/1990	No		
E9	9	Lime Slaker Vent A	Manufacturing and Materials Handling Equipment	PCP960010	11/11/1991	No		
E10	10	Lime Slaker Vent B	Manufacturing and Materials Handling Equipment	PCP960013	11/11/1991	No		
E12	12	Flyash Silo 1	Manufacturing and Materials Handling Equipment	PCP960012	11/11/1991	No		

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E13	13	Flyash Silo 2	Manufacturing and Materials Handling Equipment	PCP960012	11/11/1991	No		
E14	14	Carbon Silo	Manufacturing and Materials Handling Equipment	PCP960005	12/1/1995	No		
E16	16	Ash Conveyance Line "A	Manufacturing and Materials Handling Equipment	PCP960009	11/1/1990	No	11/1/1994	
E17	17	Ash Conveyance Line "B	Manufacturing and Materials Handling Equipment	PCP960009	11/1/1990	No	11/1/1994	
E21	RH-136-CV	Vibratory Conveyor	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E22	RH-150-SC	Grizzly Scalper	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E23	RH-170-CV	Feeder	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E24	FE-200-MAG	Ferrous Magnet	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E25	RH-160-FD	Vibratory Conveyor	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		

New Jersey Department of Environmental Protection
Equipment Inventory

Equip. NJID	Facility's Designation	Equipment Description	Equipment Type	Certificate Number	Install Date	Grand-Fathered	Last Mod. (Since 1968)	Equip. Set ID
E26	NF-230-SC	Screen	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No	12/1/2018	
E27	NF-300-ECS	Eddy Current Separator (+3/8)	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E28	NF-400-MSB	Feeder Conveyor	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No	12/1/2018	
E29	NF-410-ECS	Eddy Current Separator (-3/8)	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E30	E30	Conveyors	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E31	RH-180-VSL	Re-Feed Chute	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		
E32	RH-185-FD	Feeder	Manufacturing and Materials Handling Equipment	BOP120001	10/1/2012	No		

07736 COVANTA ESSEX CO BOP190001 E1 (Incinerator)
Print Date: 10/15/2019

Make:	
Manufacturer:	Foster Wheeler
Model:	
Unit Type:	Mass Burn Waterwall
Description:	
Maximum Waste Processing Capacity:	
Units:	
Physical State of Waste being Incinerated:	Solid
Description:	
Primary Chamber Maximum Gross Heat Input from Fuel (MMbtu/hr, HHV):	423
Primary Chamber Maximum Primary Air (acfm):	109000
Primary Chamber Maximum Gas Flow Rate (acfm):	505350
Primary Chamber Volume (ft^3):	
Primary Chamber Minimum Design Operation Temperature (ºF):	
Primary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Gross Heat Input from Fuel (MMBtu/hr, HHV):	
Secondary Chamber Maximum Primary Air (acfm):	
Secondary Chamber Maximum Gas Flow Rate (acfm):	
Secondary Chamber Volume (ft^3):	
Secondary Chamber Minimum Design Operation Temperature (ºF):	
Secondary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Outlet Air Flow Rate (acfm):	
Secondary Chamber Minimum Outlet Temperature (ºF):	
Type of Plume Supression:	
Do you have a bypass Stack?	○ Yes ● No

07736 COVANTA ESSEX CO BOP190001 E1 (Incinerator)
Print Date: 10/15/2019

Have you attached a diagram showing the location and/or the configuration of this equipment?

- ○ Yes
- ● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?

- ○ Yes
- ● No

Comments:

07736 COVANTA ESSEX CO BOP190001 E2 (Incinerator)
Print Date: 10/15/2019

Make:	
Manufacturer:	Foster Wheeler
Model:	
Unit Type:	Mass Burn Waterwall
Description:	
Maximum Waste Processing Capacity:	
Units:	
Physical State of Waste being Incinerated:	Solid
Description:	
Primary Chamber Maximum Gross Heat Input from Fuel (MMbtu/hr, HHV):	423
Primary Chamber Maximum Primary Air (acfm):	109000
Primary Chamber Maximum Gas Flow Rate (acfm):	505350
Primary Chamber Volume (ft^3):	
Primary Chamber Minimum Design Operation Temperature (ºF):	
Primary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Gross Heat Input from Fuel (MMBtu/hr, HHV):	
Secondary Chamber Maximum Primary Air (acfm):	
Secondary Chamber Maximum Gas Flow Rate (acfm):	
Secondary Chamber Volume (ft^3):	
Secondary Chamber Minimum Design Operation Temperature (ºF):	
Secondary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Outlet Air Flow Rate (acfm):	
Secondary Chamber Minimum Outlet Temperature (ºF):	
Type of Plume Supression:	
Do you have a bypass Stack?	○ Yes ● No

07736 COVANTA ESSEX CO BOP190001 E2 (Incinerator)
Print Date: 10/15/2019

Have you attached a diagram showing the location and/or the configuration of this equipment?

- ○ Yes
- ● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?

- ○ Yes
- ● No

Comments:

07736 COVANTA ESSEX CO BOP190001 E3 (Incinerator)
Print Date: 10/15/2019

Make:	
Manufacturer:	Foster Wheeler
Model:	
Unit Type:	Mass Burn Waterwall
Description:	
Maximum Waste Processing Capacity:	
Units:	
Physical State of Waste being Incinerated:	Solid
Description:	
Primary Chamber Maximum Gross Heat Input from Fuel (MMbtu/hr, HHV):	423
Primary Chamber Maximum Primary Air (acfm):	109000
Primary Chamber Maximum Gas Flow Rate (acfm):	505350
Primary Chamber Volume (ft^3):	
Primary Chamber Minimum Design Operation Temperature (ºF):	
Primary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Gross Heat Input from Fuel (MMBtu/hr, HHV):	
Secondary Chamber Maximum Primary Air (acfm):	
Secondary Chamber Maximum Gas Flow Rate (acfm):	
Secondary Chamber Volume (ft^3):	
Secondary Chamber Minimum Design Operation Temperature (ºF):	
Secondary Chamber Minimum Gas Residence Time (sec):	
Secondary Chamber Maximum Outlet Air Flow Rate (acfm):	
Secondary Chamber Minimum Outlet Temperature (ºF):	
Type of Plume Supression:	
Do you have a bypass Stack?	○ Yes ● No

07736 COVANTA ESSEX CO BOP190001 E3 (Incinerator)
Print Date: 10/15/2019

Have you attached a diagram showing the location and/or the configuration of this equipment?

- ○ Yes
- ● No

Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?

- ○ Yes
- ● No

Comments:

07736 COVANTA ESSEX CO BOP190001 E4 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	Steel Lime Storage Silo
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Lime Storage
Capacity:	6.00E+03
Units:	ft^3
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E5 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	Steel Lime Storage Silo
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Lime Storage
Capacity:	6.00E+03
Units:	ft^3
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E6 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	Steel Lime Storage Silo
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Lime Storage
Capacity:	6.00E+03
Units:	ft^3
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E7 (Emergency Generator)
Print Date: 10/15/2019

Make:	
Manufacturer:	Cummins
Model:	
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	7.00
Will the equipment be used in excess of 500 hours per year?	○ Yes ● No
Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E8 (Emergency Generator)
Print Date: 10/15/2019

Make:	
Manufacturer:	Peerless
Model:	4000
Maximum rated Gross Heat Input (MMBtu/hr-HHV):	1.60
Will the equipment be used in excess of 500 hours per year?	○ Yes ● No
Have you attached a diagram showing the location and/or the configuration of this equipment?	○ Yes ● No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	○ Yes ● No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E9 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Lime Slaker Vent A
Capacity:	
Units:	
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E10 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Lime Slaker Vent B
Capacity:	
Units:	
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E12 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Flyash System A
Capacity:	
Units:	
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E13 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Flyash System B
Capacity:	
Units:	
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E14 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Steel Activated Carbon Storage Silo
Capacity:	2.70E+03
Units:	ft^3
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E16 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Flyash Building Baghouse & Flyash System A I
Capacity:	8.50E+03
Units:	other units
Description (if other):	lb/hr
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E17 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Flyash Building Baghouse & Flyash System B
Capacity:	
Units:	
Description (if other):	
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	

07736 COVANTA ESSEX CO BOP190001 E21 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Conveyor
Capacity:	2.25E+01
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area

07736 COVANTA ESSEX CO BOP190001 E22 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Grizzly Scalper
Capacity:	2.25E+01
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area

07736 COVANTA ESSEX CO BOP190001 E23 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Feeder
Capacity:	2.01E+01
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area

07736 COVANTA ESSEX CO BOP190001 E24 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Ferrous Magnet
Capacity:	3.68E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area

07736 COVANTA ESSEX CO BOP190001 E25 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Conveyor
Capacity:	2.40E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E26 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Screen
Capacity:	1.64E+01
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E27 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	Steinert or equivalent
Model:	NES 150-220-5009 or equivalent
Type of Manufacturing and Materials Handling Equipment:	Eddy Current Separator
Capacity:	6.59E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E28 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	Joest
Model:	
Type of Manufacturing and Materials Handling Equipment:	Feeder
Capacity:	9.83E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E29 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	Steinert or equivalent
Model:	NES 150-210-E6119 or equivalent
Type of Manufacturing and Materials Handling Equipment:	Eddy Current Separator
Capacity:	9.83E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E30 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Conveyors
Capacity:	2.80E+01
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	Located in current ash/ferrous area.

07736 COVANTA ESSEX CO BOP190001 E31 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Re-Fed Chute
Capacity:	2.00E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	U15 ash handling

07736 COVANTA ESSEX CO BOP190001 E32 (Manufacturing and Materials Handling Equipment)
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Type of Manufacturing and Materials Handling Equipment:	Feeder
Capacity:	2.00E+00
Units:	other units
Description (if other):	tons/hour
Have you attached a diagram showing the location and/or the configuration of this equipment?	No
Have you attached any manuf.'s data or specifications to aid the Dept. in its review of this application?	No
Comments:	U15 ash handling

COVANTA ESSEX CO (07736) Date: 10/18/2019

BOP190001

New Jersey Department of Environmental Protection
Control Device Inventory

CD NJID	Facility's Designation	Description	CD Type	Install Date	Grand-Fathered	Last Mod. (Since 1968)	CD Set ID
CD1001	1001	Scrubber - Boiler #1	Scrubber (Other)	11/1/1990	No		
CD1002	1002	Scrubber - Boiler #2	Scrubber (Other)	11/1/1990	No		
CD1003	1003	Scrubber - Boiler #3	Scrubber (Other)	11/1/1990	No		
CD1004	1004	Electrostatic Precipitator - Boiler #1	Electrostatic Precipitator	11/1/1990	No		
CD1005	1005	Electrostatic Precipitator - Boiler #2	Electrostatic Precipitator	11/1/1990	No		
CD1006	1006	Electrostatic Precipitator - Boiler #3	Electrostatic Precipitator	11/1/1990	No		
CD1007	1007	Thermal DeNOx - Boiler #1	Selective Non-Catalytic Reduction	11/1/1994	No	7/29/1997	
CD1008	1008	Thermal DeNOx - Boiler #2	Selective Non-Catalytic Reduction	11/1/1994	No	7/29/1997	
CD1009	1009	Thermal DeNOx - Boiler #3	Selective Non-Catalytic Reduction	11/1/1994	No	7/29/1997	
CD1010	1010	Carbon Injection - Boiler #1	Adsorber	12/1/1995	No	6/21/1996	
CD1011	1011	Carbon Injection - Boiler #2	Adsorber	12/1/1995	No	6/21/1996	
CD1012	1012	Carbon Injection - Boiler #3	Adsorber	12/1/1995	No	6/21/1996	
CD1013	1013	Lime Silo A Baghouse	Particulate Filter (Baghouse)	11/1/1990	No		
CD1014	1014	Lime Silo B Baghouse	Particulate Filter (Baghouse)	11/1/1990	No		
CD1015	1015	Lime Silo C Baghouse	Particulate Filter (Baghouse)	11/1/1990	No		

COVANTA ESSEX CO (07736) Date: 10/18/2019

BOP190001

New Jersey Department of Environmental Protection
Control Device Inventory

CD NJID	Facility's Designation	Description	CD Type	Install Date	Grand-Fathered	Last Mod. (Since 1968)	CD Set ID
CD1017	1017	Flyash Silo A Baghouse	Particulate Filter (Baghouse)	11/11/1991	No		
CD1018	1018	Flyash Silo B Baghouse	Particulate Filter (Baghouse)	11/11/1991	No		
CD1019	1019	Flyash Building Baghose	Particulate Filter (Baghouse)	11/11/1991	No	3/29/2019	
CD1020	1020	Carbon Silo Baghouse	Particulate Filter (Baghouse)	12/1/1995	No		
CD1022	Ash Area Ven	Ash Area Vent Filter	Particulate Filter (Cartridge)	10/1/2012	No		
CD1023	1023	Baghouse - Boiler #1	Particulate Filter (Baghouse)	11/6/2016	No		
CD1024	1024	Baghouse - Boiler #2	Particulate Filter (Baghouse)	5/24/2016	No		
CD1025	1025	Baghouse - Boiler #3	Particulate Filter (Baghouse)	11/1/2015	No		

07736 COVANTA ESSEX CO BOP190001 CD1001 (Scrubber (Other))
Print Date: 10/15/2019

Make:	
Manufacturer:	Belco
Model:	
Scrubber Type:	Spray Dryer Absorber System
Description:	Lime Scrubber
Is the Scrubber used for Particulate Control?	No
Is the Scrubber used for Gas Control?	Yes
Is the Scrubber Equipped with a Mist Eliminator?	No
Minimum Pump Discharge Pressure (in. H2O):	0
Maximum Pump Discharge Pressure (in. H2O):	3600
Method of Monitoring Pump Discharge Pressure:	
Minimum Pump Current (amps):	0
Maximum Pump Current (amps):	50
Method of Monitoring Pump Current:	
Minimum Scrubber Medium Inlet Pressure (in. H2O):	>=6
Minimum Operating Liquid Flow Rate (gpm):	0
Maximum Operating Liquid Flow Rate (gpm):	30
Method of Monitoring Liquid Flow Rate:	Bailey Net 90 Control System
Minimum Operating Gas Flow Rate (acfm):	215000
Maximum Operating Gas Flow Rate (acfm):	315000
Method of Monitoring Gas Flow Rate:	

07736 COVANTA ESSEX CO BOP190001 CD1001 (Scrubber (Other))
Print Date: 10/15/2019

Minimum Operating Pressure Drop (in. H2O):	5.5
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	Manometer
Relative Direction of the Gas-Liquid Flow:	Co - Current
Number of Plates:	
Type of Plates:	
Spacing Between Plates (in.):	11 13/16
Maximum Inlet Gas Temperature (deg F):	491
Maximum Outlet Gas Temperature (deg F):	302
Inlet Particle Grain Loading (gr/dscf):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	SO2 monitor
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	no
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	70
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1002 (Scrubber (Other))
Print Date: 10/15/2019

Make:	
Manufacturer:	Belco
Model:	
Scrubber Type:	Spray Dryer Absorber System
Description:	Lime Scrubber
Is the Scrubber used for Particulate Control?	No
Is the Scrubber used for Gas Control?	Yes
Is the Scrubber Equipped with a Mist Eliminator?	No
Minimum Pump Discharge Pressure (in. H2O):	0
Maximum Pump Discharge Pressure (in. H2O):	3600
Method of Monitoring Pump Discharge Pressure:	
Minimum Pump Current (amps):	0
Maximum Pump Current (amps):	50
Method of Monitoring Pump Current:	
Minimum Scrubber Medium Inlet Pressure (in. H2O):	>=6
Minimum Operating Liquid Flow Rate (gpm):	0
Maximum Operating Liquid Flow Rate (gpm):	30
Method of Monitoring Liquid Flow Rate:	Bailey Net 90 Control System
Minimum Operating Gas Flow Rate (acfm):	215000
Maximum Operating Gas Flow Rate (acfm):	315000
Method of Monitoring Gas Flow Rate:	

07736 COVANTA ESSEX CO BOP190001 CD1002 (Scrubber (Other))
Print Date: 10/15/2019

Minimum Operating Pressure Drop (in. H2O):	5.5
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	Manometer
Relative Direction of the Gas-Liquid Flow:	Co - Current
Number of Plates:	
Type of Plates:	
Spacing Between Plates (in.):	11 13/16
Maximum Inlet Gas Temperature (deg F):	491
Maximum Outlet Gas Temperature (deg F):	302
Inlet Particle Grain Loading (gr/dscf):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	SO2 monitor
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	no
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	70
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1003 (Scrubber (Other))
Print Date: 10/15/2019

Make:	
Manufacturer:	Belco
Model:	
Scrubber Type:	Spray Dryer Absorber System
Description:	Lime Scrubber
Is the Scrubber used for Particulate Control?	No
Is the Scrubber used for Gas Control?	Yes
Is the Scrubber Equipped with a Mist Eliminator?	No
Minimum Pump Discharge Pressure (in. H2O):	0
Maximum Pump Discharge Pressure (in. H2O):	3600
Method of Monitoring Pump Discharge Pressure:	
Minimum Pump Current (amps):	0
Maximum Pump Current (amps):	50
Method of Monitoring Pump Current:	
Minimum Scrubber Medium Inlet Pressure (in. H2O):	>=6
Minimum Operating Liquid Flow Rate (gpm):	0
Maximum Operating Liquid Flow Rate (gpm):	30
Method of Monitoring Liquid Flow Rate:	Bailey Net 90 Control System
Minimum Operating Gas Flow Rate (acfm):	215000
Maximum Operating Gas Flow Rate (acfm):	315000
Method of Monitoring Gas Flow Rate:	

07736 COVANTA ESSEX CO BOP190001 CD1003 (Scrubber (Other))
Print Date: 10/15/2019

Minimum Operating Pressure Drop (in. H2O):	5.5
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	Manometer
Relative Direction of the Gas-Liquid Flow:	Co - Current
Number of Plates:	
Type of Plates:	
Spacing Between Plates (in.):	11 13/16
Maximum Inlet Gas Temperature (deg F):	491
Maximum Outlet Gas Temperature (deg F):	302
Inlet Particle Grain Loading (gr/dscf):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	SO2 monitor
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	no
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	70
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1004 (Electrostatic Precipitator)
Print Date: 10/15/2019

Make:	FLAKT
Manufacturer:	FLAKT
Model:	
Unit Type:	3-Stage Plate
Description:	
Number of Stages:	3
Method of Operation:	HIGH VOLTAGE
Method of Cleaning:	Rapping
Description:	
Capacity (acfm):	184,672 @ 302 degrees F
Maximum Gas Velocity (ft/sec):	137
Type of Rectifier:	Solid State
Maximum Inlet Gas Stream Moisture (%):	17.71
Maximum Inlet Gas Stream Temperature (deg F):	302
Number of Plates:	37
Number of Fields:	3
Aspect Ratio:	
Plate Surface Area (ft2):	1190
Spacing Between Plates (in):	11 13/16
Cross Sectional Area of Precipitator (ft2):	1349
Treatment Time (sec.):	
Maximum Corona Power (Volt):	3 HV units, 55 kV (DC) Avg. 115.5 kVA nominal rating each
Minimum Apparent Migration Velocity (ft/min):	13.2
Maximum Particle Resistivity (ohm-cm):	1E-011

07736 COVANTA ESSEX CO BOP190001 CD1004 (Electrostatic Precipitator)
Print Date: 10/15/2019

Average Particle Size (Micrometers):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	COM required by PCP Condition B.3.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99.9
TSP	99.9
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1005 (Electrostatic Precipitator)
Print Date: 10/15/2019

Make:	FLAKT
Manufacturer:	FLAKT
Model:	
Unit Type:	3-Stage Plate
Description:	
Number of Stages:	3
Method of Operation:	HIGH VOLTAGE
Method of Cleaning:	Rapping
Description:	
Capacity (acfm):	184,672 @ 302 degrees F
Maximum Gas Velocity (ft/sec):	137
Type of Rectifier:	Solid State
Maximum Inlet Gas Stream Moisture (%):	17.71
Maximum Inlet Gas Stream Temperature (deg F):	302
Number of Plates:	37
Number of Fields:	3
Aspect Ratio:	
Plate Surface Area (ft2):	1190
Spacing Between Plates (in):	11 13/16
Cross Sectional Area of Precipitator (ft2):	1349
Treatment Time (sec.):	
Maximum Corona Power (Volt):	3 HV units, 55 kV (DC) Avg. 115.5 kVA nominal rating each
Minimum Apparent Migration Velocity (ft/min):	13.2
Maximum Particle Resistivity (ohm-cm):	1E-011

07736 COVANTA ESSEX CO BOP190001 CD1005 (Electrostatic Precipitator)
Print Date: 10/15/2019

Average Particle Size (Micrometers):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	COM required by PCP Condition B.3.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99.9
TSP	99.9
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1006 (Electrostatic Precipitator)
Print Date: 10/15/2019

Make:	FLAKT
Manufacturer:	FLAKT
Model:	
Unit Type:	3-Stage Plate
Description:	
Number of Stages:	3
Method of Operation:	HIGH VOLTAGE
Method of Cleaning:	Rapping
Description:	
Capacity (acfm):	184,672 @ 302 degrees F
Maximum Gas Velocity (ft/sec):	137
Type of Rectifier:	Solid State
Maximum Inlet Gas Stream Moisture (%):	17.71
Maximum Inlet Gas Stream Temperature (deg F):	302
Number of Plates:	37
Number of Fields:	3
Aspect Ratio:	
Plate Surface Area (ft2):	1190
Spacing Between Plates (in):	11 13/16
Cross Sectional Area of Precipitator (ft2):	1349
Treatment Time (sec.):	
Maximum Corona Power (Volt):	3 HV units, 55 kV (DC) Avg. 115.5 kVA nominal rating each
Minimum Apparent Migration Velocity (ft/min):	13.2
Maximum Particle Resistivity (ohm-cm):	1E-011

07736 COVANTA ESSEX CO BOP190001 CD1006 (Electrostatic Precipitator)
Print Date: 10/15/2019

Average Particle Size (Micrometers):	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	COM required by PCP Condition B.3.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99.9
TSP	99.9
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1007 (Selective Non-Catalytic Reduction)
Print Date: 10/15/2019

Make:	Sierra Environmental
Manufacturer:	Sierra Environmental
Model:	
Minimum Temperature at Reagent Injection Point (deg F):	1600-1700 F
Maximum Temperature at Reagent Injection Point (deg F):	1800-1900 F
Type of Reagent:	Ammonium Hydroxide
Description:	
Minimum Concentration of Reagent in Solution (% Volume):	19
Minimum Reagent Charge Rate (gpm):	0.2
Maximum Reagent Charge Rate (gpm):	7
Maximum NOx to Reagent Mole Ratio:	0.8
Number of Reagent Injectors:	54
Location of Reagent Injectors:	First Pass of Boiler (Injection nozzles located at 84', 95' and 113'
Reagent Injection Method:	Injection Nozzles (18 per boiler level)
Maximum Anticipated Ammonia Slip (ppm):	Less than 50 ppm
Description of Feedback System which Controls the Amount of Reagent Charged to the Control Apparatus:	NOx monitor
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1

Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	50
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1008 (Selective Non-Catalytic Reduction)
Print Date: 10/15/2019

Make:	Sierra Environmental
Manufacturer:	Sierra Environmental
Model:	
Minimum Temperature at Reagent Injection Point (deg F):	1600-1700 F
Maximum Temperature at Reagent Injection Point (deg F):	1800-1900 F
Type of Reagent:	Ammonium Hydroxide
Description:	
Minimum Concentration of Reagent in Solution (% Volume):	19
Minimum Reagent Charge Rate (gpm):	0.2
Maximum Reagent Charge Rate (gpm):	7
Maximum NOx to Reagent Mole Ratio:	0.8
Number of Reagent Injectors:	54
Location of Reagent Injectors:	First Pass of Boiler (Injection nozzles located at 84', 95' and 113'
Reagent Injection Method:	Injection Nozzles (18 per boiler level)
Maximum Anticipated Ammonia Slip (ppm):	Less than 50 ppm
Description of Feedback System which Controls the Amount of Reagent Charged to the Control Apparatus:	NOx monitor
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1

Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	50
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1009 (Selective Non-Catalytic Reduction)
Print Date: 10/15/2019

Make:	Sierra Environmental
Manufacturer:	Sierra Environmental
Model:	
Minimum Temperature at Reagent Injection Point (deg F):	1600-1700 F
Maximum Temperature at Reagent Injection Point (deg F):	1800-1900 F
Type of Reagent:	Ammonium Hydroxide
Description:	
Minimum Concentration of Reagent in Solution (% Volume):	19
Minimum Reagent Charge Rate (gpm):	0.2
Maximum Reagent Charge Rate (gpm):	7
Maximum NOx to Reagent Mole Ratio:	0.8
Number of Reagent Injectors:	54
Location of Reagent Injectors:	First Pass of Boiler (Injection nozzles located at 84', 95' and 113'
Reagent Injection Method:	Injection Nozzles (18 per boiler level)
Maximum Anticipated Ammonia Slip (ppm):	Less than 50 ppm
Description of Feedback System which Controls the Amount of Reagent Charged to the Control Apparatus:	NOx monitor
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	1

Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	No
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	50
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1010 (Adsorber)
Print Date: 10/15/2019

Make:	
Manufacturer:	Norit Americas, Inc.
Model:	
Adsorber Type:	Carbon Injection
Description:	Mercury removal by adsorption onto carbon
Maximum Gas Flow Rate to Adsorber (acfm):	
Maximum Temperature of Vapor Stream to Adsorber (deg F):	491
Minimum Temperature of Vapor Stream to Adsorber (deg F):	
Minimum Moisture Content of Vapor Stream to Adsorber (%):	15 to 20%
Type of Adsorbant:	Carbon (Lignite, DARCO FGD, or equiv.)
Bed Height:	NA
Bed Length:	NA
Bed Width:	NA
Units:	Injection rate: 0 - 100 pounds per hour
Other Bed Dimension:	
Value:	
Units:	
Minimum Pressure Drop Across Adsorber (In H20):	NA
Maximum Pressure Drop Across Adsorber (In H20):	NA
Total Weight of Adsorbant (lbs):	
Total Weight of Adsorbant When Saturated (lbs):	
Maximum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Minimum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Set-up Type:	

Method of Determining Breakthrough:

Continuous Emissions Monitor (CEM)	
Replacement By Weight	Once - Through
Periodic Testing	
Sampling Frequency	
Sampling Device	
Other	
Description:	
Minimum Concentration at Breakthrough (ppmvd):	
Handling Method of Saturated Adsorbant:	Ash Disposal
Method of Regeneration:	NA
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes
Comments:	Carbon injected into boiler exit ductwork.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	
Mercury	80

07736 COVANTA ESSEX CO BOP190001 CD1011 (Adsorber)
Print Date: 10/15/2019

Make:	
Manufacturer:	Norit Americas, Inc.
Model:	
Adsorber Type:	Carbon Injection
Description:	Mercury removal by adsorption onto carbon
Maximum Gas Flow Rate to Adsorber (acfm):	
Maximum Temperature of Vapor Stream to Adsorber (deg F):	491
Minimum Temperature of Vapor Stream to Adsorber (deg F):	
Minimum Moisture Content of Vapor Stream to Adsorber (%):	15 to 20%
Type of Adsorbant:	Carbon (Lignite, DARCO FGD, or equiv.)
Bed Height:	NA
Bed Length:	NA
Bed Width:	NA
Units:	Injection rate: 0 - 100 pounds per hour
Other Bed Dimension:	
Value:	
Units:	
Minimum Pressure Drop Across Adsorber (In H20):	NA
Maximum Pressure Drop Across Adsorber (In H20):	NA
Total Weight of Adsorbant (lbs):	
Total Weight of Adsorbant When Saturated (lbs):	
Maximum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Minimum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Set-up Type:	

07736 COVANTA ESSEX CO BOP190001 CD1011 (Adsorber)
Print Date: 10/15/2019

Method of Determining Breakthrough:

Continuous Emissions Monitor (CEM)	
Replacement By Weight	Once - Through
Periodic Testing	
Sampling Frequency	
Sampling Device	
Other	
Description:	
Minimum Concentration at Breakthrough (ppmvd):	
Handling Method of Saturated Adsorbant:	Ash Disposal
Method of Regeneration:	NA
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes
Comments:	Carbon injected into boiler exit ductwork.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	
Mercury	80

07736 COVANTA ESSEX CO BOP190001 CD1012 (Adsorber)
Print Date: 10/15/2019

Make:	
Manufacturer:	Norit Americas, Inc.
Model:	
Adsorber Type:	Carbon Injection
Description:	Mercury removal by adsorption onto carbon
Maximum Gas Flow Rate to Adsorber (acfm):	
Maximum Temperature of Vapor Stream to Adsorber (deg F):	491
Minimum Temperature of Vapor Stream to Adsorber (deg F):	
Minimum Moisture Content of Vapor Stream to Adsorber (%):	15 to 20%
Type of Adsorbant:	Carbon (Lignite, DARCO FGD, or equiv.)
Bed Height:	NA
Bed Length:	NA
Bed Width:	NA
Units:	Injection rate: 0 - 100 pounds per hour
Other Bed Dimension:	
Value:	
Units:	
Minimum Pressure Drop Across Adsorber (In H20):	NA
Maximum Pressure Drop Across Adsorber (In H20):	NA
Total Weight of Adsorbant (lbs):	
Total Weight of Adsorbant When Saturated (lbs):	
Maximum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Minimum Adsorbant Capacity (lbs Adsorbate/lbs Adsorbant):	
Set-up Type:	

07736 COVANTA ESSEX CO BOP190001 CD1012 (Adsorber)
Print Date: 10/15/2019

Method of Determining Breakthrough:

Continuous Emissions Monitor (CEM)	
Replacement By Weight	Once - Through
Periodic Testing	
Sampling Frequency	
Sampling Device	
Other	
Description:	
Minimum Concentration at Breakthrough (ppmvd):	
Handling Method of Saturated Adsorbant:	Ash Disposal
Method of Regeneration:	NA
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes
Comments:	Carbon injected into boiler exit ductwork.

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	
Mercury	80

07736 COVANTA ESSEX CO BOP190001 CD1013 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	Griffen
Model:	DF44
Number of Bags:	54
Size of Bags (ft2):	7.6
Total Bag Area (ft2):	375
Bag Fabric:	Polypropylene
Fabric Weight (oz/ft):	16 oz/ sq yd.
Fabric Weave:	non - woven
Fabric Finish:	plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	1300
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.28:1 @ 340 ACFM
Minimum Operating Pressure Drop (in. H2O):	4
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	
Maximum Operating Exhaust Gas Flow Rate (acfm):	800
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1013 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative Maintenance Schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Mechanical shaking
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1014 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	Griffen
Model:	DF44
Number of Bags:	54
Size of Bags (ft2):	7.6
Total Bag Area (ft2):	375
Bag Fabric:	Polypropylene
Fabric Weight (oz/ft):	16 oz/ sq yd.
Fabric Weave:	non - woven
Fabric Finish:	plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	1300
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.28:1 @ 340 ACFM
Minimum Operating Pressure Drop (in. H2O):	4
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	
Maximum Operating Exhaust Gas Flow Rate (acfm):	800
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1014 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative Maintenance Schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Mechanical Shaking
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1015 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	Griffen
Model:	DF44
Number of Bags:	54
Size of Bags (ft2):	7.6
Total Bag Area (ft2):	375
Bag Fabric:	Polypropylene
Fabric Weight (oz/ft):	16 oz/ sq yd.
Fabric Weave:	non - woven
Fabric Finish:	plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	1300
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.28:1 @ 340 ACFM
Minimum Operating Pressure Drop (in. H2O):	4
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	
Maximum Operating Exhaust Gas Flow Rate (acfm):	800
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1015 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative Maintenance Schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Mechanical Shaking
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1017 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Number of Bags:	9
Size of Bags (ft2):	7.2
Total Bag Area (ft2):	65
Bag Fabric:	Polyester Felt
Fabric Weight (oz/ft):	16
Fabric Weave:	Non - Woven
Fabric Finish:	Plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	400
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.2:1 @ 340 acfm
Minimum Operating Pressure Drop (in. H2O):	3
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	190
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	Saturated @ 190 degrees F
Maximum Operating Exhaust Gas Flow Rate (acfm):	400
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1017 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative maintenance Schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Pulse Jet
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99.8
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1018 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Number of Bags:	9
Size of Bags (ft2):	7.2
Total Bag Area (ft2):	65
Bag Fabric:	Polyester Felt
Fabric Weight (oz/ft):	16
Fabric Weave:	Non - Woven
Fabric Finish:	Plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	400
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.2:1 @ 340 acfm
Minimum Operating Pressure Drop (in. H2O):	3
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	190
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	Saturated @ 190 degrees F
Maximum Operating Exhaust Gas Flow Rate (acfm):	400
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1018 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative maintenance Schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Pulse Jet
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99.8
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1019 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Number of Bags:	36
Size of Bags (ft2):	10.6
Total Bag Area (ft2):	382
Bag Fabric:	Polypropylene
Fabric Weight (oz/ft):	16
Fabric Weave:	Felt
Fabric Finish:	Plain
Maximum Design Temperature Capability (deg F):	180
Maximum Design Air Flow Rate (acfm):	2000
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	5.24:1 @ 2000 ACFM
Minimum Operating Pressure Drop (in. H2O):	3
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	110
Minimum Inlet Temperature (deg F):	40
Dew Point of Gas Stream (deg F):	
Maximum Operating Exhaust Gas Flow Rate (acfm):	2000
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1019 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is Done on a Preventative maintenance schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Pulse Jet
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	99
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1020 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	
Manufacturer:	
Model:	
Number of Bags:	25
Size of Bags (ft2):	10.6
Total Bag Area (ft2):	265
Bag Fabric:	Polyester felt
Fabric Weight (oz/ft):	16
Fabric Weave:	Felt
Fabric Finish:	Plain
Maximum Design Temperature Capability (deg F):	250
Maximum Design Air Flow Rate (acfm):	1000
Draft Type:	
Maximum Air Flow Rate to Cloth Area Ratio:	1:01
Minimum Operating Pressure Drop (in. H2O):	4
Maximum Operating Pressure Drop (in. H2O):	6
Method of Monitoring Pressure Drop:	
Maximum Inlet Temperature (deg F):	
Minimum Inlet Temperature (deg F):	
Dew Point of Gas Stream (deg F):	
Maximum Operating Exhaust Gas Flow Rate (acfm):	1000
Maximum Inlet Gas Stream Moisture Content (%):	

07736 COVANTA ESSEX CO BOP190001 CD1020 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Method for Determining When Bag Replacement is Required:	Replacement is done on a preventative maintenance schedule.
Method for Determining When Cleaning is Required:	
Method of Bag Cleaning:	Pulse Jet
Is Bag Cleaning Conducted On-Line?	
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	No
Have you attached data from recent performance testing?	No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	Yes
Comments:	

Control Device Design Efficiency Table

Pollutant Category	Design Efficiency (%)
PM-10	
TSP	
VOC	
NOx	
SO2	
CO	
Pb	
HAPs (Total)	
Other (Total)	
Individual HAPs/Other (speciate below)	

07736 COVANTA ESSEX CO BOP190001 CD1022 (Particulate Filter (Cartridge))
Print Date: 10/15/2019

Make:	Donaldson DownFlo OVAL
Manufacturer:	Donaldson Company, Inc.
Model:	DFO 4-16
Number of Cartridges:	16
Size of Cartridges (ft^2):	190.00
Total Cartridge Area (ft^2):	3,040.00
Maximum Design Temperature Capability (°F):	150.0
Maximum Design Air Flow Rate (acfm):	10,000.0
Maximum Air Flow Rate to Filter Area Ratio:	3.28
Minimum Operating Pressure Drop (in. H2O):	0.40
Maximum Operating Pressure Drop (in. H2O):	6.00
Maximum Inlet Temperature (°F):	150.0
Maximum Operating Exhuast Gas Flow Rate (acfm):	10,000.0
Method for Determining When Cartridge Replacement is Required:	Preventative maintenance schedule based on manufacturer's recommendations.
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	
Have you attached a Particle Size Distribution Analysis?	○ Yes ● No
Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	● Yes ○ No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	○ Yes ● No
Comments:	Minimum 99% control efficiency (MERV 13 rating)

07736 COVANTA ESSEX CO BOP190001 CD1023 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	TBD
Manufacturer:	TBD
Model:	TBD
Number of Bags:	
Size of Bags (ft²):	
Total Bag Area (ft²):	0.0
Bag Fabric:	PPS
Fabric Weight (oz/ft²):	
Fabric Weave:	Felt
Fabric Finish:	PTFE
Maximum Design Temperature Capability (°F):	375.0
Maximum Design Air Flow Rate (acfm):	240,000.0
Draft Type:	Balanced
Maximum Air Flow Rate to Cloth Area Ratio:	2.70
Minimum Operating Pressure Drop (in. H2O):	2.00
Maximum Operating Pressure Drop (in. H2O):	12.00
Method of Monitoring Pressure Drop:	Pressure Drop Transmitter
Maximum Inlet Temperature (°F):	375.0
Minimum Inlet Temperature (°F):	290.0
Dew Point of Gas Stream Maximum Inlet Temperature (°F):	262
Maximum Operating Exhuast Gas Flow Rate (acfm):	234,000.0
Maximum Inlet Gas Stream Moisture Content (%):	21.00
Method for Determining When Bag Replacement is Required:	A change in opacity level signifies that bag replacement is required.
Method for Determining When Cleaning is Required:	Cleaning cycle is initiated based upon differential pressure across the baghouse and operating time.
Method of Bag Cleaning:	Pulse Jet
Description:	
Is Bag Cleaning Conducted On-Line?	(●) Yes ( ) No
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	Continuous opacity monitoring and annual emissions testing are used to demonstrate that the control apparatus is functioning properly.
Have you attached a Particle Size Distribution Analysis?	( ) Yes (●) No

07736 COVANTA ESSEX CO BOP190001 CD1023 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	● Yes ○ No
Comments:	Number of bags, size of bags, total bag area, and fabric weight will be provided upon vendor selection. Total bag area is listed as 0.0 due to a RADIUS error. Maximum Air Flow Rate to Cloth Area Ratio is 2.4 at MCR and 2.7 at 110% MCR.

07736 COVANTA ESSEX CO BOP190001 CD1024 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	TBD
Manufacturer:	TBD
Model:	TBD
Number of Bags:	
Size of Bags (ft²):	
Total Bag Area (ft²):	0.0
Bag Fabric:	PPS
Fabric Weight (oz/ft²):	
Fabric Weave:	Felt
Fabric Finish:	PTFE
Maximum Design Temperature Capability (°F):	375.0
Maximum Design Air Flow Rate (acfm):	240,000.0
Draft Type:	Balanced
Maximum Air Flow Rate to Cloth Area Ratio:	2.70
Minimum Operating Pressure Drop (in. H2O):	2.00
Maximum Operating Pressure Drop (in. H2O):	12.00
Method of Monitoring Pressure Drop:	Pressure Drop Transmitter
Maximum Inlet Temperature (°F):	375.0
Minimum Inlet Temperature (°F):	290.0
Dew Point of Gas Stream Maximum Inlet Temperature (°F):	262
Maximum Operating Exhuast Gas Flow Rate (acfm):	234,000.0
Maximum Inlet Gas Stream Moisture Content (%):	21.00
Method for Determining When Bag Replacement is Required:	A change in opacity level signifies that bag replacement is required.
Method for Determining When Cleaning is Required:	Cleaning cycle is initiated based upon differential pressure across the baghouse and operating time.
Method of Bag Cleaning:	Pulse Jet
Description:	
Is Bag Cleaning Conducted On-Line?	(●) Yes ( ) No
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	Continuous opacity monitoring and annual emissions testing are used to demonstrate that the control apparatus is functioning properly.
Have you attached a Particle Size Distribution Analysis?	( ) Yes (●) No

07736 COVANTA ESSEX CO BOP190001 CD1024 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	● Yes ○ No
Comments:	Number of bags, size of bags, total bag area, and fabric weight will be provided upon vendor selection. Total bag area is listed as 0.0 due to a RADIUS error. Maximum Air Flow Rate to Cloth Area Ratio is 2.4 at MCR and 2.7 at 110% MCR.

07736 COVANTA ESSEX CO BOP190001 CD1025 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Make:	TBD
Manufacturer:	TBD
Model:	TBD
Number of Bags:	
Size of Bags (ft²):	
Total Bag Area (ft²):	0.0
Bag Fabric:	PPS
Fabric Weight (oz/ft²):	
Fabric Weave:	Felt
Fabric Finish:	PTFE
Maximum Design Temperature Capability (°F):	375.0
Maximum Design Air Flow Rate (acfm):	240,000.0
Draft Type:	Balanced
Maximum Air Flow Rate to Cloth Area Ratio:	2.70
Minimum Operating Pressure Drop (in. H2O):	2.00
Maximum Operating Pressure Drop (in. H2O):	12.00
Method of Monitoring Pressure Drop:	Pressure Drop Transmitter
Maximum Inlet Temperature (°F):	375.0
Minimum Inlet Temperature (°F):	290.0
Dew Point of Gas Stream Maximum Inlet Temperature (°F):	262
Maximum Operating Exhuast Gas Flow Rate (acfm):	234,000.0
Maximum Inlet Gas Stream Moisture Content (%):	21.00
Method for Determining When Bag Replacement is Required:	A change in opacity level signifies that bag replacement is required.
Method for Determining When Cleaning is Required:	Cleaning cycle is initiated based upon differential pressure across the baghouse and operating time.
Method of Bag Cleaning:	Pulse Jet
Description:	
Is Bag Cleaning Conducted On-Line?	(●) Yes ( ) No
Maximum Number of Sources Using this Apparatus as a Control Device (Include Permitted and Non-Permitted Sources):	1
Alternative Method to Demonstrate Control Apparatus is Operating Properly:	Continuous opacity monitoring and annual emissions testing are used to demonstrate that the control apparatus is functioning properly.
Have you attached a Particle Size Distribution Analysis?	( ) Yes (●) No

07736 COVANTA ESSEX CO BOP190001 CD1025 (Particulate Filter (Baghouse))
Print Date: 10/15/2019

Have you attached data from recent performance testing?	○ Yes ● No
Have you attached any manufacturer's data or specifications in support of the feasibility and/or effectiveness of this control apparatus?	○ Yes ● No
Have you attached a diagram showing the location and/or configuration of this control apparatus?	● Yes ○ No
Comments:	Number of bags, size of bags, total bag area, and fabric weight will be provided upon vendor selection. Total bag area is listed as 0.0 due to a RADIUS error. Maximum Air Flow Rate to Cloth Area Ratio is 2.4 at MCR and 2.7 at 110% MCR.

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Points Inventory

PT NJID	Facility's Designation	Description	Config.	Equiv. Diam. (in.)	Height (ft.)	Dist. to Prop. Line (ft)	Exhaust Temp. (deg. F)			Exhaust Vol. (acfm)			Discharge Direction	PT Set ID
							Avg.	Min.	Max.	Avg.	Min.	Max.		
PT1	U0001	MSW BOILER #1	Round	91	279	230	285.0	200.0	300.0	181,000.0	140,000.0	220,000.0	Up	
PT2	U0002	MSW BOILER #2	Round	91	279	230	285.0	200.0	300.0	181,000.0	140,000.0	220,000.0	Up	
PT3	U0003	MSW BOILER #3	Round	91	279	230	285.0	200.0	300.0	181,000.0	140,000.0	220,000.0	Up	
PT4	U0006	LIME SILO A	Rectangle	12	72	375	60.0	-10.0	100.0	1,176.0	1,176.0	1,176.0	Horizontal	
PT5	U0007	LIME SILO B	Rectangle	12	72	375	60.0	-10.0	100.0	1,176.0	1,176.0	1,176.0	Horizontal	
PT6	U0008	LIME SILO C	Rectangle	12	72	375	60.0	-10.0	100.0	1,176.0	1,176.0	1,176.0	Horizontal	
PT7	U0013	DIESEL GENERATOR	Round	12	43	360	915.0	915.0	915.0	6,915.0	6,915.0	6,915.0	Horizontal	
PT8	U0014	DIESEL FIRE PUMP	Round	8	39	125	983.0	982.0	982.0	1,200.0	1,200.0	1,200.0	Horizontal	
PT9	U0009	LIME SLAKER VENT A	Round	6	20	250	85.0	60.0	140.0	37.0	37.0	37.0	Horizontal	
PT10	U0010	LIME SLAKER VENT B	Round	6	20	250	85.0	60.0	140.0	37.0	37.0	37.0	Horizontal	
PT12	U0012	FLY ASH CONDITIONING ROOM	Rectangle	8	71	376	80.0	40.0	110.0	2,000.0	2,000.0	2,000.0	Horizontal	
PT13	U0004	#2 FUEL OIL STORAGE TANK	Round	3	3	100	60.0	-10.0	100.0	5.0	1.0	8.0	Down	
PT14	U0011	CARBON SILO	Round	12	35	375	60.0	-10.0	100.0	1,200.0	100.0	1,200.0	Horizontal	
PT15	U0015	ASH CONVEYANCE	Square	42	8	376	60.0	40.0	90.0	6,000.0	0.0	9,600.0	Horizontal	

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 1 MWC #1,#2,#3 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	MWC 1	Operation of MWC #1 at Maximum Input (423 MMBtu/hr).	Normal - Steady State	E1	CD1001 (T) CD1004 (T) CD1007 (P) CD1010 (S)	PT1	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS2	MWC 1	Operation of MWC #1 under Malfunction conditions	Malfunction	E1	CD1001 (T) CD1004 (T) CD1007 (P) CD1010 (S)	PT1	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS3	MWC 2	Operation of MWC #2 at Maximum Input (423 MMBtu/hr)	Normal - Steady State	E2	CD1002 (T) CD1005 (T) CD1008 (P) CD1011 (S)	PT2	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS4	MWC 2	Operation of MWC #2 under Malfunction conditions	Malfunction	E2	CD1002 (T) CD1005 (T) CD1008 (P) CD1011 (S)	PT2	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS5	MWC 3	Operation of MWC #3 at Maximum Input (423 MMBtu/hr)	Normal - Steady State	E3	CD1003 (T) CD1006 (T) CD1009 (P) CD1012 (S)	PT3	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS6	MWC 3	Operation of MWC #3 under Malfunction conditions	Malfunction	E3	CD1003 (T) CD1006 (T) CD1009 (P) CD1012 (S)	PT3	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 1 MWC #1,#2,#3 MWC #1, 2, 3 Municipal Waste Combustors (E1, E2, and E3)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS10	MWC 1	Operation of MWC #1 at Maximum Input (423 MMBtu/hr) with Baghouse	Normal - Steady State	E1	CD1001 (T) CD1007 (P) CD1010 (S) CD1023 (T)	PT1	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS11	MWC 2	Operation of MWC #2 at Maximum Input (423 MMBtu/hr) with Baghouse	Normal - Steady State	E2	CD1002 (T) CD1008 (P) CD1011 (S) CD1024 (T)	PT2	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0
OS12	MWC 3	Operation of MWC #3 at Maximum Input (423 MMBtu/hr) with Baghouse	Normal - Steady State	E3	CD1003 (T) CD1009 (P) CD1012 (S) CD1025 (T)	PT3	5-03-001-12	0.0	8,760.0		140,000.0	233,500.0	200.0	300.0

U 6 Silo A Lime Storage Silo A (E4)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS1	Silo A	Silo A	Normal - Steady State	E4	CD1013 (P)	PT4		2,920.0	8,760.0		1,176.0	1,176.0	-10.0	110.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 6 Silo A Lime Storage Silo A (E4)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS6	Silo A	Lime Storage Silo - A	Normal - Steady State	E4	CD1013 (P)	PT4		2,920.0	8,760.0		1,176.0	1,176.0	-10.0	110.0

U 7 Silo B Lime Storage Silo B (E5)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS7	Silo B	Lime Storage Silo - B	Normal - Steady State	E5	CD1014 (P)	PT5		2,920.0	8,760.0		1,176.0	1,176.0	-10.0	110.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 8 Silo C Lime Storage Silo C (E6)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS8	Silo C	Lime Storage Silo - C	Normal - Steady State	E6	CD1015 (P)	PT6		2,920.0	8,760.0		1,176.0	1,176.0	-10.0	110.0

U 9 Slaker A Lime Slaker Vent A (E9)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS9	Slaker A	Lime Slaker Vent A	Normal - Steady State	E9		PT9		4,380.0	8,760.0		37.0	37.0	60.0	140.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 10 Slaker B Lime Slaker Vent B (E10)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS10	Slaker B	Lime Slaker Vent B	Normal - Steady State	E10		PT10		4,380.0	8,760.0		37.0	37.0	60.0	140.0

U 11 Carbon Silo Activated Carbon Storage Silo (E14)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS11	Carbon Silo	Activated Carbon Storage Silo	Normal - Steady State	E14	CD1020 (P)	PT14		8,760.0	8,760.0		1,200.0	1,200.0	-10.0	110.0

U 12 Flyash Cond Flyash Conditioning Room (E12,E13)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS12	Silo 1	Flyash storage in Silo 1	Normal - Steady State	E12	CD1017 (P) CD1019 (S)	PT12		8,760.0	8,760.0		2,000.0	2,000.0	40.0	110.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 12 Flyash Cond Flyash Conditioning Room (E12,E13)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS15	Silo 2	Flyash storage in Silo 2	Normal - Steady State	E13	CD1018 (P) CD1019 (S)	PT12		8,760.0	8,760.0		2,000.0	2,000.0	40.0	110.0

U 13 Em Generator 7.4 MMBtu/hr, 740 KW Diesel Engine-Driven Emergency Generator (E7)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS13	Generator	Emergency Diesel Generator	Normal - Steady State	E7		PT7		0.0	500.0		6,915.0	6,915.0	915.0	915.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 14 Em FW Pump 1.59 MMBtu/hr Emergency Diesel Engine-Driven Fire Pump (E8)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS14	Fire Pump	Emergency Diesel Fire Pump	Normal - Steady State	E8		PT8		0.0	500.0		1,200.0	1,200.0	982.0	982.0

U 15 Ash Convey Ash and Metals Recovery System (E16, E17, E21-E30)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours Min.	Annual Oper. Hours Max.	VOC Range	Flow (acfm) Min.	Flow (acfm) Max.	Temp. (deg F) Min.	Temp. (deg F) Max.
OS16	Ash Convey A	Ash Conveyance Line A	Normal - Steady State	E16	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS17	Ash Convey B	Ash Conveyance Line B	Normal - Steady State	E17	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS21	RH-136-CV	Vibratory Conveyor E21 transporting ash to Grizzly Scalper	Normal - Steady State	E21	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS22	RH-150-SC	Grizzly Scalper E22 separating large pieces of ferrous metal for recovery	Normal - Steady State	E22	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS23	RH-160-FD	Vibratory Conveyor E25 transporting bulky ferrous to load out bunker	Normal - Steady State	E25	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS24	RH-170-CV	Feeder E23 transporting ash to ferrous recovery magnet	Normal - Steady State	E23	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0

COVANTA ESSEX CO (07736)
BOP190001

Date: 10/18/2019

New Jersey Department of Environmental Protection
Emission Unit/Batch Process Inventory

U 15 Ash Convey Ash and Metals Recovery System (E16, E17, E21-E30)

UOS NJID	Facility's Designation	UOS Description	Operation Type	Signif. Equip.	Control Device(s)	Emission Point(s)	SCC(s)	Annual Oper. Hours		VOC Range	Flow (acfm)		Temp. (deg F)	
								Min.	Max.		Min.	Max.	Min.	Max.
OS25	FE-200-MAG	Ferrous material separation by Drum Magnet E24	Normal - Steady State	E24	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS26	NF-230-SC	Screen E26 separating remainder of ash into large & small	Normal - Steady State	E26	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS27	NF-300-ECS	Eddy Current Separator (+3/8) E27 separating larger non-ferrous metal	Normal - Steady State	E27	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS28	NF-400-MSB	Conveyor E28 transporting smaller material -3/8 to E29	Normal - Steady State	E28	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS29	NF-410-ECS	Eddy Current Separator (-3/8) E29 separating smaller non-ferrous metal	Normal - Steady State	E29	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS30	E30	Conveyors E30 trasnporting to and from metals recovery systems	Normal - Steady State	E30	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS31	ReFeed Chute	Transferring ash residue from bunker to feeder (for reporcessing)	Normal - Steady State	E31	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0
OS32	Vib Conv E32	Transporting ash to re-feed metal recovery system	Normal - Steady State	E32	CD1022 (P)	PT15		4,380.0	8,760.0		0.0	10,000.0	40.0	110.0

Date: 10/18/2019

New Jersey Department of Environmental Protection
Subject Item Group Inventory

Group NJID: GR1 NSPS Sub A

Members:

Type	ID	OS	Step
U	U 1	OS0 Summary	
U	U 15	OS0 Summary	

Formal Reason(s) for Group/Cap:

☑ Other

Other (explain): Showing Subpart A requirements applicable to 2 emission units (U1 & U15)

Condition/Requirements that will be complied with or are no longer applicable as a result of this Group:

Operating Circumstances: