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**Re: Advanced Clean Trucks Program and Fleet Reporting Requirements Proposed Rule DEP Docket No. 05-21-03**

The Coalition for Healthy Ports NY/NJ ("CHP") – led by Clean Water Action, Greenfaith, International Brotherhood of Teamsters, Ironbound Community Corporation, and New Jersey Environmental Justice Alliance – and Earthjustice submit these comments to the New Jersey Department of Environmental Protection ("DEP") in support of the Advanced Clean Trucks Program and Fleet Reporting Requirements Proposed Rule, DEP Docket No. 05-21-03 ("ACT Rule"). CHP urges DEP to implement a multi-pronged program to eliminate the freight and goods-movement industry's environmental impacts on New Jersey communities, and reducing emissions from medium and heavy-duty vehicles ("MHDVs") through adoption of the ACT Rule is a necessary first step towards that goal. Freight-adjacent communities, like the people who live and work around the Port Newark-Elizabeth Marine Terminal ("Port Newark" or "the Port"), have disproportionately born the burdens of New Jersey's goods-movement industry for far too long, and DEP must ensure that its mobile source programs target emission reductions in these overburdened communities.

CHP is a broad coalition of over 50 environmental, labor, faith, community, environmental justice, and business organizations that seek to create sustainable ports in New York and New Jersey. CHP's mission is to improve the air quality, safety, security, and working conditions for all workers that support port commerce and to assure environmental justice and prevent harm in affected communities. CHP believes that maintaining environmental, labor, and community standards will enhance the Port's position and will enhance growth in the region. CHP represents the New York/New Jersey region in the Moving Forward Network, a national advocacy network of over 50 member organizations that centers knowledge, expertise, and engagement from communities that bear the negative impacts of the global freight transportation system.

For over a decade, CHP has called on stakeholders like the New Jersey government to take action to reduce emissions associated with Port Newark and improve quality of life in the surrounding communities. Reducing emissions from the thousands of diesel drayage trucks and other diesel MHDVs that drive through Port-adjacent communities every day is a particular concern of CHP. CHP has submitted and joined several comments, letters, and briefing books to New Jersey and regional agencies on this topic.[1]

For years, the New Jersey environmental justice ("EJ") community has advocated[2] that climate change mitigation policy should be designed and utilized not only to fight climate change, but also to address the disproportionate amount of pollution often found in EJ communities, *i.e.*, communities Of Color and low-income communities.[3] In the power generation sector, CHP members like the New Jersey EJ Alliance, Ironbound Community Corporation, and their allies have proposed that air pollution emission reductions should be mandated by requiring power plants to reduce their emissions if they are located in EJ communities or if their emissions significantly impact these communities.[4] In this way, emissions of locally harmful greenhouse gas co-pollutants would be diminished. The New Jersey EJ community believes that policies that both fight climate change and ensure emissions reductions in EJ communities also need to be developed for the transportation sector. The necessity of ensuring emissions reductions for EJ residential communities is one of the primary reasons the EJ advocacy community and allies have opposed the Transportation and Climate Initiative ("TCI"),[5] a climate change mitigation program for mobile sources facilitated by the Georgetown Climate Center that

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[1] *See, e.g.*, CHP, Gubernatorial Ports Briefing (2017) (attached here as Attachment 1); CHP, Reinstate the Ban on Polluting Port Trucks (June 2017) (attached here as Attachment 2); CHP, Policy Brief Clean Air Mitigation Strategies (attached here as Attachment 3); Coalition Letter to Paul Miller, Ozone Transport Commission (May 22, 2020) (attached here as Attachment 4); CHP Comments on New Jersey Protecting Against Climate Threats (Oct. 8, 2020) (attached here as Attachment 5); Paul Allen et al., *Newark Community Impacts of Mobile Source Emissions: A Community-Based Participatory Research Analysis* 1 (M.J. Bradley & Associates 2020), http://www.njeja.org/wp-content/uploads/2020/11/NewarkCommunityImpacts_FINAL-2.pdf (attached as Attachment 6) ("Newark Community Impacts Study"); Coalition Letter to Northeast States for Coordinated Air Use Management (Feb. 25, 2021), https://www.nescaum.org/files/mhdzev-attachments/Coalition%20Sign-On%20Letter_ACT%20and%20HDO%20Rule%20Adoption_2-25-2021.pdf (attached here as Attachment 7); Letter from CHP et al. to Shawn LaTourette, Acting Commissioner, DEP (Mar. 26, 2021) (attached here as Attachment 8).

[2] *See* Nicky Sheats, *Achieving Emissions Reductions For Environmental Justice Communities Through Climate Change Mitigation Policy*, 41 William and Mary Env't L. and Pol'y Rev. 377 (2017); New Jersey Environmental Justice Alliance, *New Jersey Environmental Justice Alliance Climate Change and Energy Policy Platform,* (2017).

[3] On the national level *see* two time-honored studies that show the siting of unwanted land uses is heavily influenced by race and income: U.S. Government Accounting Office, *Siting Of Hazardous Waste Landfills And Their Correlation With Racial And Economic Status Of Surrounding Communities* (1983); Robert D. Bullard et al., *Toxic Waste and Race at Twenty: 1987-2007* (2007).

In New Jersey, DEP developed a nascent cumulative impacts screening tool that provided evidence of disproportionate pollution burdens in New Jersey communities Of color and low-income communities. Two figures produced by the tool show that as the number of residents Of Color or low-income residents increases, the estimated level of cumulative impacts in a community also increases. In this context, cumulative impacts can be thought of as an estimate of the total amount of pollution in a community. These figures can be seen in a technical report and power point that are both entitled "A Preliminary Screening Method to Estimate Cumulative Environmental Impacts." The figures are on page five of the report and slide 19 of the power point, which can be accessed at https://www.state.nj.us/dep/ej/docs/ejc_screeningmethods20091222.pdf and https://www.state.nj.us/dep/ej/docs/ejc_screeningmethods_pp20091222.pdf, respectively.

[4] *See* Sheats, *supra* note 2; Bullard et al., *supra* note 2.

[5] Maria Lopez-Nunez and Melissa Miles, *Environmental Justice Communities Call on New Jersey to Reject the Transportation and Climate Initiative,* (Sept. 18, 2020); Center for Earth, Energy and Democracy et al., *Environmental Justice Organizations Oppose the Transportation and Climate Initiative* (Dec. 3, 2020).

is being created for Northeastern states.[6] At its core, TCI will use a carbon-trading system that does not guarantee emissions reductions in EJ communities and the Initiative has not yet developed other policies that will.[7]

CHP adopts the EJ policy position that climate change mitigation policy should guarantee emissions reductions in EJ communities and supports the EJ community's opposition to TCI. For the reasons stated in these comments, CHP also supports New Jersey's adoption of the ACT Rule. Additionally, CHP believes that if complementary regulations and strategies are implemented that ensure the rules will deliver emission reductions in EJ communities soon after their enactment, then this suite of rules and strategies will be an example of the types of transportation policy that should be enacted in New Jersey. This type of policy will obviate the need for a TCI-type program that employs a carbon-trading system.

## I. BACKGROUND ON PORT NEWARK

Port Newark is the largest port in the United States outside of Southern California, housing 80% of the cargo capacity of all marine facilities of the Port Authority of New York and New Jersey ("PANYNJ").[8] More than seven million units of cargo, each roughly equivalent to the volume of a standard shipping container, passed through Port Newark in 2019.[9] That number is expected to more than double by 2050.[10] Indeed, the Port has broken multiple throughput records so far in 2021 alone, notwithstanding the effects of the COVID-19 pandemic.[11]

Diesel drayage trucks transport 85% of the goods from the Port to warehouses, assembly facilities, and retailers in the immediate region.[12] On average, more than 9,000 truck drivers make 14,000 trips each day along local roads and major highways, passing schools, playgrounds, offices, and homes.[13] Twenty percent of these truck trips to the Port start in Newark, and 23% of trips from the Port end in Newark.[14]

These truck trips generate harmful air pollution and negatively affect quality of life in Newark and other Port-adjacent communities.[15] In the Ironbound section of Newark immediately north of the Port, some 24% of mobile-source NOx emissions, 14% of mobile-source fine particulate matter ("PM2.5"), and 19% of mobile-source black carbon come from MHDVs.[16]

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[6] *See* TCI, *About Us*, https://www.transportationandclimate.org/content/about-us.
[7] *See* TCI, *Transportation and Climate Initiative Statement* (Dec. 18, 2018), https://www.georgetownclimate.org/files/Final_TCI-statement_20181218_formatted.pdf and TCI website, *id.*
[8] *See* CHP, Gubernatorial Ports Briefing, Att. 1 at 3; PANYNJ, Containers, https://www.panynj.gov/port/en/shipping/containers.html (last visited Jun. 11, 2021); PANYNJ, Port Master Plan at 10, https://www.panynj.gov/port/en/our-port/port-development/port-master-plan.html.
[9] PANYNJ, Containers, https://www.panynj.gov/port/en/shipping/containers.html (last visited Jun. 11, 2021).
[10] Port Master Plan, *supra* note 8 at 24.
[11] *See* PANYNJ, *Monthly Cargo Volumes*, Breaking Waves, https://www.portbreakingwaves.com/category/monthly-cargo-volumes/.
[12] CHP, Gubernatorial Ports Briefing, Att. 1 at 3, 15.
[13] *Id*. at 5, 15.
[14] PANYNJ, *Truck Origin-Destination Data Analysis Long-Range Master Plan for the Port of New York and New Jersey* 7, 12 (Jan. 2018), https://www.panynj.gov/port/en/our-port/port-development/port-master-plan.html.
[15] CHP, Gubernatorial Ports Briefing, Att. 1 at 5.
[16] Newark Community Impacts Study, Att. 6 at 11.

MHDVs are responsible for more NOx, PM2.5, and black carbon emissions in the Ironbound than all light-duty vehicles.[17]

This MHDV diesel exhaust presents a serious risk of adverse health effects, including cancer, asthma, heart disease, impaired development, stroke, impaired liver function, and premature death.[18] Because trucks discharge diesel exhaust at ground level along roadways, a greater proportion of their emissions are inhaled by people than emissions from typical point source pollutants, such as smokestack emissions.[19] As a result, MHDVs engaged in port-related operations pose a serious threat to the health and wellbeing of local residents. There is therefore an urgent need to reduce MHDV emissions to meaningfully improve air quality within environmental justice communities, like those surrounding Port Newark.[20]

But MHDVs are only part of the problem. Seventy-seven percent of exposure from mobile-source NOx in the Ironbound comes from non-road sources like marine vessels, cargo handling equipment, and rail.[21] For PM2.5 and black carbon, that number raises to 85-86%.[22] Combining these non-road emissions with MHDV emissions results in the goods-movement industry being responsible for about 95% of total emissions exposure from mobile sources in the Ironbound.[23] Goods movement in and around Port Newark is thus a major contributor to ozone precursors and particulate emissions in the area, and DEP must address goods-movement emissions in order for northern New Jersey to both reach attainment with federal ozone standards,[24] and to avoid returning to nonattainment for federal particulate standards, which may soon be lowered.[25]

And any such efforts to reduce emissions and improve air quality must prioritize the needs of overburdened communities. New Jersey's port-related activities and goods-movement infrastructure are concentrated in communities Of Color and low-income neighborhoods.[26] Nearly one million residents of Newark, Elizabeth, Jersey City, and Bayonne face severe health risks associated with diesel air pollution and other harmful emissions generated by Port

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[17] *Id*.
[18] *See* CHP, Gubernatorial Ports Briefing, Att. 1 at 5; Newark Community Impacts Study, Att. 6 at 17; U.S. Envt'l Prot. Agency, Health Assessment Document for Diesel Engine Exhaust ch. 5 (2002).
[19] CHP, Gubernatorial Ports Briefing, Att. 1 at 5.
[20] *See* Newark Community Impacts Study, Att. 6 at 17.
[21] *Id.* at 2, 11-12; CHP, Gubernatorial Ports Briefing, Att. 1 at 5.
[22] Newark Community Impacts Study, Att. 6 at 11-12.
[23] *Id.* at 2.
[24] *See, e.g.*, Ozone Transport Commission, Statement of the Ozone Transport Commission Regarding the Need to Accelerate Electrification of Medium and Heavy-Duty Vehicles (June 2, 2020), https://otcair.org/upload/Documents/Formal%20Actions/OTC%20Statement%20on%20MHD%20ZEVs_20200602.pdf ("The Ozone Transport Commission (OTC) has identified on-road medium- and heavy-duty vehicles as a major and growing contributor of tropospheric ozone forming pollutants. . . . To demonstrate leadership in advancing regional emission reductions and to protect our most vulnerable populations, the OTC supports engaging in cooperative efforts to accelerate widespread adoption of zero emission medium- and heavy-duty vehicles as a regional air quality strategy.").
[25] *See* U.S. Env't Prot. Agency, EPA to Reexamine Health Standards for Harmful Soot that Previous Administration Left Unchanged (June 10, 2021), https://www.epa.gov/newsreleases/epa-reexamine-health-standards-harmful-soot-previous-administration-left-unchanged.
[26] Newark Community Impacts Study, Att. 6 at 2.

operations.[27] And these communities are disproportionately burdened by cumulative impacts from additional sources of pollution outside of the goods movement industry.[28] DEP's emission-reduction policies should advance equity and address the immediate health impacts in overburdened communities by taking every opportunity to reduce health-harming emissions.[29]

## II. NEW JERSEY SHOULD ADOPT FULL ELECTRIFICATION GOALS WITH A FOCUS ON OVERBURDENED COMMUNITIES.

In order to reach the emission reductions needed throughout the goods-movement industry, CHP urges New Jersey to adopt overarching goals for full electrification throughout the industry, with a focus on emission reductions in the most overburdened communities. California Executive Order N-79-20, for example, sets statewide goals for all drayage trucks to be zero-emissions ("ZE") by 2035, all off-road vehicles to be ZE by 2035, and all remaining MHDVs to be ZE by 2045 where feasible.[30] These full electrification goals are already guiding the mobile source strategy of the California Air Resources Board ("CARB"), which cites the Executive Order goals in its discussion of the ZE transition for drayage trucks, transport refrigeration units ("TRUs"), locomotives, small-off road engines, and MHDVs.[31]

New Jersey, home to the largest marine port outside of California, would similarly benefit from overarching full electrification goals to guide its policies to reduce the negative impacts from goods movement. New Jersey has taken actions in support of MHDV sales goals,[32] but has yet to support in-use ZE goals as strong as those in the California Executive Order or otherwise have those goals clearly guide internal state policy. Any such overarching goals must target emission-reduction strategies in the communities most overburdened by goods-movement pollution, and by no means should they result in an increased reliance on dirty, fossil power plants located in these or other EJ communities.

## III. CHP SUPPORTS SWIFT ADOPTION OF THE ACT RULE.

DEP's adoption of the ACT Rule is a necessary first step to address the pollution that has burdened New Jersey's port- and freight-adjacent environmental justice communities for decades. The New Jersey market is ready for electrification now, and there is no legal or policy reason for DEP to delay adoption of the ACT Rule.

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[27] CHP, Gubernatorial Ports Briefing, Att. 1 at 6.
[28] *Id.*; Newark Community Impacts Study, Att. 6 at 1.
[29] Newark Community Impacts Study, Att. 6 at 1.
[30] Cal. Exec. Order No. N-79- 20 (Sept. 23, 2020).
[31] CARB, *Revised Draft 2020 Mobile Source Strategy* at 10, 48-49 (fleets, drayage), 55 (TRU), 55-56 (locomotives), 130 (medium duty), 133 (heavy duty), 156-57 (small off-road engines) (April 23, 2021), https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf
[32] New Jersey Governor's Office, 15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification (July 14, 2020), https://www.nj.gov/governor/news/news/562020/20200714a.shtml (New Jersey joined Memorandum of Understanding with goal of 100% ZE MHDV sales by 2050); New Jersey Governor's Office, Governor Murphy Joins Group of Bipartisan Governors Calling on President Biden to Move Quickly Toward a Zero-Emissions Transportation Future (Apr. 21, 2021), https://www.nj.gov/governor/news/news/562021/20210421a.shtml (asking for 100% ZE MHDV sales by 2045).

## A. The ACT Rule will succeed in reducing emissions from New Jersey MHDVs.

### 1. ACT Rule sales requirements will reduce the pollution that affects freight-adjacent communities.

The ACT Rule will result in significant reductions in the health-harming emissions that directly injure residents in freight-adjacent communities. Preliminary results from a forthcoming study by M.J. Bradley & Associates finds that in 2050, the MHDV electrification required by the ACT Rule will result in 43% lower petroleum fuel use, 31% lower NOx emissions, and 10% lower PM emissions than business as usual.[33] Cumulatively, from 2020 to 2050, this results in 2.7 billion gallons of avoided diesel and gasoline use, 36,000 metric tons of avoided NOx emissions, and 192 metric tons of avoided PM emissions.[34] These emission reductions result in 61 fewer premature deaths, 64 fewer hospital and emergency room visits, and 35,597 fewer cases of respiratory health impacts.[35]

All told, M.J. Bradley & Associates estimates that the ACT Rule would provide $8.9 billion of net societal benefit to New Jersey from 2020 to 2050.[36] This figure is derived from the air quality benefits described above, plus the benefits from reduced greenhouse gas emissions and savings to fleet owners and operators by switching to ZE MHDVs.[37]

While the figures presented above are statewide, the ACT Rule's effects on local exposure, such as around Port Newark, are also under investigation.

### 2. The New Jersey MDHV Market is Ready for Electrification Now.

New Jersey is ready for MHDV electrification. New Jersey has been recognized as a high-potential state for truck electrification.[38] Many ZE MDHV models are available now – over 130 ZE MDHV models, including drayage capable tractors, have already been certified under the California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program.[39] And many additional ZE MHDV models will be available by model year 2025, when DEP proposes to begin compliance requirements. According to CalSTART's Zero Emission Vehicle Inventory, 53 companies – including major manufacturers in the Truck & Engine Manufacturers Association like Daimler (Mercedes-Benz), Ford, and Volvo – will have over 200 models of ZE MHDVs available in the U.S. by 2023.[40] This data is broken out by vehicle type in the table below:

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[33] M.J. Bradley & Associates, New Jersey Clean Trucks Program: An Analysis of the Impacts of Zero-Emission Medium- and Heavy-Duty Trucks on the Environment, Public Health, Industry, and the Economy at 12, 14 (preliminary findings, 2021) (attached as Attachment 9) ("NJ Clean Trucks Study").
[34] *Id*.
[35] *Id*. at 14.
[36] *Id*. at 24.
[37] *Id*.
[38] Jessie Lund & Mike Roeth, N. Am. Council for Freight Efficiency, High Potential Regions for Electric Truck Deployments Data Analysis [spreadsheet] (Aug. 2020), https://nacfe.org/wp-content/uploads/2020/08/High-Potential-Regions-for-Electric-Trucks-Data-Analysis-Tool.xlsx.
[39] California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program, *Vehicles*, https://californiahvip.org/vehicles/ and list (attached as Attachment 10)
[40] CALSTART, Drive to Zero's Zero-emission Technology Inventory (ZETI) Tool Version 5.9 (2020), https://globaldrivetozero.org/tools/zero-emission-technology-inventory.

| Vehicle Type | Number of Companies | Number of Different Models |
|---|---|---|
| Transit buses | 13 | 32 |
| School buses | 9 | 17 |
| Shuttle buses | 15 | 26 |
| Cargo vans | 8 | 12 |
| Yard tractors | 6 | 7 |
| MD trucks | 17 | 65 |
| MD step vans | 9 | 20 |
| HD trucks | 14 | 22 |
| Other (garbage trucks, etc.) | 6 | 12 |

And this high model availability through 2023 is just the start, especially given the bold commitment to electrification that various Truck & Engine Manufacturers Association members have already announced across their product lines. Volvo has already stopped production of diesel buses for the European market.[41] By 2025, Volvo says that half of its cars will be electric,[42] and Daimler expects that up to 25% of unit sales of its Mercedes-Benz brand to be battery-electric vehicles.[43] By 2030, Fiat will only sell electric cars,[44] Volkswagen will have electric versions available for all its 300 models,[45] and Ford expects 40% of its global sales – and 100% of sales in Europe – to be fully electric.[46] By 2035, GM says that it will sell ZE vehicles only.[47] By 2040, the European Automobile Manufacturers' Association, which includes Daimler, Ford, MAN, Scania, and Volvo, will sell only ZE trucks.[48] Large manufacturers are already on board to electrify their vehicles.

These ZE models can be used with minimal operational changes. CalSTART anticipates that long-haul ZE MDHV models will have ranges of over 600 miles by 2023,[49] which more

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[41] Shaandiin Cedar, *5 Electric Bus Makers Shifting into Next Gear,* GREENBIZ (June 1, 2021), https://www.greenbiz.com/article/5-electric-bus-makers-shifting-next-gear

[42] Andrew J. Hawkins, *Volvo Unveils its First Fully Electric Car and a Bold Pledge to go Carbon Neutral*, The Verge (Oct. 16, 2019) https://www.theverge.com/2019/10/16/20915841/volvo-xc40-recharge-electric-suv-specs-miles-range-reveal

[43] Damiler, *10 Facts on EQ*, https://www.daimler.com/innovation/case/electric/10-facts-eq.html.

[44] Chris Randall, *Fiat to go Fully Electric by 2030*, Electrive.com (June 5, 2021, 07:50 PM), https://www.electrive.com/2021/06/05/fiat-to-go-fully-electric-by-2030/.

[45] *Volkswagen Plans Electric Option for All Models by 2030*, BBC NEWS (Sept. 11, 2017), https://www.bbc.com/news/business-41231766.

[46] Mike Colias, *Ford Expects 40% of Global Vehicle Volume to Be Fully Electric By 2030*, The Wall Street Journal, https://www.wsj.com/articles/ford-expects-40-of-global-vehicle-volume-to-be-fully-electric-by-2030-11622033457; Neal E. Boudette, *Ford will Spend $30 Billion on Electric Vehicles, a Big Increase from Earlier Plans*, N.Y. Times (May 26, 2021), https://www.nytimes.com/2021/05/26/business/ford-electric-vehicles.html; Andrew J. Hawkins, *Ford says it will go all-electric in Europe by 2030*, The Verge (Feb. 17, 2021), https://www.theverge.com/2021/2/17/22287284/ford-electric-vehicles-ev-europe-2030.

[47] Neal E. Boudette & Coral Davenport, *G.M. Will Only Sell Zero-Emission Vehicles by 2035*, N.Y. Times (Jan. 28, 2021), https://www.nytimes.com/2021/01/28/business/gm-zero-emission-vehicles.html.

[48] European Automobile Manufacturing Association, Joint Statement: The Transition to Zero-Emission Road Freight Transport (Dec. 2020), https://www.acea.auto/uploads/publications/acea-pik-joint-statement-the-transition-to-zero-emission-road-freight-trans.pdf.

[49] John Hitch, *U.S. Heavy-duty ZEV Models to Grow 250% by 2023*, Fleetowner (May 21, 2021), https://www.fleetowner.com/running-green/article/21164837/us-heavyduty-zev-models-to-grow-250-by-2023.

than covers both the average 200-mile distance between 30-minute stops, and the estimated 500 miles that correspond to the federal limit on continuous driving.[50] And though batteries can add weight to the truck, some of that weight is offset by the removal of the engine, cooling system, transmission, and accessories, resulting in potential payload loss of only about 3% (375-mile range) to 19% (500-mile range) before light-weighting.[51] This should not be an issue for most shipments, given that average payloads are only 70% of maximum capacity.[52]

And switching to ZE MHDVs is *already* the economical choice. A recent Lawrence Berkeley National Laboratory study used the current global average battery price of $135/kWh to find that, when compared to a diesel truck, a Class 8 electric truck operating 300 miles/day already has a 13% lower total cost of ownership per mile, a 3.2-year payback period, and net present savings of about $200,000 over a 15-year vehicle lifetime.[53] These savings are largely due to the significantly lower fuel costs of switching from diesel to electricity – up to 45% lower based on New Jersey electricity rates[54] – as well as lower maintenance costs, which can similarly be around 50% lower than diesel trucks.[55] For the average MHDV, with lower operating costs than long-haul trucks, M.J. Bradley & Associates estimates that a ZE MHDV in New Jersey will save $36,000 in net fuel and maintenance costs over the life of the vehicle.[56]

And the economics for ZE MHDVs will be even better in the near future. Reductions in upfront costs will reach a milestone by 2024, when the global average battery price is expected to fall below $100 per kWh – long regarded as the threshold for upfront price parity with internal combustion engine vehicles.[57] By 2030, battery prices are expected to be as low as $60 per kWh,[58] and electric long-haul truck total cost of ownership could be over 40% lower than diesel.[59] This estimate is in line with other studies that have similarly found substantially lower total cost of ownership for Class 6 delivery vans and Class 8 short-haul/drayage trucks by 2030.[60] M.J. Bradley & Associates estimates that by 2040, ZE MHDVs in New Jersey would

[50] Amol Phadke et al., Lawrence Berkeley National Laboratory, Goldman School of Public Policy, UC Berkeley & Institute of Environment and Sustainability, UCLA, Why Regional and Long-Haul Trucks are Primed for Electrification Now at 5-6, 12-13 (March 2021), https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf (attached as Attachment 11).
[51] *Id.* at 11, 26-27.
[52] *Id*. at 11.
[53] *Id*. at 1, 28.
[54] Jessie Lund & Mike Roeth, *supra* note 38.
[55] *See* California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program, Total Cost of Ownership Estimator, https://californiahvip.org/tco; Sebastian Blanco, *Proterra Ready for Electric Bus Battery Leasing With $200-Million Credit Facility*, Forbes (Apr. 18, 2019), https://www.forbes.com/sites/sebastianblanco/2019/04/18/proterra-ready-for-electric-bus-battery-leasing-with-200-million-credit-facility/.
[56] NJ Clean Trucks Study, Att. 9 at 17.
[57] *Battery Pack Prices Fall as Market Ramps Up With Market Average At $156/kWh In 2019*, Bloomberg NEF (Dec. 3 2019), https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/.
[58] *Id.*
[59] Phadke, Att. 11 at 3, 24.
[60] Jimmy O'Dea, Union of Concerned Scientists, Ready for Work: Now Is the Time for Heavy-Duty Electric Vehicles 12-13 (2019), https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf.

have an average lifetime total cost of ownership saving of $25,000, even when taking incremental upfront cost, charger costs, and charger maintenance costs into account.[61]

### 3. The ACT Rule's sales mandate, by itself, has worked before, and will work again now.

While DEP should adopt fleet purchase mandates to direct early fleet electrification in the communities most overburdened by diesel truck emissions (see section below), the ACT Rule's sales mandate, by itself, can effectively begin to transition New Jersey MDHVs to ZE before the implementation of a corresponding purchase mandate. This type of mandate is not a new, untested concept: since 2005, California's Zero-Emission Vehicle ("ZEV") Regulation has required manufacturers to produce and deliver for sale a certain percentage of ZE passenger cars and light-duty trucks in the state.[62] Ten additional States – including New Jersey – have adopted this rule, collectively covering 30% of new car sales in the U.S.[63] China and Quebec and British Columbia, Canada, have modeled their light-duty ZEV mandates on the California program.[64]

This mandate on manufacturers has spurred ZEV sales without the need of a parallel purchase mandate on consumers. CARB's recent analysis of its ZE policies found that this ZEV regulation "provide[s] the stable, long-term signal that encourages manufacturers to make and sell ZEVs in the early market."[65] Through model year 2019, 625,000 ZEVs have been sold in California under this program.[66] Manufacturers have more than met their requirements under the ZEV program, generating a surplus of credits to meet their ZEV requirements.[67] Thus, far from failing to meet the ZEV program requirements, manufacturers have been overperforming even without a regulatory purchase mandate.

Manufacturers have many tools at their disposal to encourage ZE MHDV purchases in the absence of a regulatory purchase mandate. The Northeast States for Coordinated Air Use Management ("NESCAUM") has noted that, before the ZEV program required manufacturers to deliver ZEVs to the Northeastern states that had opted in, light-duty ZEVs were consistently less available for purchase in the Northeast compared to California, and that there was a "dramatic disparity" between manufacturers' advertising spending on their gasoline models versus their ZEV models.[68] NESCAUM therefore concluded that lower sales rates of light-duty ZEVs were

[61] NJ Clean Trucks Study, Att. 9 at 17.
[62] Cal. Code Regs. tit. 13, § 1962.2; *see also id.* § 1962; 1962.1.
[63] CARB, States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act (Aug. 19, 2019), https://ww2.arb.ca.gov/sites/default/files/2019-10/ca_177_states.pdf.
[64] CARB, Draft: Assessment of Carb's Zero-Emission Vehicle Programs Per Senate Bill 498 at 74, 78-79 (Dec. 17, 2019), https://ww2.arb.ca.gov/sites/default/files/2019-12/SB%20498%20Report%20Draft%20121719.pdf.
[65] Id. at 82.
[66] CARB, 2019 Zero Emission Vehicle Credits at 3, https://ww2.arb.ca.gov/sites/default/files/2020-10/2019_zev_credit_annual_disclosure.pdf.
[67] *See id.* at 2 (California ZEV credit balance of 1.2 million); DEP, 2019 Zero Emission Vehicle Credits (Jan. 21, 2021), https://www.nj.gov/dep/cleanvehicles/2019ZEV.pdf at 3 (New Jersey ZEV program credit balance of 344,000).
[68] Letter from Arthur N. Marin, Exec. Dir., NESCAUM to Elaine Chao, Sec'y, U.S. Dep't of Transportation at 10 & exhibits 2 and 3 (Oct. 18, 2018), https://ww2.arb.ca.gov/sites/default/files/2020-10/2019_zev_credit_annual_disclosure.pdf.

attributable to factors within the control of automakers.[69] MHDV manufacturers similarly are not beholden to consumer preference, but can affirmatively shape that preference through vehicle availability, marketing, purchase incentives, pricing, and other factors within their control.

Thus, while DEP must adopt rules to direct fleet turnover in the communities where it is most needed, DEP should not delay its adoption of the ACT Rule in order to release both rules at once. As CARB explained in its supporting documents on the ACT Rule, "A necessary first step [is] to ensure that ZEVs [a]re supported by manufacturers and made widely available before placing requirements on fleets. . . . The manufacturer ZEV sales requirement needs to be in place first because of the lead time needed to develop and manufacture vehicles. . . . [A] manufacturer sales requirement is necessary to ensure ZEVs are available and fully supported before fleet rules can begin."[70]

**4. Fears of pre-buy/no-buy effects are not warranted.**

Fears of excessive MHDV pre-buy/no-buy are unwarranted, and at any rate provide no reason for DEP to withhold or delay adoption of the ACT Rule. When developing the ACT Rule, CARB explained that it was "not anticipating any pre-buy situation where manufacturers increase sales of their vehicles before the Proposed ACT Regulation and decrease sales after implementation begins. Fleets, not manufacturers, decide when to purchase vehicles and this regulation would not encourage them to delay their purchases."[71] And while a 2018 economic study recognized a short-lived pre-buy effect before some – but not all – of EPA's updates to the federal MHDV emission standards, that study noted standards that phase in over time "diminish the incentive to pre-buy,"[72] and that standards that result in lower vehicle total cost of ownership "are not likely to create conditions that would induce a pre-buy."[73] All of these conditions apply to the ACT Rule, which will require a gradually increasing sales requirement for vehicles with lower total cost of ownership compared to diesel.

Thus, pre-buy situations are unlikely here, but even assuming they do occur, pre-buy would weigh in favor of DEP moving *swiftly* to adopt the ACT Rule, and not the opposite. Pre-buy would theoretically dampen some of the beneficial effects of the ZE MHDV sales mandate by slightly shifting vehicle purchases to the pre-model year 2025 diesel status quo, but a failure to adopt the ACT Rule at all would result in a diesel status quo in perpetuity. Meanwhile, delaying ACT Rule implementation to model year 2026 would essentially create an additional 12 months of the "pre-buy" diesel status quo, whereas the 2018 study found pre-buy effects to last only four to eight months even in situations – unlike those here – most conducive to pre-buy.[74] So even assuming pre-buy is an unavoidable phenomenon, which it is not, DEP should rip the

[69] *Id*. at 10.
[70] CARB, Advanced Clean Trucks Regulation: Final Statement of Reasons at 13 (March 2021), https://ww3.arb.ca.gov/regact/2019/act2019/fsor.pdf.
[71] CARB, Advanced Clean Trucks Regulation: F Standardized Regulatory Impact Assessment (SRIA) at 27 (Aug. 8, 2019), https://ww3.arb.ca.gov/regact/2019/act2019/appc.pdf.
[72] Katherine Rittenhouse, Matthew Zaragoza-Watkins, Journal of Environmental Economics and Management, *Anticipation and environmental regulation* at 29 (March 18, 2018), https://www.sciencedirect.com/science/article/abs/pii/S0095069617306848.
[73] *Id.* at 30.
[74] *Id.* at 19 n.25.

band-aid off and implement the ACT Rule as soon as it can so that the New Jersey MHDV market swiftly overcomes any potential, short-term weakening of the ACT Rule's benefits from pre-buy.

### B. DEP has full legal authority to adopt the ACT Rule.

DEP has full legal authority to adopt the ACT Rule and take this necessary first step to reduce emissions in the state's overburdened communities. Clean Air Act Part D, Section 177 specifies, "any State *which has plan provisions approved under this part* may adopt and enforce for any model year [California] standards relating to control of emissions from new motor vehicles or new motor vehicle engines."[75] "Plan provisions approved under this part" applies both to nonattainment plan provisions and maintenance plan provisions, both of which EPA approves under Clean Air Act Part D.[76] Because EPA has approved multiple New Jersey nonattainment and maintenance plan provisions,[77] New Jersey satisfies the threshold requirement of Section 177 to adopt the California Standards.[78]

### C. DEP must not delay in adopting the ACT Rule.

DEP should reject invitations to defer adopting the ACT Rule until 2022 because such delay could hamper DEP's application of the standards to the 2025 model year. Section 177 requires New Jersey to "adopt [California] standards at least two years before commencement of [the vehicle] model year (as determined by regulations of the [EPA] Administrator)."[79] So delaying adoption of the ACT Rule may delay the first model years that New Jersey could address. To ensure New Jersey can implement the ACT Rule beginning with model year 2025 trucks, DEP should adopt the Rule before 2022.

There is no legal requirement for DEP to delay adoption of the ACT Rule until all other California MHDV rules have been finalized. While the Clean Air Act requires DEP to adopt a rule that is "identical" to the ACT Rule, adopting the ACT Rule now and future California low-emission MHDV standards later would not contravene this "identicality" requirement because manufacturers would not need to create a "third vehicle" that does not already meet the California or federal standards.[80] Indeed, over a dozen Section 177 States have separately adopted California's various light-duty vehicles emission standards (*e.g.*, low-emission vehicle

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[75] 42 U.S.C. § 7507 (emphasis added).
[76] *See* 42 U.S.C. §§ 7502(c), 7505a (concerning nonattainment and maintenance plans, respectively, both under Part D); *see also Am. Auto. Mfrs. Ass'n v. Comm'r, Mass. Dep't of Env't Prot.*, 31 F.3d 18, 23 n.2 (1st Cir. 1994) (correctly explaining that Section 177 says that "any State which has plan provisions [for the attainment and maintenance of the NAAQS] may adopt and enforce for any model year standards . . ." (paraphrasing in original)).
[77] U.S. Envt'l Prot. Agency, *New Jersey Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants* (as of Feb. 28, 2021), https://www3.epa.gov/airquality/greenbook/anayo_nj.html.
[78] For more on DEP's legal authority to adopt the ACT Rule, please refer to Attachment 8.
[79] 42 U.S.C. § 7507; *see also* 40 C.F.R. §§ 85.2302, 85.2303, 85.2304(a) (noting that "model year" can mean the "manufacturer's annual production period," which in turn can start as early as "January 2 of the calendar year preceding the year for which the model year is designated").
[80] *See* 42 U.S.C. § 7507; *Engine Manufacturers Ass'n v. S. Coast Air Quality Mgmt. Dist.,* 158 F. Supp. 2d 1107, 1119 (C.D. Cal. 2001), *aff'd* 309 F.3d 550 (9th Cir. 2002), *vacated on other grounds*, 541 U.S. 246 (2004) ("Congress' purpose in enacting § 177 is to prevent states from adopting and enforcing standards in a manner that would create a 'third vehicle.'").

standards and ZEV standards) in different years, all without violating the identicality requirement.[81] DEP can, and should, adopt each MDHV rule as soon as it can, and not wait until California finalizes all possible MDHV rules so that DEP can adopt them all at once.

Nor is there a policy reason why DEP should delay adoption of the ACT Rule. As explained above, pre-buy/no-buy is unlikely for a gradually increasing sales mandate like the ACT Rule, and even if it were a cause for concern, delay will only make the negative effects of pre-buy/no-buy worse.[82] And delaying implementation of the ACT Rule sales mandate until DEP can adopt a complimentary purchase mandate is not only unnecessary, but may backfire if manufacturers do not first have sufficient ZE models available for sale before a purchase requirement is placed on fleet owners.[83] In addition, waiting to synchronize ACT Rule adoption with other forthcoming rules could result in years of delay: for example, EPA's proposed Cleaner Trucks Initiative would not start to affect MHDVs until model year 2027, if not further delayed.[84]

## IV. DEP SHOULD IMPROVE THE FLEET REPORTING RULE.

We also applaud DEP's proposal to adopt a fleet reporting rule, which will provide necessary information to DEP and the public about the state of New Jersey fleets. But DEP must make a number of improvements to ensure robust and up-to-date reporting from as many fleets as possible.

### A. DEP Must Lower the Fleet-Size Threshold.

DEP's proposed 50-vehicle threshold is set too high, and would fail to cover the majority of New Jersey MHDVs, which operate in much smaller fleets. DEP data show that statewide, only 32% of commercial Class 2b-8 vehicles are in fleets with 50 or more vehicles.[85] Looking only at the drayage trucks registered with PANYNJ similarly shows that only 34% of PANYNJ-registered trucks are in fleets with 50 or more vehicles.[86] These low percentages are consistent with initial data from California's fleet reporting rule, whose 50-vehicle threshold appears to have only captured about 15-20% of trucks in that state.[87] Lowering the threshold down to 5 or more vehicles would cover 71% of commercial Class 2b-8 vehicles statewide, and 92% of PANYNJ-registered drayage trucks. And lowering the threshold down to 1 vehicle would clearly cover 100% of vehicles.

DEP should require *all* tractors and drayage trucks to submit reports under the reporting rule. As noted below, small fleet owners and contract drivers are the least likely to have

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[81] *See* CARB, States that have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act (Aug. 19, 2019), https://ww2.arb.ca.gov/sites/default/files/2019-10/ca_177_states.pdf.
[82] *See supra* Section III.A.4.
[83] *See supra* Section III.A.3.
[84] Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine Standards, 85 Fed. Reg. 3306, 3311 (Jan. 21, 2020).
[85] The fleet size calculations represent all commercial MHDVs operating in New Jersey and are based on publicly available information shared by DEP.
[86] PANYNJ-registered drayage truck fleet data from PANYNJ's April 8, 2013 Freedom of Information Code document production (attached as Attachment 12).
[87] Information from May 19, 2021 California trucks coalition meeting with CARB staff.

information or resources to be able to shoulder the upfront costs of switching to ZE MHDVs, notwithstanding savings over the lifetime of the vehicle. And these small fleets often operate locally in neighborhoods. Information about these vehicles will help DEP and other New Jersey agencies conduct outreach and better direct resources to this segment of the industry. At the very least, DEP should set a reporting threshold of no higher than 5 vehicles for tractors and drayage trucks to ensure that the majority of trucks serving PANYNJ facilities are covered by the rule.

### B. DEP Must Ask For More Information About Fleet Brokerage Practices.

DEP must also require fleet owners and brokers to provide more information about their operational practices, particularly with respect to contract drivers. A contract driver system shifts capital and operating costs to low-income truck drivers and creates fundamental barriers to the adoption of new technology, like ZE vehicles.[88] These barriers are all the more prevalent for misclassified contract drivers who earn very low wages and must take high-interest loans to finance any new capital expenditures.[89] This issue is of particular concern around port communities, where some 85-90% of port driving operations are carried out by contractors, and 75-85% are likely carried out by misclassified workers.[90] These barriers are not just theoretical – CARB data shows that noncompliance with its 2008 Truck and Bus Rule is concentrated in the contractor segment of the trucking industry, with compliance rates 22% lower than large firms

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[88] Sam Appel & Carol Zabin, UC Berkley Labor Center, Truck Driver Misclassification: Climate, Labor and Environmental Justice Impact at 2, 9, 11-12 (August 2019), https://laborcenter.berkeley.edu/pdf/2019/Truck-Driver-Misclassification.pdf (attached as Attachment 13); North American Council for Freight Efficiency, Barriers to the Increased Adoption of Fuel Efficiency Technologies in the North American On--Road Freight Sector, at 6 (2013), https://www.theicct.org/sites/default/files/publications/ICCT-NACFE-CSS_Barriers_Report_Final_20130722.pdf ("Insufficient capital [to adopt new technologies] was a much bigger issue for the small end users (medium fleets, used truck fleets, and owner-operators) than their larger company counterparts, who stated that their organizations would commit the capital if there is a high degree of confidence that the technology will pay back."); Karthikeyan Ramachandran et al., Carbon War Room & Trimble, Road Transport: Unlocking Fuel-Saving Technologies in Trucking and Fleets at 19 (Nov. 2012), https://rmi.org/wp-content/uploads/2017/04/Unlocking-Fuel-Saving-Technologies-in-Trucking-and-Fleets-Carbon-War-Room_0.pdf ("In the United States, a significant proportion of the tractor-trailers on the road are part of owner-operated fleets of fewer than five trucks (US-DOT 2008). Truckers operate on thin margins, leaving very little capital to finance major upgrades out of pocket (US-DOE 2009). These efficiency technologies have high upfront costs, so without easy access to capital many truck owners cannot afford them, even those upgrades that offer extremely attractive payback periods. For the ICT options in particular, many of the benefits of implementing them occur on an economy of scale. For owner-operators of small fleets with only a few trucks, these solutions will not be feasible."); Giuliano, Genevieve et al. Developing Markets for Zero Emissions Vehicles in Goods Movement, at 84 (2018), https://ncst.ucdavis.edu/project/developing-markets-for-zero-emission-vehicles-in-short-haul-goods-movement/ ("Owner operators are very unlikely to consider ZE because such a vehicle would severely restrict job opportunities. Those who lease vehicles may be more inclined to use [ZE heavy-duty trucks] as long as the price is right and the vehicle is able to do the job. Those who own their own fleets may consider ZE when a vehicle is due for replacement, but would be averse to shedding vehicles otherwise due to the costs involved."); Marin Economic Consulting. Driver-LMC Relationships in Port Drayage: Effects on Efficiency, Innovation, and Rates, at 9-11 (2014), http://www.marineconomicconsulting.com/whitepapers/MEC_DrayageDrivers_081414.pdf ("[A] failing of this [independent owner-operator] model is that the truck, the fuel, and the driver's time all tend to be used inefficiently. Even though the drivers clearly have significant incentives to eliminate these inefficiencies, they generally lack sufficient control to address them. Much of this control lies with the [licensed motor carriers] and terminal operators. . . . Because [driver] compensation is so low, there is often a direct conflict between keeping up their vehicles and putting food on the table").

[89] Sam Appel & Carol Zabin, Att. 13 at 2, 9, 11-12.

[90] *Id.* at 8.

that directly employ drivers.[91] The split incentives created by leased fleets is an additional barrier to ZE adoption, since the company bears the upfront cost of buying the new ZE vehicle while the drivers would reap the long-term fuel, and sometimes maintenance, cost savings.[92]

Thus, in order to ensure that DEP's future measures to address MDHV emissions are effective, DEP's reporting rule must cover topics such as contracting patterns across sub-segments, economics of asset and non-asset fleets, truck rental and leasing practices, contractor finances, and extent of employee misclassification. Specifically, DEP should include these questions in its reporting rule:

1. Among all trucks operating under the entity [fleet owner or broker, etc.], how many are operated by drivers who are classified as employees (with a W-2 form) and how many by drivers who are classified as contractors (with a 1099 form)?
2. Among all loads carried by the entity, how many are carried by employees and how many by contractors?
3. By load type, what number and percent of loads are carried by contractors and by employees?
4. What percentage of the entity's costs do contracted worker labor costs represent?
5. What percentage of the entity's revenues do earnings from services rendered by contracted workers represent?
6. How many contractors lease vehicles from the entity? What are the terms and interest rates of these leases?
7. What is the rate of employee turnover year-over-year at the entity?
8. What is the rate of contractor turnover year-over-year at the entity?
9. Has the entity been found to be in violation of any labor, employment, or tax laws in the past five years? If so, disclose for each: nature of violation; date; case number; whether terms of order were satisfied; outcome of case.

In addition to asking this information, DEP should make sure to cross-reference the reported information with information under the entity's Federal Motor Carrier Safety Administration broker registration, its U.S. Department of Transportation number, and other identification to ensure that all contracted trucks are being reported to DEP. To assist in cross-referencing and ensure that no contracted trucks fall through the cracks, DEP should also ask reporting entities to report the vehicle identification numbers of all vehicles owned or brokered by the entity.

### C. DEP should require reporting on a yearly basis.

DEP should require not just one-time reporting, but periodic reporting on an annual basis. The trucking industry may see significant changes over the coming years, including driver shortages, new technologies, growth in e-commerce, and new safety and insurance regulations, which could

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[91] *Id*. at 2, 11.

[92] Karthikeyan Ramachandran et al., *supra* note 88 at 19; John D. Haveman, Marin Economic Consulting, Driver-LMC Relationships in Port Drayage: Effects on Efficiency, Innovation, and Rates (Aug. 14, 2014), http://www.marineconomicconsulting.com/whitepapers/MEC_DrayageDrivers_081414.pdf ("[Under the lease-driver model] drivers continue to be responsible for much of the operational cost of driving the truck; the cost to the driver may include charges for insurance, gas, and sometimes maintenance, as a part of the lease.").

mean that the information fleets report in April 2022 may not hold true for long.[93] And the pandemic's effects on trucking, such as shifting of trucking demand and lower rates from fleet brokers,[94] may still be impacting the industry when they report in 2022, potentially making that information unrepresentative of future years. In addition, yearly reporting would assist DEP not only in formulating new policies, but in enforcing and tracking the success of current and future policies like the ACT Rule. At the very least, DEP should require yearly reporting for the initial period of the ACT Rule's implementation to better track the impacts and benefits of the Rule, even if DEP allows less frequent reporting later on.

### D. DEP must keep fleet information available to the public.

DEP should ensure that any reporting entity's request to keep its information confidential is constructed narrowly to ensure as much public access to this information as possible. DEP proposes that any confidentiality request be made through the generally applicable provisions of N.J.A.C. 7:27-1.8 through 1.30. These regulations expressly provide that "emissions information, as defined at N.J.A.C. 7:27–1.4, is not confidential information,"[95] and "emissions information" is broadly defined to cover "[i]nformation necessary to determine the identity, amount, frequency, concentration, or other characteristics (to the extent related to air quality) of any air contaminant which has been emitted by the source operation, equipment or control apparatus," which includes "location" and "[o]wnership and point of contact information."[96] Thus, the majority of the information sought under the fleet reporting rule, such as location and ownership information, would be considered "emissions information" under DEP's confidentiality regulations, and would thus be ineligible for confidentiality requests. To the extent DEP does grant any reporting entity's request for confidentiality, DEP must continue to make the entity's information available to the public through cumulated data or in future rulemakings.[97]

## V. IN ADDITION TO THE ACT RULE, DEP MUST ADOPT FURTHER POLICIES TO REDUCE ROADWAY AND NON-ROADWAY EMISSIONS FROM GOODS MOVEMENT.

Though the ACT Rule is a necessary first step in reducing emissions from New Jersey's transportation and goods-movement sectors, DEP must adopt additional complementary policies to reduce harmful, and potentially fatal, impacts. By adopting the ACT Rule and complementary policies, New Jersey can improve the state's air quality and, importantly, alleviate the disproportionate impact shouldered by environmental justice communities across the state.

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[93] Fred Fakkema and Gary Schmidt, *8 Changes to Expect in Trucking in 2021*, Truckinginfo (Jan. 31, 2021), https://www.truckinginfo.com/10135749/8-changes-to-expect-in-trucking-in-2021

[94] Ashley, *Truckers say they're facing another pandemic — 'cheap rates' from brokers*, CDL Life (Apr. 28, 2020), https://cdllife.com/2020/truckers-say-theyre-facing-another-pandemic-cheap-rates-from-brokers/.

[95] N.J.A.C. 7:27-1.18.

[96] N.J.A.C. 7:27-1.4. "Source operation" is broadly defined as "any process or any identifiable part thereof that emits or can reasonably be anticipated to emit any air contaminant either directly or indirectly into the outdoor atmosphere," and "equipment" is broadly defined as "any device capable of causing the emission of an air contaminant either directly or indirectly to the outdoor atmosphere, and any stack or chimney, conduit, flue, duct, vent or similar device connected or attached to, or serving the equipment." N.J.A.C. 7:27-1.4.

[97] *See* N.J.A.C. 7:27-1.24 ("Nothing in this chapter shall be construed as prohibiting the incorporation of confidential information into cumulations of data subject to disclosure as public records . . ."); N.J.A.C. 7:27-1.25(a) ("[DEP] may disclose confidential information in rulemaking, permitting and enforcement proceedings.").

As noted above, in all forthcoming policies, DEP should prioritize emission reductions in overburdened, environmental justice communities. The risk of exposure to harmful emissions is not evenly distributed, as people Of Color and low-income communities are disproportionately impacted.[98] Low-income communities and communities Of Color in New Jersey are disproportionately exposed to transportation emissions and are more likely to live near goods movement infrastructure and experience higher levels of diesel exposure.[99] While adopting the ACT Rule is a necessary first step in addressing localized impacts from truck emissions, DEP can and must do more for New Jersey communities overburdened by goods movement impacts.

### A. DEP must continue to reduce emissions from MHDVs through adoption of the Omnibus Low NOx Rule and a fleet purchase rule.

DEP's measures to reduce MHDV emissions cannot stop at ACT Rule adoption. By itself, the ACT Rule would result in only 35% of New Jersey MHDVs being zero-emission by 2040.[100] While this percentage is meaningful, DEP can and should do more than achieving only one-third electrification two decades from now. Nor does the ACT Rule contain provisions expressly focused on transportation sector emissions in environmental justice communities. In addition to the ACT Rule, DEP must adopt complementary policies that prioritize fleet electrification in overburdened communities and that will reduce emissions from combustion MHDVs. Specifically, DEP must consider adopting the Omnibus Low NOx Rule, a fleet purchase rule, and a rule to limit emissions from transport refrigeration units, discussed in turn below.

#### 1. The Heavy-Duty Omnibus Low NOx Rule

In August 2020, CARB adopted the Heavy-Duty Omnibus Low-NOx Rule, which is designed to significantly decrease NOx emissions in communities living near railyards, ports, and warehouses experience high levels of truck traffic, where trucks are often idling and driving slowly.[101] The rule achieves this through a comprehensive overhaul of exhaust emission standards, test procedures, and other emissions-related requirements for combustion-engine MHDV beginning with model year 2024, requiring 75% reduction in NOx through model year 2026, and 90% NOx reduction thereafter.[102]

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[98] American Lung Association, The Road to Clean Air at 4 (2020), https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf (finding that people Of Color are 1.5 times more likely to live in a county with at least one failing air quality grade, and 3.2 times more likely to live in a county with a failing grade for unhealthy ozone days, particle pollution days, and annual particle levels); Maria Cecilia Pinto de Moura & David Reichmuth, Union of Concerned Scientists, Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic (June 21, 2019), https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles (finding people Of Color in the Northeast and Mid-Atlantic breathe 66% more air pollution from vehicles than white residents).

[99] Newark Community Impacts Study, Att. 6 at 1, 5.

[100] NJ Clean Trucks Study, Att. 9 at 10.

[101] CARB, *Facts about the Low NOx, Heavy-Duty Omnibus Regulation,* https://ww2.arb.ca.gov/sites/default/files/classic/msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf ("[T]he Regulation will help to reduce adverse health impacts and improve air quality throughout the state, especially in these areas which are disproportionately impacted by truck emissions.").

[102] California Regulatory Notice Registrar, *Proposed Action on Regulations* at 932 (June 26, 2020), https://oal.ca.gov/wp-content/uploads/sites/166/2020/06/2020-Notice-Register-Number-26-Z-June-26-2020.pdf.

Adoption of the Heavy-Duty Omnibus Low-NOx Rule together with the ACT Rule would result in 81% lower MHDV NOx emissions in New Jersey by 2050 compared to business-as-usual – far greater than the 31% reduction from the ACT Rule alone.[103] The ACT Rule would reduce cumulative NOx emissions by 36,000 metric tons over the next 30 years, but adding the Heavy-Duty Omnibus Low-NOx Rule would save an additional 107,000 metric tons over the same time.[104] Both rules together would avoid over 3.5 times more premature deaths and hospital visits than just the ACT Rule alone.[105]

Given the significant NOx emission reductions from the Heavy-Duty Omnibus Low-NOx Rule, it is no wonder that CARB recognized the rule as the greatest reducer of NOx emissions of all the measures in its State Implementation Plan ("SIP").[106] New Jersey should similarly prioritize adoption of the Heavy-Duty Omnibus Low-NOx Rule as a measure in its SIP. On-road sources emit more NOx in the Northern New Jersey nonattainment area than any other source category, and MHDVs emit more NOx than any other on-road source.[107] The prospect of 81% lower NOx emissions from the largest emitter in the state is a measure DEP must prioritize in order for Northern New Jersey to attain the federal ozone standards and improve air quality in overburdened communities.

#### 2. Fleet ZE MHDV Purchase Requirements

CHP also urges DEP to adopt rules that would require fleets in overburdened communities to electrify at a faster rate. CARB is currently developing such a rule, the Advance Clean Fleets rule, which is an important component to fully electrify California's truck and bus fleet by 2045 in line with the timeline of the California Executive Order.[108] The rule requires a phased approach for zero-emission fleet purchases and will initially focus on high-priority fleets like drayage trucks for early electrification.[109] CARB has identified a focus on disadvantaged communities, noting that the Advanced Clean Fleet rule would benefit communities seeking action on transportation and freight emissions.[105]

M.J. Bradley & Associates estimates that moving towards 100% ZE MHDV sales by 2035-2040, together with the ACT Rule, the Heavy-Duty Omnibus Low-NOx Rule, and a cleaner electricity grid, would lower MHDV NOx emissions by 97% and lower PM emissions by 86% in New Jersey by 2050.[110] This three-pronged approach would have significant public

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[103] NJ Clean Trucks Study, Att. 9 at 14.
[104] *Id.*
[105] *Id.*
[106] *Id.*
[107] DEP, Proposed State Implementation Plan (SIP) Revision: 2008 75 ppb 8-Hour Ozone Attainment Demonstration, 2008 75 ppb and 2015 70 ppb Reasonably Available Control Technology (RACT) Determinations and Nonattainment New Source Review (NNSR) Program Compliance Certifications, and 2017 Periodic Emissions Inventory, at 4-10 (May 2021), https://www.nj.gov/dep/baqp/OA/PEI%20Proposal.pdf; *Id.* App. 4-6 Att. 1, Onroad 2017 and 2020 Inventories, Summer, Northern NAA*, available at* https://www.nj.gov/dep/baqp/sip/OA.html.
[108] CARB, Advanced Clean Fleets, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets/about.
[109] *Id.*; CARB, Advanced Clean Fleets Regulation Workshop, at 15, 25, 34-43 (Mar. 2, 2021), https://ww2.arb.ca.gov/sites/default/files/2021-02/210302acfpres_ADA.pdf.
[110] NJ Clean Trucks Study, Att. 9 at 14.

health impacts, avoiding 325 hospital visits and 303 premature deaths, which is greater than the projected benefits of the ACT rule and the Heavy-Duty Omnibus Low-NOx rule combined.[111]

### 3. Transport Refrigeration Units

CHP also urges DEP to adopt California's forthcoming regulations that further limit emissions from transport refrigeration units.[112] TRUs are significant sources of pollutants like diesel PM, NOx, and black carbon, and degrade the air quality at ports, warehouses, railyards, supermarkets, and adjacent neighborhoods.[113] CARB estimates that 8,000 hours of TRU run-time per week cause an approximate cancer risk of 1800 per million at cold-storage warehouses and 600 per million at grocery stores.[114] But implementation of CARB's proposed regulation could reduce that risk by 95–98% by 2031.[115]

Earlier this year, CARB announced that it would bifurcate the TRU rulemaking and first consider a new rulemaking on truck TRUs this fall.[116] That rulemaking would require new TRUs to meet ultra-low emission standards and will begin the transition to ZE truck TRUs.[117] CARB would thereafter issue a second rulemaking to address other TRU categories, such as trailers, domestic shipping containers, railcars, and TRU generator sets.[118] CHP urges DEP to adopt these truck TRU regulations as soon as they are finalized, and to adopt the additional TRU regulations thereafter.

## B. DEP must adopt policies to adequately address emissions from non-road sources related to port and goods movement.

DEP must adopt additional policies to reduce emissions from port and goods-movement operations, which collectively have a higher air quality impact in port- and freight-adjacent

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[111] NJ Clean Trucks Study, Att. 9 at 14.

[112] *See* CARB, *Additional Information on the Transport Refrigeration Unit Rulemaking* (Jan. 22, 2021) https://ww2.arb.ca.gov/sites/default/files/2021-01/Informational%20Document%20on%20Changes%20to%20TRU%20Rulemaking.pdf; CARB, *Transport Refrigeration Unit Regulation Draft Regulatory Language for Stakeholder Review* (Mar. 12, 2020 Discussion Draft) https://ww2.arb.ca.gov/sites/default/files/2021-01/Informational%20Document%20on%20Changes%20to%20TRU%20Rulemaking.pdf; CARB, *Transport Refrigeration Unit Regulation Draft Regulatory Language for Stakeholder Review* (Mar. 12, 2020), https://ww2.arb.ca.gov/sites/default/files/2020-07/Draft%20TRU%20Regulatory%20Language_03122020.pdf; CARB, *Preliminary Cost Document for the Transport Refrigeration Unit Regulation* (Aug. 2020), https://ww2.arb.ca.gov/sites/default/files/2020-08/Preliminary%20TRU%20Cost%20Doc%2008202020.pdf.

[113] CARB, *Preliminary Health Analyses: Transport Refrigeration Unit Regulation Public Review Draft* ES-2–3 (Oct. 18, 2019), https://ww2.arb.ca.gov/sites/default/files/classic/cc/cold-storage/documents/hra_healthanalyses2019.pdf ("TRU Preliminary Health Analyses"); CARB, *Transport Refrigeration Unit Emissions Inventory and Preliminary Health Analyses Workshop [Presentation]* 8 (Oct. 31, 2019), https://ww2.arb.ca.gov/sites/default/files/classic/cc/cold-storage/documents/tru_healthanalysisslidesworkshop10312019.pdf.

[114] TRU Preliminary Health Analyses, *supra* note 112, at ES-8–9.

[115] *Id.*

[116] *See* CARB, *Additional Information on the Transport Refrigeration Unit Rulemaking* (Jan. 22, 2021) https://ww2.arb.ca.gov/sites/default/files/202101/Informational%20Document%20on%20Changes%20to%20TRU%20Rulemaking.pdf

[117] *Id.*

[118] *Id.*

communities than MHDVs alone.[119] These sources include warehouses, locomotives, logistics centers, railyards, and emission sources at the port like cargo-handling equipment and marine vessels.

### 1. Cargo Handling Equipment Rules

CHP urges DEP to move forward with its commitment to adopt regulations to lower emissions from cargo-handling equipment ("CHE") and electrify CHE in New Jersey.[120] CHE refers to any motorized vehicle used to handle cargo or perform routine maintenance activities at ports and intermodal rail yards, including yard trucks, rubber-tired gantry cranes, container handlers, forklifts, and more.[121]

Some 83% of the CHE at Port Newark is powered by diesel engines that do not meet the most recent diesel emission standards.[122] Port Newark's rubber-tired gantry cranes and straddle carriers, in particular, are large emitters, collectively responsible for over half of CHE emissions for most pollutants despite making up only about a third of the CHE population at the Port.[123] The impacts are significant, particularly for nearby port and freight communities. Indeed, DEP's own estimates indicate that non-road sources are the biggest source of NOx emissions in Essex County, at 49%.[124]

Zero-emission technology for CHE is already available. The Port of Los Angeles and Long Beach are already using zero-emission yard trucks and zero-emission container handlers[125] Tenants at the Port of Authority of New York and New Jersey have been operating or testing an all-electric straddle carrier and at least fourteen ZE yard tractors since 2019.[126]

In 2006, CARB implemented CHE regulations that require Tier 4 diesel engines or other pollution control measures for new and in-use cargo handling equipment. In 2006, CARB implemented CHE regulations that require Tier 4 diesel engines for new CHE and best available control technology for new and in-use cargo handling equipment. The requirements apply to in-use and newly purchased diesel-powered equipment at ports and intermodal rail yards for new yard trucks, new non-yard truck equipment, in-use yard trucks and in-use non-yard trucks. With

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[119] Newark Community Impacts Study, Att. 6 at 11.
[120] DEP, *Preview of Rules Proposal,* at 11 https://www.nj.gov/dep/workgroups/docs/njpact-20201221-pres.pdf ("Cargo Handling Equipment: Adopt CA's rules by reference to require existing diesel-powered cargo handling equipment to upgrade to cleaner technology, and require that new purchases meet the tightest standards.").
[121] CARB, *Cargo-Handling Equipment* (2021) https://ww2.arb.ca.gov/ou.r-work/programs/cargo-handling-equipment.
[122] PANYNJ, *Air Emissions Inventory and Related Studies:2019 Emission Inventory* at 20 https://www.panynj.gov/port/en/our-port/sustainability/air-emissions-inventories-and-related-studies.html.
[123] *Id.* at 12 and 20
[124] DEP, SIP Proposal, *supra* note 107 at 4-10.
[125]San Pedro Bay Port, *Clean Air Action Plan Implementation Stakeholder Advisory Meeting Summary* at 5 (June 24, 2020), https://cleanairactionplan.org/documents/june-24-2020-stakeholder-advisory-meeting-minutes.pdf/.
[126] PANYNJ, *First All Electric Saddle Carrier in the U.S. Coming to the Port of New York and New Jersey* (Jan.11, 2019), https://www.panynj.gov/port-authority/en/press-room/press-release-archives/2019_press_releases/first_all-electricstraddlecarrierintheunitedstatescomingtothepor.html; PANYNJ, *New Jersey Allocates Funding Toward Further Electrification at the Port of NY and NJ* (Mar. 2, 2021), https://www.portbreakingwaves.com/new-jersey-allocates-funding-toward-further-electrification-at-the-port-of-ny-and-nj/.

the rule's implementation and amendments in 2012, CARB estimated an 80% reduction in particulate emissions and a cumulative reduction of NOx emissions, amounting to approximately 37 million pounds, by 2020.[127] CHP urges DEP to adopt CARB's CHE regulations as soon as possible, to decrease particulate matter and NOx emissions that disproportionately harm port communities.

In 2018, CARB presented a plan to amend the CHE regulations, focusing on zero-emission equipment and facility infrastructure, with an implementation date of 2026.[128] CARB is assessing the availability of zero-emission technology as an alternative to all combustion powered-cargo equipment and will consider these amendments in 2022.[129] The amendments will improve existing regulations for diesel cargo handling equipment at ports and rail yards, including but not limited to yard trucks, rubber-tired gantry cranes, container handlers, and forklifts.[130] C9ARB is assessing zero-emission technology as an alternative to all combustion-powered equipment. Of note, CARB is also considering opportunities to prioritize early implementation in communities most impacted by air pollution.[131] CHP urges DEP to being reducing CHE emissions now by promptly adopting CARB's current CHE rule, and then adopt CARB's ZE CHE requirements once CARB's rulemaking is finalized.

### 2. Ocean-Going Vessels and Harbor Crafts

CHP urges DEP to adopt CARB's Ocean-Going Vessels at Berth regulations to decrease emissions from container ships, passenger ships, and refrigerated cargo ships.[132] Based on PANYNJ estimates, ocean-going vessels at the port contribute to 36% of VOC emissions, 44% of NOx emissions, and 25% of particulate matter emissions.[133] Indeed, oceangoing vessels are the largest contributor of NOx emissions at the Port, and the second-largest contributor of the other pollutants behind heavy-duty diesel vehicles.[134]

CARB's Ocean-Going Vessels at Birth regulations were adopted in 2007 and implemented in 2014 with the goal of addressing pollution that CARB recognized adversely impacts environmental justice communities.[135] As of 2020, CARB reported an 80% reduction in NOx and PM emissions from container, refrigerated cargo (reefer), and cruise vessels at

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[127] CARB, Cargo Handling Equipment: 2011 Regulatory Amendments (Dec. 2013), https://ww2.arb.ca.gov/sites/default/files/2020-07/chefactsheet121813.pdf.
[128] CARB, Cargo Handling Equipment Regulation to Transition to Zero-Emissions (2021), https://ww2.arb.ca.gov/resources/documents/cargo-handling-equipment-regulation-transition-zero-emissions.
[129] *Id.*
[130] *Id.*
[131] *Id.*
[132] CARB, *Commercial Harbor Crafts* (2021), https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft/about.
[133] NJDEP, *Ocean Going Vessels and Harbor Craft: Bureau of Mobile Sources* at 7 (Sept. 16, 2020), https://www.nj.gov/dep/workgroups/docs/njpact-air-co2-20200916-ogv-pm-pres.pdf.
[134] *Id.*
[135] CARB, *Ocean-Going Vessels at Berth Regulation* (2021), https://ww2.arb.ca.gov/our-work/programs/ocean-going-vessels-berth-regulation/about; *see also* CARB, Control Measure for Ocean-Going Vessels At Berth (Aug. 6, 2020), https://ww2.arb.ca.gov/resources/fact-sheets/control-measure-ocean-going-vessels-berth.

California ports.[136] Upon full implementation, CARB estimates a 90% reduction in pollution and a 55% reduction in potential cancer risks for nearby port communities.[137]

CHP also urges DEP to adopt CARB's Commercial Harbor Craft regulations to decrease emissions from fishing vessels, tug boats, tow boats, crew and supply boats, ferries, excursion vessels, barges, dredges, and other vessel types.[138] According to PANYNJ, harbor craft contribute to 5% of VOC emissions, 8% of NOx emissions, 10% of CO emissions, and 8% of particulate matter emissions at the Port.[139]

CARB's Commercial Harbor Craft regulations were adopted in 2007, with a final implementation date of 2022.[140] The regulations were designed to decrease diesel particulate matter, NOx, and reactive organic gases. [141] Of note, CARB is currently amending the regulations and evaluating the feasibility of Tier 4 engine technology, retrofit emission control devices, and other operational control strategies to further reduce emissions.[142] DEP should adopt both the current and future Commercial Harbor Craft regulations to address emissions from this significant source of Port emissions.

California has seen significant results from these regulatory programs and CARB is taking further steps to protect environmental justice communities. DEP must continue to lead the way in the East Coast, not only on land, but also at sea – by adopting the Ocean-Going vessels and Harbor Craft regulations.

### 3. ISR/Warehouse, Zero-Emissions Zones

CHP urges DEP to adopt place-based regulations to reduce harmful pollution from warehouses and other locations that concentrate goods-movement emissions. Such measures should meaningfully improve air quality and related health outcomes in port-adjacent communities, where residents suffer disproportionate environmental harms.

Port Newark has more than one billion square feet of warehouse and distribution space within 50 miles.[143] Even though warehouses do not generate pollution directly, warehouse operations and the goods movement infrastructure involve multiple mobile sources of harmful

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[136] CARB, Control Measure for Ocean-Going Vessels at Berth (2021), https://ww2.arb.ca.gov/resources/fact-sheets/control-measure-ocean-going-vessels-berth.
[137] *Id.*
[138] *Id.*
[139] DEP, Ocean-Going Vessels and Harbor Craft, at 20 (Sept. 16, 2020), https://www.nj.gov/dep/workgroups/docs/njpact-air-co2-20200916-ogv-pm-pres.pdf.
[140] CARB, *Commercial Harbor Craft* (2021), https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft/about.
[141] *Id.*
[142] *Id.*
[143] PANYNJ, Warehousing & Distribution, https://www.panynj.gov/port/en/shipping/warehousing---distribution.html.

emissions, such as diesel pollution from heavy-duty trucks and cargo handling equipment.[144] Recently, the Port has attracted a growing volume of certain imported goods, thus increasing demand for warehouse space and contributing to the mounting problem of "warehouse sprawl" in New Jersey.[145] Furthermore, Port throughput is expected to double by 2050.[146] Communities near the Port's warehousing and distribution operations face significant adverse health impacts from goods-movement emissions.

To address emissions from the proliferation of warehouses throughout New Jersey, DEP should adopt a measure like the Warehouse Indirect Source Rule ("ISR") adopted by the South Coast Air Quality Management District ("SCAQMD") in May 2021.[147] The Warehouse ISR, which applies to warehouses that are 100,000 square feet or larger,[148] requires warehouse operators to earn points each year by completing specific actions to reduce emissions. They can earn points by selecting actions from a list of options, including acquiring and using zero- or near-zero emission trucks, zero-emission cargo handling equipment, or a zero-emission charging and fueling system, among others.[149] If warehouse operators fail to earn the required number of points, they must pay a mitigation fee.[150] These fee payments will fund a mitigation program, designed to incentivize emissions reductions in nearby communities by subsidizing the purchase of zero-emissions trucks or the installation of charging and fueling systems for cleaner vehicles.[151] The rule includes a three-year phase-in period, during which the largest warehouses will be phased in first.[152]

The Warehouse ISR is a significant step toward cleaner air and healthier communities. According to SCAQMD, the Rule is expected to save up to 300 lives, prevent up to 5,800 asthma attacks, and result in up to 20,000 fewer sick days in the South Coast region.[153] The expected health benefits range from $1.2 to $2.7 billion.[154] Furthermore, under the ISR, businesses will spend less on fuel and maintenance costs, thanks to less expensive charging and refueling options for cleaner vehicles.[155]

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[144] Paul Stroik & Ryan Finseth, SCAQMD, Second Draft Socioeconomic Impact Assessment for Proposed Rule 2305 (South Coast Air Quality Management District, April2021), http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/pr-2305_sia_2nd-draft_4-7-21.pdf; Ivette Torres et al., Warehouses, Pollution, and Social Disparities: An analytical view of the logistics industry's impacts on environmental justice communities across Southern California, 4 (April 2021), https://earthjustice.org/sites/default/files/files/warehouse_research_report_4.15.2021.pdf.

[145] Jon Hurdle, *Warehouse 'sprawl' spreads in NJ as pandemic accelerates e-commerce surge*, NJ Spotlight News, Jan. 27, 2021, https://www.njspotlight.com/2021/01/nj-warehouse-sprawl-pandemic-surge-e-commerce-white-township-hamilton-upper-freehold-pollution-runoff-truck-traffic-feared-overwhelm-rural-roads/.

[146] Port Master Plan, *supra* note 8 at 24.

[147] SCAQMD, South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule, 1 (May 7, 2021), https://www.aqmd.gov/docs/default-source/news-archive/2021/board-adopts-waisr-may7-2021.pdf.

[148] Paul Stroik & Ryan Finseth, *supra* note 148 at ES-1.

[149] South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule, *supra* note 147 at 1.

[150] Paul Stroik & Ryan Finseth, *supra* note 148 at ES-1.

[151] *Id.*; South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule, *supra* note 147 at 2.

[152] South Coast AQMD Governing Board Adopts Warehouse Indirect Source Rule, *supra* note 147 at 2.

[153] Paul Stroik & Ryan Finseth, *supra* note 148 at ES-9.

[154] *Id.*

[155] Earthjustice, Southern California's Air District Votes to Electrify and Clean Up Air Pollution from Mega-Warehouses, Earthjustice (May 7, 2021), https://earthjustice.org/news/press/2021/southern-californias-air-district-votes-to-electrify-clean-up-air-pollution-from-mega-warehouses.

CHP also urges DEP to explore the implementation of zero-emission zones ("ZEZs") as a potential framework for reducing dangerous emissions generated by the warehousing and distribution functions of Port Newark. ZEZs are designated areas where only zero-emission vehicles are permitted. These zones may be created for certain types of vehicles, such as delivery vehicles in a zero-emission zone for freight.[156] To ensure that ZEZs follow a common approach from one location to another, collaboration among state and local governments is key.[157] This framework has been implemented in communities around the world, including Santa Monica, the first city in the United States to establish a ZEZ.[158] Equity and environmental justice should be central to the ZEZ framework, prioritizing the reduction of air pollution in communities Of Color and low-income communities, where warehouses and distribution centers tend to be concentrated.[159] DEP should coordinate with local communities in New Jersey, particularly those most affected by emissions from Port Newark's operations, to explore the potential for ZEZs to improve local air quality and better protect residents' health and wellbeing.

#### 4. Railyards & Locomotives

DEP should also take efforts to reduce air emissions from locomotives and railyards, whose emissions have a significant public-health impact given their presence inside of residential areas like those of the Ironbound. Of all Port Newark-related facilities, the sprawling Oak Island railyard is the closest to the residential area of the Ironbound, some 500 meters from sensitive receptors like the St. Justine II Pre-School and Fresenius Kidney Care Center.[160] Ninety-two percent of exposure to mobile-source NOx and PM2.5 at these sites comes from the railyard.[161] Rail is the single largest contributor to mobile-source PM2.5 exposure over much of the southern half of the residential area of the Ironbound.[162] And looking at the entire residential area of the Ironbound, rail is responsible for 67-70% of mobile-source NOx and PM2.5 emissions.[163]

As emissions from MHDVs reduce through the ACT Rule and other future measures, the relative contribution of rail to local air quality will only grow worse. CARB estimates that, given the transition to ZE trucks, transporting cargo by trucks will be cleaner than transporting cargo

[156] Transport Decarbonisation Alliance et al., How-to Guide: Zero Emission Zones, 12 (Dec. 2020), http://tda-mobility.org/wp-content/uploads/2020/12/ZEZ-F_How-to-Guide_low.pdf.
[157] *Id.* at 6.
[158] Katie Fehrenbacher, California city of Santa Monica maps first U.S. zero-emission delivery zone, GreenBiz, Jun. 17, 2020, https://www.greenbiz.com/article/california-city-santa-monica-maps-first-us-zero-emission-delivery-zone; City of Santa Monica, LACI Launches First-In-Nation Zero Emissions Delivery Zone With City of Santa Monica and Partners Including Nissan, IKEA (Feb. 25, 2021), https://www.santamonica.gov/press/2021/02/25/laci-launches-first-in-nation-zero-emissions-delivery-zone-with-city-of-santa-monica-and-partners-including-nissan-ikea.
[159] Aileen Nowlan & Sabah Usmani, Environmental Defense Fund, Accelerating Zero Emissions Delivery: An innovative approach to transforming the last mile, 2 (2021), https://business.edf.org/files/EDF023_Zero-Emissions_v3.pdf.
[160] Newark Community Impacts Study, Att. 6 at 6-7.
[161] *Id*. at 10.
[162] *Id*. at 8.
[163] *Id*. at 9.

by rail as soon as 2023.[164] But using commercially available Tier 4 diesel technology – with NOx and PM2.5 emissions 80% lower than typical trains – could keep rail emissions comparable to ZE truck emissions through 2040.[165]

Given the significant impacts of rail operations on neighboring residents, we strongly urge DEP to explore and adopt measures to reduce emissions at railyards. Such measures could include prioritizing CHE and truck electrification at railyards, agreements or incentives for locomotive emission reductions,[166] prohibitions on the remanufacture of locomotives with the oldest, dirtiest engines,[167] and operational regulations to reduce emissions.[168]

## VI. CONCLUSION

The ACT Rule promises to make substantive emission reductions in the medium and heavy-duty vehicles that traverse the state every day. But the ACT Rule is just the start, since much more needs to be done to reduce emissions in the New Jersey communities that disproportionately bear the negative impacts of the region's goods-movement industry. CHP urges DEP to move swiftly in its adoption of the ACT Rule, and looks forward to working with DEP to attain further emission reductions at Port Newark and goods-movement centers throughout the state through additional policies for mandatory emission reductions.

Sincerely,

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*Earthjustice is grateful to Thomas Gooding, a summer law clerk, for his significant contributions to this comment letter.

(sign-ons follow on next page)

[164] CARB, Trucks or trains – which is cleaner? CARB staff compared emissions from trucks and trains moving cargo containers, using an example scenario from the Ports of Los Angeles and Long Beach (Ports) (Sept. 23, 2020), https://ww2.arb.ca.gov/resources/fact-sheets/draft-truck-vs-train-emissions-analysis.
[165] *Id.*
[166] *See* CARB, Rail Emission Reduction Agreements, https://ww2.arb.ca.gov/resources/documents/rail-emission-reduction-agreements; CARB, Revised Draft 2020 Mobile Source Strategy, *supra* note 31 at 55-56, 144-45; CARB, Status Update on Railyard Indirect Source Rule 9, 16 (Apr. 3, 2020), https://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2020/2020-apr3-028.pdf.
[167] CARB, Revised Draft 2020 Mobile Source Strategy, *supra* note 31 at 55-56, 144-45; CARB, Status Update on Railyard Indirect Source Rule, *supra* note 166 at 10.
[168] CARB, Status Update on Railyard Indirect Source Rule, *supra* note 166 at 14.

The following groups sign on in agreement with these comments:

John Reichman, Environmental Chair
BlueWaveNJ

Matt Smith, NJ Director
Food & Water Watch

Sara Cullinane, Esq, New Jersey Director
Make the Road Action

Joan Farkas, Chairperson
Our Revolution Monmouth

Paulina Muratore, Northeast States Campaign Manager, Clean Transportation Program
Union of Concerned Scientists

# Attachment 1

# GUBERNATORIAL PORTS BRIEFING

COALITION FOR Healthy PORTS NJ / NY

# 2017

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# EXECUTIVE SUMMARY

The Coalition for Healthy Ports (CHP) is a bi–state collaboration of over 40 environmental and social justice, community, labor, and interfaith organizations committed to a ***Clean Environment, Healthy Neighborhoods, and Good Jobs.*** The Coalition is led by a Steering Committee that includes Clean Water Action/Clean Water Fund (chair), GreenFaith, International Brotherhood of Teamsters, Ironbound Community Corporation, and the New Jersey Environmental Justice Alliance. This Coalition formed almost a decade ago because seaports represent one of the most significant environmental burdens in an already overburdened and vulnerable region. The seaports also represent a significant economic driver in the region, one with the promise of greater opportunities for local communities and workers. The Ports of Newark and Elizabeth are part of a larger port complex overseen by the bi-state agency, the Port Authority of New York and New Jersey (PANYNJ). It is the third largest seaport in the nation and the largest on the East Coast. The PANYNJ handled more than 3 million cargo containers in 2014, a 5 percent increase from 2013. The PANYNJ continues to see record volumes and is the busiest on the East Coast with a dollar value of all cargo that moved through the port exceeding $200 billion.[1] A majority of the goods leaving the ports (85%) are moved by diesel drayage trucks along major highways and local roads within the region to nearby warehouses, assembly facilities, and retailers.[2] This complex logistics chain from global shipping to consumers constitutes the *goods movement industry*. The goods movement industry has large-scale implications for the economic and environmental wellbeing of seaport adjacent communities like Newark that bear the brunt of the environmental pollution generated by this industry. The PANYNJ estimates that more than 14,000 trucks on average currently enter and leave the port on a daily basis and this number is expected to increase as the completion of the raising of the Bayonne Bridge nears.

Unfortunately, port trucks are some of oldest and dirtiest trucks on the road, spewing health harming diesel pollution and greenhouse gases. The drivers are primarily owner operators who lack the resources to upgrade or maintain their trucks. Their income and expenses are largely controlled by trucking companies – resulting in poverty wages that are not enough to support a family, much less upgrade to a modern, cleaner truck. Port pollution is an environmental and health injustice – increasing asthma, heart disease, and cancer rates. In addition to thousands of diesel trucks, the seaport is run almost exclusively by diesel-powered engines and equipment from ships burning bunker fuel to cargo handling equipment and tug boats. The entire seaport operation is one of the largest area sources of pollution in the region. Current seaport operations represent an environmental injustice because they are contributing significant amounts of localized pollution in an area that is already overburdened by other sources of pollution in the midst of one of the most densely populated areas of the state where a majority of residents are low income, communities of color.

Despite city ownership of Port Newark land, the PANYNJ controls the terms of tenant leases, operations and expansions. The City of Newark has had virtually no say in the land development process and has not been fairly or consistently compensated for the use of its land. The PANYNJ touts the port as an economic engine for the region with 4500 workers employed directly by the seaports and another 143,000 employed by the larger ports industry in New Jersey.[3] Despite this, a relatively small number of Newark residents directly benefit from the economic opportunities at the seaports, with only 6 percent of the more than 3,200 longshore workers at the Port live in Newark and less than 12 percent of the Port's 2,300 total warehouse and maintenance workers have Newark addresses. These are lower percentages than port adjacent communities like Los Angeles or Long Beach where an average of 15% or more of the direct workforce resides in the host communities. ***The reality is stark – cities like Newark bear the burdens of pollution and poverty wages resulting from the ports but reap few of the benefits.***

[1] http://www.panynj.gov/about/port-initiatives.html
[2] http://www.panynj.gov/port/trucking-roadway-network.html
[3] New Jersey, the industry annually supports $14.5 billion in personal income, $20 billion in business income, and $1.6 billion in state and local taxes, New York Shipping Association, The Economic Impact of the New York-New Jersey Port Industry, 2014, http://nysanet.org/wp-content/uploads/NYSA_Economic_Impact_2014V2

Together with our partners, we believe the best way to achieve a clean and healthy port is through strategic policy reforms and investments at the Port Authority of New York & New Jersey (PANYNJ) that will clean the air and improve the conditions of workers and adjacent communities. The strategies detailed in this report include recommendations in four key areas: **(1) Clean Air, (2) Community Benefits (3) Good Jobs and (4) Good Governance.** Each section details in brief the problems, impacts and solutions related to the ports.
We call on the next Governor of the State of New Jersey to be a committed advocate for achieving the goals outlined in this report and to implementing a comprehensive, proactive approach to the ports that will bring New Jersey closer to realizing the vision of a clean, healthy and prosperous port region for all residents.
The following is a summary of the recommendations included across all four sections of this report:

| **1. CLEAN AIR** |
|---|
| 1. **Mitigate Port Related Air Pollution**<br>❖ Develop a bi-state plan for tackling emissions from the freight sector.<br>❖ Seaports to submit air emissions reduction plans for compliance with the State Implementation Plan<br>❖ Implement a state environmental impact assessment law (Mini-NEPA)<br>❖ Enact an Executive Order on Environmental Justice and Cumulative Impacts |
| **2. Legislation to Mitigate Freight Emissions**<br>❖ Review California's freight related emissions reductions programs, determine what can be replicated<br>❖ Pass legislation that will create a "clean truck exemption" program. |
| **3. Mitigate and Incentivize Emissions Reductions**<br>❖ Reinstate the pre-2007 engine truck ban<br>❖ Implement "concession agreement"<br>❖ Raise marine tariffs on shippers to help fund emissions capture and control systems for ships, locomotives,<br>❖ Apply Volkswagen settlement funds in a manner that prioritizes the most aggressive air mitigation<br>❖ Larger investments by the PANYNJ in technology and capital spending to modernize and clean up port<br>❖ Implement appointment system<br>❖ Implement anti-idling and enforcement program<br>❖ Install ample plug-in capacity for all refrigerated cargo<br>❖ Implement a "Virtual Container Yard" system to eliminate empty container trip. |
| **2. COMMUNITY BENEFITS** |
| **1. Economic & Policy Priorities**<br>❖ Re-negotiating the lease with Newark to provide a more equitable sharing of the revenues from the seaport and the airport.<br>❖ Maximizing business opportunities for Newark-based companies at PANYNJ facilities.<br>❖ Establishing education, training and employment centers to provide skills for port-related jobs & improve health of communities.<br>❖ Working closely with and implementing recommendations of the City of Newark Port Authority Oversight Advisory Committee. |
| **2. Land Use & Planning**<br>❖ Require port construction (on and off port) to include payment into an "inclusionary zoning" program to fund affordable housing.<br>❖ Working with City of Newark to develop a comprehensive warehouse zone and plan.<br>❖ Truck traffic should be routed away from residential neighborhoods and schools.<br>❖ Invest in Idling Emissions capture technology at truck stops or other local areas where drayage trucks congregate<br>❖ Low emitting engines should be mandated for truck trips between the port and warehouse zone.<br>❖ Warehouse operators should be required to hire full-time employees (as opposed to misclassified contingent workers), pay a living wage, and comply with all Newark labor regulations including "ban the box" and paid sick days.<br>❖ Working with the port-adjacent communities to create a development plan addressing port-related issues |
| **3. Quality of Life & Environmental Benefits**<br>❖ Establish an environmental mitigation fund that implements local community-based projects to reduce port emissions<br>❖ Create buffers to restrict the spread of dust/particulate contamination, odors, noise, and other impacts of port related operations.<br>❖ Installing and maintaining air filtration systems in areas with sensitive receptors impacted by port emissions.<br>❖ Install sound-dampening windows in schools and residences in proximity to port facilities or truck routes serving port trucking.<br>❖ Funding hospitals, schools, community clinics, medical training facilities, and other health care providers to address health impacts related to pollution emanating from Port operations.<br>❖ Fund independent emissions monitoring inside and/or perimeter of ports as well as during construction.<br>❖ Developing evacuation and emergency preparedness plans for all port and port-related facilities. |
| **3. GOOD JOBS** |

| | |
|---|---|
| **1. Compensation**<br>❖ All jobs in and around the port, including work performed by contractors, employees for temporary contractor services and tenants, shall earn at least $15 an hour as well as full benefits for full-time employees | |
| **2. Employment Opportunities**<br>❖ PANYNJ should adopt a First Source Hiring Program with regard to all direct Port Jobs and any Port Contractor, Port Lessee (including warehouse and distribution facilities on port property), and/or Licensee.<br>❖ PANYNJ shall be required to fund job training for Port-Related Jobs, and Pre-apprenticeship Programs.<br>❖ All port and port related employers should implement, Ban the Box policy.<br>❖ PANYNJ should initiate a program to increase participation in the planning, construction, operation and maintenance of PANYNJ related projects by small businesses and minority-owned business enterprises and women-owned business enterprises. | |
| **3. Contracting & Employment Practices**<br>❖ PANYNJ should create an “enhanced responsible contractor” policy that requires all entities wishing to provide direct or subcontracted services at port facilities to adhere to the highest standards of wage and workplace protections.<br>❖ Institute more rigorous screening of prospective bidders to ensure that federal contracts are not awarded to employers that are significant or repeat violators of workplace, tax or other laws.<br>❖ Establish a preference in the contractor selection process for employers that provide good jobs, by prioritizing firms that provide living wages, health benefits, and paid sick days.<br>❖ Expand & improve the national contractor misconduct database (2008 National Defense Authorization Act)<br>❖ Strengthen monitoring and enforcement of contractors' compliance with workplace standards. [4]<br>❖ Enact legislation that permits labor peace agreements in projects in which public entities have proprietary interests.[5] This type of legislation would be applied to PANYNJ contracts.[6]<br>❖ Call upon NJ Department of Labor to conduct full investigation into tax evasion and wage theft in the port trucking industry. | |
| **4. GOOD GOVERNANCE** | |
| **1. Structural Reforms**<br>❖ Uphold and enforce the standards set by the Board of Commissioners’ Code of Ethics. The PANYNJ should be directed to complete a comprehensive assessment of adherence to the ethical code by employees and produce recommendations for improving public accountability and ethical compliance by all employees.<br>❖ Reform the Board of Commissioner's appointment system and hiring processes for high-ranking PANYNJ employees. The Board of Commissioners should have seats reserved for members representing local communities/municipalities. Commissioners and high–level employees should be subject to legislative review and public vetting. Renewal of appointments to these positions should be contingent on performance reviews that include adherence to the Code of Ethics of the Agency.<br>❖ Pass a substantive legislative reform package that enforces greater agency oversight and transparency. Existing NJ Legislature Bills S-1761, A1011, S-2181 S355, S2183, S2182, should be reviewed and implemented to improve port governance. | |
| **2. Oversight of Budget Allocations**<br>❖ Identify criteria for appropriate use of Port Authority funds consistent with its organizational mission and also with equity and fairness standards that extend consideration to environmental justice issues. Decisions about prioritizing large pools of public funds should be done to maximize both economic and environmental well being for all of the region's residents.<br>❖ Prioritize investments that benefit port host communities through environmental mitigations and economic opportunities.<br>❖ Increase investments for environmental mitigation projects in the Ports Commerce division. Expansion or growth in the marine and airport divisions should be tied to increased environmental or community mitigation investments to offset potential harmful impacts on local communities. | |
| **3. Public Processes and Records**<br>❖ PANYNJ should improve community relations and meaningful involvement of local communities via improved public processes<br>❖ Partner with a third party to report and verify data on the implementation of port’s clean air programs and to conduct regular, independent monitoring of air quality and all environmental measures taken at the seaports.<br>❖ Comply with requests for agency documents, data and research, particularly when such requests provide insight into agency decisions that impact the public. Comply fully with FOIA requests promptly.<br>❖ Conduct research and studies relevant to impacted communities with their full participation, knowledge and consent.<br>❖ Ensure that the PANYNJ creates an official *Environmental Justice Stakeholder group* that meets regularly with and produces recommendations for consideration directly to the PANYNJ Commissioners and Governor's Office. | |

[4] http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1429&context=bjell
[5] https://legiscan.com/NJ/text/A1416/id/518438
[6] A labor peace agreement is an arrangement between a union and an employer under which one or both sides agree to waive certain rights under federal law with regard to union organizing and related activity. US Chamber of Commerce, https://www.uschamber.com/sites/default/files/documents/files/labor_peace_agreements_2013_09_12.pdf

# CLEAN AIR

## PROBLEM

Seaports are significant contributors to local and regional air pollution due to their heavy reliance on diesel engines to power seaport operations including: ocean-going cargo vessels, harbor-craft (tugboats and other small boats), cranes, cargo handling equipment, locomotives, and drayage trucks. Diesel exhaust is a known cause of lung cancer and has been linked to asthma, heart disease, premature death, and other serious adverse health effects. An important reason that diesel exhaust is connected to these afflictions is because it is a significant source of fine particulate matter (PM2.5), which itself is linked to the aforementioned illnesses. It is also important to understand that it appears there is no lower threshold for the detrimental impacts of fine particulate matter.[7] In other words, the lower the concentrations of fine particulate matter, the better it is for the health of New Jersey residents. This fact provides an incentive to decrease emissions of diesel exhaust as much as possible.

Residents living in communities located in and around the seaport bear the brunt of the air pollution emanating directly from on-port operations, as well as the local and regional goods movement system that serves as an extension of port infrastructure. The health of residents in Newark, Elizabeth, Jersey City and Bayonne are particularly impacted by the emissions from thousands of truck that traverse local roads and nearby highways daily. Truck emissions have a high intake fraction (or portion of emissions inhaled by people) compared to typical point (smokestack) sources due to the fact that diesel exhaust is emitted on roadways at ground level in close proximity to where people live, go to school, work and play. These port adjacent communities host a myriad of port-related operations from truck-intensive warehousing to the network of highways and feeder roads that serve to move goods to and from the port. Through this system of diesel truck and rail traffic, the health impacts of the seaport operations extend far beyond the seaport fence line.

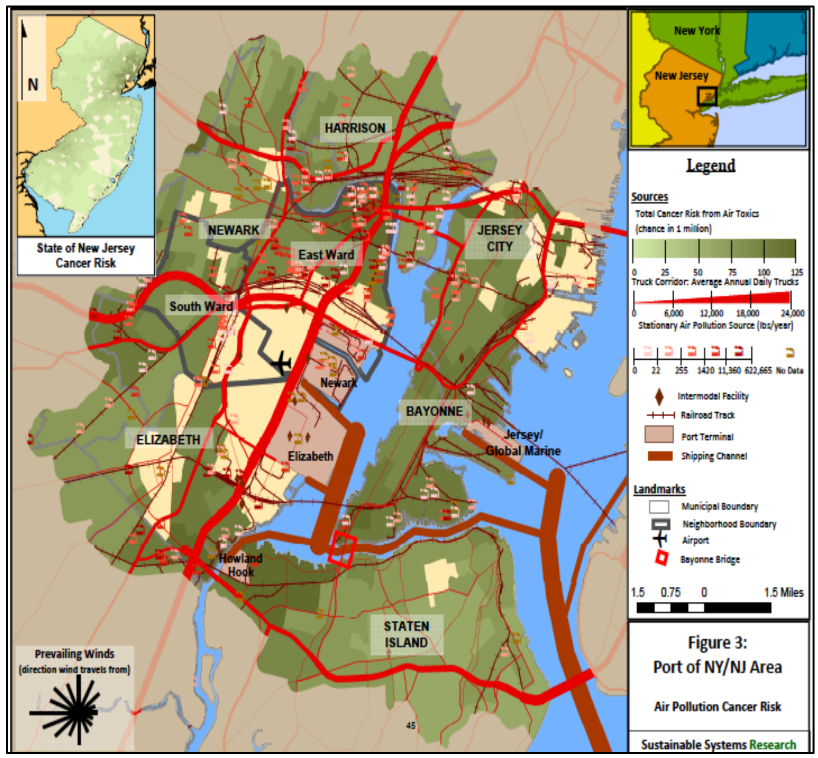



Figure 1: Cancer risk associated with port traffic

The NJ Department of Environmental Protection (NJDEP) predicted that cancer risk from only on-port activities alone ranged up to 1000 in a million, well above the NJDEP's benchmark of 1 in a million risk.[8] In this study, diesel emissions were found to contribute to a violation of the 24-hour Particulate Matter 2.5 (PM2.5) National Ambient Air Quality Standard (NAAQS) and exceedance of the annual and 24-hour

[7] *See* 80 Fed. Reg. 64995, 65047 (2015); 79 Fed. Reg. 34829, 34941-34942 (2014). In documents connected to its climate change rule, the Clean Power Plan, EPA states that it assumes no lower threshold for health benefits stemming from reductions in PM2.5 concentrations based on a report it issued entitled "Integrated Science Assessment for Particulate Matter". This report evaluates scientific investigations that examined fine particulate matter and associated health impacts. *Id.* at 34942

[8] http://www.nj.gov/dep/stopthesoot/port%20modeling%20phase%202%20FINAL%206-24-11.pdf.

Significant Impact Level (SIL) in most of the surrounding communities. However, this study underestimated the full impact of the ports because drayage trucks traveling and idling outside of port boundaries were not considered in the calculation of risk. These port related trucks are contributing to sharply elevated cancer risks associated with diesel particulate matter that exists in New Jersey counties located near the ports.[9] In recent years these cancer risks may have declined but certainly remain significantly elevated and worrisome. Similarly, New Jersey is no longer in violation of the PM2.5 NAAQS [and SILs?] but particulate matter still poses a threat to health especially when considered in combination with other air pollutants.

## IMPACTS

Air pollution emanating from port related activities, has the greatest impact in communities that are already disproportionately burdened by pollution and vulnerable (i.e. lack access to health care, greater health burdens, etc). Close to one million people living in Newark, Elizabeth, Jersey City, and Bayonne suffer from the most harmful effects of diesel air pollution from port operations and trucks. Figure 1 shows the cancer risk associated with local truck traffic in the region surrounding the New Jersey seaports. Residents like Melissa Miles face economic, social and health related impacts from port related diesel exposure.

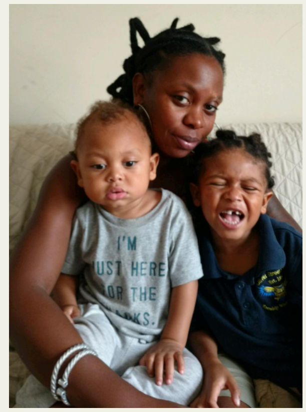
## SOLUTIONS

The following recommendations are focused on reducing diesel emissions and corresponding human health and environmental impacts of Port related diesel sources. While there are many air pollutants emitted from port operations (NOx, SOx, PM, GHG, etc.) that must be reduced, the focus of the mitigation strategies presented here target mitigation efforts to diesel sources because of the harmful impacts of diesel at the local level.

**1. Mitigate Port Related Air Pollution**

- ❖ The next Governor should demonstrate leadership on the issue of air pollution from freight operations by establishing a partnership between relevant New Jersey and New York agencies to develop a bi-state plan for tackling emissions from the freight sector. This plan should include bi-state regulatory proposals, incentives and a robust

**A MOTHER'S VIEW OF PORT POLLUTION**



In the Newark neighborhood known as the Ironbound, things look tidy on the surface. The Ironbound is often talked about as being one of the most vibrant and diverse neighborhoods in the city. But it has a dirty secret - air pollution. It is a port adjacent community where asthma, bronchitis, severe allergies and other chronic diesel-related illnesses plague residents. Parents fear for their children's health. Melissa Miles is a mother of two young boys residing in the Ironbound community. She recounts what it's live with the impacts of diesel.

"*I never wanted my 4 year old son to be a statistic. When he first began to wheeze, I attributed it to a cold. But then his pediatrician prescribed asthma medication. Even then, I refused to believe. No one in my family or in his father's family has asthma. I thought this was a onetime occurrence. But then it happened again and again. By our third emergency room visit, reality began to sink in. Then his cousin who lives around the corner on South Street began to have severe respiratory issues. South Street is a major truck thoroughfare to and from the port. Our air quality is impacted everyday by living so close to the ports. When I thought things couldn't get any worse, my two year old began to have difficulty breathing too. Now my family has three children with respiratory issues all living within one block of each other in the Ironbound. Our children deserve clean air and I know that cleaning up the ports and modernizing the trucks will help make that a reality.*"

**Figure 1: Ironbound Resident and Diesel Induced Asthma**

[9] http://www.nj.gov/dep/airtoxics/diesemis.htm. Diesel particulate matter related cancer risks are elevated throughout the state but appear to be even higher in counties near the port.

public participation process. Such a comprehensive plan should include (1) quantification of the emissions from freight operations in the bi-state area, localized health risks, and the economic benefits associated with reducing diesel pollution; (2) establish emissions reduction and health risk goals; and (3) identify the strategies and funding necessary to meet those goals. This comprehensive emissions freight plan can serve as the state's roadmap for reducing emissions and health risks from goods movement operations.[10] California already has this type of freight plan in place to meet new climate and clean air goals, create incentives and funding for truck fleet turnovers with an eye towards creating a zero emission passenger and container movement system by 2035.[11]

❖ The next Governor should work with the New Jersey Department of Environmental Protection (NJDEP) to require large area sources like the seaports to submit air emissions reduction plans for compliance with the State Implementation Plan (SIP). Additionally, the NJDEP can update their assessment of air emissions & environmental health risk associated with freight activities both on and off port properties.
❖ Implement a state environmental impact assessment law (Mini-NEPA) modeled after the New York State Environmental Quality Review Act (SEQRA). Such legislation would improve government decision-making by increasing transparency, information, and dialogue about the environmental and public health impacts of government actions.
❖ Implement statewide environmental justice and cumulative impacts legislation that protects low-income communities and communities Of Color from disproportionate amounts of pollution. While the legislation would prioritize communities Of Color and low-income communities it would also provide protection to other communities.

**2. Legislation to Mitigate Freight Emissions**

❖ California used state law and powers given to states under the federal Clean Air Act to adopt a suite of regulations to reduce diesel exhaust, including from port-serving trucks, ships, harbor craft, and cargo handling equipment. Many of these regulations modernize older fleets of diesel vehicles and equipment and/or require the use of emissions control technologies. These successful programs are models for the State of New Jersey to consider how best to protect its residents from air pollution created by PANYNJ operations. Moreover, these initiatives show that states are empowered to reduce freight-generated emissions. New Jersey should promptly review California's freight related emissions reductions programs and determine what initiatives can be replicated including:
    - TRUCK AND BUS REGULATION to reduce emissions of diesel particulate matter, oxides of nitrogen and other criteria pollutants, from in-use heavy-duty diesel-fueled vehicles[12]
    - AT-BERTH REGULATION to establish airborne toxic control measures for auxiliary diesel engines operated on ocean-going vessels at-berth[13]
    - TRANSPORT REFRIGERATION UNIT AIRBORNE TOXIC CONTROL MEASURE to establish airborne toxic control measures for in-use diesel-fueled transport refrigeration units (TRU) and TRU generator sets, and facilities where TRUs operate.[14]
    - CARGO HANDLING EQUIPMENT REGULATION for mobile cargo handling equipment at ports and intermodal rail yards.[15]
    - COMMERCIAL HARBOR CRAFT REGULATION to establish airborne toxic control measures for commercial harbor craft.[16]

❖ Pass legislation that will create a "clean truck exemption" program. This program would fund port-related environmental mitigation and specifically incentivize the turnover of the drayage truck fleet. Clean trucks

[10] https://www.arb.ca.gov/planning/gmerp/plan/final_plan.pdf
[11] http://www.casustainablefreight.org/files/managed/Document/289/CSFAP_FINAL_07272016.pdf
[12] https://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm
[13] https://www.arb.ca.gov/ports/shorepower/shorepower.htm
[14] https://www.arb.ca.gov/diesel/tru/tru.htm#mozTocId507635
[15] https://www.arb.ca.gov/ports/cargo/documents/chefactsheet0516.pdf; https://www.arb.ca.gov/ports/cargo/cargo.htm
[16] https://www.arb.ca.gov/ports/marinevess/harborcraft/documents/chcfactsheet0516.pdf; https://www.arb.ca.gov/ports/marinevess/harborcraft.htm

meeting the standard for entry (trucks with post-2007 engines) would be exempt from the fee and truck companies with older, dirtier trucks would pay a fee into a fund used to subsidize fleet modernization.[17]

**3. Mitigate and Incentivize Emissions Reductions**

The PANYNJ should adopt proactive policies within its purview to more aggressively mitigate diesel emissions from their operations. As a bi-state agency, the Governor of New Jersey has the ability to advise the PANYNJ to consider policies that benefit the residents of the state. The following are specific PANYNJ policies that can be promoted by our next Governor:

- ❖ Reinstate the pre-2007 engine truck ban (initially approved by PANYNJ in 2009), and update the ban transition the drayage fleet to 2010 and newer engines. The structure of the ban will ensure that the drivers are not paying for the new trucks.
- ❖ Implement "concession agreement" with terminal operators, which includes vehicle, equipment, environmental and labor standards

PANYNJ uses their authorized budget as well as federal, state and other funds to implement clean air strategies. Mitigation funds should be increased and prioritized to maximize the mitigation of diesel emissions.

- ❖ Raise marine tariffs on shippers to help fund emissions capture and control systems for ships, locomotives, etc.
- ❖ Apply Volkswagen settlement funds in a manner that prioritizes the most aggressive air mitigation strategies from drayage trucks and ships, which are the two largest sources of air pollution.
- ❖ Prioritize federal mitigation funds from sources such as the USEPA DERA, USDOT TIGER and CMAQ funds for reducing diesel emissions from mobile sources at seaports, including truck replacement, zero emissions technologies for cargo handling equipment (CHE), and emissions capture and control systems for ships.
- ❖ The PANYNJ's Port Commerce division receives the smallest relative percentage of the agency's budget for their operations (less than 4%). Mitigation measures will require larger investments by the PANYNJ in technology and capital spending to modernize and clean up port operations.

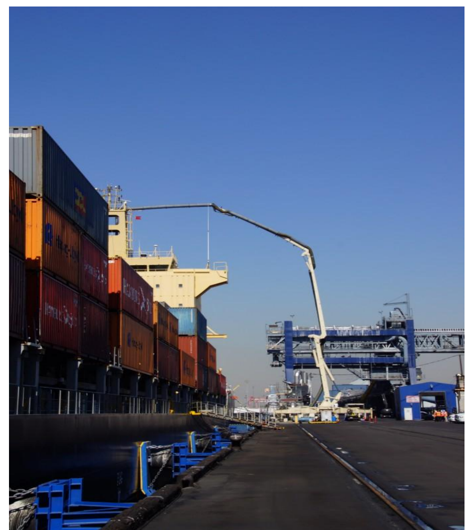


Figure 2: AMECS mobile dock-side smoke stack emission control system

The PANYNJ can also implement specific operational policies and procedures that can improve efficiency and reduce diesel emissions in and around their facilities.

- ❖ Implement appointment system and tiered shifts to reduce traffic congestion, idling and number of trucks needed to move goods in/out of the port.
- ❖ Implement anti-idling and enforcement program both on and off port property for drayage service areas including chassis yards, empty container storage yards, intermodal rail facilities, etc.
- ❖ Install ample plug-in capacity for all refrigerated cargo both at the port and off-site port related warehouses.
- ❖ Implement a "Virtual Container Yard" system to eliminate empty container trip.[18]

[17] Support passage of S2507 / A4120 or a similar bill, which establishes "Clean Trucks Tariff Fund" that helps incentivize and equitably pay for the replacement of older heavy-duty diesel trucks at the port.

[18] Investigating the Feasibility of Establishing a Virtual Container Yard to Optimize Empty Container Movement in the NY-NJ Region http://www.utrc2.org/sites/default/files/pubs/Investigating-Feasibility-of-Establishing-Virtual-Container-Yard.pdf

# COMMUNITY BENEFITS

## PROBLEM

The PANYNJ is setting new records for profitability. In 2015, port activity generated $21.2 billion in personal income, nearly $53.5 billion in business income and almost $7.1 billion in federal, state and local tax revenues.[19] The Port Authority recorded a $95 million profit from the port commerce division.[20] Unfortunately, port-adjacent communities like Newark, Elizabeth, Jersey City and Bayonne receive little financial benefit and very few good paying jobs while suffering the greatest impact from port-related traffic and pollution. New Jersey's port-adjacent communities have unique financial relationships with PANYNJ. Some municipalities like Newark hold title to lands leased to the Port Authority for seaport and airport activities while other municipalities like Elizabeth no longer have port land holdings. While taxes or payments in lieu of taxes are paid by the PANYNJ to municipalities that host port operations, there is a failure to sufficiently compensate port impacted municipalities for the fair market value of port occupied real estate and to offset or mitigate the environmental pollution and other related burdens (i.e. wear and tear on local roads, etc.) of hosting freight industries near densely populated, overburdened and vulnerable population centers.

## IMPACTS

The economic and environmental impacts of port activities in communities vary based on the level of activity and economic arrangement between the PANYNJ and the individual municipality. The related community mitigation and benefits owed to each impacted municipality should reflect these differences in characteristics. The following details each municipality's financial arrangement with the PANYNJ.

**Newark - "**In the agency's [PANYNJ] lease with Newark, there's a 'true-up' provision, which allows the city to increase the authority's rent if revenues from the port increase. The city recently determined that it's owed at least $12 million on an annual basis, and is currently negotiating for that money." [21] The PANYNJ has a long-term lease for the airport and seaport that expires in 2065. As part of this agreement, the amount of rent paid to the City of Newark may be increased based upon an increase in the gross revenues received by Port Authority from Newark Airport and Port Newark.[22]

**Jersey City -** Global Terminal was acquired by PANYNJ in 2010. Jersey City receives $2.2 million in annual Payment in Lieu of Taxes (PILOT) payments, but claims it should receive at least an additional $1.7 million. Jersey City has sued the Port Authority for $400 million to address the lack of sufficient pilot payments. [23]

**Bayonne -** PANYNJ acquired approximately 227 acres from Bayonne Local Redevelopment Authority for $235,000,000 in 2010. The PANYNJ pays Bayonne $1.5 M in annual pilot fees.[24]

**Elizabeth -** PANYNJ purchased 2,100 acres, the Marine Terminal, in 1951. "Elizabeth Mayor Chris Bollwage

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[19] http://corpinfo.panynj.gov/documents/2015/
[20] http://corpinfo.panynj.gov/documents/2015/
[21] "After a Voice Investigation, Newark Is Looking to Make the Port Authority Pay," http://www.villagevoice.com/news/after-a-voice-investigation-newark-is-looking-to-make-the-port-authority-pay-8850119
[22] The PANYNJ paid $200 million in up front lease payments to Newark in 2002-2007; The long-term lease agreement that dates to 1947 between the City of Newark and the Port Authority was amended in 2002 and included a provision which provided that the amount of rent paid to the City of Newark may be increased based upon an increase in the gross revenues received by Port Authority from Newark Airport and Port Newark, and also included a five (5) year "look back" and "true-up" intended to ensure fairness and the maximization of revenues to the City of Newark (City of Newark Executive Order on Port Oversight Committee, 2015 http://www.ci.newark.nj.us/wp-content/uploads/2016/05/ExecOrd.pdf)
[23] http://www.cityofjerseycity.com/uploadedFiles/Homepage/Port%20Authority%20Discussion%20Document%20vF%204-14.pdf
[24] http://www.nj.com/hudson/index.ssf/2013/05/port_authority_to_pay_bayonne_1.html

said his city might also consider legal action, as the authority uses hundreds of acres of land for port terminals and Newark Liberty International Airport. The Port Authority pays $63,000 in PILOT fees for the land, which would be worth $500 million in revenue if it were taxed at the city's standard rate for property." [25]

It is not just the relationship between the PANYNJ and the port-adjacent communities that needs to change. Other significant issues include:

- Lack of employment opportunities (% hired and quality of jobs) for local residents at the port
- Health impacts from port-related pollution
- Traffic congestion, vibrations and noise generated by port-related activities
- Depression of economic development in port-adjacent neighborhoods

## SOLUTIONS

The PANYNJ should have a long-term capital plan for investing in port-adjacent communities to off set the negative economic and environmental impacts of hosting this infrastructure. Local community organizations and residents should have a meaningful role in planning and monitoring these investments. For example, in Newark this should take the form of a **Community Benefits Agreement (CBA)** between the PANYNJ and port-adjacent neighborhoods. The following are CBA terms that are focused on Newark but which can be applied to any port adjacent community in New Jersey. Also Figure 3 features a groundbreaking CBA that was negotiated in Los Angeles between the Ports and local communities. This agreement in LA included a Port Community Mitigation Trust Fund with more than $12 million.

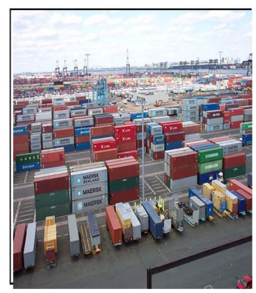
April 8, 2008

**NEWSPAPER**

Coalition for Healthy Ports • Volume 2, Number 1 • SPECIAL EDITION

### $50 million deal gives long-delayed SoCal terminal project go-ahead

Los Angeles port officials Friday (need a real date) approved a multimillion-dollar agreement with opponents of a long-stalled Port of Los Angeles terminal expansion project that will allow the $170 million project to move forward without the threat of litigation. Three Los Angeles port commissioners voted unanimously to approve a memorandum of understanding (MOU) between the port and a group of 20 environmental and community groups that will allow the Environmental Impact Report for the port's TransPacific (TraPac) terminal expansion to move forward unopposed. The groups threatened to sue the City to stop the project, which the groups claimed did not move fast enough or far enough to reduce pollution from the terminal's expanded operations. The MOU, composed by the City and the Natural Resources Defense Council (NRDC) without involvement of the TraPac operators, will create a Port Community Mitigation Trust Fund with the port providing an initial investment of more than $12 million.



The agreement also calls for the creation of a non-profit group to administer the fund. Money from the fund will be used to support pollution mitigation programs at nearby schools and health programs in surrounding communities, and to provide for studies into off-port impacts. City Councilmember Janice Hahn, who represents the port area, said the plan could eventually shift more than $50 million into off-port mitigation projects. (Source: American Shipper, insert year)

*News from the world* 1

Figure 3: Port Community Mitigation Trust Fund from the Ports of Los Angeles and San Pedro Bay, 2008

A Newark CBA would include:

**1. Economic & Policy Priorities**

- ❖ Re-negotiating the lease between the PANYNJ and the City of Newark to provide a more equitable sharing of the revenues captured from the seaport and the airport.
- ❖ Maximizing business opportunities for Newark-based companies at PANYNJ facilities.
- ❖ Establishing education, training and employment centers in port-adjacent neighborhoods to provide skills for port-related jobs and improve the overall health of the communities.
- ❖ Working closely with and implementing recommendations of the City of Newark Port Authority Oversight Advisory Committee.

[25] http://www.wsj.com/articles/SB10001424052702303914304579194350926516792

**2. Land Use & Planning**

- ❖ Requiring new port-related construction (on and off the port) to include payment of fees into an “inclusionary zoning” program to fund affordable housing.
- ❖ Working with City of Newark to develop a comprehensive warehouse zone and plan.
- ❖ Develop a comprehensive truck traffic routing plan with local municipalities to identify where routes should moved away from residential neighborhoods and schools.
- ❖ Invest in anti-idling emissions capture technology at truck stops or other local areas where drayage trucks congregate
- ❖ Working with the port-adjacent communities to create a development plan addressing port-related issues including: mitigation of traffic and idling and buffer zone(s) between port and port-related operations (e.g. ship loading facilities, container storage, facilities for loading containers onto commercial vehicles, and secondary structures) and nearby residential communities.

**3. Quality of Life & Environment**

- ❖ Establishing an environmental mitigation fund that implements local community-based projects to reduce or minimize the emissions and impacts of air pollution on impacted communities (see Figure 3: Port Community Mitigation Trust Fund from the Port of Los Angeles and Pedro Bay port complex).[26]
- ❖ Create buffers to restrict the spread of dust/particulate contamination, odors, noise, and other impacts of port and port-related operations. In some cases, these buffer zones could fund physical interventions in the form of greenspace (i.e. trees, bushes, vertical walls or barriers with vegetation, etc.) or the expansion of park and recreational corridors.
- ❖ Installing and maintaining air filtration systems in areas with sensitive receptors (schools, senior housing, public housing, healthy clinics, recreation and community centers, etc.) impacted by port emissions.
- ❖ Installing sound-dampening windows in schools and residences in proximity to port facilities or truck routes serving port trucking.
- ❖ Funding hospitals, schools, community clinics, medical training facilities, and other health care providers to address health impacts related to particulate and other pollution emanating from Port operations.
- ❖ Fund independent emissions monitoring for real time monitoring of emissions inside and perimeter of ports as well as during construction.
- ❖ Developing evacuation and emergency preparedness plans for all port and port-related facilities.

[26] CAL. CODE REGS tit.13, § 2025(2016)

# GOOD JOBS

## PROBLEM

The PANYNJ boasts about the significant employment benefits resulting from port commerce at the third largest seaport complex in the nation. Specifically they cite: 4500 workers employed directly by the seaports and another 143,000 employed by the larger ports industry in New Jersey.[27] Despite this, a relatively small number of Newark residents directly benefit from the economic opportunities at the seaports. Only 6 percent of the more than 3,200 longshore workers at the Port live in Newark and less than 12 percent of the Port's 2,300 total warehouse and maintenance workers have Newark addresses. "Newark has only half the per-capita representation of local residents working at the port, according to a 2013 study"[28]. Other port adjacent communities like Los Angeles or Long Beach see an average of 15% or more of the direct workforce resides in the host communities. In addition to a lack of representative employment in the port sectors, some of the most accessible port related jobs like truck driving, airport workers and warehouse work, are among the least regulated, unhealthy, unsafe and lowest paid work in the sector. The PANYNJ has largely absolved itself of any responsibilities regarding the enforcement of appropriate workforce policies, standards, and procedures for those doing business at the ports even though there is precedent for ports taking an active role in improving the quality, representation and compensation of employment in their industry.

The employment opportunities derived from the PANYNJ's airport and seaport related industries presents one of the biggest opportunities for contributing positively to local economic and social well being in cities that most need these opportunities. The Ports of Newark and Elizabeth boast record container volumes with annual throughput value of goods exceeding $200 billion. According to Forbes Magazine, "*Almost 80% of all the cargo imported into the port of New York/New Jersey is marketed to consumers within 100 miles of the port, making it a critical element of the regional economy.*"[29] While the PANYNJ ports represent one of the nation's most valuable goods movement hubs, in the middle of the world's largest and wealthiest consumer markets - the ports sit in the most economically depressed and underemployed cities in the region. This extreme contradiction demonstrates that the wealth generated by the movement of people and goods under the purview of the PANYNJ must be better distributed to produce real benefits for all residents of New Jersey.

## IMPACTS

The impacts of the PANYNJ port operations on various employment sectors vary by the unique characteristics and economic conditions that apply to each sector. The following is a brief description of some of the most egregious impacts on: warehouse workers, drayage truck drivers, and airport workers.

<u>Warehouse Workers</u>
Intermodal Warehouse Distribution Centers (IWDC'S) have been a fact of life in many parts of the U.S for over a decade. Unlike many other ports in the nation, the majority (85%) of goods that come through the PANYNJ

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[27] New Jersey, the industry annually supports $14.5 billion in personal income, $20 billion in business income, and $1.6 billion in state and local taxes, New York Shipping Association, The Economic Impact of the New York-New Jersey Port Industry, 2014, http://nysanet.org/wp-content/uploads/NYSA_Economic_Impact_2014V2
[28] http://www.villagevoice.com/news/after-a-voice-investigation-newark-is-looking-to-make-the-port-authority-pay-8850119
[29] http://www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/#1e22286f6fee
https://www.bbh.com/en-us/insights/history-in-the-making--the-port-of-new-york-and-new-jersey-s-past--present-and-future/18900

are bought and sold in the immediate region.[30] This has resulted in the growth and expansion of warehouses throughout the State of New Jersey. Warehouse and distribution centers are important parts of the logistics chain as goods shipped through local ports are hauled via drayage trucks to local or regional warehouses for processing, sorting and distribution. These facilities generally require large tracts of land and intensive labor forces to quickly process goods. Increasingly, port adjacent cities are seeing an increase in the development of warehouses closer to port where they attract large concentrations of polluting diesel trucks. These facilities pose serious environmental, social, and labor problems. The industry practice in warehousing is to staff through temporary employment agencies, which charge people fees for placement, pay minimum wages with few labor protections or benefits. Many of these workers remain "temporary" workers despite working for years in the same facility and never rising above minimum wage or receiving employment benefits.[31] These workers are often subject to unsafe working conditions with workers alleging mistreatment, gender discrimination, and wage theft.

Port Truck (Drayage) Drivers

Port trucking is based on an independent contractor (IC) system of employment.[32] The majority of goods moved from the ports in our region are consumed within 70 miles of the port and 85% of these goods are moved via drayage truck from seaports to warehouses to retailers and consumers. It is estimated that over 9,000 port truck drivers transport more than 14,000 containers everyday. Drayage (container) trucking is an essential component of the global supply chain. "Drivers are on the job five days a week, from ten to twelve hours a day, earning an average income of $28,000 per year. Because they are not considered employees, they have no benefits -- no health care, pension, paid vacation, etc. Drivers must pay for the rig and for truck maintenance, tolls, road taxes, licenses, and fuel."[33] According to a 2009 Rutgers study, drivers reported working, on average more than 14 hours per day.[34] This low road employment model, means that drivers make so little money that they can afford only the oldest and dirtiest trucks. According to the PANYNJ, 65% of all drayage trucks have pre-2007 model engines, which emit significantly more diesel pollution than newer engines. In addition to local impacts, these diesel emissions directly impact drivers that are exposed daily.

The IC misclassification also leads to numerous labor law violations. Investigations by the U.S. Department of Labor, New Jersey Department of Labor, as well as numerous private lawsuits, also suggest that drivers may be misclassified as "independent contractors". The low wages that misclassification forces on drivers also makes it impossible for drivers to buy or maintain trucks that comply with current pollution standards. Finally, New Jersey law requires employers to make contributions towards worker's compensation, unemployment benefits and other employment taxes. Port truck drivers do not enjoy any of these employment protections due to their misclassification. While the PANYNJ relies heavily on port truck drivers (i.e. 85% of goods transported by these drivers off port), the industry wide misclassification undergirds the economic exploitation of low wage drivers and the severe localized health impacts from mobile diesel emissions tied to port trucking.

Airport Workers

In addition to seaport related employment, the PANYNJ also oversees employment across all three airports in the region (LaGuardia, JFK, Newark International Liberty). Local labor unions representing thousands of service workers in the airports are demanding that the PANYNJ pay a living wage, $15/hour rather than the minimum wage to these workers. New York airport workers will see a raise in wages due to a bill to increase

[30] http://www.nj.com/news/index.ssf/page/invisible_workforce_temp_workers_face_abuse_in_nj.html
[31] http://www.forworkingfamilies.org/sites/pwf/files/documents/OABEastandCentralGateway.pdf
[32] http://gothamist.com/2016/09/21/new_jerseys_port_authority_employee.php
http://www.nj.com/essex/index.ssf/2016/07/newark_mayor_wants_port_authority_hiring_policy_at.html
http://pix11.com/2016/05/02/mayor-baraka-newark-residents-rally-against-job-discrimination-at-port-newark-elizabeth/
[33] Bensman, David. (2009). Port trucking down the low road: a sad story of deregulation. Rutgers University. DEMOS
[34] http://www.nelp.org/content/uploads/2015/03/PovertyPollutionandMisclassification.pdf

the statewide minimum wage (above PANYNJ's minimum of $10.10/hr). Meanwhile, Newark airport workers have not yet won an increase in wages. In addition to pay increases, workers are seeking greater job security and more regular schedules, among other improvements in their working conditions.[35]

## SOLUTIONS

"Good jobs" requires a living wage, healthy and safe working conditions, the right to collectively bargain and the right to basic provision of employment benefits. Port industry workers currently bear the brunt of a very lucrative goods movement industry. It's time that the wealth generated by this industry is shared with the workers that are critical to the successful and efficient operation of the industry and the entire regional economy. The following recommendations move the agenda of "Good Jobs" forward:

**1. Fair Compensation**

- All jobs in and around the port, including work performed by contractors, employees for temporary contractor services and tenants, shall earn at least $15 an hour, indexed for inflation, as well as full benefits for full-time employees [36] including access to paid sick days [37]

**2. Increased Employment Opportunities**

- PANYNJ should adopt a First Source Hiring Program with regard to all direct Port Jobs and any Port Contractor, Port Lessee (including warehouse and distribution facilities on port property), and/or Licensee.
- Working with local organizations and city officials PANYNJ shall be required to fund job training for Port-Related Jobs, and Pre-apprenticeship Programs.
- All port and port related employers should implement, Ban the Box policy.
- PANYNJ should coordinate with the City of Newark, community groups and other relevant business advocacy and assistance organizations to initiate a program to increase participation in the planning, construction, operation and maintenance of PANYNJ related projects by small businesses and minority-owned business enterprises and women-owned business enterprises (MBE/WBE).[38]

**3. Contracting & Employment Practices**

- Urge PANYNJ to create an "enhanced responsible contractor" policy that requires all entities wishing to provide direct or subcontracted services at port facilities to adhere to the highest standards of wage and workplace protections.
- Institute more rigorous screening of prospective bidders to ensure that federal contracts are not awarded to employers that are significant or repeat violators of workplace, tax or other laws.
- Establish a preference in the contractor selection process for employers that provide good jobs, by prioritizing firms that provide living wages, health benefits, and paid sick days.
- Expand & improve the national contractor misconduct database (2008 National Defense Authorization Act)
- Strengthen monitoring and enforcement of contractors' compliance with workplace standards. [39]
- Enact legislation that permits labor peace agreements in projects in which public entities have proprietary interests.[40] This type of legislation would be applied to PANYNJ contracts.[41]
- Call upon the NJ Department of Labor (DOL) to conduct full investigation into tax evasion and wage theft in the port trucking industry.

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[35] https://www.nytimes.com/2016/12/15/nyregion/new-union-contract-for-new-york-city-area-airports-does-not-cover-wages.html
[36] http://www.ci.seatac.wa.us/Modules/ShowDocument.aspx?documentid=8233
[37] http://www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/#494f39cf6fee
[38] http://www.forworkingfamilies.org/sites/pwf/files/document
[39] http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1429&context=bjell
[40] https://legiscan.com/NJ/text/A1416/id/518438
[41] A labor peace agreement is an arrangement between a union and an employer under which one or both sides agree to waive certain rights under federal law with regard to union organizing and related activity. US Chamber of Commerce, https://www.uschamber.com/sites/default/files/documents/files/labor_peace_agreements_2013_09_12.pdf

# GOOD GOVERNANCE

## PROBLEM

The PANYNJ is a bi-state agency vested with a tremendous amount of political and economic power. This entity controls six tunnels and bridges between the two states, six airports, the PATH train, the World Trade Center site, two bus terminals, marine ports and additional real estate holdings. The agency has a $7.8 billion dollar annual budget controlled by a 12-member board of commissioners. Six of the commissioners are appointed by the Governor of New York and six are appointed by the Governor of New Jersey and the Governors retain the right to veto the actions of any Commissioners they appoint. As part of a power sharing agreement, the Governor of New Jersey chooses the chairman of the board and the deputy executive director, while the Governor of New York selects the vice-chairman and Executive Director. This structure has come under increased scrutiny over the years particularly for the lack of public accountability, transparency and accounts of patronage and corruption. Most recently, the illegal closure of the George Washington Bridge, raised increased concerns about the accountability and governance of the PANYNJ. The problems of governance extend from the leadership at the top of the agency to decisions about capital expenditures and budget allocations in the region. While the PANYNJ controls billions in public revenue, primarily from the collection of tolls and fees, budgeting decisions are not subject to a public vetting process via the legislature or public hearings.[42] Decisions about how revenue is allocated across the PANYNJ's large land holdings and operations are the subject of intense political debate across both states. These decisions have significant impacts on residents in both states who have little recourse in terms of their ability to influence these decisions.

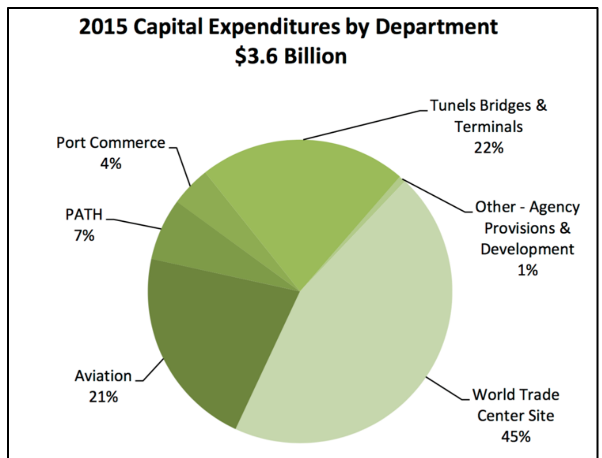


**Figure 4: PANYNJ 2015 Capital Expenditures**

This lack of public accountability or provision of public participation processes means that investments in areas critical to port impacted communities, such as fair wages, community benefits or environmental mitigation are not prioritized by the agency. This problem plays out in the form of investment imbalances in the PANYNJ's operations. For example, the maritime ports consistently get the smallest share of the PANYNJ's budget allocation, only 4% of the overall expenditures.[43] While most of the PANYNJ's revenue comes from tolls, only 22% of the capital expenditures went to tunnels, bridges and terminals.

The critical function that the PANYNJ serves in the region and its large fiduciary responsibility to residents in both New York and New Jersey would require a high degree of adherence to an ethical code of conduct. Subsequent to the Bridgegate scandal, legislators in both states attempted to pass reforms that would better align the oversight and transparency of the agency with public expectations. Unfortunately, these attempts were thwarted by gubernatorial vetoes.

Beyond accountability of public employees and the leadership of the agency, the day-to-day practices of the PANYNJ do not reflect best practices with respect to open records and public information. Requests for agency records by the media, local organizations, government representatives, or members of the general public are frequently denied. Often the public must resort to Freedom of Information Act (FOIA) requests to gain access to

[41] http://www.nj.com/traffic/index.ssf/2016/03/the_port_authoritys_16b_spending_spree_includes_these_6_projects.html#incart_river_mobileshort_home
[43] http://www.panynj.gov/corporate-information/pdf/2015_PROPOSED_BUDGET_BOOK.pdf

records that should be in the public domain and pertain to issues, investments and decisions that are made with public funds. Even when FOIAs are filed, the agency often does not comply with requests under FOIA. These issues of poor governance are a result of weak systems of public accountability and transparency that can be a priority of the next Governor of New Jersey.

## SOLUTIONS

Good governance and structural reforms at the Port Authority are essential requirements for the proper functioning of the seaports under the agency's control. Decisions about how to prioritize capital expenditures related to clean air mitigation, labor standards and improved community relations cannot be achieved without leadership from our next Governor. The following are recommendations pertaining to improving governance at the PANYNJ:

**1. Structural Reforms**

- Uphold and enforce the standards set by the Board of Commissioners' Code of Ethics, requiring that "the conduct of the Commissioners and employees of the Port Authority hold the respect and confidence of the peoples of the States of New York and New Jersey."[44] The PANYNJ should be directed to complete a comprehensive assessment of adherence to the ethical code by employees and produce recommendations for improving public accountability and ethical compliance by all employees.
- Reform the Board of Commissioner's appointment system and hiring processes for high ranking PANYNJ employees. The Board of Commissioners should have seats reserved for members representing local communities/municipalities. Commissioners and high–level employees should be subject to legislative review and public vetting. Renewal of appointments to these positions should be contingent on performance reviews that include adherence to the Code of Ethics of the Agency.
- Pass a substantive legislative reform package that enforces greater oversight and transparency. Multiple bipartisan bills have been proposed and passed in the NJ and NY legislatures, which aim to make significant improvements to the PAYNJ's governance (e.g. NJ Legislature Bills S-1761, A1011, S-2181 S355, S2183, S2182)[45]. These bills should be reviewed and implemented to improve port governance.

**2. Oversight of Budget Allocations**

- Identify criteria for appropriate use of Port Authority funds consistent with its organizational mission and also with equity and fairness standards that extend consideration to environmental justice issues. According to the 2014 Special Panel Report to the Governors, a "Mission Statement for the Future" was developed, which says it is to " Meet the critical transportation infrastructure needs of the bi-state region's people, businesses, and visitors by providing the highest quality and most efficient transportation and port facilities and services to move people and goods within the region, provide access to the nation and the world and promote the region's economic development."[46] Decisions about prioritizing large pools of public funds should be done to maximize both economic and environmental well being for all of the region's residents.
- The poorest and most vulnerable residents that host the region's transportation and goods movement infrastructure should not have to bear an unfair burden in the form of degraded health and environmental quality. Consideration should be given to prioritizing investments that will benefit the most burdened local communities through environmental mitigations and economic opportunities.
- Increase investments for environmental mitigation projects in the Ports Commerce division. Expansion or growth in the marine and air port divisions should be tied to increased environmental or community

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[44] http://www.panynj.gov/pdf/SpecialPanelReporttotheGovernors.pdf
[45] http://www.njspotlight.com/stories/15/02/16/explainer-legislators-in-two-states-push-to-reform-the-ny-nj-port-authority/
[46] http://www.panynj.gov/pdf/SpecialPanelReporttotheGovernors.pdf

mitigation investments to offset potential harmful impacts on local communities.

**3. Public Processes and Records**

- PANYNJ should improve their community relations and meaningful involvement of local communities through improved public processes such as: changing the structure of Board of Commissioner meetings to allow for greater public comment and involvement; hiring community liaisons to work directly with local communities and PANYNJ leadership; ensuring channels for learning about and weighing in on, agency decisions well in advance of approval by the Board; review all public processes for cultural appropriateness and language access.
- Partner with a third party, such as an academic institution, to report and verify data on the implementation of port's clean air programs and to conduct regular, independent monitoring of air quality and all environmental measures taken at the seaports.
- Comply with requests for agency documents, data and research, particularly when such requests provide insight into agency decisions that impact the public. Comply fully with FOIA requests promptly.
- Conduct research and studies relevant to impacted communities with their full participation, knowledge and consent.
- Ensure that the PANYNJ creates an official *Environmental Justice Stakeholder group* that meets regularly with and produces recommendations for consideration directly to the PANYNJ Commissioners and Governor's Office. The stakeholder group should be comprised primarily of impacted community representatives, city officials and other environmental justice stakeholders.

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# PARTNERS

**Coalition for Healthy Ports** is a bi-state alliance of environmental activists, truck drivers, faith leaders, labor unions and community advocates fighting for environmental and economic justice at the ports of New York and New Jersey. **www.coalitionforhealthyports.org**

**Clean Water Action** is a one million-member organization (150,000 in NJ) of diverse people and groups joined together to protect our environment, health, economic well-being and community quality of life. Our goals include clean, safe and affordable water; prevention of health threatening pollution; creation of environmentally safe jobs and businesses; and empowerment of people to make democracy work. http://cleanwateraction.org/nj

**Greenfaith** is a non-profit organization who's mission is to inspire, educate and mobilize people of diverse religious backgrounds for environmental leadership. Our work is based on beliefs shared by the world's great religions - we believe that protecting the earth is a religious value, and that environmental stewardship is a moral responsibility. http://www.greenfaith.org

**Ironbound Community Corporation** is a community based non-profit organization founded in 1969 to serve the residents of Newark. ICC's mission is to engage and empower individuals, families and groups in realizing their aspirations and, together, work to create a just, vibrant and sustainable community. http://ironboundcc.org

**New Jersey Environmental Justice Alliance (NJEJA)** is a statewide alliance of organizations and individuals focused on environmental justice issues. In addition to addressing statewide issues, the organization also works on local concerns in north, central, and south Jersey. http://njeja.org/

**International Brotherhood of Teamsters**, founded in 1903, has a mission is to organize and educate workers towards a higher standard of living. There are currently 1.4 million members under 21 Industrial Divisions that include virtually every occupation imaginable, both professional and non-professional, private sector and public sector. http://teamster.org/

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**EELC**

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*This statement is to confirm that any gubernatorial briefing book containing work product developed with the input of New Jersey Environmental Justice Alliance (NJEJA), the Natural Resource Defense Council (NRDC), and Ironbound Community Corporation (ICC), will be prepared in compliance with electioneering rules, including requirements that the book will be shared with all candidates at the same time and via the same means.*

# Attachment 2

# REINSTATE THE BAN ON POLLUTING PORT TRUCKS

## Port Authority fulfill your promise to end deadly diesel emissions in port communities

**CONTINUED FAILURE TO PROTECT OUR HEALTH IS UNACCEPTABLE**

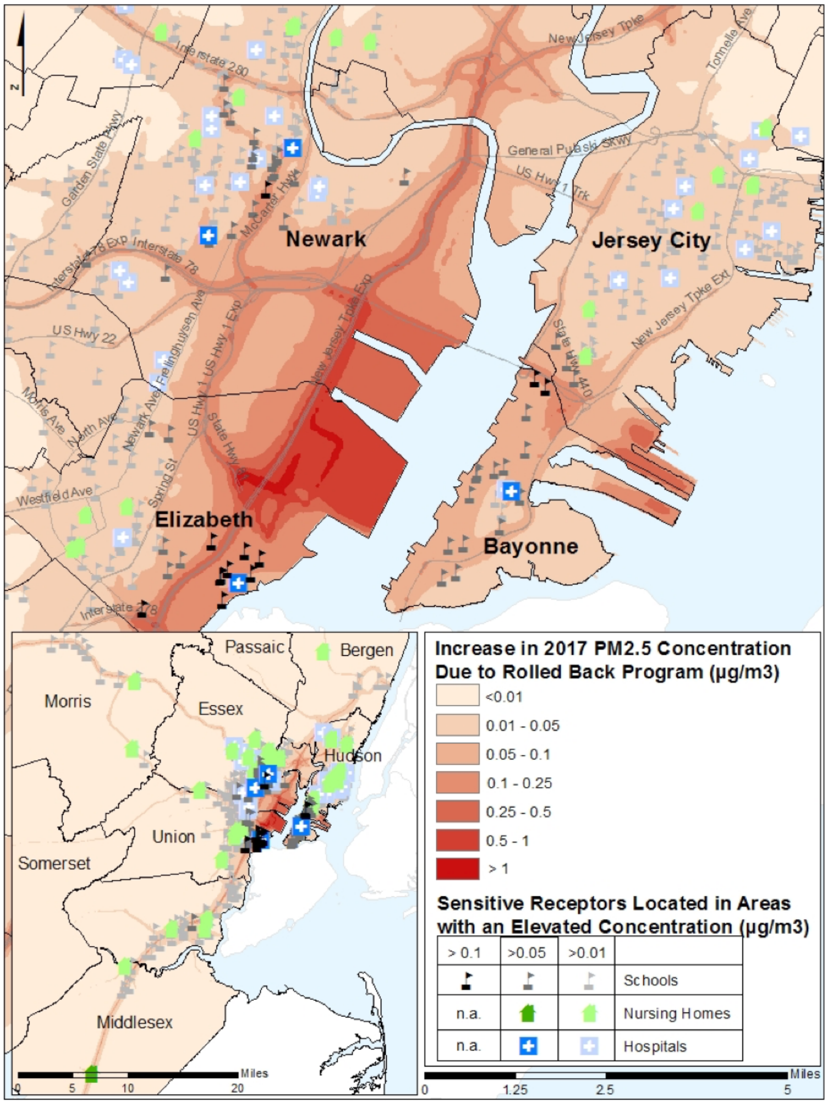
**NEWER, LESS POLLUTING VEHICLES ARE AVAILABLE TODAY**

**Diesel emissions from the trucks, trains and ships that transport freight into and out of the Port of New York and New Jersey are killing our communities.** Exposure to exhaust from the vehicles and equipment that serve our ports is associated with illnesses including childhood asthma and premature death from lung cancer, heart disease and stroke. The consequences are lives lost, sky-high medical bills, lost work and school days, and more.

### But it doesn't have to be this way if the port authority would keep its promise to ban older, diesel-polluting trucks from entering the port.

Other ports have done this. We have to make sure our port does too.

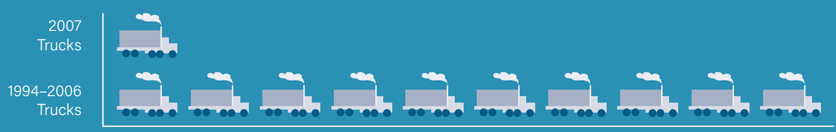
A new report, commissioned by the Coalition for Healthy Ports (CHP) calculates the price New Jersey communities will pay if we allow the Port Authority to get away with breaking its promise to implement its 2009 Clean Truck Program.



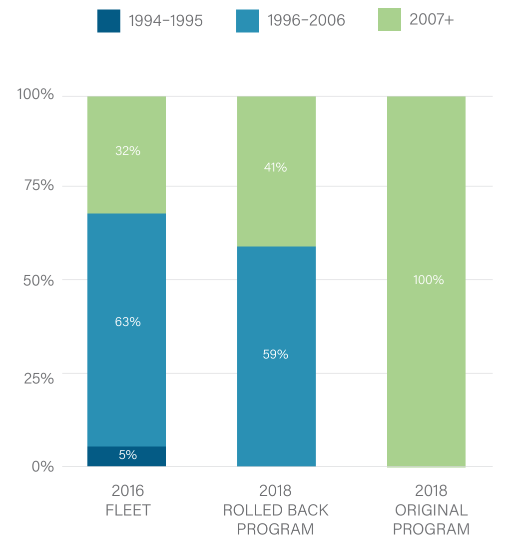
**The overwhelming majority of trucks serving the port are very old and very polluting.** Eight years ago, the Port Authority promised that by January 2017, it would ban trucks that failed to meet EPA 2007 emissions standards.

**BUT,** in 2016, the Port Authority went back on its promise and will continue to allow trucks with 1996 engines to serve the port and poison our neighborhoods. These older trucks produce ten times more deadly fine particulate matter (PM2.5) than the newer trucks required by the original Clean Truck Program.

**Relative magnitude of PM 2.5 emissions standards for heavy duty trucks**



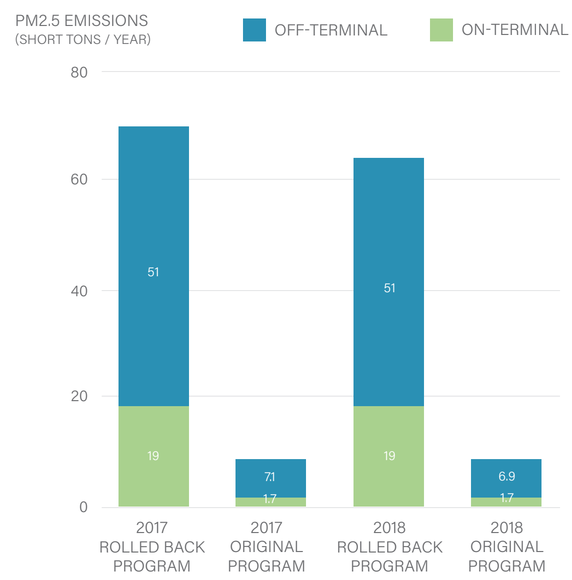

**2018 Port truck fleet visitation estimates for the original and rolled back Clean Truck Programs. Observed truck visits from the 2016 fleet (as of May 2016) are shown for comparison.**




## The Port Authority's decision to break its promise means that:

- There will be ***11 times more PM2.5 emissions*** from Port terminals in 2017 and 2018 when compared to the original program.
- There will be ***7 times more emissions*** along off-terminal truck routes in the surrounding communities under the rolled back Clean Truck Program in 2017 and 2018 when compared to the original program.
- Up to ***700,000 adults in the region will experience increased risks of premature death*** from the increase in emissions in 2017 alone. Residents in Essex, Hudson, and Union counties will face the highest risks.
- Under the rolled back program, it will take ***15 years of unnecessarily high levels of emissions*** to gradually achieve what the original truck ban would have achieved this year.

**PM2.5 Emissions from Port Trucks under the original and rolled back Clean Trucks Program.**




# OUR DEMANDS

**REINSTATE the PANYNJ pre-2007 engine truck ban at the port.**

**SUPPORT and require faster clean truck replacement with incentives like container fee waivers for 2007 & newer trucks.**

**ADOPT diesel emission reduction policies similar to California that affect the entire logistics industry.**

**WWW.COALITIONFORHEALTHYPORTS.ORG**


Amy Goldsmith, *Chair Coalition for Healthy Ports (CHP)* ▪ agoldsmith@cleanwater.org ▪ 732.963.9714

# Attachment 3

**POLICY BRIEF CLEAN AIR MITIGATION STRATEGIES**
**COALITION FOR HEALTHY PORTS**
**DECEMBER 2017**

With the expansion of port terminals and the introduction of Post-Panamax ships to the Newark and Elizabeth seaports, as well as the continued growth (4% annually) of container cargo - achieving significant reductions in air pollution in the coming years will require aggressive mitigation strategies. This policy brief serves to provide a per-sector analysis of the areas in which emissions reductions potential is greatest, as well as the estimated costs associated with each proposed action. Information pertaining to the health costs associated with unmitigated diesel emissions as well as potential fiscal strategies to reduce diesel emissions is also provided where possible. While economic growth at the ports is a priority for the region, it should not be at the expense of the health and well being of the region's most impacted and vulnerable populations. The costs associated with the mitigation of air pollution can result in significant health and economic gains and should be prioritized for investment on par with infrastructure improvements such as the raising of the Bayonne Bridge.

PORT GROWTH & HEALTH COSTS

The Port of New York and New Jersey is currently developing a Port Master Plan (PMP) which will 'guide the growth and development of the Port of New York and New Jersey' for the next 30 years.[1] Since 2006, capital expenditures have totaled roughly $6 billion.[2] Another $1.1 billion is planned for the period of 2017 to 2026. With the deepening of the shipping channels and the raising of the Bayonne bridge, the Port of New York and New Jersey is preparing for continued growth. From 2014 to 2016, TUE volume increased by 8.3%, bulk cargo by 11%, and break bulk cargo by 27%. During this period, business revenue saw a 21% increase, totaling $63.8 billion. Federal, state, and local tax revenue saw a cumulative increase of 20%, or $8.5 billion. In 2010, the trading volume of shipping company stocks amounted to $492 billion.[3]

One of the goals of the 2030 Port Master Plan is to "support environmental quality and mitigate footprint'.[4] While certain criteria pollutant emissions have declined from the 2006 baseline year, measures taken thus far have been inadequate to meet targets established in 2009. In 2016, the Port Authority of New York and New Jersey rolled back a key measure from the Clean Air Strategy which would have accelerated the modernization of the highly-emissive diesel drayage fleet. With port traffic expected to rise, achieving the necessary emissions reductions will require a stronger strategy than what has been demonstrated thus far.

The environmental impacts of future growth will be disproportionally felt by neighboring communities and workers unless an aggressive low-emissions strategy is adopted. A study on the effects of the Clean Truck Program rollback revealed that up to 700,000 individuals in affected regions will experience an increased risk of premature death from the rise in emissions in 2017 alone.[5] With respect to health costs, diesel emissions carry a significant economic weight. A recent study on the economic impact of repowering switcher locomotives in two Atlanta railyards reported a $140 million net-gain from the initiative over a ten-year period. In the calculation, avoided mortality accounted for 99% of savings. Additional benefits such as reduced maintenance costs and increased fuel efficiency were not included.[6]

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1 http://www.panynj.gov/port/port-master-plan.html

2 http://nysanet.org/wp-content/uploads/NYSA_Economic_Impact_2014V2

3 http://www.nj.com/essex/index.ssf/2017/10/port_jobs_up_20_study_finds.html

4 http://www.panynj.gov/port/pdf/PMP_Presentation_Summit_Adapated.pdf

5 http://www.cleanwateraction.org/sites/default/files/Truck%20Rollback%20Report%20-%20Port%20of%20New%20York%20New%20Jersey.%20June%202017.pdf

6 https://nicholasinstitute.duke.edu/sites/default/files/publications/1-s2.0-s0048969715302606-main.pdf

PROPOSED STRATEGY

This policy recommends a per-sector approach to achieving dramatic reductions in emissions resulting from port activity. Details on the following actions are shown in Table 1 on the last page.

1. *Diesel drayage fleet:* Replacing pre-MY2010 (pre-EPA tier 4 standards) diesel trucks with newer tier 4 trucks is the top priority as this technology is the most emissive with respect to all other sectors.
2. *Ocean-going vessels (OGV):* 'Hoteling' at berth constitutes a significant portion of port emissions. Flexible emissions capture technologies should be implemented to reduce the emissions resulting from long-term auxiliary engine idling. This policy recommends Advanced Maritime Emissions Control Systems (AMECS) as a more cost-effect solution than shore-power infrastructure.
3. *Cargo Handling Equipment (CHE):* Older CHE is responsible for a significant portion of port emissions, specifically particulate matter. This policy recommends an aggressive modernization of terminal tractors and straddle carriers which together encompass a majority of criteria pollutant emissions. Pre-MY2008 equipment should be replaced with Tier 4 equipment, or with electric-powered equipment for additional GHG reductions.
4. *Harbor Craft:* Harbor craft engines have a uniquely long lifespan, making the turnover pace lag behind the EPA emissions standards schedule. This policy recommends repowering, at least, the declared 27 pre-regulation vessels documented in the PANYNJ 2015 multi-facility inventory. The data in Table 1 for this sector reflects a Tier 2 repower strategy although best-available is recommended.
5. *Rail:* This policy focuses on switcher locomotive emissions at ExpressRail facilities. Currently the average switcher locomotive emits at a Tier 1 rate. Repowering older switcher locomotives with Tier 4 Genset engines presents an opportunity for dramatic pollution reduction and improved fuel economy. Table 1 provides estimates for repowering 3 switcher locomotives.

FISCAL STRATEGY

- The Governor can support and sign legislation into law that will create a "clean truck exemption" program. This program would fund port-related environmental mitigation and specifically incentivize the turnover of the drayage truck fleet. Clean trucks meeting the standard for entry (trucks with post-2007 engines) would be exempt from the fee and truck companies with older, dirtier trucks would pay a fee into a fund used to subsidize fleet modernization.[7]
- PANYNJ can implement a "concession agreement" that sets standards for operations, working conditions and environmental and community protections.
- PANYNJ can use their authorized budget to implement aggressive clean air strategies. Mitigation funds should be increased and prioritized to maximize the reduction of diesel emissions and related health and community harms. PANYNJ's Port Commerce Division receives the smallest relative percentage of the agency's capital budget (less than 4%).
- The PANYNJ can raise marine tariffs on shippers to help fund air pollutions mitigation technologies.
- The State of New Jersey can allocated Volkswagen settlement funds in a manner that prioritizes the most aggressive air mitigation strategies from drayage trucks and ships, which are the two largest sources of air pollution.
- The State and PANYNJ can prioritize federal mitigation funds from sources such as the USEPA DERA, USDOT TIGER and CMAQ funds for reducing diesel emissions from mobile sources at seaports, including truck replacement, electrification of cargo handling equipment (CHE), and emissions capture and control systems for ships.

[7] Support passage of S2507 / A4120 or a similar bill, which establishes "Clean Trucks Tariff Fund" that helps incentivize and equitably pay for the replacement of older heavy-duty diesel trucks at the port.

Table 1. Targeted Actions and Cost Estimates

For the 'Emissions' and 'Penetration' columns, estimates were based on PANYNJ *Multi-Facility Emissions Inventories*, PANYNJ *A Clean Air Strategy* (2009, 2014 update), as well as various EPA resources for emissions factors.

| Target | Emissions (Sector) | Emissions (PANYNJ) | Action | Reductions potential | Penetration | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| *1. Diesel Drayage Fleet:* Pre-MY2010 trucks | 95-98% | 37% of NOx, 48% of PM | Replace with new or used MY2010 truck | Tier 4: -90% criteria pollutants | 7,000 trucks, (80% of fleet) | New: $130-$165k[8] Used: $60k | New: $770 million - $1.1 billion, 50% subsidy: $385 -$550 million |
| *2. Ocean-Going Vessels:* Container ship hoteling | 44% of NOx, 51% of PM | 18% of NOx, 11% of PM | Implement 1 barge bonnet system per terminal | -95% criteria pollutants | 5 barge bonnet systems | $1 to $3 million, $6 million high end[9] | Low: $5-$15 million + operational expenses, high: $30 million |
| *3. Cargo Handling Equipment (CHE):* Pre-MY2008 Terminal Tractors and Straddle Carriers | %67 of NOx, 76% of PM | 8% of NOx, 16% of PM | Replace with Tier 4 equipment, or electric (baseline: tier 2 average) | Tier 4: -90% criteria pollutants, electric: additional GHG reductions | ~313 terminal tractors, ~185 straddle carriers (59% of CHE) | $125k per terminal tractor (electric - $300k), $1,100,000 per straddle carrier (electric – $2.5 million)[10] | Tier 4: $243,500,000 electric: $530,000,000 |
| *4. Harbor Craft:* Pre-regulation Tugboats | 85% of criteria pollutants | 5% of NOx, 4% of PM | Repower pre-regulation tugs | Tier 2 marine: -60% criteria pollutants | 27 vessels (declared pre-regulation) | Tier 2: $100,000 per engine, $270,000 per vessel[11] | Tier 2 repower: $7,300,000 |
| *5. Rail:* Switcher Locomotives | 53% of NOx, 65% of PM | 2% of NOx and PM | Implement Tier 4 Genset retrofits at ExpressRail stations (baseline: tier 1 average) | Tier 4: -90% criteria pollutants | 3 retrofits, 1 per ExpressRail station | $1-$1.5 million per retrofit (estimate based on Tier 3 repower projects)[12] | $3-$4.5 million |
| **TOTALS** | | **70% of NOx, 80% of PM** | | | | | **Low: $735,000,000 High: $1,675,000,000** |

8 http://www.cleanairactionplan.org/documents/preliminary-cost-estimates-select-caap-strategies.pdf

9 Low estimate provided by manufacturer, high: Ibid.

10 Ibid

11 https://www.northeastdiesel.org/pdf/CMVERP.pdf

12 https://www.dot.ny.gov/recovery/repository/NYSDOT%20Narrative%20FINAL.pdf

# Attachment 4

May 22, 2020

Via electronic mail to: pmiller@nescaum.org

Paul Miller
OTC Lead Manager
Ozone Transport Commission
89 South Street, Suite 602
Boston, MA 02111

**Re: OTC Consideration of Low-NOx Standards for Heavy-Duty Vehicles**

Dear Mr. Miller:

On behalf of the above organizations, we write in response to recent comments submitted to the Ozone Transport Commission on April 29, 2020 on behalf of the Engine Manufacturers Association regarding consideration of next-generation low-NOx standards for heavy-duty trucks. In those comments EMA erroneously advises that:

> A low-NOx rule for new [heavy-duty] vehicles, phasing-in starting with the 2027 model year, may not have a material impact on ozone NAAQS-attainment demonstrations in the OTC States. In that regard, state opt-ins to California regulations under section 177 of the federal Clean Air Act (CAA) are limited to States that are in and are projected to remain in NAAQS nonattainment. (See 42 U.S.C. §7507.)

Nothing in this statement is factually or legally accurate.

First, as a legal matter, nothing in section 177 requires states choosing to opt-in to California vehicle standards to be "in and . . . projected to remain in NAAQS nonattainment." Section 177 allows "any State which has plan provisions approved under this part" to adopt and enforce model year standards that meeting the requirements outlined in that section. 42 U.S.C. § 7507. This language applies to any plans approved under Clean Air Act title I part D, which includes both nonattainment plans, as required under Clean Air Act section 172, *and* maintenance plans as required under section 175A. There is no requirement in section 177 for demonstrating need, let alone need into the future. There is no justification requirement whatsoever. Indeed, to require justification of such control measure choices would have been antithetical to Congress's well-established cooperative federalism scheme for addressing criteria pollution problems. *See Train v. Natural Res. Def. Council, Inc.*, 421 U.S. 60, 79 (1975) ("The Clean Air Act "gives EPA no authority to question the wisdom of a State's choices of emission limitations if they are part of a [state implementation] plan which satisfies the standards of § 110(a)(2)."); *see also Union Electric Co. v. EPA*, 427 U.S. 246, 265-66 (1976). EMA's description of section 177 has no foundation in the statutory text or history.

EPA has sowed some confusion recently by claiming that the title and placement of section 177 suggest that Congress intended to limit States to adopting only standards related to criteria pollution. 84 Fed. Reg. 51310, 51350 (Sept. 27, 2019) (withdrawing California waiver for greenhouse gas standards). Those arguments are unavailing because it is well established that statutory headings cannot be used to create ambiguity where none exists. *See, e.g., Brotherhood of R.R. Trainmen v. Baltimore & O.R. Co.*, 331 U.S. 519, 528-29 (1947) (reiterating "the wise rule that the title of a statute and the heading of a section cannot limit the plain meaning of the text"); *Whitman v. Am. Trucking Ass'ns*, 531 U.S. 457, 483 (2001) (explaining that a title "may only she[d] light on some ambiguous word or phrase in the statute itself) (internal quotation omitted). But even under EPA's reading, the limitation is on the *types* of pollutant standards that can be adopted, not the nonattainment circumstances that may justify adoption of criteria pollutant-related standards.

Second, as relates to material impact and on-going need, even if the Commission felt obliged to explain the need for recommending adoption of next-generation NOx standards for heavy-duty trucks, there is little question that stronger standards will be necessary. As you are well aware, NESCAUM has documented the need for stronger truck standards to meet existing air quality standards,[1] and it is entirely rational to expect that EPA will eventually strengthen the ozone and particulate matter NAAQS based on current science, notwithstanding proposed actions by this administration. Finally, it is simply beyond dispute that adopting the next-generation of NOx standards for heavy-duty trucks is important to ensure a cleaner fleet will be operating in the region to protect the health of the its residents.

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[1] See https://www.nescaum.org/documents/nescaum-anpr-cleaner-trucks-initiative-comments-20200220-final.pdf/

Indeed, while EPA is considering new standards for 2027, CARB plans to adopt rules requiring improvements for 2024 that will deliver needed emission reductions before 2027. In 2016, leaders of air pollution control districts in Arizona, California, Connecticut, Delaware Massachusetts, Ohio, Nevada, New Hampshire, New York, Vermont and Washington petitioned EPA to tighten heavy-duty engine NOx standards from 0.2 grams per brake-horsepower-hour (g/hp-hr) to 0.02 g/hp-hr, with full implementation for new vehicles by 2024. EPA is working on a potential 0.02 g/hp-hr standard with full implementation by 2027. That slower timeline means that the pollution concerns raised by the air districts will be even worse, and earlier action is warranted.

Thank you for including these comments in your meeting docket and for the opportunity to correct the record.

Sincerely,

/s/

Paul Cort
Earthjustice

# Attachment 5

October 8, 2020

*Via E-mail to* njairrulesmobile@dep.nj.gov

New Jersey Department of Environmental Protection
401 E State St
Trenton, NJ 08608

**Re: NJ PACT Stakeholder Comments on California Advanced Clean Truck Regulation, Drayage Trucks, California Zero Emission Fleets Regulation, California Heavy-Duty Engine and Vehicle Omnibus Regulation, Medium Duty Diesel Vehicle Inspection Regulation, Cargo Handling Equipment, Oceangoing Vessels, and Harbor Craft**

The Coalition for Healthy Ports NY NJ (CHP) and Earthjustice submit these comments to the New Jersey Department of Environmental Protection (DEP) regarding the regulatory concepts for medium- and heavy-duty trucks, cargo-handling equipment, ocean-going vessels, and harbor craft that DEP discussed at the New Jersey Protecting Against Climate Threats (NJ PACT) stakeholder meetings held on September 10, 2020 and September 16, 2020. We strongly urge DEP to move forward with the proposals to adopt the California Advanced Clean Trucks Rule and a medium-duty diesel vehicle inspection program, as well as the forthcoming heavy-duty engine and vehicle omnibus regulation and rules regarding drayage trucks, zero-emission fleets, cargo handling equipment, ocean-going vessels, and harborcraft, as outlined in the stakeholder meetings. We also urge DEP to adopt California regulations concerning transportation refrigeration units. In addition, DEP's implementation of these new rules and standards should prioritize reducing emissions in environmental justice communities first, to the extent feasible.

CHP is a bi-state collaboration of over forty environmental, social justice, community, labor, and interfaith organizations committed to a clean environment, healthy neighborhoods, and good jobs. CHP formed over a decade ago because seaports in the New York-New Jersey area, and the associated goods movement infrastructure, represent one of the most significant environmental burdens on already overburdened and vulnerable communities in the region.

Much of this environmental impact stems from the burning of diesel fuel by drayage trucks, transport refrigeration units, cargo handling equipment, and marine vessels in and around Port Newark-Elizabeth. Diesel emissions are associated with damage to cardiovascular, respiratory, and immunological systems, impaired neurological development, stroke, impaired liver function, and other conditions.[1] Emissions in the United States from on-road diesel

[1] *See, e.g.*, U.S. Envtl. Prot. Agency, EPA-600-8-90-057F, *Health Assessment Document for Diesel Engine Exhaust* ch. 5 (2002).

vehicles, non-road mobile sources, and international shipping are estimated to cause some 16,000 deaths a year—73% of total transportation-emission-related deaths in the country.[2] Importantly, risks and exposures are not equally distributed, since certain communities and demographic groups face greater harms and impacts from poor air quality. Historically disadvantaged communities are more likely to be located near truck-traffic corridors, more likely to be exposed to vehicle emissions, and more likely to experience higher rates of asthma, lung and heart disease, and chronic bronchitis.[3] Emissions from transportation and goods movement add to the burdens that these communities face. The American Lung Association's 2020 *State of the Air* report finds that people of color are 1.5 times more likely to live in a county with at least one failing air quality grade, and 3.2 times more likely to live in a county with a failing grade for unhealthy ozone days, particle pollution days, and annual particle levels.[4] DEP must therefore ensure, to the extent possible, that its NJ PACT rulemakings prioritize emission reductions in the overburdened communities that have borne a disproportionate share of this pollution.

The impact of transportation and goods movement on New Jersey's air quality, greenhouse gas (GHG) emissions, and public health is particularly striking. A forthcoming study by MJ Bradley and Associates finds that, in the study area surrounding the Port Newark-Elizabeth complex and adjacent residential neighborhoods, the largest sources of PM2.5, black carbon, and NOx are medium- and heavy-duty vehicles (MHDVs), ports-related equipment, locomotives, and idling trucks. Together, these sources far outweigh the emissions from passenger vehicles. Other recent studies confirm that switching from diesel to zero-emission vehicles and equipment makes sense for New Jersey. The American Lung Association estimates that by transitioning to zero-emission vehicles, New Jersey could avoid 169 premature deaths, 2,306 asthma attacks, nearly 11,000 lost work days, and nearly $2 billion in health costs annually.[5] And the North American Council for Freight Efficiency and Rocky Mountain Institute give New Jersey 10 out of a total of 16 points for prioritization of MHDV electrification – with New Jersey scoring the maximum possible points for air quality need, life-cycle GHG emission reduction, and cost savings from switching from diesel to electric.[6] Their analysis shows that if MHDVs in New Jersey switched from diesel to electric, MHDV fuel costs would decrease by 45% and GHG emissions from MHDVs would decrease by 72%.[7]

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[2] Susan Anenberg et al., Int'l Council on Clean Transp., *A Global Snapshot of the Air Pollution-Related Health Impacts of Transportation Sector Emissions in 2010 and 2015*, at 19 tbl.4 (2019), https://theicct.org/sites/default/files/publications/Global_health_impacts_transport_emissions_2010-2015_20190226.pdf.

[3] Jessie Lund & Mike Roeth, N. Am. Council for Freight Efficiency, *High Potential Regions for Electric Truck Deployments* 18 (Aug. 2020).

[4] Am. Lung Ass'n, *The Road to Clean Air* 4 (2020), https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf.

[5] *Id.* at 10.

[6] Jessie Lund & Mike Roeth, N. Am. Council for Freight Efficiency, *High Potential Regions for Electric Truck Deployments Data Analysis* [spreadsheet] (Aug. 2020), https://nacfe.org/wp-content/uploads/2020/08/High-Potential-Regions-for-Electric-Trucks-Data-Analysis-Tool.xlsx.

[7] *Id.*; Jimmy O'Dea, Union of Concerned Scientists, *Ready for Work: Now Is the Time for Heavy-Duty Electric Vehicles* 8 (2019), https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf ("Ready for Work Report").

DEP's proposed regulatory timelines are appropriate and achievable. For example, the proposed timeline for zero-emission MHDV targets, with the first sales targets applying to the 2025 model year, are more than appropriate given the advanced state of zero-emission MHDVs even today. As recognized by the Northeast States for Coordinated Air Use Management (NESCAUM) – of which DEP is a part – the California Air Resources Board (CARB) has certified over 100 zero-emission MHDVs, including school buses, urban buses, intercity buses, utility trucks, tractors, and refuse trucks.[8] Indeed, over 25 manufacturers have zero-emission MHDVs available, including models with ranges over 200 miles.[9] This includes at least a dozen models of delivery vans, shuttles, and straight trucks available today.[10] Manufacturer BYD has already delivered more than 100 battery-electric trucks in the United States, including battery-electric Class 8 Semi trucks.[11] And where necessary, many fossil-fuel-powered heavy-duty trucks can be converted to run with all-electric technology.[12]

Switching to zero-emission MDHVs need not be a financial burden. Over a vehicle's lifetime, many types of zero-emissions commercial vehicles show "undeniable" cost savings compared to diesel trucks.[13] Electric trucks and buses have vastly lower operating and maintenance costs,[14] with some models showing a fuel economy roughly three times that of a conventional vehicle.[15] As noted above, switching from diesel to electric could reduce New Jersey MHDV fuel costs by 45%.[16] Upfront costs, meanwhile, continue to decline, with battery prices predicted to reach $100/kWh (a milestone of upfront cost parity for zero-emission vehicles) by 2024.[17]

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[8] NESCAUM, Comments on Docket ID No. EPA-HQ-OAR-2019-0055, at 12 (Feb. 20, 2020), https://www.nescaum.org/documents/nescaum-anpr-cleaner-trucks-initiative-comments-20200220-final.pdf/.

[9] Ready for Work Report, *supra* note 7, at 8–9.

[10] *Id.; id.* at Appendix, https://www.ucsusa.org/sites/default/files/2019-12/Ready%20for%20Work_appendix.pdf.

[11] Trucking Info, *Anheuser-Busch Receives BYD's 100th Battery-Electric Truck*, Heavy Duty Trucking (Jan. 8, 2020), https://www.truckinginfo.com/348215/anheuser-busch-receives-byds-100th-battery-electric-truck.

[12] *See Hybrid and Plug-In Electric Vehicle Conversions*, U.S. Dep't of Energy, https://afdc.energy.gov/vehicles/electric_conversions.html (last visited Oct. 6, 2020).

[13] Bernd Heid et al., McKinsey & Co., *What's Sparking Electric-Vehicle Adoption in the Truck Industry?* at 4 (2017), https://ackermanmunson.com/wp-content/uploads/2019/06/Whats-sparking-electric-vehicle-adoption-in-the-truck-industry.pdf.

[14] *See, e.g.*, Ready for Work Report at 11–12.

[15] *See* Conner Smith, Atlas Pub. Policy, *Electric Trucks and Buses Overview* 8 (2019), https://atlaspolicy.com/wp-content/uploads/2019/07/Electric-Buses-and-Trucks-Overview.pdf. Fuel savings from electric vehicles can be enhanced even further by optimizing utility rate structures for commercial medium- and heavy-duty charging. *See* Ready for Work Report at 14.

[16] Lund & Roeth, NACFE, *supra* note 6.

[17] *See* Veronika Henze, *Battery Pack Prices Fall as Market Ramps up with Market Average at $156/kWh in 2019*, BloombergNEF (Dec. 3, 2019), https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/; Smith, Atlas Pub. Policy, *supra* note 15, at 2, 4

As for total cost of ownership, NESCAUM notes that "even without taking into account available incentives . . . total cost of ownership parity [for zero-emission MHDVs] is projected for commonly used applications in every vehicle class by 2030, and in many cases before 2025, with steadily declining ZEV costs through 2030," well in line with DEP's timeline.[18] Battery-electric technologies are already cost-competitive with conventional vehicles for many of the most common heavy-duty vehicle applications.[19] In at least one application, electric trucks were found to have a positive cost of ownership compared to a diesel alternative today, without any incentives.[20] By the end of this decade, savings are projected to exceed $200,000 per vehicle for some applications,[21] with life-cycle cost savings projected for a majority of heavy-duty applications.[22] Vehicle-to-grid applications could provide an additional revenue stream for fleet owners while reducing costs for other ratepayers.[23]

Technology for zero-emission cargo handling equipment (CHE) similarly is advancing at a pace to meet DEP's proposed 2031 zero-emission timeframe.[24] Four models of zero-emission yard trucks are available today, with ranges of up to 62 hours.[25] At least one terminal operator reports being "very pleased" with the performance of a battery-electric yard tractor.[26] The Ports of Los Angeles and Long Beach are already using both zero-emission yard trucks and zero-emission container handlers.[27] These ports also plan to have zero-emission rubber-tired gantry

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("Upfront costs of electric buses have come down from almost $1,200,000 in early commercialization periods to roughly $750,000 today."); Ready for Work Report at 11.

[18] Letter from NESCAUM to CARB re: Proposed Amendments to the Proposed Advanced Clean Trucks Regulation (May 26, 2020), https://www.nescaum.org/documents/nescaum-comments-to-carb-re-act-mhd-zev-20200526.pdf/; *see also* Heid et al., McKinsey & Co., *supra* note 13, at 4; Smith, *supra* note 15, at 2, 8.

[19] *See* ICF, *Comparison of Medium- and Heavy-Duty Technologies in California*, Part 2: Total Cost of Ownership Technology Analysis, at 17–18 (2019), ("ICF 2019 Study"), https://caletc.com/comparison-of-medium-and-heavy-duty-technologies-in-california/; Ready for Work Report at 11–12.

[20] CARB, *Advanced Clean Trucks Total Cost of Ownership Discussion Document*, at 22 tbl.14 (draft 2019), https://ww3.arb.ca.gov/regact/2019/act2019/apph.pdf ("CARB TCOE Study"); Smith, *supra* note 15, at 5–6, 9.

[21] *See* Smith, *supra* note 15, at 6–7; CARB TCOE Study, *supra* note 20, at 27 tbl.19; ICF 2019 Study, *supra* note 19, at 19–22, 29–30. The ICF study found that electric vehicles were favorable from a total cost of ownership perspective for almost all heavy-duty classes studied, even without incentives.

[22] *See* ICF 2019 Study, *supra* note 19, at 18 tbl. III-1.

[23] Yang Zhao et al., *Vehicle to Grid Regulation Services of Electric Delivery Trucks: Economic and Environmental Benefit Analysis*, 170 Applied Energy 161 (2016).

[24] *See* DEP, *Cargo Handling Equipment Regulatory Concepts* [PowerPoint] at 7 (Sept. 16, 2019), https://www.nj.gov/dep/workgroups/docs/njpact-air-co2-20200916-cargo-am-pres.pdf.

[25] *See* Ready for Work Report Appendix at 3.

[26] San Pedro Bay Ports Tech. Advancement Program, *2019 Annual Report and 2020 Priorities*, at 14 (Mar. 2020), https://cleanairactionplan.org/documents/2019-tap-annual-report.pdf/.

[27] San Pedro Bay Ports, Clean Air Action Plan Implementation Stakeholder Advisory Meeting Summary 5 (Aug. 3, 2020), https://cleanairactionplan.org/documents/june-24-2020-stakeholder-advisory-meeting-minutes.pdf/; *see also Balqon E-30 Electric Terminal Tractor Development & Demonstration Project*, San Pedro Bay Ports Clean Air Action Plan, https://cleanairactionplan.org/documents/balqon-e-30-demo-2009-summary.pdf/ (last visited Oct. 6, 2020).

cranes and forklifts, and associated charging infrastructure, in use by mid-2021.[28] The Port Authority of New York and New Jersey (PANYNJ) began testing an all-electric straddle carrier at Port of Elizabeth in 2019.[29] Converting these various types of equipment to zero-emission models would end nearly all NOx, PM, and GHG emissions from CHE in PANYNJ's inventory.[30] Thus zero-emission CHE technology exists today, and 2031 is a reasonable goal for full adoption of this current technology throughout New Jersey's ports.

CHP similarly supports DEP's adoption of CARB's forthcoming ocean-going vessel and harborcraft rules.[31] Promising examples of zero-emission or hybrid harborcraft such as ferries[32] and tugboats[33] are in operation or testing across the country. And given that PANYNJ itself calculates that ocean-going vessels are either the first or second largest source of NOx, PM, VOC, and GHG emissions at the port, DEP must do all it can to mitigate or eliminate pollution from this significant emission source.

CHP also urges DEP to adopt California's forthcoming regulations that further limit emissions from transportation refrigeration units (TRUs).[34] TRUs are significant sources of pollutants like diesel PM, NOx, and black carbon, and degrade the air quality at ports,

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[28] *See* S. Coast Air Quality Mgmt. Dist., *Clean Fuels Program 2019 Annual Report & 2020 Plan Update* 21 (Mar. 2020), http://www.aqmd.gov/docs/default-source/technology-research/annual-reports-and-plan-updates/2019-annual-report-2020-plan-update.pdf; Meeting Summary, *supra* note 27, at 5; San Pedro Bay Ports Tech. Advancement Program, *supra* note 26, at 6–9.

[29] Press Release, PANYNJ, First All-Electric Straddle Carrier in the United States Coming to the Port of New York and New Jersey (Jan. 11, 2019), https://www.panynj.gov/port-authority/en/press-room/press-release-archives/2019_press_releases/first_all-electricstraddlecarrierintheunitedstatescomingto thepor.html.

[30] *See* PANYNJ, *2018 Multi-Facility Emissions Inventory*, at 12 fig. 2.1 (Jan. 2020), https://www.panynj.gov/content/dam/port/our-port/clean-vessel-incentive-program/PANYNJ-2018-Multi-Facility-EI-Report.pdf.

[31] *See* DEP, *supra* note 24.

[32] *See, e.g.*, Brian Gauvin, *Alabama River Ferry Reborn with Electric Propulsion*, Prof'l Mariner (Jan. 30, 2020), https://www.professionalmariner.com/alabama-river-ferry-reborn-with-electric-propulsion/; *Current Projects*, Golden Gate Zero Emission Marine, https://ggzeromarine.com/projects/ (last visited Oct. 6, 2020); Jason Deign, *World's Second-Largest Ferry Operator Switching from Diesel to Batteries*, Green Tech Media (Nov. 29, 2019), https://www.greentechmedia.com/articles/read/worlds-second-largest-ferry-operator-switching-from-diesel-to-batteries.

[33] *See* S. Coast Air Quality Mgmt. Dist., *supra* note 28, at 21; Varalakshmi Jayaram et al., *Evaluating Emission Benefits of a Hybrid Tug Boat* (Oct. 2010), https://cleanairactionplan.org/documents/foss-hybrid-tug-development-project-2-evaluating-emissions-benefits-of-a-hybrid-tug-boat-october-2010.pdf/; Foss Mar. Co., *Foss Hybrid Tug Development Project Final Report* (n.d.), https://cleanairactionplan.org/documents/foss-hybrid-tug-development-project-1-final-report.pdf/.

[34] *See* CARB, *Transport Refrigeration Unit Regulation Draft Regulatory Language for Stakeholder Review* (Mar. 12, 2020 Discussion Draft), https://ww2.arb.ca.gov/sites/default/files/2020-07/Draft%20TRU%20Regulatory%20Language_03122020.pdf; CARB, *Preliminary Cost Document for the Transport Refrigeration Unit Regulation* (Aug. 2020), https://ww2.arb.ca.gov/sites/default/files/2020-08/Preliminary%20TRU%20Cost%20Doc%2008202020.pdf.

warehouses, and adjacent neighborhoods.[35] CARB estimates that 8,000 hours of TRU run-time per week cause an approximate cancer risk of 1800 per million at cold-storage warehouses and 600 per million at grocery stores.[36] But implementation of CARB's proposed regulation could reduce that risk by 95–98% by 2031.[37] DEP must follow CARB's lead and adopt regulations to address TRU emissions.

CHP also urges DEP to avoid, to the extent possible, technologies that use so-called "renewable" natural gas or other fossil-gas alternatives (FGAs), especially for vehicle and equipment types for which zero-emission models currently or will soon exist. These technologies represent false solutions to climate mitigation and pose potential environmental injustices for communities at the points of extraction, manufacturing, and transport of these fuel types. Furthermore, the potential supply of FGAs is not sufficient to meet the existing demand for fossil gas.[38] The American Gas Foundation's own estimates show that, after fully ramping up production, FGAs could only supply between 5% and 12% of the current gas demand.[39] And low-carbon gases are significantly more expensive than fossil gas. A report for the California Energy Commission found that "[e]ven under optimistic cost assumptions, the blended cost of hydrogen and synthetic natural gas is 8 to 17 times more expensive than the expected price trajectory of natural gas."[40] DEP should not rely on half-measures like FGAs that delay true zero-emission adoption and are neither technologically nor economically feasible.

[35] CARB, *Preliminary Health Analyses: Transport Refrigeration Unit Regulation Public Review Draft* ES-2–3 (Oct. 18, 2019), https://ww2.arb.ca.gov/sites/default/files/classic//cc/cold-storage/documents/hra_healthanalyses2019.pdf; CARB, Transport Refrigeration Unit Emissions Inventory and Preliminary Health Analyses Workshop [Presentation] 8 (Oct. 31, 209), https://ww2.arb.ca.gov/sites/default/files/classic//cc/cold-storage/documents/tru_healthanalysisslidesworkshop10312019.pdf.

[36] *Preliminary Health Analyses*, *supra* note 35, at ES-8–9.

[37] *Id.*

[38] Lorne Stockman, Oil Change Int'l, *Burning the Gas 'Bridge Fuel' Myth* 6 (May 2019), http://priceofoil.org/content/uploads/2019/05/gasBridgeMyth_web-FINAL.pdf.

[39] *See* U.S. Energy Info. Admin., *Natural Gas Explained* (last updated July 22, 2020), https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php (noting total U.S. gas consumption in 2019 was 32,000 tBtu); Am. Gas Found., *Renewable Sources of Natural Gas Executive Summary* 2 (Dec. 2019), https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Executive-Summary-Final-12-18-2019-AS-1.pdf (estimating total FGA resource potential in 2040 to be between 1,660 and 3,780 tBtu – and therefore only 5–12% of actual natural gas consumption in 2019).

[40] *See, e.g.*, Cal. Energy Comm'n, CEC-500-2019-055-F, *The Challenge of Retail Gas in California's Low-Carbon Future* 4 (Apr. 2020), https://ww2.energy.ca.gov/2019publications/CEC-500-2019-055/CEC-500-2019-055-F.pdf.

We urge the Department to move forward with the proposed regulatory concepts and we would like to maintain contact with DEP on these issues going forward. CHP looks forward to submitting additional comments during the formal rulemaking processes for these proposals. Thank you for your consideration of these comments.

Sincerely,

Jonathan J. Smith
Jasmine Jennings
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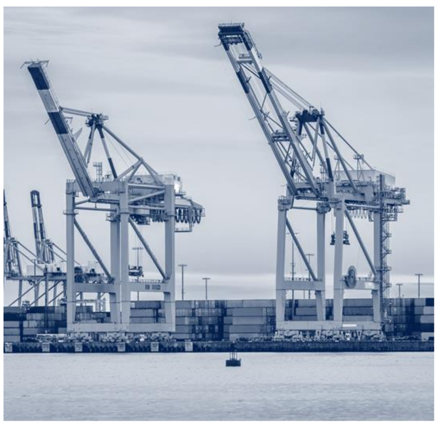
jjennings@earthjustice.org

*On behalf of:*
Coalition for Healthy Ports NY NJ

# Attachment 6

# Newark Community Impacts of Mobile Source Emissions

A Community-Based Participatory Research Analysis





MJB & A

November 2020

# Contents



# Table of Figures

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Members of the Coalition for Healthy Ports (*including Greenfaith, Ironbound Community Corporation, New Jersey Clean Water Action, and New Jersey Environmental Justice Alliance*)

*Funding for this report was provided by the Natural Resources Defense Council (NRDC). Lead manager for NRDC was Luke Tonachel.*

## About New Jersey Environmental Justice Alliance

The NJEJA (the Alliance, or NJEJA) is an alliance of New Jersey-based organizations and individuals committed to working together to create healthy, sustainable and just communities by eliminating environmental injustices in low income and communities Of Color. Together we support and work with communities through local, state, and national policy development, targeted campaigns and organizing, education, advocacy, training and technical assistance focused on critical environmental justice issues.

## About M.J. Bradley & Associates

M.J. Bradley & Associates, LLC (MJB&A), founded in 1994, is a strategic consulting firm focused on energy and environmental issues. The firm includes a multi-disciplinary team of experts with backgrounds in economics, law, engineering, and policy. The company works with private companies, public agencies, and non-profit organizations to understand and evaluate environmental regulations and policy, facilitate multi-stakeholder initiatives, shape business strategies, and deploy clean energy technologies. In March 2020, MJB&A became a part of ERM, the world's leading sustainability consultancy. ERM has more than 5,500 technical experts and thought leaders in over 40 countries and territories.



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# Introduction and Executive Summary

The transportation and mobile source sector in New Jersey significantly contributes to air quality issues within the state: in 2017, mobile sources contributed 71 percent of nitrogen oxides (NOx) and 27 percent of fine particulate matter ($PM_{2.5}$) statewide.[1] Transportation is also the largest contributor (42 percent) to the state's greenhouse gas (GHG) emissions.[2] Reducing emissions from this sector will be critical if the state is to meet its emissions reduction goals and improve air quality, especially within disproportionately burdened, environmental justice (EJ) communities which experience higher levels of air pollutants known to impact human health such as $PM_{2.5}$ and NOx.

There is an extensive body of empirical evidence detailing the health impacts of diesel and other goods movement related transportation emissions in environmental justice communities (communities Of Color and low-income communities). In New Jersey, there is a pattern of proximity to goods movement and transportation infrastructure largely in communities Of Color and low wealth areas of the state. For example, a recent study produced by the Union of Concerned Scientists found that communities Of Color throughout the Northeast and Mid-Atlantic are more likely to be exposed to high levels of $PM_{2.5}$, which contributes to higher levels of asthma, lung cancer, and heart disease within these communities.[3]

Efforts to drive down emissions in this sector are often focused on electrification of vehicles, especially passenger vehicles. However, passenger vehicles, or even transportation broadly, are not the only significant contributor of harmful air pollution across environmental justice communities. While electrification can have a meaningful impact across the transportation sector, electrification efforts should also carefully consider the equity and health implications that electrification scenarios will have on these particularly overburdened parts of the state: these same areas are also home to fossil fuel energy infrastructure that may be part of the electrification of the transportation sector.

Environmental justice communities are increasingly calling for the examination and prioritization of reducing co-pollutants in climate mitigation strategies.[4] The legacy of cumulative impacts from multiple sources of pollution in communities Of Color and low wealth communities requires that every opportunity to reduce health-harming emissions be explored. While climate mitigation efforts, including those targeting the transportation sector, are focused on GHG emissions, there are important opportunities to target the reduction of co-pollutants such as PM, NOx, sulfur dioxide and harmful air pollutants. This approach will appropriately center equity and immediate health impacts in considering policies to address climate change.

In New Jersey, while vehicle emissions contribute broadly to both GHG and harmful local air pollution, emissions from diesel trucks and buses emit higher levels of air pollution which can lead to even greater health concerns in populations who are more directly exposed to diesel emissions. Communities located adjacent to ports and related goods movement infrastructure (e.g., warehouses, logistics centers, railyards, etc.) experience higher levels of truck traffic, both from surrounding thruways and on local streets, which exacerbate health concerns. Since these emissions are local in their effects, policies to reduce transportation emissions from medium- and heavy-duty vehicles can significantly improve the health and well-being of communities in urban areas or around transportation corridors, which are often Of Color, low-income or otherwise vulnerable or disadvantaged communities.

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[1] https://www.nj.gov/dep/baqp/inventory.html

[2] https://www.nj.gov/dep/aqes/oce-ghgei.html

[3] Union of Concerned Scientists. (2019). Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic Fact Sheet. https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf

[4] Sheats, N. (2016). Achieving emissions reductions for environmental justice communities through climate change mitigation policy. Wm. & Mary Envtl. L. & Pol'y Rev., 41, 377.

This community-based participatory research project, completed in partnership with the New Jersey Environmental Justice Alliance (NJEJA) and the Natural Resource Defense Council (NRDC), evaluates the transportation-related pollution burden that environmental justice communities experience in and around port-adjacent communities in Newark, New Jersey. It highlights which transportation sources are the largest contributors to pollution exposure across the region generally and in specific hot spot areas. It then analyzes potential pathways, specifically focused on electrification, to reduce transportation-related emissions.

This analysis evaluates the distribution and intensity of vehicle emissions within the study area, and pathways for their reduction, by: 1) creating a comprehensive inventory of nearby vehicle emissions data across the marine and ground transportation sectors; 2) calculating relative emissions and emissions exposure within the entire study area as well as at specific locations determined by NJEJA and allies; and, 3) evaluating electrification pathways to reduce vehicle emissions.

## Key Findings from Analysis

1) **The highest transportation emissions burden can be found in locations close to high density truck and bus routes and locations close to port facilities and rail yards.** However, the analysis shows that total emissions exposure, and relative contribution from different transportation sources, varies significantly across the study area.

2) **Emissions of $PM_{2.5}$, black carbon, and NOx from non-roadway sources, particularly locomotives and port operations, have the highest air quality impact in the total study area, followed by medium- and heavy-duty vehicles.** These sources far outweigh the emissions exposure from passenger vehicles and together contribute around 95 percent of the total emissions exposure modeled within the study area (from mobile source emissions).

3) **Population centers and residential areas in close proximity to roadway emissions would benefit from efforts to reduce emissions from medium- and heavy- duty vehicles which can significantly reduce air emissions of particulates and NOx within certain key locations in the study area.** The analysis shows that while electrification could be one path to these reductions, electrification of these vehicles must be accompanied by a focus on emissions reductions from electric generating units co-located within the same community in order to ensure a reduction in overall air pollution burden.

# Study Design and Local Community Leadership and Engagement

This study was conducted in close consultation with the New Jersey Environmental Justice Alliance (NJEJA). NJEJA is a statewide alliance of organizations and individuals focused on a wide range of environmental justice issues.

Following a community-based participatory research model, this study built on strengths and resources within the community to integrate and achieve a balance between research and action for the mutual benefit of all partners. As an equal partner in the project, NJEJA provided critical guidance and input through their place-based experience and local data as well as helping to shape the study to ensure its usefulness for local applications. This guidance took many forms, including:

- Establishing study geographic scope;
- Determining included sources and emissions (within the analytical restrictions of this study);
- Identifying local hot spots (e.g. idling locations) and possible sensitive areas (e.g., schools) for deep analysis;
- Helping to prioritize pollutants and mobile sources of interest;
- Facilitating feedback of local residents and advocates through the Coalition for Healthy Ports (CHPS); and
- Shaping scenarios and highlighting local priorities for electrification analysis.

These elements are of vital importance to the communities located within the study area and were included because community leaders were able to bring these considerations to light. This bias to action approach to the research ensured that the aims of the study aligned with the goals of the groups advancing strategies for environmental justice with respect to transportation climate mitigation strategies. The results of this study help refine and prioritize the necessary interventions to reduce emissions with the greatest impact in environmental justice communities in close proximity to transportation infrastructure like seaports, airports, and highways.

Figure 1 Key Demographics of Study Area

| | Study Area | New Jersey |
|---|---|---|
| Population | 209,000 | 8,880,000 |
| Population, % of Color | 58% | 32% |
| Median household income[1] | ~$44,000 | ~$88,000 |
| Burdened communities[2] | 47 of 52 (90%) | 662 of 1,987 (33%) |

*Adapted from U.S. Census Bureau 2014-2018 American Community Survey Estimates*

[1] Population-weighted average estimate
[2] Defined as any census tract, as delineated in the most recent federal decennial census, that is ranked in the bottom 33 percent of census tracts in the State for median annual household income

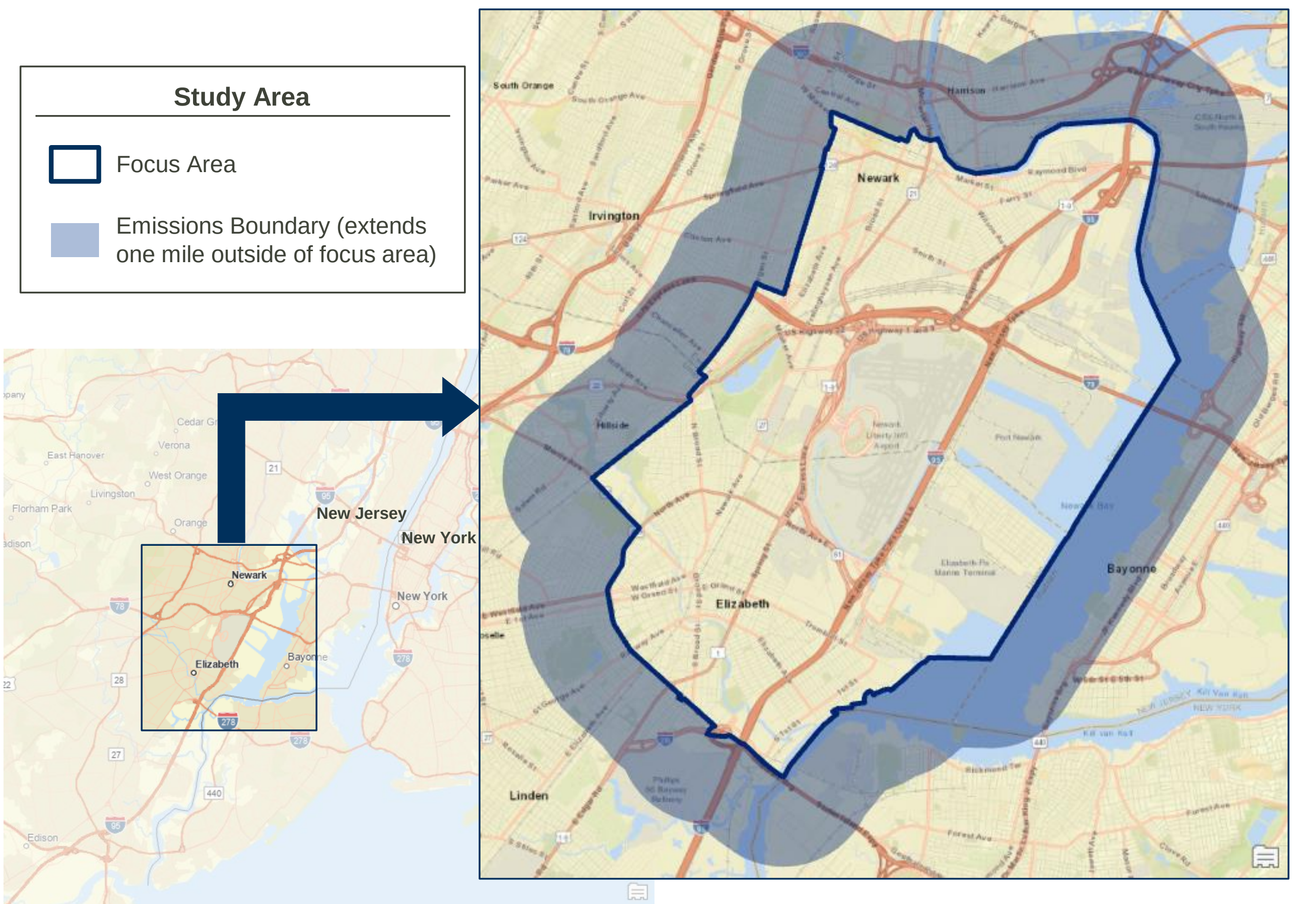
# Methodology

MJB&A conducted a two-phase analysis in and around the ports of Newark and Elizabeth to evaluate transportation-related emissions and calculate how these emissions accumulate across the region to result in total emissions exposure. Phase One constituted developing a detailed inventory of roadway and non-roadway mobile source emissions, while Phase Two evaluated relative emissions and emissions exposure across the region and in particular in key areas.[5]

Working with NJEJA, MJB&A defined a study area that included much of southeast Newark and north Elizabeth, including Newark Airport and the ports of Newark and Elizabeth. By including both roadway and non-roadway sources, it covered key emissions known to negatively impact human health and the environment—specifically, NOx, fine particulate matter ($PM_{2.5}$), black carbon, and carbon dioxide ($CO_2$). To account for emission dispersion and ensure that emissions that may impact communities were included, a one-mile buffer (displayed in blue in Figure 2) was added to the analysis.

In this study, we use the term "emissions" to mean modeled emissions from transportation *sources in* the study area (or a subset of the study area). "Exposure" is a function of both emissions and dispersion and refers to the *cumulative (transportation) emissions impact* experienced at a location or area; that is, emissions from nearby transportation sources are included as well as those that have been carried by wind to a location from other sources.

**Figure 2** Geographic Scope and Study Area




5 See Appendix A for a detailed methodology.

## Phase One: Emissions Inventory

Phase One created an inventory of local transportation emissions using both top-down and bottom-up approaches. This analysis was based on publicly available resources, purchased vehicle registration data, and adjustments using spatial analysis to account for local characteristics. Emission sources were disaggregated to the furthest extent possible to provide the most accurate and transparent representation of transportation-related emissions in the area. This inventory is comprised of a collection of 75 unique emission sources (48 roadway sources and 27 non-roadway sources) that have different emission factors, dispersion characteristics, and ultimately, contributions to emissions exposure.[6]

### Roadway Emissions

MJB&A used a combination of spatial traffic datasets and Newark-specific summary traffic/vehicle data to create a traffic inventory that provided a detailed breakdown of vehicle miles traveled (VMT) by vehicle type, roadway type, county, and zip code, where applicable.

To translate VMT to emissions, MJB&A applied emissions factors to the most dominant vehicles stock at the state-, county-, and zip code-level for each roadway type. Figure 3 identifies each roadway sources captured within the emissions inventory and displays vehicle traffic on all roadways included in the analysis.

**Figure 3** Roadway Mobile Emission Sources

**Included Vehicles**

**Light-duty vehicles**

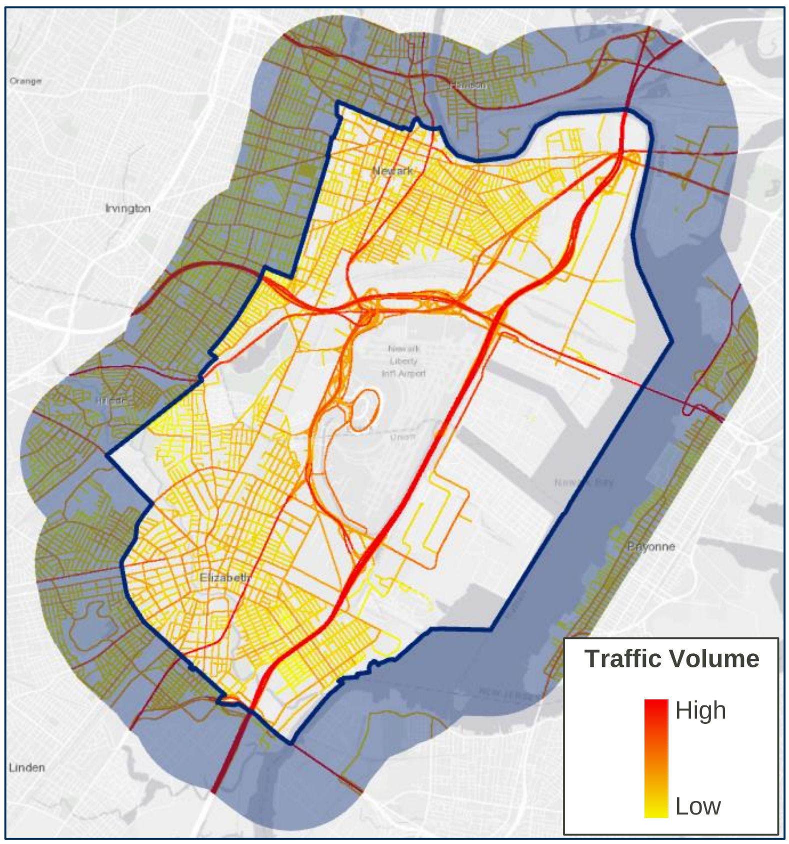
- Motorcycle
- Passenger car
- Light-duty truck

**Medium-/Heavy-duty vehicles**

- Single-unit truck
- Combination Truck

**Buses**

- School bus
- Intercity bus
- NJ Transit Bus (NJ Transit-designated routes only)




6 Note that this emissions inventory and subsequential dispersion analysis are not comprehensive of all emission sources located within the study area. This analysis focused on select, transportation-related mobile sources and did not account for other potential sources of emissions, such as (but not limited to) electric generating units, industrial manufacturing facilities, oil refineries, buildings, construction, and airplanes (landing, taking off, and taxiing).

### Non-Roadway Emissions

In addition to roadway emissions, this analysis focused on select non-roadway mobile emission sources located within railyards, port facilities, and the Newark International Airport; specific "hotspot" locations where heavy-duty diesel vehicles idle were also included.[7] MJB&A utilized data from the Port Authority of New York and New Jersey (PANYNJ) 2016 Greenhouse Gas and Criteria Pollutant Emissions Inventory for base port and airport emissions. Additional adjustments were required to allocate emissions from commercial marine vessels to specific ports. Using best available locomotive activity data for the relevant railyards, MJB&A performed detailed emissions analyses to estimate locomotive emissions within each railyard.

For each of these sources, all emissions within each source area were assumed to originate in an evenly distributed manner across the source (e.g., across the entire area of the railyard or port berth). Figure 4 identifies each non-roadway source captured within the emissions inventory and shows the boundaries and locations associated with each source.

Figure 4 Non-Roadway Mobile Emission Sources

**Included Areas & Locations**

**Port[1]**

1. Port Elizabeth
2. Port Newark
3. Howland Hook

**Railyard[2]**

4. ExpressRail Elizabeth
5. ExpressRail Staten Island
6. South Kearny
7. NS E-Rail
8. Oak Island
9. Trumbull

**Airport[3]**

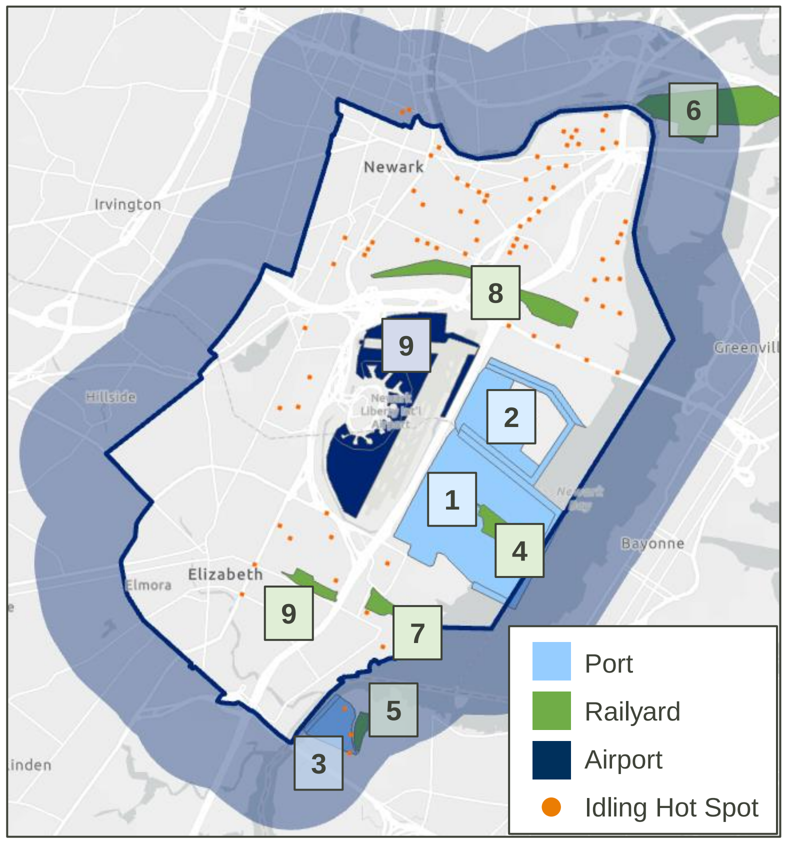
10. Newark International Airport

**Heavy-duty diesel truck idling**

- Identified hotspots

**Emission Sources**

[1] Cargo handling equipment, commercial marine vessels, & on-port heavy-duty diesel vehicles
[2] Switch & line-haul locomotives
[3] Ground support equipment & auxiliary power units




## Phase Two: Emissions Evaluation

In Phase Two, MJB&A evaluated transportation emissions by utilizing the emissions inventory developed in Phase One to: 1) create heat maps of emissions exposure across the community and 2) evaluate the effect that policy interventions would have on emissions exposure under a range of electrification scenarios (e.g., low-to-high and in select policy-specific cases).

[7] Emissions from heavy-duty diesel vehicle idling are considered to be port-related activity (e.g., non-roadway) but occur on or along roadways and are referred to as roadway sources in the remaining report

To determine the level of emissions exposure experienced at any given location or area within the study area, MJB&A performed a dispersion analysis that modeled the movement of each pollutant. Although this analysis is a simplification of atmospheric dispersion modeling that can be used to develop air quality standards,[8] it does account for important factors that affect pollutant dispersion, such as fuel-source specific emission impact curves and wind direction. MJB&A utilized U.S. EPA AERSCREEN modeling tools to create engine-specific emission impact curves[9] to estimate the relative magnitude of emissions downwind from the source. These impact curves were combined with local wind data to create wind-adjusted impact functions that accounted for 360-degree dispersion out to one mile from the emissions source.

These impact functions were then applied to the emissions inventory created in Phase One to produce source-specific, spatial emission dispersion data. Ultimately, the outputs (or "exposure" values) of each dispersion analysis were aggregated to produce cumulative values; Figure 5 shows an illustrative example of how cumulative exposure values were calculated.

These spatial, cumulative exposure values enabled the ability to characterize relative pollution exposure at any location or within any defined area in the study area. To highlight the most impactful emission sources and identify emissions reduction interventions that could have the largest impact in the area, MJB&A performed detailed analyses at key "receptor sites" provided by NJEJA (displayed in Figure 6).[10] A case study of Hawkins Street Elementary School (receptor site #3) is further discussed on pages 12 and 13.

**Figure 5** Illustration of Cumulative Exposure Calculation

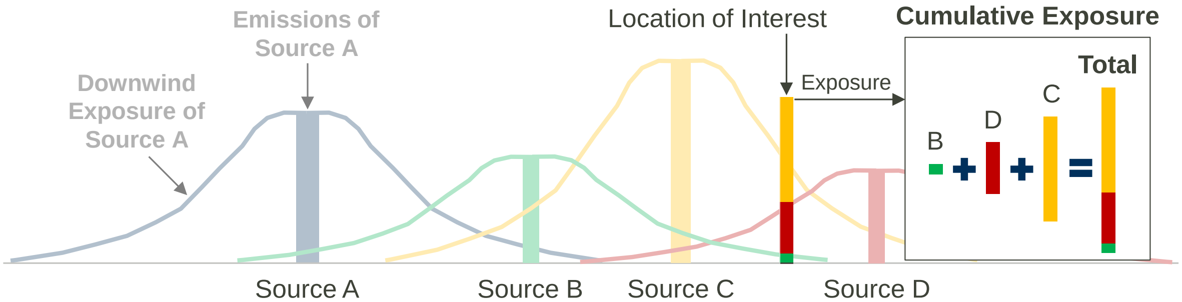
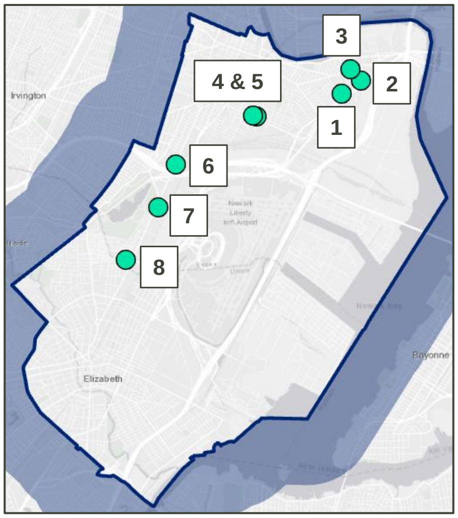



**Figure 6** NJEJA Receptor Sites

**Receptor Sites**

1. Ironbound Aquatic Center
2. Newark Pre-School Council
3. Hawkins Street Elementary School
4. St. Justine II Pre-School
5. Fresenius Kidney Care Center
6. The Harbor
7. DaVita Parkside Dialysis Center
8. Kretchmer Senior Center




[8] Output of this analysis ("exposure" values) may be viewed as proportional to typical atmospheric dispersion model outputs (e.g., pollutant concentrations given as grams per cubic meter) but should not be directly compared

[9] Generic dispersion curves were modeled for all relevant engine types; see Appendix B for more information

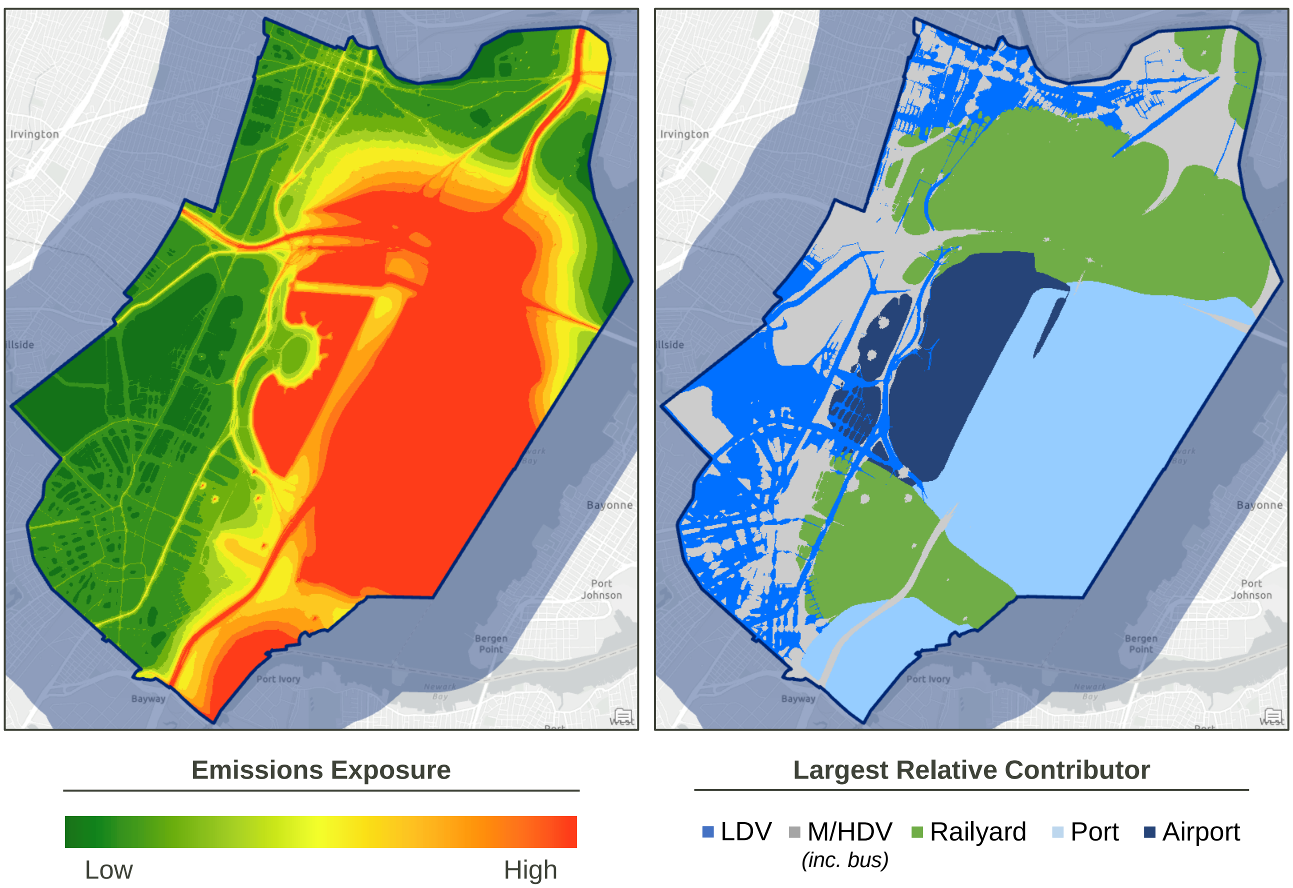
[10] See Appendix C for results from each receptor site.

# Key Findings

**Total emissions exposure, and relative contribution from different transportation sources, varies significantly across the study area.**

This analysis finds that those emissions sources that contribute most to a location's exposure may be up to a mile away from the study area and that community exposure to pollution is affected by both nearby emissions and total exposure from sources that are not in the immediate vicinity.[11] Since pollutant exposure is a function of both emissions and dispersion, locations with the highest exposure are likely to be close to, and downwind from, port facilities, railyards, and high-density truck and bus routes. Figure 7 presents two different ways to visualize $PM_{2.5}$ emissions exposure experienced throughout the study area.[12] The leftward map represents the relative emissions exposure as a "heat map" to convey how $PM_{2.5}$ exposure varies across the area. The rightward map indicates the emissions source that is most responsible for $PM_{2.5}$ exposure experienced at any given location.[13]

Figure 7 $PM_{2.5}$ Emissions Exposure Across Study Area

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[11] As a reminder, in this study, we use the term "emissions" to mean actual emissions from sources in the study area (or a subset of the study area). "Exposure" is a function of both emissions and dispersion and refers to the cumulative emissions impact experienced at a location or area; that is, emissions from nearby sources are included as well as those that have traveled to a location from other sources.

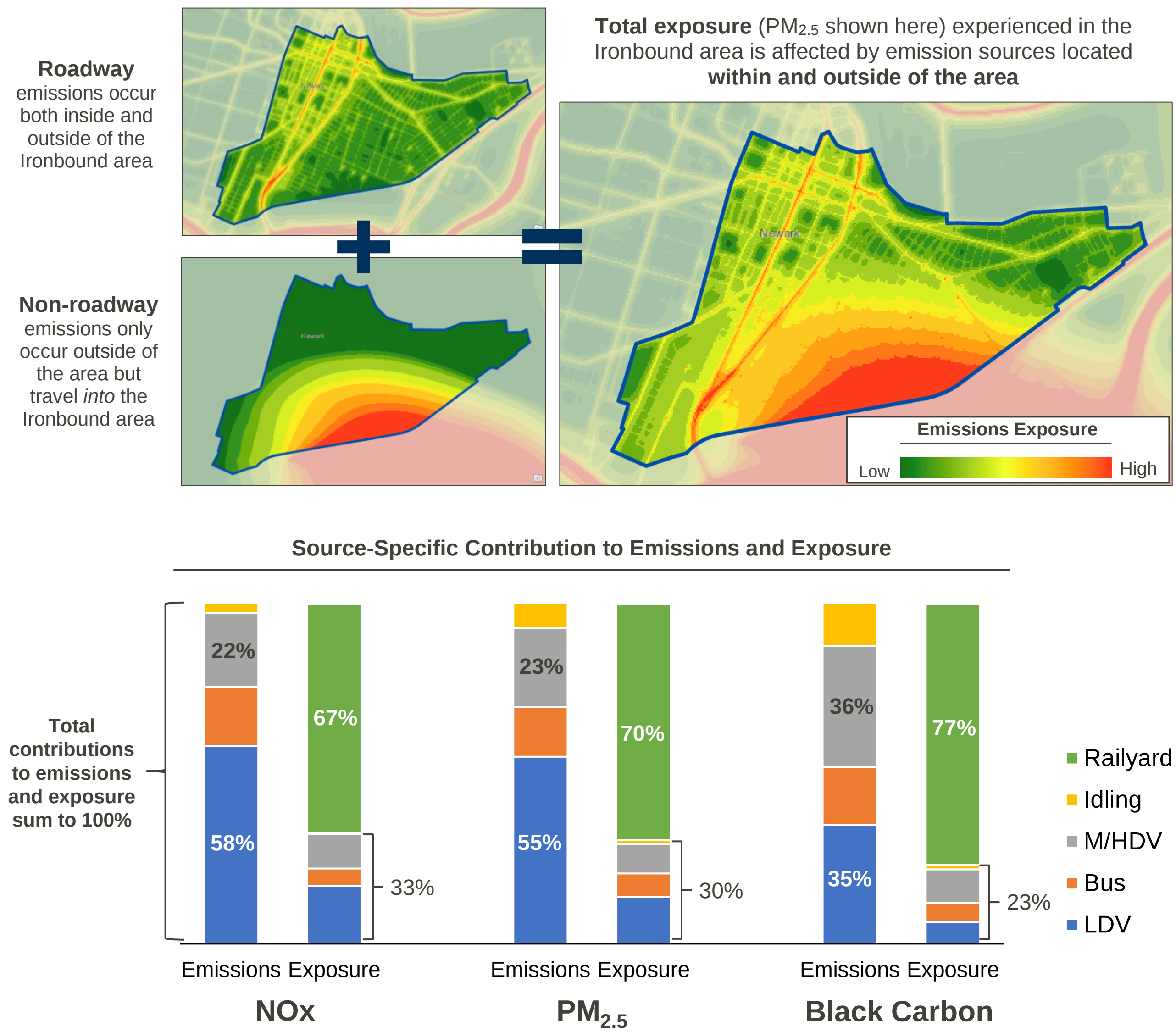
[12] See Appendix B for detailed emission exposure maps by emission source and pollutant (NOx, $PM_{2.5}$, and black carbon) for a more refined spatial visualization of contributing emission sources

[13] Emission sources aggregated as light-duty vehicles, medium-/heavy-duty vehicles (including buses), aggregated railyards, aggregated ports, and Newark International Airport.

As Figure 7 shows, location has a significant impact on the magnitude of exposure and the specific emission sources responsible for that exposure. Railyards, especially, are the primary source of exposure in many neighborhoods and communities around the study area, but high traffic bus and truck routes that travel through and around downtown Newark and Elizabeth are largely responsible for exposure in those areas.

The importance of accounting for pollutant dispersion and movement can also be seen in the Ironbound neighborhood and surrounding area of Newark. This study defined this area with a western border of Dr. Martin Luther King, Jr. Boulevard, extending through downtown and into the North and South Ironbound neighborhoods, bordered by U.S. Route 1 and Raymond Boulevard. Figure 8 shows a heat map of $PM_{2.5}$ emissions exposure within this defined area, which derives from both roadway and non-roadway sources. The chart in Figure 8 explores more detail on how each source contributes, on a relative basis, to emissions and exposure within the Ironbound area. The analysis shows that while total emissions emitted *within the area* primarily derive from light-duty vehicles (or medium- and heavy-duty vehicles for black carbon, specifically), emissions that originate from *outside the area* (in this case, Oak Island railyard to the southeast) are largely responsible for the total emissions exposure experienced within the area.

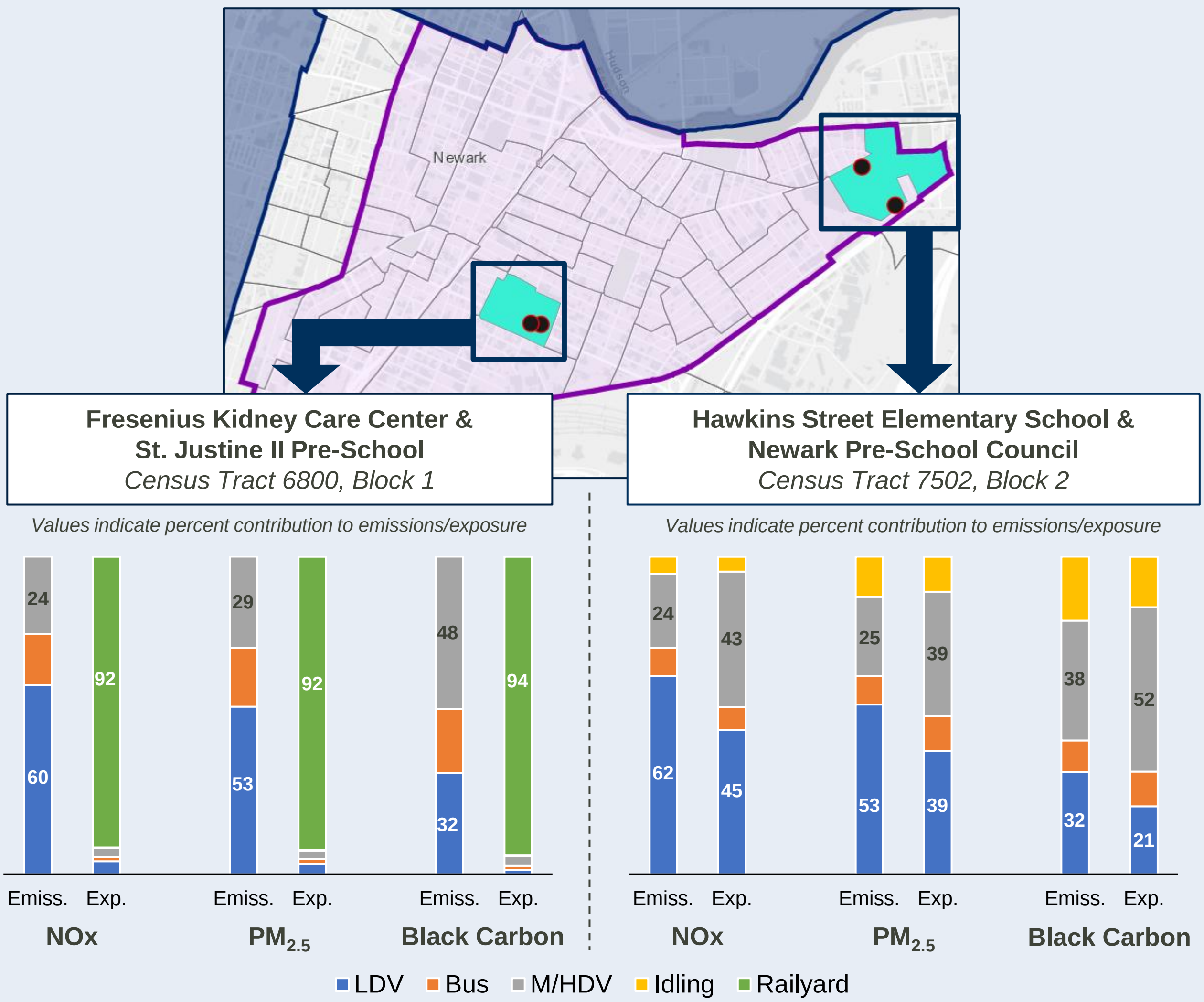
Figure 8 Emissions and Exposure in the Ironbound



Looking at specific locations within the total exposure heat map of Figure 8, one can see how certain points within the neighborhood, for example those around downtown Newark to the north and west, are more affected by exposure from roadway sources. Figure 9 illustrates a case study that was performed around key receptor sites to further highlight how nearby emissions can compare to exposure on a hyper local level. This case study also shows the significance of a location's proximity to emission sources; while non-roadway emissions have a significant impact on the emissions exposure experienced across the Ironbound area, vehicle emissions—particularly those from medium- and heavy-duty vehicles—can also have a major impact on local exposure in certain population centers.

**Figure 9** Ironbound Receptor Site Case Studies: Emissions vs. Local Exposure

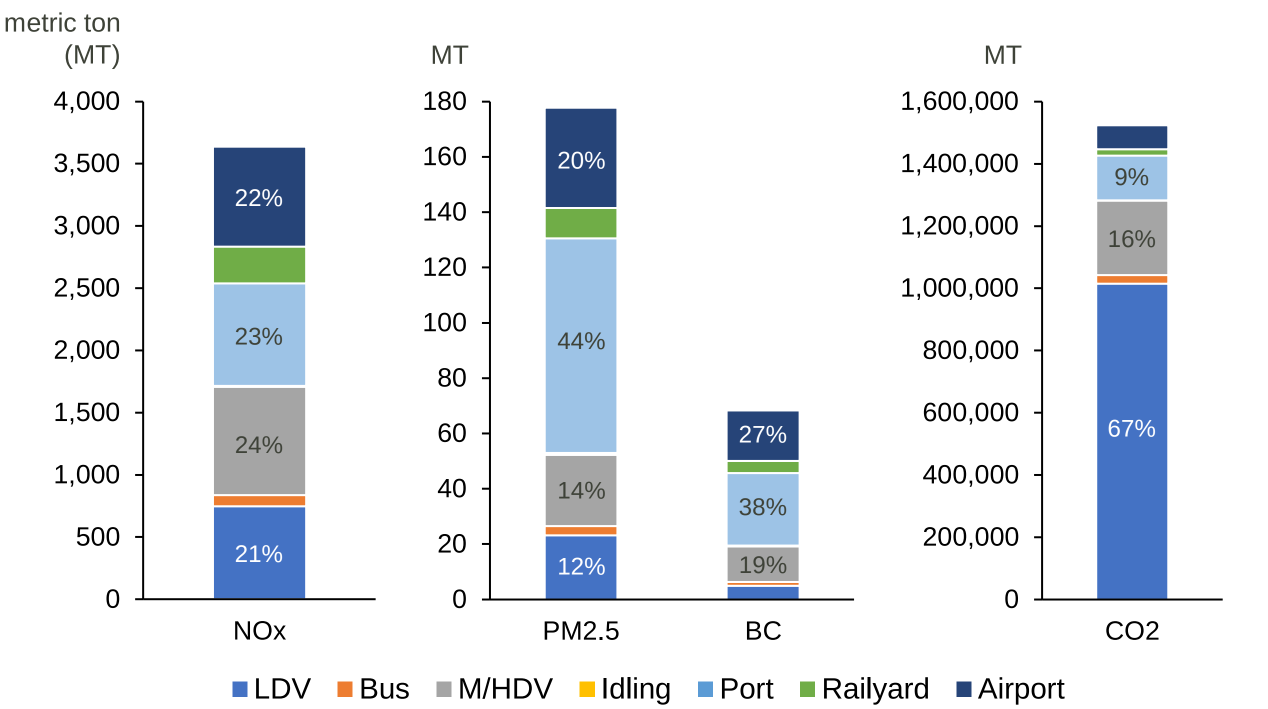
The highlighted areas below are both census tract blocks within the Ironbound and surrounding area. However, the key sources of emissions and exposure for each area vary significantly. Emissions that occur nearby Fresenius Kidney Care Center & St. Justine II Pre-School (within the tract block) derive largely from local traffic, but the pollution exposure experienced within the area is primarily caused by locomotives in Oak Island railyard, located approximately one-third of a mile away. Emissions near Hawkins Elementary and Newark Pre-School Council primarily come from local vehicle traffic, but idling emissions and truck traffic on surrounding highways (US-1 and the NJ Turnpike) contribute more significantly to exposure.



**Emissions from non-roadway sources, particularly locomotives and ports operations, have the highest air quality impact in the total study area, followed by medium-and heavy-duty vehicles.**

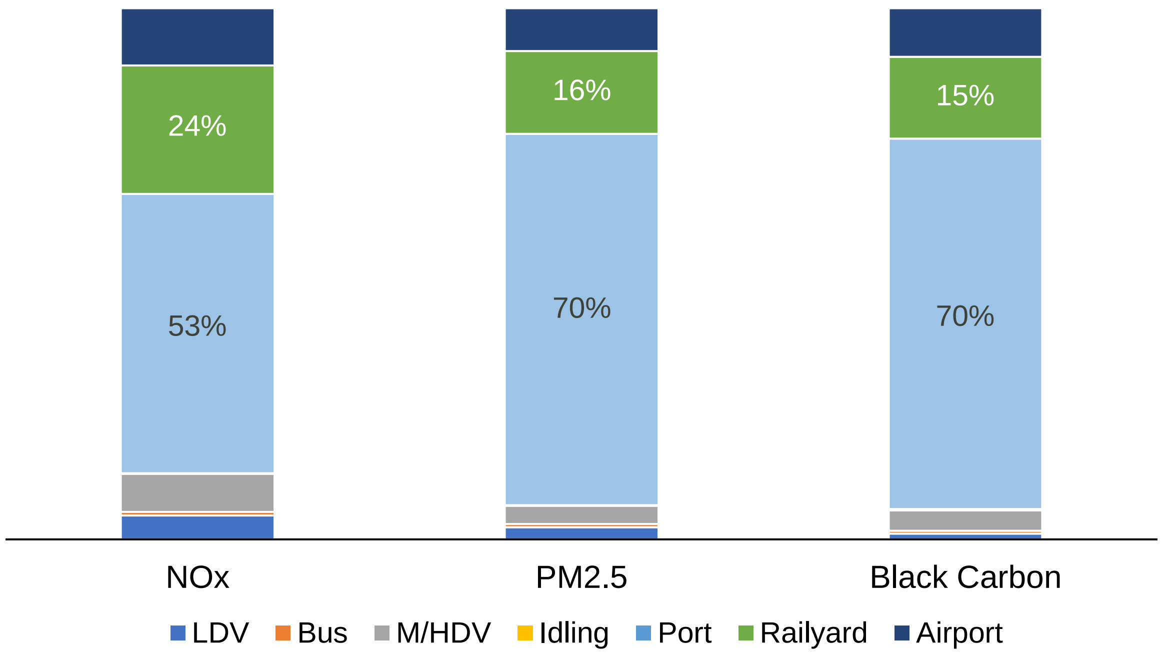
This analysis finds that non-roadway sources are responsible for the majority of $PM_{2.5}$ and black carbon emissions in the study area, while roadway vehicles produce similar NOx to non-roadway sources and much more $CO_2$. Figure 10 shows how light- and medium-/heavy-duty vehicles in the study area emit about the same amount of NOx as included sources in the airport and ports. However, non-roadway sources—particularly ports—are the dominant contributor to $PM_{2.5}$ and black carbon emissions in the area.

Figure 10 Total Emissions in Study Area, by Source




Although Figure 10 provides insight into emissions produced in the area, the dispersion analysis used to calculate total exposure reveals the even larger impact that ports and railyards have on local communities. As shown in Figure 11, these two sources alone are responsible for 77% of NOx exposure and around 85% of $PM_{2.5}$ and black carbon exposure. Buses and medium- and heavy-duty vehicles are the next largest sources of exposure, contributing jointly to around 8% of NOx and 4% of $PM_{2.5}$ and black carbon exposure.

Figure 11 Relative Contribution to Emissions Exposure within Study Area




While there are some policies in place to reduce the emissions from locomotives and marine vehicles, these vehicle classes have historically presented a much more difficult path for emissions reductions, including through electrification, due to limited policy attention and lack of funding. Policy intervention can help drive further development in this space. As discussed in the following finding, however, it is also important to look at emissions exposure on a very local basis when considering policy interventions.

**Population centers and residential areas in close proximity to roadway emissions would benefit from efforts to reduce emissions from medium- and heavy-duty vehicles which can significantly reduce air emissions of particulates and NOx within certain key locations in the study area**.

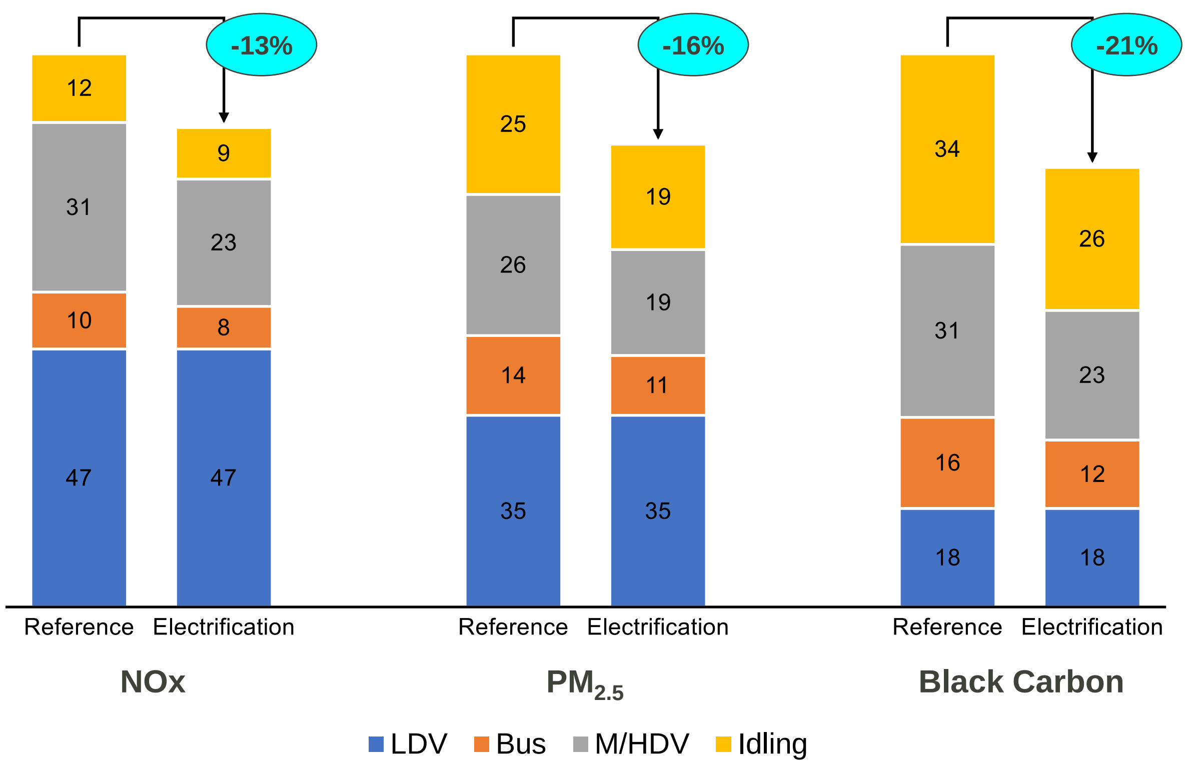
This analysis also includes an assessment of emission sources' relative contribution to exposure at a hyper local level—at a school, a hospital, or any other point within the study area. This highlights that many locations within the study area experience much lower relative exposure from non-roadway sources and may receive higher relative and total impact exposure from roadway sources depending on the location's proximity to a roadway.[14]

Because many population centers are severely impacted by roadway emissions, reducing emissions from high-emitting light-, medium- and heavy-duty vehicles can meaningfully reduce exposure in locations and areas near roadways. These benefits can be particularly local in nature if the emissions exposure at a specific location is dominated by emissions from a nearby truck or bus route or idling hot spot. The emissions exposure experienced at Hawkins Street Elementary School, for instance, is entirely from roadway sources, especially medium- and heavy-duty vehicle traffic and additional idling emissions from heavy-duty diesel trucks. Figure 12 shows how a 25 percent electrification of buses and medium- and heavy-duty vehicles can

[14] In short, this is because, among other things, the impact of non-roadway emissions is concentrated within one-mile of each source whereas roadway vehicle emissions are more evenly "spread" over the study area emissions. Although non-roadway sources disperse farther than roadway vehicles and distribute their emissions more substantially across a wider region, their relative impact on a specific location's exposure may be relatively small depending on that location's proximity to each type of emissions source.

reduce emissions at Hawkins St. Elementary School by 13 to 21 percent, depending on the pollutant.[15] Note that a significant share of these reductions come from a decrease in heavy-duty diesel vehicle idling emissions, which come from a nearby identified idling "hot spot." These emissions reductions could represent meaningful improvement in health outcomes for the children and staff attending this school in addition to those living and working in the surrounding areas. However, when assessed across the entire study area, this level of electrification of roadway vehicles would only reduce emissions exposure by 1 to 2 percent, simply because the magnitude of total port and railyard emissions affecting exposure in the study area is so high.[16]

Figure 12 Case Study: Effect of Electrification on Exposure at Hawkins St. Elementary School




[15] See Appendix C for results from each receptor site.

[16] A 60 percent electrification of all roadway vehicles (light-duty, buses, and medium-/heavy-duty) would reduce total area NOx emissions exposure by about 7 percent and $PM_{2.5}$ and black carbon by 3-4 percent when averaged across the study area, though it could have significant impacts on specific locations within the study area.

It is also critical that any analysis of electrification of transportation sources as an emissions reduction strategy take into account the potential impact of increased emissions from local power plants, which also contribute to the local pollution burden. In other words, if electrification is to be pursued for the light-, medium-, and heavy-duty transportation sector, to assure emissions reductions compared to the status quo, it must be paired with emissions reductions in local electric generating units (EGUs) as well, and across the broader power pools that dispatch generating units.  To illustrate this point, MJB&A performed a preliminary emissions analysis of nearby EGUs, displayed in Figure 13.

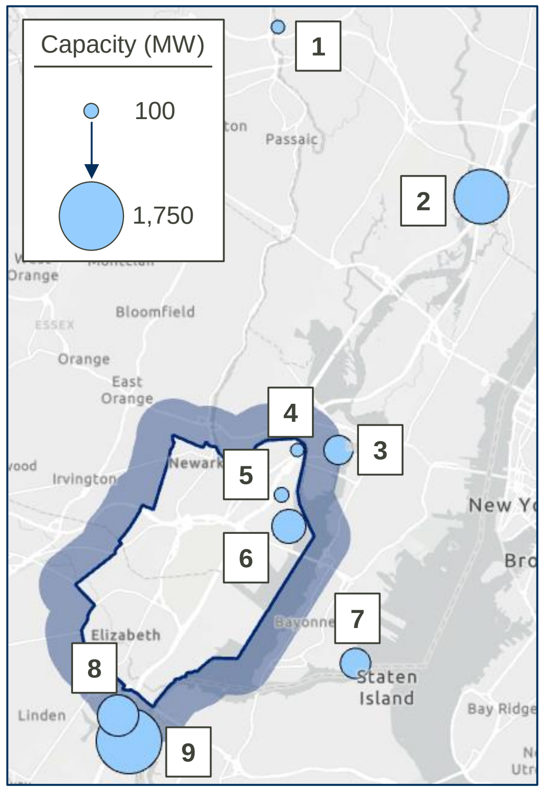
**Figure 13** Electric Generating Units (EGUs) Included in Analysis

**Included Power Plants***

1. Elmwood Power Park
2. Bergen Generating Station
3. PSEG Kearny Generating Station
4. PSEG Essex Generating Station
5. Newark Bay Cogeneration Plant
6. Newark Energy Center
7. Bayonne Energy Center
8. Linden Cogeneration Plant
9. PSEG Linden Generating Station

*All natural gas facilities

10. Elmwood Power Park
11. Bergen Generating Station
12. PSEG Kearny Generating Station




These EGUs exist within the PJM grid, a wholesale electricity market that operates in states throughout the mid-Atlantic.  This analysis does not conduct a dispatch model to identify if these emitting EGUs, in particular, are likely to increase their output—and thus emissions—if electricity demand increases due to electrification of transportation.  However, it does attempt to compare the relative emissions rates of transportation sources with the average emission rates of local EGUs to determine one possible scenario regarding the emissions effect of electrified transportation.

Figure 14 shows the emission rates of light-duty vehicles, buses, and medium- and heavy-duty vehicles under three conditions: 1) the average vehicle from the current fleet, 2) a new conventional internal combustion engine vehicle, and 3) an electric vehicle powered exclusively by the EGUs shown in Figure 13.

Figure 14 $CO_2$, NOx, and $PM_{2.5}$ Emissions Rates: Vehicles vs. EGUs

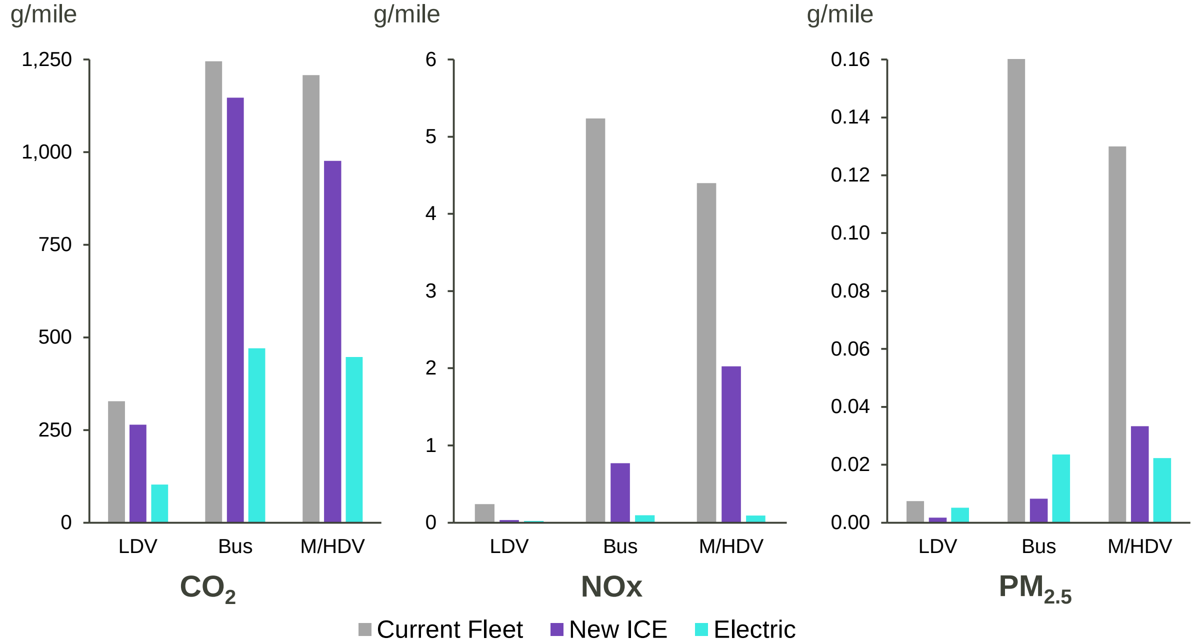



Figure 14 shows that the NOx and $CO_2$ emissions rates of these units are significantly lower than the rates of the vehicle fleet considered in this analysis. Accordingly, if one were to assume that 100 percent of the electricity needed to power a newly electrified truck, car, or bus were to come from these local EGUs, total NOx and $CO_2$ emissions would still decrease compared to prior emissions from a conventional gas- or diesel-powered vehicle. Of course, local emissions could be even lower if some portion of that electricity to power a new electric vehicle is produced by non-emitting generation or generation outside the region. However, a more detailed dispatch analysis is necessary to determine which, if any, EGUs in the area increase output and therefore determine local emissions impact. As with the transportation emissions exposure findings in this study, power plant emissions can have hyper local impacts that can be obscured when looking across broad areas.

Furthermore, the analysis finds that local EGUs have a lower $PM_{2.5}$ rate than the current vehicle fleets across all classes and than a new conventional truck, but higher emissions rates than that of the average new conventional light duty vehicle or bus. Accordingly, if a conventional bus is replaced with an electric bus, and all electricity to power that bus comes from local emitting EGUs, total local emissions (i.e., those from transportation sources affecting the study area and these local power plants) are likely to decrease. However, it is possible that somewhat greater $PM_{2.5}$ emissions reductions could be achieved through the purchase of a new conventional bus. Similarly, if a passenger vehicle is electrified and powered by exclusively local emitting EGUs, $PM_{2.5}$ emissions in the same locality could rise compared to a case in which that passenger vehicle was simply replaced by a new, cleaner conventional car.

One benefit of electrification, compared to replacing vehicles with new conventional vehicles, is that emissions can continue to decrease over time. The “electric” emissions in Figure 14 can be viewed as a ceiling on local emissions for electric vehicles, with room for improvement if and when the electric sector continues to reduce emissions through improving performance of emitting sources and replacing emitting resources with renewables, advanced energy storage, or other zero emitting resources.

In addition, further analysis could be conducted to assess the dispersion of NOx and $PM_{2.5}$ from electricity sources, as these impacts are often very local. As discussed above, because many population centers are severely impacted by very local roadway NOx and $PM_{2.5}$ emissions, electrifying high-emitting light-, medium- and heavy- duty vehicles can significantly reduce exposure in locations and areas near roadways.

However, those communities adjacent to EGUs may experience concurrent increases in emissions from the electric sector. Though outside of the scope of this study, more analysis should be conducted to identify the local impacts of these potential shifts in emissions.

In total, this study finds that the emissions impact of transportation electrification depends on which pollutant is being considered, what electricity generation sources are assumed to serve new demand, and how locally emissions are accounted for (i.e., averaged across a region or taking into account local emissions hot spots).

# Discussion

This analysis displays the direct relationship between local air quality and pollution from transportation sources. While this is not a new finding—the literature on the impact of transportation emissions on human health and the environment is substantial—the street by street variation in the level of emissions impact that communities may experience sheds light on the direct impact that higher polluting vehicle routes have on local street and neighborhood air quality. This finding—and its implications—are critical for policymakers who are looking to create more equitable communities that do not disproportionately burden parts of the population with levels of air pollution that negatively impact health.

Historically, policies focused on reducing emissions from the transportation sector have been designed with the goal of reducing transportation pollution by either requiring—through vehicle emissions standards—or encouraging—through vehicle trade-in or scrappage programs—cleaner light-duty and medium-and heavy-duty vehicles. Within the medium- and heavy-duty space, vehicle trade-in programs and scrappage programs have led to some improvements in air quality. However, these policies have not gone far enough in reducing emissions, in particular in communities that are disproportionately burdened by poor air quality.

Many states across the country have shifted their transportation sector emissions policy, focusing instead on strategies to reduce climate-warming GHG emissions, often evaluating local air quality improvements as a co-benefit to $CO_2$ emissions reductions. The majority of policies implemented to reduce emissions within the transportation sector within the United States have focused primarily on the electrification of light-duty vehicles. These policies typically have a goal of broadly reducing GHG emissions from the transportation sector and focus less on local harmful air pollution.

New Jersey has followed this climate-centric path, and has implemented several policies as part of its climate and energy agenda to reduce GHG emissions from the transportation sector.  This has included: signing the light-duty and medium- and heavy-duty zero-emissions vehicle electrification Memorandums of Understanding;[17]developing several incentive programs designed to encourage the procurement of light-duty electric vehicles; and, through the passage of SB 2252, codifying procurement targets, setting charging infrastructure targets, and creating transit bus electrification targets. These and other initiatives have placed New Jersey among the states actively pursuing transportation electrification, in particular for light-duty vehicles.

These policies, while constituting a meaningful step in reducing GHG emissions across the state, do not adequately focus on medium-and heavy-duty vehicle pollution or improving local air quality within environmental justice communities. For communities like those in the study area and especially those adjacent to the ports of Newark and Elizabeth, other types of vehicles in addition to light-duty vehicles have a significant impact on the emissions of local air pollution, like $PM_{2.5}$, black carbon, and NOx, that negatively impact human health the most.

Based on the findings of this analysis, when evaluating roadway transportation emissions sources, medium- and heavy-duty vehicles have an outsized impact on the harmful local pollutants that impact human health as well as contributing significantly to transportation sector GHG emissions. This analysis further found that reducing emissions from the medium- and heavy-duty vehicle sector would have meaningful and immediate impacts on air-quality within disproportionately burdened communities. These objectives, and programs specifically aimed at these communities' needs, should be centered alongside that of GHG reduction when developing transportation policies. This rebalancing is critical to ensure that GHG reduction policies, including those focused on electrification, are improving air quality within disproportionately burdened communities today in order to reduce the lifetime health burdens that community members face. For communities like those within the study area, the greatest opportunity for local air quality improvement

[17] In 2018, New Jersey joined eight other states in signing the state zero-emissions vehicle (ZEV) Memorandum of Understanding (MOU).  New Jersey specifically set a target of 330,000 light-duty plug-in electric vehicles (PEV) in the state by December 2025.  In 2020, New Jersey joined 15 other states and Washington DC in signing the state Medium- and heavy-duty Zero emission vehicle MOU.

comes when these emissions are directly targeted by policy, rather than arising as a co-benefit from policies focused on GHG reduction.

The State of California, in particular, has taken a leadership role in approving a number of policies in recent years designed to reduce emissions from medium- and heavy-duty vehicles, including the recent approval of two landmark rulings — the Advanced Clean Truck Rule and the Heavy-Duty Low NOx Omnibus Rule. Both of these rulings are designed to address medium- and heavy-duty vehicles emissions in distinct and complementary ways— with one program focused on developing a market for new zero-emitting medium- and heavy-duty vehicles and the other designed to reduce emissions from existing trucking fleets.

By addressing both local harmful air pollution in the short-term and developing a supply chain for zero-emitting trucks, the state is both considering the immediate and long-term needs of communities located in heavily trafficked areas. The California Air Resources Board (CARB) estimates that both of these policies will dramatically reduce emissions and improve air quality. Notably, CARB anticipates that the NOx Omnibus Rule is expected to reduce harmful NOx emissions in California by more than 24 tons per day once it is fully phased in by 2031.[18]

These policies, and those like them, represent a possible model for New Jersey to follow if it is serious about reducing community pollution exposure from the transportation sector. Several additional examples of how states are pursuing medium- and heavy-duty electrification are described below. Critical to implementing any policy similar to those described below is ensuring that reductions in medium- and heavy-duty vehicle emissions occur within environmental justice communities.

- **California Advanced Clean Trucks Rule**— The Advanced Clean Truck Rule focuses on developing a market for zero-emission MHDVs by requiring manufacturers of Class 2b-8 vehicles to sell zero-emission trucks at an increasing percentage of their annual California sales from 2024 to 2035 and by requiring large employers and fleet owners to report their existing fleet operations. California is also developing a partner regulation to the Advanced Clean Trucks rule that will require all medium and heavy-duty fleets to be 100% zero-emissions by 2045, per Executive Order N-79-20.
- **California Innovative Clean Transit—** All new transit buses in CA must be zero-emission, electric buses by 2029. By 2040, all public transit agencies must transition to 100% zero-emission bus fleets. Zero-emission bus technologies include all-electric or fuel cell electric buses.
- **California Heavy-Duty Low NOx Omnibus Rule—** The Heavy-Duty NOx Omnibus Rule increases exhaust emissions standards and test procedures, requiring engines to be approximately 75 percent below current standards beginning in 2024, and 90 percent below current standards in 2027.
- **California Port Electrification Goals—** A number of Ports in California have set aggressive truck electrification goals. The San Pedro Bay Port 2017 Clean Air Action Plan proposes to establish a new clean truck program with a goal to have a fully zero-emission drayage truck fleet by 2035 and to require all trucks entering the port to be zero-emission, meet the Low-NOx standard, or pay a fee by 2024. By 2035, trucks would need to be zero-emitting or would have to pay a fee. Additionally, the Ports of Los Angeles and Long Beach Clean Air Action Plan set a goal of 100 percent zero-emission drayage trucks by 2035. By 2035, all drayage trucks at California ports must be zero-emissions, per Executive Order N-79-20.

Importantly, this analysis also reveals the significant contribution to GHG and local harmful pollutant emissions from non-roadway sources in port-adjacent communities—specifically, from ports and railyards. However, strategies to reduce these emissions have not received the same amount of policy focus or investment as have roadway sources of emissions. While there are measures that can be taken in the short term to reduce some of these emissions (e.g., reducing vessel and locomotive idling or electrification of shore

[18] California Air Resources Board. (2020). Facts about the Low NOx Heavy-Duty Omnibus Regulation. https://ww2.arb.ca.gov/sites/default/files/classic//msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf

power sources), more dedicated action and research and development will be needed to have a meaningful impact on reducing emissions from these non-roadway sources. Some ports, such as Long Beach and Los Angeles, have reduced emissions under state regulation and long-term planning, but a more comprehensive approach is needed within ports in order to improve air quality in port-adjacent communities.

By taking a comprehensive approach to all modes of mobility and by keeping a focus on where air pollution exposure is most severe, policymakers in states like New Jersey can become leaders in equitably addressing emissions reductions within the transportation sector.

## Conclusion

The damaging and significant health effects associated with exposure to local air pollutants such as NOx, black carbon, and $PM_{2.5}$ are well documented and significantly impact vulnerable populations in disproportionately burdened communities. This report contributes to this broader body of work by displaying the unequal emissions burden that roadway and non-road vehicles have on the port-adjacent communities of Newark. Notably, this report finds that a wide range of pollution sources dramatically impact the levels of exposure felt throughout a community— displaying the important role that bus and trucking routes, ports, and railyards have on the relative emissions exposure that community members experience.

Many population centers and residential areas, in particular, are highly impacted by roadway emissions—particularly those from medium- and heavy-duty vehicles. While it is critical to work towards addressing both roadway and non-road vehicle emissions, roadway gasoline and diesel vehicles have a cleaner alternative technology that is either already available (e.g., light-duty electric vehicles and transit buses) or is anticipated to be on the market within the next five years (e.g., box trucks). Investing in this technology today is not only feasible but is essential in order to make meaningful emissions reductions, improving air quality in disproportionately burdened communities and enabling the state to meet its short- and long-term emission reduction goals. Climate mitigation efforts in the transportation sector often focus primarily on the reduction of GHG in the sector, particularly through the electrification of passenger vehicles. This study illustrates the importance of prioritizing the reductions of harmful local air pollutants alongside $CO_2$ in this sector in order to realize the immediate health benefits such a reduction will have on areas most burdened by transportation sector emissions.

# Attachment 7

NRDC
EDF Environmental Defense Fund — Finding the ways that work
Sierra Club
cleanairnow
Southward Environmental Alliance

Respiratory Health Association
LVEJO — Little Village Environmental Justice Organization
Union of Concerned Scientists
north carolina Justice Center
NYLCV — New York League of Conservation Voters

Conservation Colorado
RPA — Regional Plan Association
Green Energy Institute — Lewis & Clark Law School
PNC — Media. Action. Progress.
climate solutions — accelerating the transition to our clean energy future

NJEJA — New Jersey Environmental Justice Alliance
SWEEP — Southwest Energy Efficiency Project
LACI
CCAEJ
CFASE

Ironbound Community Corporation
Backbone Campaign
Harambee House — Citizens for Environmental Justice
Solutionary Rail — On Track For a Just Transition
Coalition for Healthy Ports NJ/NY

greenfaith
LAMC — Lowcountry Alliance for Model Communities
CCAC — Central California Asthma Collaborative
t.e.j.a.s — Texas Environmental Justice Advocacy Services
GreenLatinos

Duwamish River Cleanup Coalition — Technical Advisory Group
CVAQ
TFN — Tallahassee Food Network
Bureau of Planning and Sustainability — City of Portland, Oregon
WWJ — Warehouse Workers for Justice

nca — Neighbors for Clean Air
cleanenergy.org — Clean Energy
GRID Alternatives
Tri-State Transportation Campaign — Mobilizing the Region
Ecology Center — Healthy People, Healthy Planet

25 Years — 1000 Friends of Wisconsin
oec — Oregon Environmental Council
Minnesota Interfaith Power & Light
E2
ConnPIRG

MASSPIRG
NCPIRG
NJPIRG
OSPIRG
PennPIRG

RIPIRG
WashPIRG
Maryland PIRG
CALPIRG
CoPIRG
U.S. PIRG

Environment America
Environment California
Environment Colorado
Environment Connecticut
Environment Massachusetts

Environment Maryland
Environment Maine
Environment North Carolina
Environment New Jersey
Environment New York

February 25, 2021

Northeast States for Coordinated Air Use Management
89 South Street, Suite 602
Boston, MA 02111

To Whom It May Concern,

The undersigned organizations continue to be encouraged by the forward progress made by entities participating in the Multi-State Zero-Emission Truck and Bus initiative organized by the Northeast States for Coordinated Air Use Management (NESCAUM) in advancing zero-emission trucks and buses. It is inarguable that a suite of policies is necessary to transition to zero-emission trucks and buses on a timeline commensurate with the public health and climate impacts caused by transportation and in a way that maximizes benefits to the environment, the grid, and to communities most impacted by pollution while minimizing cost. However, this letter focuses on the importance of adopting standards passed by California in 2020 to increase the availability of zero-emission trucks and reduce emissions from combustion trucks. By including the Advanced Clean Trucks (ACT) rule and the Heavy-Duty Omnibus (HDO) rule in the model action plan, NESCAUM can help ensure that states are demonstrating strong commitments to achieving a zero-emission transportation sector. State leadership on these issues is critical – especially in the absence of protective national standards. These programs are needed to protect public health and the environment, help mitigate climate change, and stimulate the economy. The Biden Administration also has the opportunity to adopt federal standards that help secure substantial emission reductions. We offer these comments with that context in mind.

We believe a suite of policies is necessary to achieve the goals set by the 15 states and Washington, DC in their Memorandum of Understanding (MOU). The ACT rule and the HDO rule are foundational policies that can be complemented with a range of policies to realize a wide-scale transition to zero-emission vehicles. Measures such as a fleet rule, incentives to defray or help finance the relative higher purchase price of zero-emission trucks and buses, and assistance with the cost and deployment of infrastructure will be needed. This is not a task solely for one agency or department – true change requires an "all hands on deck" approach that includes utility commissions, relevant transportation and environmental agencies, utilities, private companies, and others. The following comments address misconceptions and frequently asked questions about the ACT and HDO rules that have come to our attention in recent weeks.

**The transition to zero-emission vehicles must reflect the urgency of the health crisis caused by transportation pollution.**

Despite making up only around 10 percent of the nation's vehicles, heavy-duty vehicles (HDVs) are responsible for 28 percent of climate change-causing emissions from the transportation sector, as well as 45 percent of on-road nitrogen oxide (NOx) emissions, and 57 percent of on-road, direct fine particulate matter ($PM_{2.5}$) emissions.[1] Forty percent of NOx pollution is from the transportation sector.[2] NOx contributes to ozone and the formation of secondary particulate matter (PM), which, along with primary PM emissions (elemental black carbon), are associated with an increased risk of premature deaths, hospitalization, and emergency room visits. Numerous respiratory and cardiovascular diseases are linked to these pollutants, such as asthma, decreased lung function, heart attacks, and lung cancer.[3]

Reducing NOx and PM emissions is vital for improving public health and meeting the federal National Ambient Air Quality Standards for ozone and $PM_{2.5}$. Cleaning up HDV emissions is long overdue for the communities living adjacent to highways, ports, and freight hubs that disproportionately suffer from harmful air pollution. The communities most burdened by this pollution are predominantly communities of color and low-income communities.[4] A report by the Union of Concerned Scientists confirms this across the country, stating that Asian Americans, African Americans, and Latinos are exposed to 34 percent, 24 percent, and 23 percent more $PM_{2.5}$ pollution (respectively) from cars, trucks, and buses than the national average."[5]

To put a finer point on it, allowing transportation and freight to continue with the status quo will have a detrimental impact on health in communities, particularly those in close proximity to highways and other major sources of transportation pollution. Indeed, a new study estimates that more than 20,000 people die prematurely every year as a result of the health burden from motor vehicle pollution on our roads, demonstrating the severity of this sector on human health.[6] States must act now to mitigate these vehicles' impact and ensure that environmental justice communities are prioritized and equipped to take part in infrastructure and vehicle deployment programs.

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[1] Union of Concerned Scientists, *Ready for Work: Now is the Time for Heavy-Duty Electric Vehicles* (Dec. 2019) at 2, https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf.
[2] ChargEVC, *Full Market Vehicle Electrification in New Jersey* (Oct.,2020), http://www.chargevc.org/wp-content/uploads/2020/10/ChargEVC-Full-Market-Electrification-Study-FINAL-Oct-7-2020.pdf
[3] American Lung Association, *Health Effects of Ozone and Particle Pollution*, http://www.stateoftheair.org/health-risks.
[4] Union of Concerned Scientists, *Factsheet: Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic*, https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf.
[5] Union of Concerned Scientists, *Ready for Work: Now is the Time for Heavy-Duty Electric Vehicles* (Dec. 2019) at 2, https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf.
[6] Environmental Defense Fund, *Accelerating to 100% Clean: Zero Emitting Vehicles Saves Lives, Advance Justice, Create Jobs* (Aug. 27, 2020) at 2, https://www.edf.org/sites/default/files/documents/TransportationWhitePaper.pdf.

Allowing transportation and freight emissions to continue "business-as-usual" will also delay critical reductions in greenhouse gas (GHG) pollution, causing greater GHG buildup in the atmosphere over time and exacerbating the impacts of climate change. Acting urgently to curb transportation emissions will set us on course for the steep and persistent reduction pathway necessary to avoid the worst effects of climate change.

**The ACT and HDO rules are foundational policies to transition medium- and heavy-duty fleets to zero-emission technology.**

Thanks to improving economics and forward-looking policies, the medium- and heavy-duty vehicle (MHDV) sector is heading towards a zero-emission future. However, additional action is needed to accelerate this transition and maximize benefits. One of the most effective actions states can take to jumpstart the zero-emission MHDV market would be to adopt relevant manufacturing and emission standards, including the ACT and HDO rules. The ACT rule will ensure more zero-emission MHDVs are available for sale, while the HDO rule will reduce emissions from new fossil fuel MHDVs that continue to be sold. The rules work in tandem and, if adopted together, would come into effect simultaneously. They send a clear market signal around which industry, government, and other stakeholders can plan and mobilize investments. These rules were extensively researched and developed by California and follow all federal Clean Air Act requirements for adoption. States may quickly start the regulatory and/or legislative process to adopt these rules under the Section 177 provision of the Clean Air Act and begin enforcement for vehicle model year (MY) 2025 (calendar year 2024), contingent on California receiving a federal waiver from the U.S. Environmental Protection Agency (EPA) under the Clean Air Act for each rule.

**Today, on a total cost of ownership basis and without incentives, certain zero-emission trucks are cost-competitive if not less expensive than their fossil fuel equivalents. Most classes of vehicles are expected to achieve total cost of ownership parity by 2030.**

Although electric truck purchase prices are rapidly declining, they remain higher than most comparable diesel trucks. However, electric trucks are attractive on a total cost of ownership (TCO) basis due to fuel cost savings from charging with potentially less expensive electricity and anticipated 50 percent lower maintenance costs than a comparable diesel or gasoline vehicle.[7] In many cases, these savings will compensate for higher up-front vehicle costs. It is important to remember that upfront vehicle costs will continue to fall as battery prices decline. According to Bloomberg New Energy Finance, battery costs have decreased by 89 percent over the past ten years and continue to drop.[8] Additionally, electric trucks' residual values are expected to be higher than used diesel trucks because a purchaser will receive a more reliable truck with much lower fuel and maintenance costs.[9] Meanwhile, financial institutions are exploring ways to pull forward expected fuel and maintenance savings to reduce electric MHDV purchase prices further.[10] The same downward price trend seen in trucks also holds true for buses.

[7] Andrew Burke and Anisha Kumar Sinha, *Technology, Sustainability, and Marketing of Battery Electric and Hydrogen Fuel Cell Medium- Duty and Heavy-Duty Trucks and Buses in 2020-2040* (2020), UC Davis Institute of Transportation Studies, *available at* https://escholarship.org/uc/item/7s25d8bc#article_main.

[8] BNEF, *Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137 kWh* (Dec. 16, 2020), https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/.

[9] Oberon Insights, *Electric Trucks should have better residual values than diesel*, https://www.oberoninsights.com/insights/residual-value.

[10] Sebastian Blanco, *Proterra Ready for Electric Bus Battery Leasing with $200-Million Credit Facility*, Forbes (Apr. 18, 2019), https://www.forbes.com/sites/sebastianblanco/2019/04/18/proterra-ready-for-electric-bus-battery-leasing-with-200-million-credit-facility/?sh=4f2a81ae2314.

Zero-emission trucks and buses are quickly becoming available across every size and duty cycle. In the North American market, more than 100 zero-emission truck and bus models are either already available or coming to market by 2022, ranging from shuttle buses and cargo vans to school buses and tractor-trailers (Figure 1 and Figure 2).[11] Rapid technological progress is unlocking electrification of even the most demanding duty cycles. Daimler, Paccar, and Volvo, who collectively account for nearly 90 percent of the Class 7-8 truck market, are all actively testing zero-emission Class 8 tractors and have announced plans to bring them to series production over the next 1-2 years.[12] In addition, several other legacy and zero-emission vehicle manufacturers are currently developing prototypes and first-generation commercial products, including hydrogen fuel cell vehicles for long-haul operations.

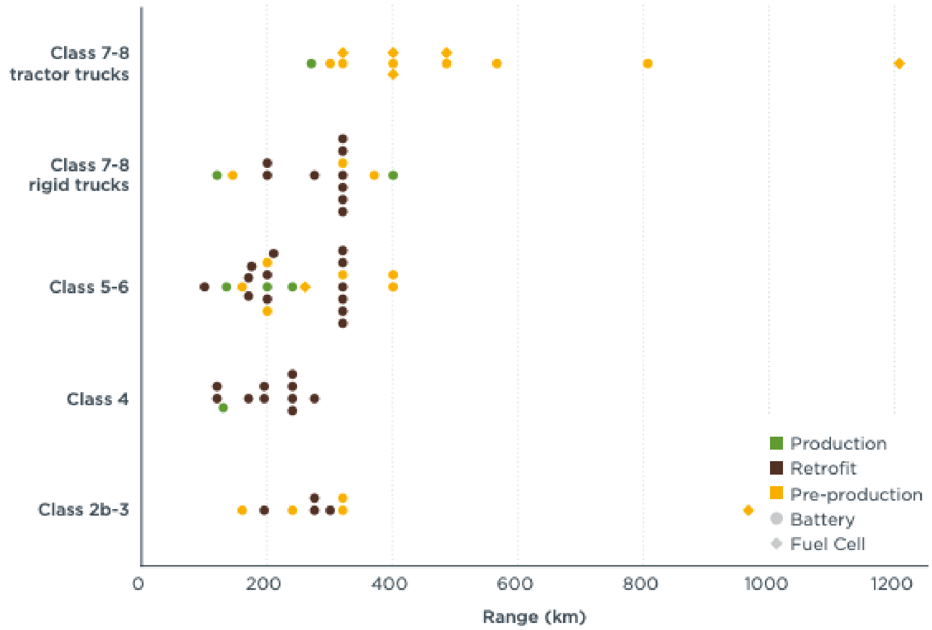


Figure 1. Available and Announced Zero Emissions Truck Models in the U.S. and Canada[13]

[11] Ben Sharpe, et al., *Race to Zero - How manufacturers are positioned for zero emission commercial trucks and buses in North America*, International Council on Clean Transportation and Environmental Defense Fund (Oct. 2020), Appendix E, https://www.edf.org/sites/default/files/documents/Race%20to%20Zero-ICCT_EDF_PQ-FINAL.pdf.

[12] Daimler, *Freightliner eCascadia,* https://freightliner.com/trucks/ecascadia/?gclid=Cj0KCQiAk53-BRD0ARIsAJuNhpvaY5r5sdujZrtV0MVKCZW1b7S45zOAePmr-OXhBQpd8evPgzOW5MkaArDzEALw_wcB; Paccar, *Kenworth T680E and Peterbilt 579EV*, https://www.kenworth.com/news/news-releases/2020/october/t680e/ and https://www.peterbilt.com/electric-vehicles, Volvo, *Volvo VNR Electric Truck to Hit the Market Dec.3*, https://www.truckinginfo.com/10129692/volvo-vnr-electric-truck-to-hit-the-market-dec-3.

[13] Ben Sharpe, et al., *Race to Zero - How manufacturers are positioned for zero emission commercial trucks and buses in North America*, International Council on Clean Transportation and Environmental Defense Fund (Oct. 2020), Figure 7, https://www.edf.org/sites/default/files/documents/Race%20to%20Zero-ICCT_EDF_PQ-FINAL.pdf..

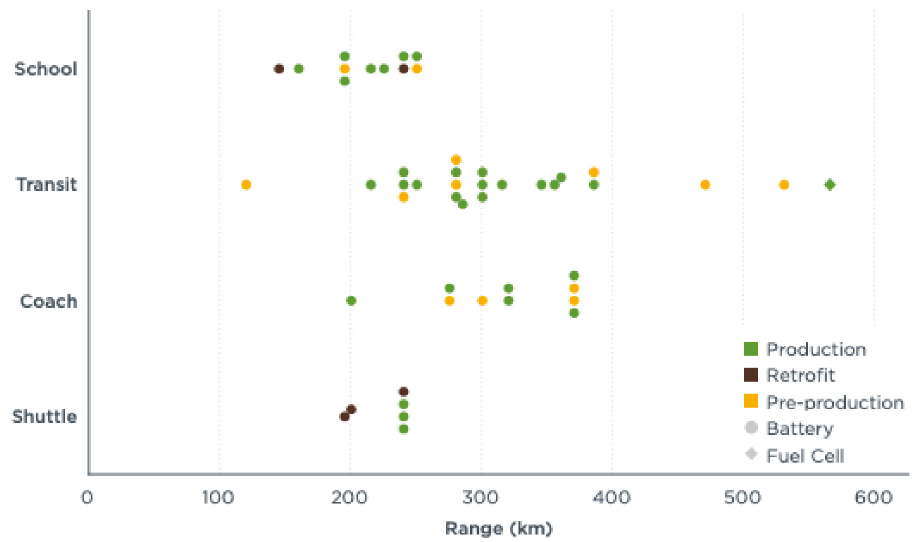


Figure 2. Available and Announced Zero Emissions Bus Models in the U.S. and Canada[14]

Although the upfront cost of zero-emission trucks and buses still exceeds that of their diesel counterparts and requires mitigation, cost parity over the total cost of ownership will be achieved well before the MOU's currently proposed 2050 timeframe. Medium-duty trucks (Class 3-6) are already cost-competitive over the TCO, and heavy-duty short-haul vehicles (Class 7-8) are expected to achieve TCO parity with diesel-powered vehicles by 2025, without incentives.[15] Heavy-duty long-haul vehicles (likely powered by hydrogen fuel cells) are expected to demonstrate TCO parity without incentives by around 2030.[16] As component costs continue to decline, the business case for zero-emissions vehicles will only strengthen leading up to 2040.

Fleet owners and operators are banding together in groups such as the Corporate Electric Vehicle Alliance (CEVA) to loosely aggregate and signal strong demand for more diverse zero-emission MHDV model options.[17] As discussed above, model availability continues to grow, and regulations like the ACT rule can further enhance that availability.

The ACT rule will soon be accompanied by purchase requirements that will further stimulate participating states' zero-emission truck market. California plans to finalize an aggressive fleet purchase requirement by 2022, which other states can and should consider adopting. Adopting the ACT rule will act as an accelerator to increase the supply of electric trucks, achieve economies of scale from higher production volumes, lower costs, and encourage solutions to increase demand and possibly result in significant savings.[18]

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[14] *Id.* at Figure 8.
[15] North American Council for Freight Efficiency, *Electric Trucks: Where They Make Sense* (May 2019) at 13-14, https://nacfe.org/emerging-technology/electric-trucks/.
[16] ICF, Comparison of Medium- and Heavy-Duty Technologies in California – Executive Summary (Dec. 2019) at 4, https://www.caletc.com/assets/files/ICF-Truck-Report_Final_December-2019.pdf.
[17] Ceres, *Corporate Electric Vehicle Alliance*, https://www.ceres.org/our-work/transportation/corporate-electric-vehicle-alliance.
[18] Chris Busch, *et. al.*, *Clean Trucks, Big Bucks: California Energy Policy Simulator evaluation of the proposed Advanced Clean Trucks Rule*, Energy Innovation and Environmental Defense Fund (Jun. 2020), https://energyinnovation.org/wp-content/uploads/2020/06/Clean-Trucks-Big-Bucks_June_17_2020.pdf

**Deploying electric truck infrastructure is technically and economically feasible and offers a host of potential benefits.**

Meeting the electric infrastructure needs to support the deployment of MHD battery electric vehicles (BEVs) is technically feasible – that is, the ability to integrate BEVs into the grid already exists. The expected generation and capacity needs for BEVs over the next half-century are below historical annual growth rates.[19] For example, there have been periods of rapid electric demand growth in the US associated with home electrification and the addition of household appliances (1970-75) and with the widespread adoption of air conditioning (1990-95). These years saw annual generation increases equal to the needs of tens of millions of BEVs.[20] While the increased load from MHD BEVs will more than likely require additional investment in grid infrastructure, utilities can and should plan to mitigate the need for expensive build-out of grid infrastructure through non-wires solutions, such as on-site generation and storage, and ensure new load is integrated to avoid exacerbating peak demand. MHD BEVs' challenge is not feasibility and could in fact lower consumer electricity prices by increasing grid utilization.

There are many potential benefits to developing a robust electric charging network for MHD BEVs. For example, due to the large battery size and, in some cases, predictable operation schedules, MHD BEVs may be prime candidates for vehicle-to-grid applications. Vehicle-to-grid technologies can improve grid stability and reliability, help integrate more renewable energy, and in some applications, possibly offer additional revenue streams to BEV owners. Another advantage to the infrastructure build-out is high-quality job creation.[21]

In 2019, over a quarter-million Americans were employed in the clean vehicle industry.[22] To date, over $300 billion in global private investments have flowed into electric vehicles.[23] Moreover, thanks to the lower cost of filling up with electricity rather than fossil fuels and lower maintenance costs, electric vehicles save fleets and consumers money. These savings are largely redirected towards local services—the most labor-intensive and skill-diverse sector of the economy—and are less likely to be outsourced.[24] Shrinking and shifting expenditures from diesel and gasoline to the labor-intensive service industry will serve as a potent job creator and economic stimulant. Of course, protections must be included to prevent exploitative practices and ensure new jobs are equitably distributed. Moreover, there is a need for zero-emission workforce training and development programs that prioritize displaced workers, residents of pollution-burdened communities, communities facing barriers to employment, low-income communities, and communities of color.

**The ACT and HDO rules are built around flexibility and designed for an evolving market with segments in different electrification suitability stages.**

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[19] US DRIVE, *Summary Report on EVs at Scale and the U.S. Electric Power System*, https://www.energy.gov/sites/prod/files/2019/12/f69/GITT%20ISATT%20EVs%20at%20Scale%20Grid%20Summary%20Report%20FINAL%20Nov2019.pdf.
[20] *Id*. at 3
[21] E2, ACORE, CELI, bw Research Partnership, *Clean Jobs, Better Jobs: An examination of clean energy job wages and benefits* (Oct. 2020), https://e2.org/wp-content/uploads/2020/10/Clean-Jobs-Better-Jobs.-October-2020.-E2-ACORE-CELI.pdf.
[22] E2, *Clean Jobs America 2020: Repowering America's Economy in the Wake of COVID-19* (Apr. 2020), https://e2.org/reports/clean-jobs-america-2020/.
[23] Paul Lienert and Christine Chan. *Charged: A Reuters analysis of 29 global automakers found that they are investing at least $300 billion in electric vehicles, with more than 45 percent of that earmarked for China* (Jan. 20, 2019), Reuters, https://graphics.reuters.com/AUTOS-INVESTMENT-ELECTRIC/010081ZB3HD/index.html.
[24] David Roland-Holst, et al. *Exploring Economic Impacts in Long-Term California Energy Scenarios* (June 2018), Consultant Report for the California Energy Commission, https://ww2.energy.ca.gov/2018publications/CEC-500-2018-013/CEC-500-2018-013.pdf.

The ACT rule starts with low sales requirements and gradually increases, leaving time for technology to improve, the supporting ecosystem to mature, and vehicle prices to decline. The ramp-up in sales requirements is modest: from adopting the rule in 2021 to the second year of compliance in calendar year 2025, the sales requirement only grows to 10-13% of sales. We can expect significant advancements in range and efficiency in the intervening years, expanding suitability for a wider spectrum of zero-emission vehicle uses and classes. The HDO rule follows a comparable transition with stronger emission standards beginning in MY 2024 and then tightening further in MY 2027.

While unique use cases that are harder to electrify, such as snowplows, may persist, large percentages of each state's truck fleet will be suitable for a transition to zero-emission vehicles over the rules' lifetime, and these exceptions should not dictate the rule. Further, both the ACT and HDO rules employ credit mechanism systems that incentivize voluntary early action and permit a high degree of compliance flexibility. For example, the ACT rule allows zero-emission credit trading between manufacturers and between most truck classes, accounting for vehicle size, enabling manufacturers to shift credits from truck segments ripe for electrification to those that are less suitable. However, states must adopt complementary measures that explicitly prioritize frontline communities to ensure that those most burdened by harmful air pollution are not further negatively impacted and experience disproportionate pollution reduction benefits.

The ACT rule can accommodate potential fluctuations in vehicle sales from year-to-year. The rule does this by basing manufacturers' ZEV credit requirements on average truck sales data from the previous three years. In that way, peaks or troughs in purchases due to economic or regulatory forces are smoothed and have minimal impact on the overall trajectory of ZEV sales.

**The HDO rule is a vital complement to the ACT rule with substantial public health and environmental benefits.**

The HDO rule makes much-needed reforms, such as strengthening NOx and PM emission standards for new fossil fuel trucks, introducing a new NOx standard for a low-load certification cycle, extending manufacturer warranties, and improving in-use testing to better align with actual operations and global standards. Moreover, the proposed emission standards derive from nearly a decade of rigorous research and analysis demonstrating that the new requirements are not only technically feasible but cost-effective methods of emissions reduction.

The HDO rule is expected to cut NOx emissions from HDVs by 75 percent below current standards beginning in 2024 and 90 percent in 2027.[25] In addition to cleaning up NOx, the proposed rule looks to institutionalize PM pollution controls and prevent backsliding by adopting a more stringent standard that aligns with current industry certifications. These reductions in California are projected to amount to $36 billion in statewide health benefits from 3,900 avoided premature deaths and 3,150 hospitalizations from 2022 to 2050.

While the ACT rule works year-over-year to gradually increase the share of new truck sales that are zero-emission, the HDO rule curtails toxic air pollution from new diesel vehicles that will continue to be sold in the interim. The ACT and HDO rules are two sides of the same coin: together, they collectively

[25] California Air Resources Board, *Facts about the Low NOx Heavy-Duty Omnibus Regulation*, https://ww2.arb.ca.gov/sites/default/files/classic//msprog/hdlownox/files/HD_NOx_Omnibus_Fact_Sheet.pdf.

enable a state's long-term vision of a zero-emission MHDV fleet and address toxic transportation pollution in the near-term.

**Seven years of research and analysis informed the HDO rule to ensure it is technically feasible, cost-effective, and adheres to all legal requirements.**

When developing the HDO rule, the California Air Resources Board (CARB) thoroughly evaluated the technical feasibility of the rule's emission standards in partnership with the Southwest Research Institute (SwRI), Manufacturers of Emission Controls Association, U.S. EPA, South Coast Air Quality Management District, and engine manufacturers. The testing convincingly demonstrated and modeled cost-effective solutions to meet both 2024 and 2027 standards.[26] Importantly, certification data shows that many manufacturers today certify well below current standards and nearly meet the 2024 requirements.[27] Moreover, several engine manufacturers have already committed to developing compliant MY 2024 engines and are actively making plans to meet the MY 2027 requirements.[28]

CARB staff has demonstrated the technical feasibility of both the 2024 and 2027 proposed $NO_x$ standards through several years of extensive development and testing in partnership with SwRI.[29] The development and testing, together with related work by manufacturers, show that the proposed 2024 standards can be met using a combination of improved engine calibration, the newest configuration of after-treatment devices and urea injection. The 0.02 g/bhp-hr $NO_x$ standard proposed for MY 2027 and subsequent years can be achieved by further refinements to the aftertreatment plus well-established powertrain technologies including cylinder deactivation – a technology widely used in passenger vehicles.[30] Moreover, recent opposed-piston engine testing were able to reduce $NO_x$ emissions below the MY 2027 requirement in a Peterbilt tractor using conventional downstream aftertreatment equipment.[31] A cost assessment showed that opposed-piston engines "cost 11 percent less than conventional engines of the same power and torque" with substantially less $NO_x$ and $CO_2$ emissions.[32]

It should be noted that the timeline set out by the current iteration of the low $NO_x$ rule does not present undue constraints. The $NO_x$ standards preceding the recent HDO rule, which largely mirrored the EPA standards, were some of the most technology-forcing emissions standards ever adopted – requiring the development of an entirely new catalyst, new particulate filters, and a system that had to track the amount of $NO_x$ in the tailpipe, an amount that varies greatly under different driving conditions and integration of an advanced and complex engine exhaust gas recirculation system. Those new technological elements all had to work in concert without significantly impacting fuel consumption. Despite these challenges, manufacturers were readily able to meet these standards in a timely manner. In contrast,

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[26] California Air Resources Board, *Technological Feasibility of Proposed Standards*, https://ww3.arb.ca.gov/regact/2020/hdomnibuslow NOx /appi.pdf.
[27] California Air Resources Board, *Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, Staff Report - Initial Statement of Reasons*, https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/isor.pdf
[28] California Air Resources Board, *Responses to Comments on the Environmental Analysis for THE PROPOSED HEAVY-DUTY ENGINE AND VEHICLE OMNIBUS REGULATION AND ASSOCIATED AMENDMENTS*, https://ww3.arb.ca.gov/regact/2020/hdomnibuslow NOx /res20-23attbrtc.pdf.
[29] *Id.* at ES-12.
[30] *Id.* at III-12 to III-27.
[31] Achates Power, *Achates Power Opposed-Piston Heavy-Duty Diesel Engine Demonstration Performance Results – Ultralow NOx without additional hardware*, https://achatespower.com/wp-content/uploads/2020/12/Achates-Power-Opposed-Piston-Heavy-Duty-Diesel-Engine-Demonstration-Performance-Results-Ultralow-NOx-without-additional-hardware.pdf
[32] *Id.* at 2.

"meeting the envisioned CARB 2024 targets would require very modest increases in technology complexity and costs."[33] Thus, compliance can reasonably be achieved on the timeline set forth by CARB.

Per CARB's extensive economic analysis, the cost in California to manufacturers of complying with the rule is $4.07 billion from 2022 through 2050. These costs are dwarfed by the rule's $36.8 billion in expected public health benefits for Californians over the same period – the significance of which should not be given short shrift in other states that pass analogous rules. And, manufacturers can expect to pass on costs through higher prices. However, buyers are not without benefits: the HDO rule would lengthen manufacturer emission warranty periods, effectively eliminating repair costs to vehicle owners during that extended period. Also, the HDO's longer useful life and durability requirements would encourage manufacturers to produce more durable components, resulting in fewer failures and less downtime for vehicle owners. As a percent of baseline purchase prices, price increases are minimal and expected to range from 0.4 to 9.5 percent, with an average of 2.6 percent in MY 2024 to 2026, 5.2 percent in MY 2027 to 2030, and 5.8 percent in MY 2031 and beyond. Consequently, the HDO rule's cost-effectiveness is $5.45 per pound of NOx reduced – well within the range of previously adopted emission regulations.

**The ACT and HDO rules will not prompt manufacturers to exit participating markets, and fears of a pre-buy/no buy scenario are unwarranted.**

The trend towards zero-emission MHDVs and the sharp curtailment of diesel emissions is global and durable. In many ways, the HDO rule is an opportunity to catch up with European regulators, while the ACT rule is a way to continue maintaining American manufacturing competitiveness relative to China. And, while the trend is global, so too are the truck manufacturers. The notion that multinational (and even multi-state) OEMs will abandon markets rather than invest and innovate is counterintuitive based on their stated intent.[34] For example, at the end of 2020, the European Automobile Manufacturers' Association, which includes major truck manufacturers such as Daimler, Volvo, Scania, CNH, MAN, DAF, and Ford, committed to only sell zero-emission trucks by 2040.[35] Also, as previously mentioned, several manufacturers are already close to meeting the initial HDO rule emission standards and have committed to developing compliant engines.

Analysis performed by EDF clearly shows that there are significant benefits inherent in more stringent standards.[36] When reviewing market growth in response to 2007 and 2010 federal engine standards, there was smooth growth in vehicle demand prior to, and during implementation of the 2014 Phase 1 fuel efficiency and emissions standards. Indeed, the purchase of MY 2014 vehicles was *higher* than any year since 2005.[37] This demonstrates that strict standards do not lead to dampened adoption of cleaner vehicles; as well, these standards can lead to fuel cost savings, an important component of making the economic case for the transition.

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[33] International Council on Clean Transportation, *Estimated cost of diesel emissions-control technology to meet the future California low NOx standards in 2024 and 2027* (May 20, 2020), https://theicct.org/publications/cost-emissions-control-ca-standards.
[34] Volvo Trucks, *The Future of Electric Trucks*, https://www.volvotrucks.us/innovation/electromobility/.
[35] European Automobile Manufacturers' Association, *Joint Statement: The Transition To Zero-Emission Road Freight Transport*, https://www.acea.be/uploads/publications/acea-pik-joint-statement-the-transition-to-zero-emission-road-freight-trans.pdf
[36] Katherine Rittenhouse and Matthew Zaragoza-Watkins, *Strategic Response to Environmental Regulation: Evidence from U.S. Heavy-Duty Vehicle Air Pollution Regulations*, MIT CEEPR Working Paper, (2016).
[37] Heavy Duty Trucking, *Healthy Demand Overall for Trucks in September*, Heavy Duty Trucking (Oct. 3, 2014), http://www.truckinginfo.com/channel/fleet-management/news/story/2014/10/healthy-demand-overall-for-trucks-in-september.aspx?ref=rel-recommended.

It should also be noted that "the pre-buy in response to 2007 criteria pollutant standards [was found] to be approximately symmetric, short-lived, and small in volume relative to previous estimates"[38] – indicating that fears of mass purchase of more polluting vehicles before implementation of a standard may not come to fruition. The bottom line is that, rather than seeing fleets buy dirtier, ostensibly cheaper vehicles in a panic, there is clear evidence that no meaningful adjustment in market purchasing occurs as a result of these standards – fleets recognize the cost savings over time of cleaner vehicles and do not seem inclined to ignore those benefits to reap the marginally lower purchase price of more polluting vehicles while they still can.

**Future national low-NOx or ZEV truck standards are uncertain, and communities need emission reductions today.**

Toxic air pollution from fossil fuel MHDVs is an urgent public health emergency. Although the federal EPA launched a Cleaner Trucks Initiative in 2018 to reduce NOx emissions from HDVs, the rulemaking is in its infancy and was delayed indefinitely in 2020. Due to federal lead-time requirements and other rulemakings at EPA, it is doubtful a national low-NOx standard could take effect before MY 2027. At a minimum, this would create a gap of several years between the HDO rule schedule and federal implementation, delaying critical reductions in toxic air pollution and greenhouse gas emissions. Notably, federal and state action is not mutually exclusive and is, in fact, complementary. States should adopt the more robust ACT and HDO rules in line with Section 177 requirements under the federal Clean Air Act while also advocating for a strong national standard. In this way, MOU states can take concrete action today to address toxic air pollution from vehicles registered in-state while getting a new national standard to clean up out-of-state trucks that travel across state lines. Adopting ambitious state rules will go a long way to ensuring near-term air quality improvements for all residents and accelerating the transition to a cleaner transportation future.

**Conclusion**

States should adopt the ACT and HDO rules, bolstering the zero-emission MHDV market and easing the long-term transition to a clean transportation sector. Fundamentally, these regulations are feasible, economical, and represent a timely means of achieving necessary reductions in air pollution and GHG emissions. These programs' importance should be highlighted in the model action plan developed by the states and facilitated by NESCAUM.

Sincerely,

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[38] Katherine Rittenhouse and Matthew Zaragoza-Watkins, *Strategic Response to Environmental Regulation: Evidence from U.S. Heavy-Duty Vehicle Air Pollution Regulations* at 33, MIT CEEPR Working Paper, (2016).

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Coalition for Healthy Ports

# Attachment 8

March 26, 2021

*Via E-mail*

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Department of Environmental Protection
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**Re: New Jersey's Adoption California Mobil Source Standards under the Clean Air Act**

The Coalition for Healthy Ports NJ/NY, Clean Water Action, GreenFaith, Ironbound Community Corporation, New Jersey Environmental Justice Alliance, South Ward Environmental Alliance, and Earthjustice submit this letter to respond to and clarify the inaccuracies in the January 21, 2021 letter and attached memo of the Truck and Engine Manufacturers' Association ("EMA") that seeks to dissuade the New Jersey Department of Environmental Protection ("DEP") from moving forward with its proposal to adopt California's Advanced Clean Trucks Rule and Omnibus Low-NOx Rule (together, the "California Standards"). The EMA Letter misstates the law and the facts and provides no basis for DEP to withhold its swift adoption of these vital pollution-reduction measures.

## I. THE CLEAN AIR ACT ALLOWS NEW JERSEY TO ADOPT THE CALIFORNIA STANDARDS.

New Jersey can adopt these and other California mobile source standards because it has nonattainment and maintenance plan provisions approved by the U.S. Environmental Protection Agency ("EPA"). Clean Air Act Part D, Section 177 specifies, "any State *which has plan provisions approved under this part* may adopt and enforce for any model year [California] standards relating to control of emissions from new motor vehicles or new motor vehicle engines." 42 U.S.C. § 7507 (emphasis added). "Plan provisions approved under this part" applies both to nonattainment plan provisions and maintenance plan provisions, both of which EPA approves under Clean Air Act Part D. *See* 42 U.S.C. §§ 7502(c), 7505a (concerning nonattainment and maintenance plans, respectively, both under Part D); *see also Am. Auto. Mfrs. Ass'n v. Comm'r, Mass. Dep't of Env't Prot.*, 31 F.3d 18, 23 n.2 (1st Cir. 1994) (correctly explaining that Section 177 says that "any State which has plan provisions [for the attainment and maintenance of the NAAQS] may adopt and enforce for any model year standards . . ." (paraphrasing in original)). Because EPA has approved multiple New Jersey nonattainment and maintenance plan provisions,[1] New Jersey satisfies the threshold requirement of Section 177 to adopt the California Standards.

EMA is incorrect to suggest the California Standards may be adopted only by those States that are *currently* in nonattainment and that show that the California Standards are necessary to demonstrate attainment.[2] EMA Memo at 1-3. EMA's reliance on the title of Part D – "Plan Requirements for Nonattainment Areas" – is not dispositive since, as noted above, Part D plainly covers maintenance plans in addition to nonattainment plans, even if the word "maintenance" is not expressly included in the title. 42 U.S.C. § 7505a. Nor is EMA's reliance on the legislative history of unenacted, alternate proposals for Section 177 instructive, since this legislative history does not control the interpretation of the version of Section 177 that Congress *did* adopt.[3] EMA quotes EPA's recent SAFE Rule, but that passage explained the prior administration's position that the California waiver is available for criteria pollutant reduction but not greenhouse gas reduction – *not* that Section 177 States must show that the California Standards are necessary to reach attainment.[4] And though EMA cites Second Circuit dicta that Congress enacted Section 177 "to assist those states struggling to meet federal pollution standards," the Second Circuit's explanation of Congressional intent does not rewrite Section 177 to add the limiting language that EMA desires. EMA Memo at 2 (quoting *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. N.Y. State Dep't of Env't Conservation*, 17 F.3d 521, 527 (2d Cir. 1994)). Any State that has a nonattainment or maintenance plan provisions in its State

[1] EPA, *New Jersey Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants* (as of Feb. 28, 2021), https://www3.epa.gov/airquality/greenbook/anayo_nj.html.

[2] EMA is also incorrect when it suggests that the "compelling and extraordinary" language of Clean Air Act Section 209(a) is incorporated into Section 177 and applies to Section 177 States. *See* EMA Memo at 3. The Clean Air Act says nothing that requires other States adopting the California rules to make this showing. The only Clean Air Act section to include the phrase "compelling and extraordinary" is Section 209(a), which allows EPA to deny California a waiver to set its own motor vehicle standards in limited circumstances only, including upon a finding that California "does not need such State standards to meet compelling and extraordinary conditions." 42 U.S.C. § 7543(b)(1)(B). This waiver process applies to California only, and there is no independent need for States like New Jersey to get a waiver in order to adopt a California standard. *See Chamber of Commerce of U.S. v. EPA*, 642 F.3d 192, 196 (D.C. Cir. 2011) (quoting 42 U.S.C. §7507) ("Congress amended the CAA to permit other states to adopt and enforce standards 'identical to the California standards for which a waiver has been granted,' *without obtaining a separate waiver* . . ." (emphasis added)). This different treatment for California makes sense. Congress' purpose was to allow California to create its own vehicle standards only if it could justify a departure from the federal standards. Once those "second vehicles" exist as a result of an EPA waiver, there are no longer the same reasons for requiring a single national vehicle and precluding other states from choosing which of the two vehicles to demand.

[3] *See* EMA Memo at 2-3 (discussing unenacted proposals for Section 177 that would have tied the ability to adopt California standards to vehicle inspection and maintenance provisions, or would have *required* nonattainment States to adopt California standards – neither of which appear in Section 177 as enacted).

[4] *See* The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program, 84 Fed. Reg. 51,310, 51,351 (Sept. 27, 2019) (explaining prior administration's view that "CAA section 177 is in fact intended for NAAQS attainment planning *and not to address global air pollution*." (emphasis added)). Though EMA suggests that EPA will deny a waiver for the Advanced Clean Trucks Rule because it is "principally aimed at reducing GHGs," EMA Memo at 4, that is also incorrect. California expressly adopted this rule to broadly "reduce emissions of oxides of nitrogen (NOx), fine particulate matter (PM), toxic air contaminants, greenhouse gases (GHG), and other criteria pollutants generated from on-road mobile sources." Cal. Air Res. Bd., *Advanced Clean Trucks Regulation, Final Statement of Reasons* (Mar. 2021), https://ww3.arb.ca.gov/regact/2019/act2019/fsor.pdf.

Implementation Plan can adopt California Standards, no matter that State's current attainment status.

As DEP is no doubt aware, even if EMA's interpretation of the CAA were correct – which it is not – EMA's factual assertions about New Jersey's nonattainment status are incorrect. Contrary to EMA's representation, New Jersey is *not* in attainment with the 2008 ozone National Ambient Air Quality Standards ("NAAQS").[5] The New York-Northern New Jersey-Long Island Area was recently redesignated from moderate to serious nonattainment for that NAAQS.[6] The area's most current design value of 82 ppb is well above the 75 ppb NAAQS, and is the highest design value outside of California.[7] Meanwhile, the Philadelphia-Wilmington-Atlantic City Area remains in marginal nonattainment with this NAAQS.[8] The American Lung Association ranks these two areas as the 12th and 23rd most ozone-polluted areas in the nation, respectively.[9]

EMA's argument relies on the assumption that New Jersey must by necessity reach ozone attainment by the regulatory attainment date. *See* EMA Memo at 3-4 (assuming that New Jersey attained 2008 ozone NAAQS by the 2018 attainment date and will attain 2015 ozone NAAQS by the 2022 attainment date). Unfortunately, more is needed than the mere passage of time for New Jersey to reach attainment, and New Jersey's attainment status is not determined by the date on the calendar. It is instead determined by the design value in the nonattainment area. And with a current design value of 82 ppb, the New York-Northern New Jersey-Long Island Area is far from reaching attainment of either of the ozone NAAQS, and soon will likely be reclassified as "severe" nonattainment for failing to attain the 75 ppb NAAQS by the July 20, 2021 attainment deadline.[10]

## II. DEP MUST NOT DELAY ITS PROPOSED ADOPTION OF THE CALIFORNIA STANDARDS.

DEP should reject EMA's invitation to defer rulemaking to adopt the California Standards until 2022 because, contrary to EMA's assertion, such delay could hamper DEP's application of the standards to the 2025 model year. Section 177 requires New Jersey to "adopt [California] standards at least two years before commencement of [the vehicle] model year (as

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[5] EPA, *8-Hour Ozone (2008) Designated Area Design Values* (as of Feb. 28, 2021), https://www3.epa.gov/airquality/greenbook/hdtc.html.

[6] Determinations of Attainment by the Attainment Date, Extensions of the Attainment Date, and Reclassification of Several Areas Classified as Moderate for the 2008 Ozone National Ambient Air Quality Standards (NAAQS), 84 Fed. Reg. 44,239 (Aug. 23, 2019).

[7] EPA, *8-Hour Ozone (2008) Designated Area Design Values* (as of Feb. 28, 2021), https://www3.epa.gov/airquality/greenbook/hdtc.html.

[8] *Id.*

[9] Am. Lung Ass'n, *State of the Air 2020*, at 22, http://www.stateoftheair.org/assets/SOTA-2020.pdf.

[10] 84 Fed. Reg. at 44,244.

determined by regulations of the [EPA] Administrator)."[11] So delaying adoption of the California Standards may delay the first model years that New Jersey could address. To ensure New Jersey can implement California Standards beginning with model year 2025 trucks, DEP should adopt the California Standards before 2022.

## III. THE NEW JERSEY ADMINISTRATIVE PROCEDURE ACT DOES NOT PREVENT DEP FROM ADOPTING THE CALIFORNIA STANDARDS.

Finally, EMA suggests that the New Jersey Administrative Procedure Act would not allow DEP to adopt the California Standards because the costs of compliance with the rules would exceed the benefits of the rule. EMA Memo at 4-5. But the Administrative Procedure Act provisions that EMA cites merely require DEP to "provide interested parties with notice of the impacts anticipated by the agency proposing the rule," such as socio-economic and regulatory impacts. *In re Adoption of N.J.A.C. 5:96 & 5:97*, 416 N.J. Super. 462, 506–07 (App. Div. 2010), aff'd, 215 N.J. 578 (2013) (collecting cases). Nothing that EMA raises suggests that DEP would not be able to provide interested parties with such a notice of anticipated impacts.

Nor does EMA provide adequate support for its assertion that the costs of the California Standards would outweigh their benefits. EMA provides no basis for its claim that the Advanced Clean Trucks Rule would be cost-prohibitive, nor could it, since zero-emission Class 3-6 trucks are already cost-competitive over the total cost of ownership, and zero-emission Class 7-8 trucks will be cost-competitive by 2025, if not already.[12] The California Air Resources Board ("CARB") calculates that this Rule will result in $11.2 billion in net benefits from 2020 to 2040.[13] As for the Heavy-Duty Omnibus Rule, CARB calculates $32.8 in net benefits from that Rule between 2022 and 2050, with benefits outweighing costs 8-to-1.[14] CARB has already explained why it disagrees with the EMA-funded research that EMA cites in its memo and with

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[11] 42 U.S.C. § 7507; *see also* 40 C.F.R. §§ 85.2302, 85.2303, 85.2304(a) (noting that "model year" can mean the "manufacturer's annual production period," which in turn can start as early as "January 2 of the calendar year preceding the year for which the model year is designated"); https://ww3.arb.ca.gov/regact/2019/act2019/fro2.pdf (Advanced Clean Trucks Rule incorporating the definition of "model year" at Cal. Code Regs. tit. 17, § 95662(a)(16)).

[12] N. Am. Council for Freight Efficiency, *Electric Trucks: Where They Make Sense*, at 13-14 (May 2019), https://nacfe.org/emerging-technology/electric-trucks/; Amol Phadke et al., Lawrence Berkeley Nat'l Lab'y, *Why Regional and Long-Haul Trucks are Primed for Electrification Now*, at 3 (2009), https://eta-publications.lbl.gov/sites/default/files/finalfinal_ehdv_report_final_15marforupload.pdf (finding long-haul Class 8 electric trucks already have 13% lower total cost of ownership compared to diesel counterparts, and will have 40% lower total cost of ownership by 2030).

[13] Cal Air Res. Bd., *Attachment C: Updated Costs and Benefits Analysis for the Proposed Advanced Clean Trucks Regulation*, at 23, https://ww3.arb.ca.gov/regact/2019/act2019/30dayattc.pdf.

[14] Cal. Air Res. Bd., *Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, Staff Report - Initial Statement of Reasons*, at IX-70, https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/isor.pdf.

EMA's calculation of per-vehicle costs that are seven times higher than any of CARB's estimates.[15]

*                    *                    *

Thus, nothing in the Clean Air Act or the New Jersey Administrative Procedure Act prevents DEP from adopting the California Standards. We urge DEP to move forward with its plan to finalize a rule adopting these vital standards before the end of 2021 and begin to apply the standards in New Jersey with the 2025 model year.

Sincerely,

/s/ *Jonathan Smith*
Jonathan Smith
Earthjustice

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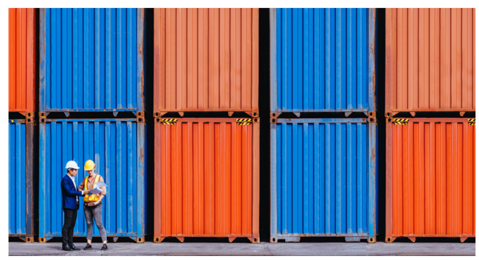
[15] *Id.* at ES-15 to ES-16; California Air Resources Board, *Attachment B: Responses to Comments on the Environmental Analysis for the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments*, at 12-15, https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/res20-23attbrtc.pdf.

# Attachment 9

*Preliminary findings, subject to change*

# New Jersey Clean Trucks Program

An Analysis of the Impacts of Zero-Emission Medium- and Heavy-Duty Trucks on the Environment, Public Health, Industry, and the Economy



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an ERM Group company

# Acknowledgments

Lead Authors: Dana Lowell, Amlan Saha, Miranda Freeman, Doug MacNair, David Seamonds, and Ted Langlois.

This report summarizes the projected economic, climate, and public health benefits of actions that the state of New Jersey could take to increase the sale of low- and no-emission medium- and heavy-duty trucks in the state over the next 30 years.

This report was developed by M.J. Bradley & Associates for the Natural Resources Defense Council and the Union of Concerned Scientists.

## About M.J. Bradley & Associates

MJB&A, an ERM Group company, provides strategic consulting services to address energy and environmental issues for the private, public, and nonprofit sectors. MJB&A creates value and addresses risks with a comprehensive approach to strategy and implementation, ensuring clients have timely access to information and the tools to use it to their advantage. Our approach fuses private sector strategy with public policy in air quality, energy, climate change, environmental markets, energy efficiency, renewable energy, transportation, and advanced technologies. Our international client base includes electric and natural gas utilities, major transportation fleet operators, investors, clean technology firms, environmental groups, and government agencies. Our seasoned team brings a multi-sector perspective, informed expertise, and creative solutions to each client, capitalizing on extensive experience in energy markets, environmental policy, law, engineering, economics, and business. For more information, we encourage you to visit our website, www.mjbradley.com.



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# Contents

# Introduction

M.J. Bradley & Associates was commissioned by the Natural Resources Defense Council and the Union of Concerned Scientists to evaluate the costs and benefits of state-level requirements for manufacturers that New Jersey could adopt to increase sales of no- and low-emission medium- and heavy-duty (M/HD) trucks and buses. The analysis examines all on-road vehicles registered in New Jersey with greater than 8,501 pounds gross vehicle weight, encompassing vehicle weight classes from Class 2b though Class 8. This is a diverse set of mostly commercial vehicles that includes heavy-duty pickups; school and shuttle buses; sanitation, construction, and other types of work trucks; and freight trucks ranging from local delivery vans to tractor-trailers that weigh up to 80,000 pounds when loaded.

Collectively the New Jersey M/HD fleet includes almost 423,000 vehicles that annually travel more than 6.2 billion miles and consume 653 million gallons of petroleum-based fuels.

In New Jersey M/HD vehicles are currently responsible for an estimated 7.6 million metric tons (MMT) of greenhouse gas (GHG) emissions annually—approximately 20 percent of all GHGs from the on-road vehicle fleet.[1] In New Jersey M/HD vehicles are also responsible for 44 percent of the nitrogen oxide (NOx) and 39 percent of the particulate matter (PM[2]) emitted by on-road vehicles, both of which contribute to poor air quality and resulting negative health impacts in many urban areas, including low-income and disadvantaged communities that are often disproportionately affected by emissions from freight movement due to the proximity of transportation infrastructure to the communities.

Prior work by MJB&A conducted in consultation with the New Jersey Environmental Justice Alliance and members of the Coalition for Healthy Ports NY NJ demonstrated that emissions from diesel trucks and buses emit higher levels of air pollution, which can lead to even greater health concerns in populations more directly exposed to diesel emissions.[3] Communities located adjacent to ports and related goods-movement

1 The remainder of emissions are from passenger cars and light trucks. This includes tailpipe emissions and "upstream" emissions from fuel production and transport.

2 In this report all references to PM are particulate matter with mean aerodynamic diameter less than 2.5 microns (PM2.5).

3 MJB&A, *Newark Community Impacts of Mobile Source Emissions: A Community-Based Participatory Research Analysis*, November 2020, http://www.njeja.org/wp-content/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf.

infrastructure (e.g., warehouses, logistics centers, rail yards, etc.) experience higher levels of truck traffic, both from surrounding thruways and on local streets, which exacerbates health concerns. Since these emissions are local in their effects, policies to reduce transportation emissions from medium- and heavy-duty vehicles can significantly improve the health and well-being of communities in urban areas or around transportation corridors, which are often home to people of color, low income residents, or those who are otherwise vulnerable or disadvantaged.

For the study of New Jersey, MJB&A modeled three Clean Truck policy scenarios with increasing levels of ambition. Under the least aggressive scenario—state adoption of California's Advanced Clean Truck (ACT) rule (allowable under the Clean Air Act)—estimated cumulative net societal benefits total almost $9 billion (in constant 2020$) through 2050, compared with the baseline scenario.[4] These net societal benefits include the monetized value of climate and public health benefits resulting from reduced GHG, NOx, and PM emissions in the state, including up to 61 fewer premature deaths and 64 fewer hospital visits from breathing polluted air. Net societal benefits also include net cost savings to fleets from operating zero-emission trucks, and savings to all residential and commercial electricity customers due to lower electric rates made possible by the additional electricity sales for electric vehicle charging. Under the ACT scenario, by 2050 annual cost savings for New Jersey fleets are estimated to be more than $421 million, and annual bill savings for electric utility customers in the state could reach an estimated $5 million.

The most aggressive policy scenario (100 x 40 ZEV + Clean Grid, discussed below) results in turnover of virtually the entire New Jersey M/HD fleet to zero-emission vehicles (ZEVs) by 2050, together with a shift to cleaner electricity generation sources. Cumulative net societal benefits through 2050 increase to almost $21 billion under this scenario, and there will be an estimated 303 fewer premature deaths and 325 fewer hospital visits. In 2050 estimated annual fleet cost savings also increase, to $826 million, and electric customer annual bill savings increase to an estimated $81 million.

The modeling tools used for this analysis could not apportion these estimated benefits to individual communities within the state, but prior work indicates that emission reductions from M/HD trucks and buses would provide the greatest benefits in areas in close proximity to freight corridors and other transportation infrastructure. As such, communities that are currently disproportionately impacted by transportation are expected to receive a higher share of the public health benefits, as long as zero emission trucks and buses are deployed equivalently across the state.

Implementation of the modeled scenarios will require significant changes to the national economy, as manufacturing of internal combustion engine vehicles is replaced by manufacturing of electric and fuel cell vehicles, and production and sale of petroleum fuels is replaced by increased production and sale of electricity and hydrogen. This analysis indicates that this transition will have positive macroeconomic effects, including increased net jobs and gross domestic product (GDP), as well as increased wages for the new jobs that will be added, relative to the jobs that will be replaced.

Compared with the baseline scenario, net national job gains under the most aggressive policy scenario total 412 in 2035, though there is a net job loss by 2045 due to total fleet fuel and maintenance cost savings. This will be accompanied by a $139 million increase in 2035 GDP, and an $88 million increase in 2045 GDP. Average wages for the new jobs created under the ZEV transition are expected to be, on average, almost twice as high as average wages for the jobs that will be replaced.

4 All values cited in this report are in constant 2020$, unless otherwise stated.

# Policy Scenarios

This report summarizes the projected environmental and economic effects of New Jersey adopting policies requiring manufacturers to sell a greater number of M/HDV low- and no-emission vehicles over the next 30 years. Three specific Clean Truck policy scenarios, representing increasing levels of ambition, were evaluated.

- **ACT Rule:** New Jersey adopts requirements analogous to those adopted by California under the Advanced Clean Trucks Rule, which requires an increasing percentage of new trucks purchased in the state to be ZEVs beginning in the 2025 model year. The percentage of new vehicles that must be ZEV varies by vehicle type, but for all vehicle types the required ZEV percentage increases each model year between 2025 and 2035 (see Figure 1).
- **ACT Rule plus NOx Omnibus Rule:** In addition to adopting the ACT Rule, New Jersey adopts requirements analogous to those adopted by California under the Heavy-Duty Omnibus Rule (referred to herein as the NOx Omnibus Rule). This rule requires an additional 75 percent reduction in nitrogen oxide (NOx) emissions from the engines in new gasoline and diesel trucks sold between model year 2025 and 2026, and a 90 percent reduction for trucks sold beginning in the 2027 model year.[5]
- **100 x 40 ZEV + Clean Grid:** In addition to adopting the ACT and NOx Omnibus Rules, New Jersey takes further actions to ensure more rapid and continued increases in new ZEV sales, such that virtually all new trucks are ZEV by 2040 (see Figure 1), with Class 2b–3 achieving 100 percent ZEV sales in 2038 and Class 4–8 (non-tractors) achieving 100 percent ZEV sales in 2035. In addition, an aggressive federal Clean Energy Standard is assumed to ensure that electricity generation in the state is virtually carbon free and 53 percent renewable by 2050. State-specific, renewable portfolio standards that could increase the renewable electricity levels even more were not analyzed as part of this study.

All three of these New Jersey policy scenarios are compared with a baseline "business as usual" scenario in which all new trucks sold in the state continue to meet existing EPA NOx emission standards and ZEV sales increase only marginally, never reaching more than 1 percent of new vehicle sales each year.[6]

The analysis assumes that M/HD annual vehicle miles traveled (VMT) in New Jersey will continue to grow by approximately 0.3 percent annually through 2050, as projected by the Energy Information Administration (EIA), as the economy and population continue to grow. The modeled policy scenarios do not include freight system enhancements or mode shifting to slow the growth of, or reduce, M/HD truck miles; this would be expected to provide additional emission reductions.

The analysis was conducted using MJB&A's STate Emission Pathways (STEP) Tool. The climate and air quality impacts of each policy scenario were estimated on the basis of changes in M/HD fleet fuel use and include both tailpipe emissions and "upstream" emissions from production of the transportation fuels used in each scenario. These include petroleum fuels used by conventional internal combustion engine vehicles (gasoline, diesel, natural gas) and electricity and hydrogen used by ZEVs, which are assumed to include both battery electric (EV) and hydrogen fuel cell electric (FCV) vehicles.

5 Reductions are relative to current federal EPA new engine emission standards. This rule does not require additional PM reductions but includes anti-backsliding provisions to ensure that PM emissions do not increase compared with engines designed to meet current federal standards.

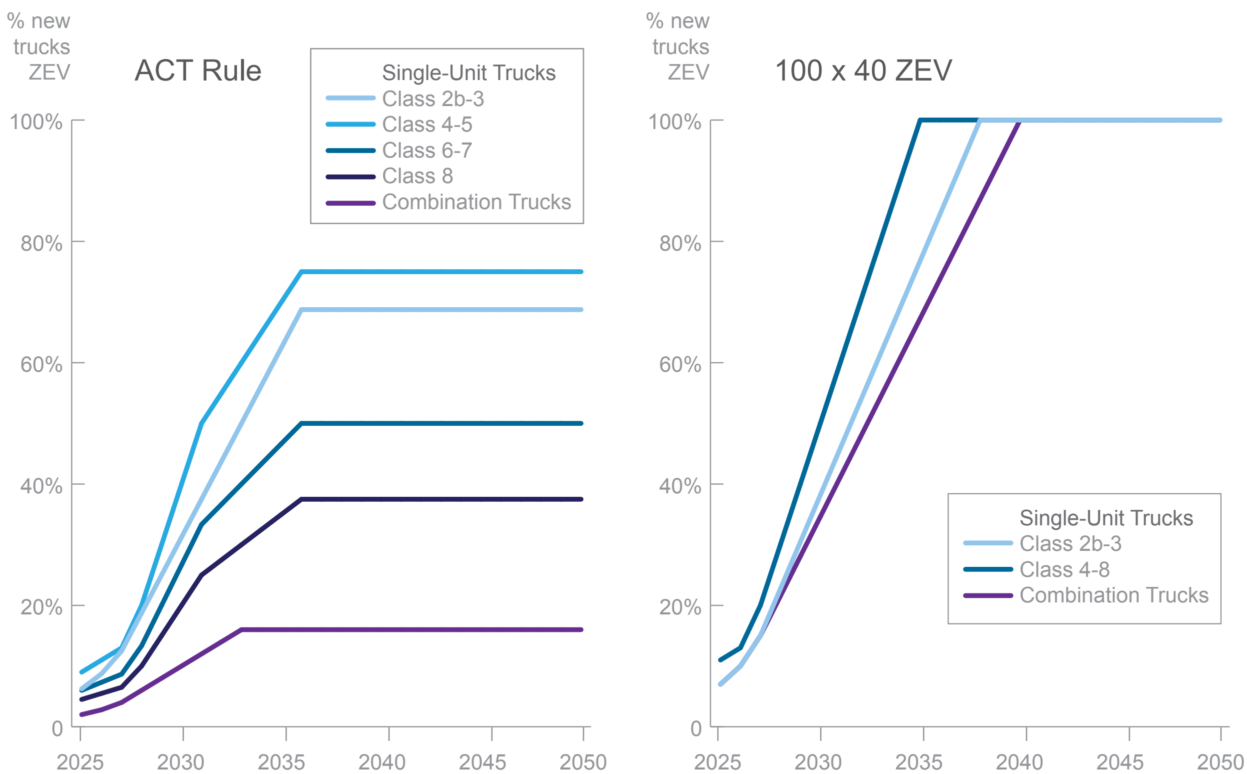
6 The baseline ZEV sales assumptions are consistent with projections in the Energy Information Administration's Annual Energy Outlook 2021.

To evaluate climate impacts, the analysis estimated changes in all combustion related GHGs, including carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$). To evaluate air quality impacts, the analysis estimated changes in total nitrogen oxide (NOx) and particulate matter (PM) emissions and resulting changes in ambient air quality and health metrics such as premature deaths, hospital visits, and lost workdays.

The economic analysis estimated the change in annual M/HD fleet-wide spending on vehicle purchase, charging/fueling infrastructure to support ZEVs, vehicle fuel, and vehicle and infrastructure maintenance under each scenario. Currently ZEVs are more expensive to purchase than equivalent gasoline and diesel vehicles, but they have lower fuel and maintenance costs. Over time the incremental purchase cost of ZEVs is also projected to fall. Technologies required to meet the more stringent NOx standards of the NOx Omnibus Rule are also projected to increase purchase costs for compliant vehicles.

On the basis of estimated changes in fleet spending, the analysis estimated the macroeconomic effects of each scenario on national jobs, wages, and gross domestic product (GDP).

Figure 1 Annual Zero-Emission Vehicle Sales in Clean Truck Policy Scenarios

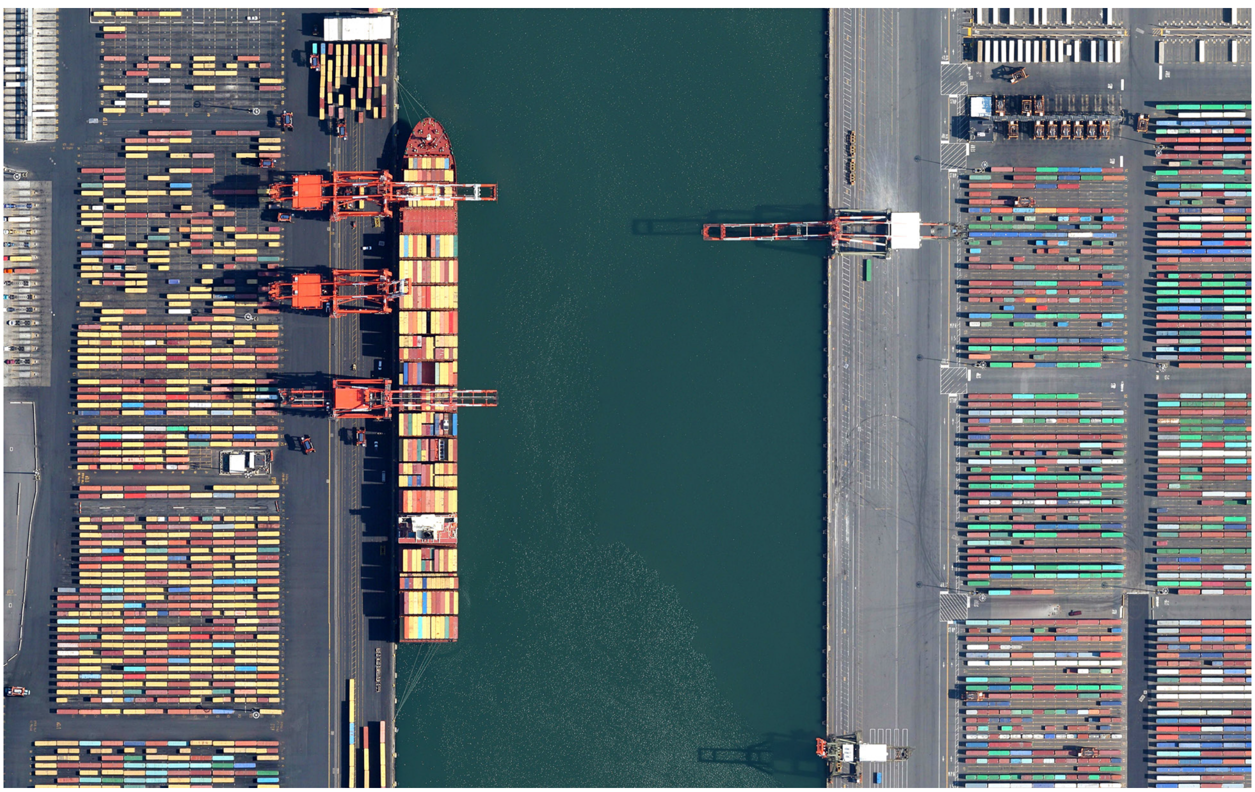


The analysis also estimated the impact of each scenario on New Jersey's electric utilities, including the total statewide change in power demand (kW) and energy consumption (kWh) for M/HD EV charging, as well as the additional revenue and net revenue that would be received by the state's electric utilities for providing this power. On the basis of projected utility net revenue, the analysis estimates the potential effect on state electricity rates for residential and commercial customers.

In addition, the analysis estimated the total number of vehicle chargers that will be required to support the increase in M/HD EVs under each scenario—both depot-based chargers and shared public chargers—compared with the existing charging network in the state.

For a full description of the modeling approach and sources of assumptions used for this analysis, see the report: *Clean Trucks Analysis: Costs & Benefits of State-Level Policies to Require No- and Low-Emission Trucks, Technical Report—Methodologies and Assumptions*, May 2021 (https://mjbradley.com/clean-trucks-analysis).

The New Jersey electric grid mix and energy cost assumptions used can also be found in the Appendix to this report.



# New Jersey Results

The sections below detail the results of the New Jersey Clean Trucks analysis, beginning with a description of the current New Jersey M/HDV fleet and the projected fleet under each modeled policy scenario. This is followed by a summary of the environmental and public health benefits of each scenario and the economic impacts of the modeled fleet transitions.

## New Jersey M/HD Vehicle Fleet

Table 1 summarizes the current M/HD fleet in New Jersey State, broken down by the four major vehicle types used to frame the Clean Trucks analysis.

**Table 1** Current New Jersey M/HD Fleet

| Vehicle Type | | No. of Vehicles | Annual VMT (billion miles) | Annual Fuel (million gallons) |
|---|---|---|---|---|
| **Heavy-Duty Pickup and Van**<br>**Class 2b** |  | 194,358 | 2.19 | 117 |
| **Bus**<br>**Class 3–8** |  | 8,643 | 0.16 | 20 |
| **Single-Unit Work and Freight Truck**<br>**Class 3–8** |  | 194,512 | 2.39 | 294 |
| **Combination Truck**<br>**Class 7–8** |  | 25,334 | 1.52 | 223 |
| **TOTAL** | | **422,847** | **6.25** | **653** |

Approximately 46 percent of the in-use M/HD fleet are Class 2b vehicles (8,500–10,000 in gross vehicle weight rating, GVWR), which are mostly heavy-duty pickup trucks and vans.[7] These vehicles account for 35 percent of annual M/HD miles and 18 percent of annual fuel use. Approximately 2 percent of the fleet are buses, which account for 2 percent of annual VMT and 3 percent of annual fuel use. This includes relatively small shuttle buses (class 3–5) as well as school buses, transit buses, and intercity/charter coach buses.[8] Forty six percent of the fleet are single-unit freight and work trucks, which account for 38 percent of annual VMT and 45 percent of annual fuel use. These vehicles come in a wide variety of sizes (Class 3–8) and have a wide variety of uses, from vans and box trucks used to deliver freight, to sanitation and construction trucks, to boom-equipped utility trucks. Only 6 percent of the fleet are combination truck-tractors, but these vehicles account for 24 percent of annual VMT and 34 percent of annual fuel use, since approximately two-thirds of these vehicles are used primarily for long-distance freight hauling and typically log many more daily and annual miles than other M/HD vehicles.

Today less than 1 percent of the national M/HD fleet is powered by electricity or alternative fuels (natural gas and propane). Approximately 64 percent of the fleet have diesel engines and 36 percent use gasoline.[9] The largest Class 7 and 8 vehicles are almost all diesel, while almost 50 percent of the smaller Class 2b–5 trucks have gasoline engines, with most of the remainder diesel.

Figure 2 summarizes the modeled turnover of the New Jersey in-use fleet to zero-emission and low-NOx trucks under the three Clean Truck policy scenarios. Fleet turnover to new trucks is based on historical average turnover rates and projected fleet growth rates, along with the new vehicle ZEV purchase percentages shown in Figure 1. Approximately 6.1 percent of existing Class 2b trucks and 4.7 percent of Class 3–8 trucks and buses are retired each year and replaced with new vehicles.[10] The ACT + NOx Omnibus scenario and the 100 x 40 ZEV + Clean Grid scenario further assume that all new vehicles purchased in 2024 and later years that are not ZEV will have low-NOx engines compliant with the NOx Omnibus standards.

As shown, under the ACT Rule policy scenario, 35 percent of the in-use M/HD fleet will turn over to ZEV by 2040, and 62 percent are ZEV by 2050; all of these ZEVs are assumed to be electric vehicles. Under the ACT + NOx Omnibus policy scenario, the same percentage of the fleet turns over to ZEV, but the remaining internal combustion engine vehicles in the fleet turn over to low-NOx engines by 2044. Under the 100 x 40 ZEV + Clean Grid policy scenario, 52 percent of the in-use fleet turns over to ZEV by 2040 and 96 percent do so by 2050. This scenario assumes that new ZEVs will include both EV and fuel cell vehicles powered by hydrogen. In 2050, 7 percent of in-use ZEVs are assumed to be FCV and 93 percent are EV.

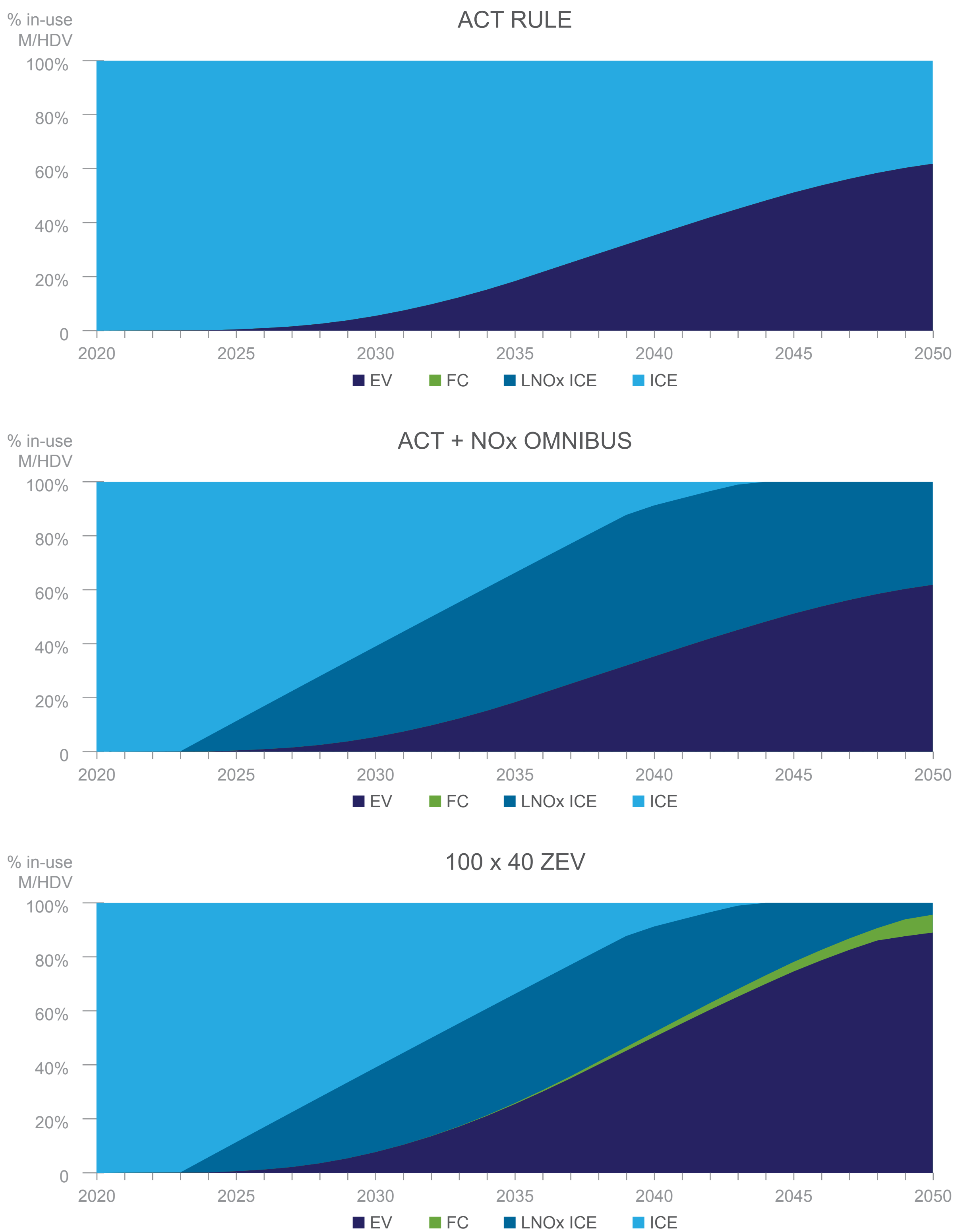
7 A very small percentage of these vehicles are large SUVs.

8 Note that the ACT Rule does not include ZEV requirements for transit buses, as these vehicles are covered by a separate Innovative Clean Transit regulation in California.

9 These figures are based on state registration data collected by IHS Markit.

10 This is a long-term average. Actual annual turnover is highly correlated to economic conditions and can vary widely from year to year.

**Figure 2** Fleet Turnover to Low-NOx and Zero-Emission Vehicles in Clean Truck Policy Scenarios




EV (battery electric vehicle); FC (fuel cell vehicle); LNOx ICE (low-NOx internal combustion engine vehicle); ICE (conventional internal combustion engine vehicle)

## Changes in Fleet Fuel Use

Under all modeled Clean Truck policy scenarios, a significant portion of the New Jersey M/HD fleet is assumed to turn over to EV and FCV trucks and buses. This will result in replacement of petroleum fuels—primarily gasoline and diesel fuel—with electricity and hydrogen.[11]

Under the baseline scenario, total petroleum fuel use by the New Jersey M/HD fleet in 2050 is projected to be 510 million gallons. Under the ACT Rule policy scenario, petroleum fuel use in 2050 falls to an estimated 293 million gallons (–43 percent), and cumulative reductions in diesel and gasoline use by the M/HD fleet total 2.7 billion gallons between 2020 and 2050. This petroleum fuel is replaced by 39.3 million megawatt-hours (MWh) of electricity between 2020 and 2050. Electricity use for M/HD EV charging in 2050 is estimated to be 3.4 million MWh, a 4 percent increase to estimated baseline electricity use by New Jersey residential and commercial customers that year (77.8 million MWh).

Adding the NOx Omnibus Rule to the ACT Rule does not result in additional reductions in petroleum fuel use.

Under the 100 x 40 ZEV + Clean Grid scenario, estimated petroleum fuel use by the M/HD fleet in 2050 falls to 38 million gallons (–93 percent), and cumulative reductions in diesel and gasoline use by the M/HD fleet total 5.5 billion gallons between 2020 and 2050. This petroleum fuel is replaced by 77.8 million MWh of electricity and 700 million kilograms of hydrogen between 2020 and 2050. Electricity use for M/HD EV charging in 2050 is estimated to be 6.8 million MWh, a 9 percent increase to estimated baseline electricity use by New Jersey residential and commercial customers that year.

## Public Health and the Environment

The modeled Clean Trucks policy scenarios produce significant reductions in NOx, PM, and GHG emissions from the M/HD fleet, even after accounting for the emissions from producing the electricity and hydrogen needed to power ZEVs. NOx and PM reductions will improve local air quality, particularly in urban areas, resulting in public health benefits from reduced mortality and hospital visits. As noted earlier, low-income and disadvantaged communities are often disproportionately impacted by emissions from freight movement, due to the proximity of the transportation infrastructure to many of these communities.[12]

### *Air Quality Impacts*

Figures 3 and 4 show estimated annual M/HD fleet NOx and PM emissions, respectively, under the baseline scenario and the modeled Clean Truck policy scenarios. Under the baseline scenario, annual M/HD fleet NOx emissions are projected to fall by 50 percent and annual fleet PM emissions are projected to fall 75 percent through 2040 and 2045, respectively, as the current fleet turns over to new gasoline and diesel trucks with cleaner engines that meet more stringent EPA new engine emissions standards. In later years baseline annual NOx and PM emissions are then projected to start rising again as annual fleet VMT continues to grow.

11 A small number of M/HD trucks and buses in New Jersey currently use natural gas.

12 MJB&A, Newark Community Impacts.

Figure 3 Projected M/HD Fleet NOx Emissions

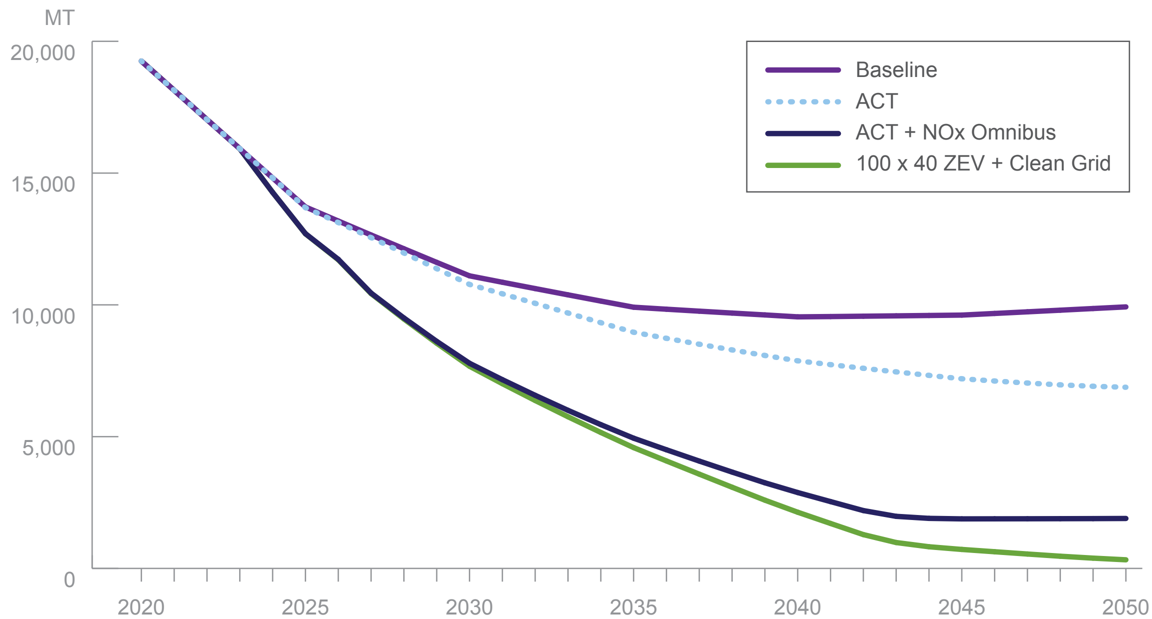
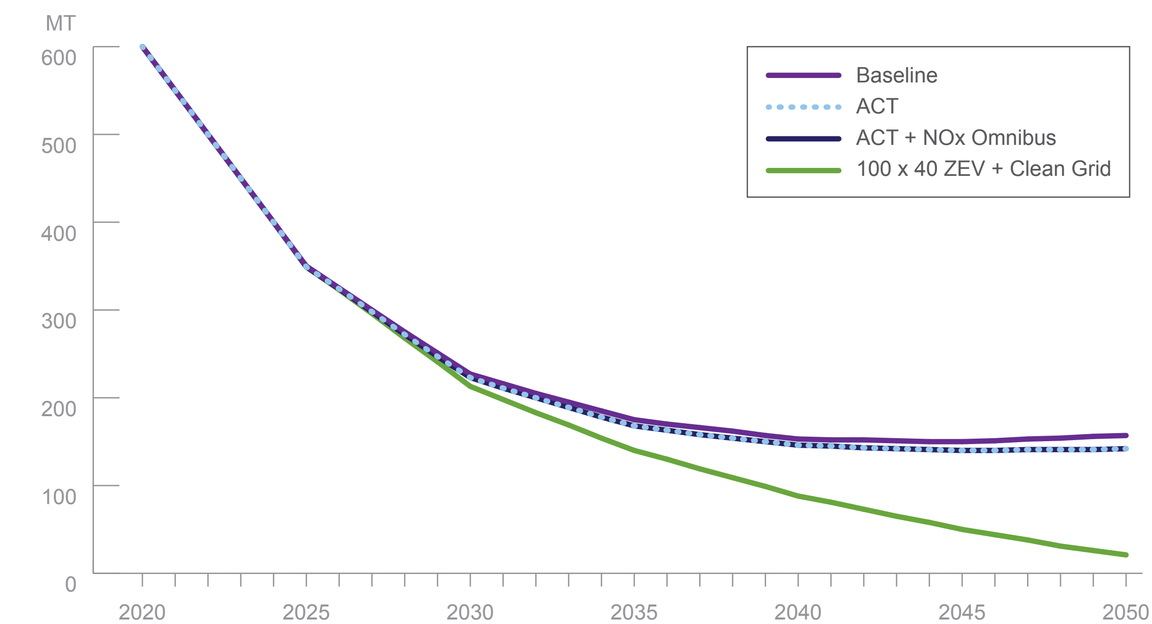



Figure 4 Projected M/HD Fleet PM Emissions



Compared with the baseline, by 2050 the ACT rule is estimated to reduce annual fleet NOx and PM emissions by 31 percent and 10 percent, respectively, as diesel and gasoline trucks are replaced with electric vehicles. Adding the NOx Omnibus Rule will further reduce annual fleet NOx emissions due to turnover of the diesel and gasoline portion of the fleet to new vehicles with low-NOx engines; by 2050 annual NOx emissions are projected to be 81 percent lower than under the baseline if both the ACT and NOx Omnibus Rules are implemented.

The 100 x 40 ZEV + Clean Grid scenario has the lowest fleet emissions due to replacement of virtually all gasoline and diesel trucks and buses with EVs and FCVs by 2050, when annual NOx and PM emissions are estimated to be 97 percent and 86 percent lower, respectively, than baseline emissions.

Over the next 30 years, cumulative NOx and PM emission reductions from the ACT Rule (compared with the baseline scenario) total 36,000 metric tons (MT) and 192 MT, respectively. Additional cumulative NOx reductions from the NOx Omnibus Rule are estimated at 107,000 MT over the same time. Cumulative NOx and PM emission reductions from the 100 x 40 ZEV + Clean Grid scenario (compared with the baseline) are projected to total 160,000 MT and 1,500 MT, respectively.

## *Public Health Benefits*

The reduced annual NOx and PM emissions under the Clean Truck policy scenarios will reduce ambient particulate levels in the air, which will reduce the negative health effects on New Jersey residents breathing in these airborne particles.[13] Estimated public health impacts include reductions in premature mortality and fewer hospital admissions and emergency room visits for asthma. There will also be reduced cases of acute bronchitis, exacerbated asthma, and other respiratory symptoms, and fewer restricted activity days and lost workdays. Cumulative estimated reductions in these health outcomes in New Jersey under the modeled Clean Truck policy scenarios are shown in Table 2; these benefits were estimated using the U.S. Environmental Protection Agency's CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool. While this analysis did not apportion estimated public health benefits to specific communities within the state, they are expected to disproportionately accrue to those communities in close proximity to freight infrastructure, since these communities are disproportionately impacted by current emissions from M/HD truck traffic.

Table 2 Cumulative Public Health Benefits of Clean Truck Policy Scenarios, 2020–2050

| Health Metric | ACT Rule | ACT + NOx Omnibus | 100 x 40 ZEV + Clean Grid |
|---|---|---|---|
| Avoided Premature Deaths | 61 | 223 | 303 |
| Avoided Hospital Visits[a] | 64 | 241 | 325 |
| Avoided Minor Cases[b] | 35,597 | 133,032 | 181,409 |
| Monetized Value, 2020$ (millions) | $709 | $2,606 | $3,543 |

a Includes hospital admissions and emergency room visits.

b Includes reduced cases of acute bronchitis, exacerbated asthma, and other respiratory symptoms, and reduced restricted activity days and lost workdays.

13 PM is directly emitted to the atmosphere from combustion sources as solid particles. NOx is emitted from combustion sources as a gas but contributes to the formation of secondary particles via chemical reactions in the atmosphere. Both direct and secondary particles have negative health effects when taken into the lungs.

The monetized value of cumulative public health benefits from the ACT Rule over the next 30 years totals more than $709 million. Adding the NOx Omnibus Rule would increase the monetized value of cumulative net public health benefits to nearly $2 billion. The monetized value of cumulative public health benefits under the 100 x 40 ZEV + Clean Grid policy scenario totals $3.5 billion through 2050.

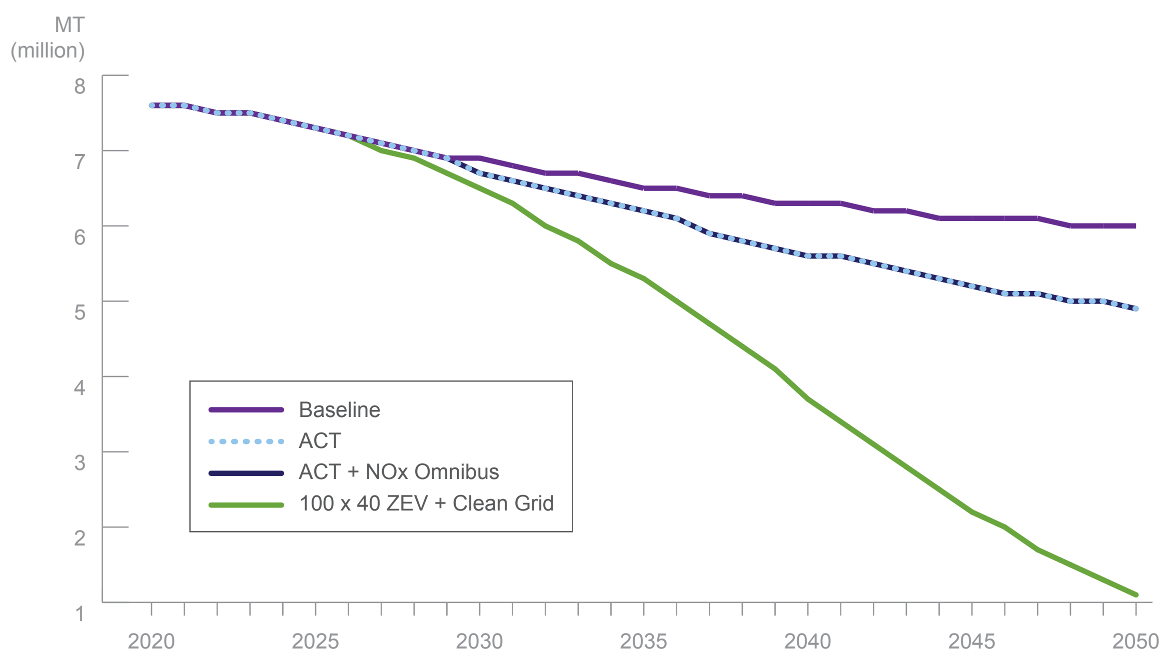
## Climate Benefits

Figure 5 illustrates estimated annual M/HD fleet GHG emissions under the baseline scenario and the modeled Clean Truck policy scenarios. As shown, under the baseline scenario annual M/HD fleet GHG emissions are projected to fall by 21 percent through 2050 as the current fleet turns over to new, more efficient gasoline and diesel trucks that meet more stringent EPA new engine and vehicle emission standards.

Compared with the baseline, by 2050 the ACT rule is estimated to further reduce annual fleet GHG emissions by 18 percent, as diesel and gasoline trucks are replaced with electric vehicles; adding the NOx Omnibus Rule does not produce additional fleet GHG emissions beyond those achieved by the ACT Rule.

The 100 x 40 ZEV + Clean Grid scenario has the lowest fleet emissions due to replacement of virtually all gasoline and diesel trucks and buses with EV and FCV by 2050, when annual fleet GHG emissions are estimated to be 82 percent lower than baseline emissions.

Figure 5 Projected M/HD Fleet GHG Emissions




Over the next 30 years, cumulative GHG emission reductions from the ACT Rule (compared with the baseline scenario) total 13.5 million MT. Cumulative GHG emission reductions from the 100 x 40 ZEV + Clean Grid scenario (compared with the baseline) are projected to total 54.8 million MT. These estimates of GHG reductions from each policy scenario account for reductions in petroleum fuel use (gasoline, diesel fuel) by the M/HD fleet as well as increased emissions from electricity and hydrogen production to fuel the EVs and FCVs that will replace gasoline and diesel trucks and buses.

Using the social cost of greenhouse gases as estimated by the federal government's Interagency Working Group, these estimated cumulative GHG reductions have a monetized value of $4.6 billion for the ACT Rule policy scenario and $10.3 billion for the 100 x 40 ZEV + Clean Grid policy scenario.[14] The social value of GHG reductions represents potential societal cost savings from avoiding the negative effects of climate change, if GHG emissions are reduced enough to keep long-term warming below 2 degrees Celsius from preindustrial levels.[15]

The assumed New Jersey grid mix for electricity production each year is shown in the Appendix. For the baseline, ACT Rule, and ACT+ NOx Omnibus scenarios, this analysis conservatively uses a business-as-usual (BAU) grid mix, while the 100 x 40 ZEV + Clean Grid scenario assumes a "decarbonized" grid mix. In 2020 the BAU grid mix is 2.6 percent coal-fired generation, 53 percent natural gas–fired generation, and 44.4 percent "zero-emitting" generation sources.[16] By 2050 the zero-emitting portion of the BAU grid mix increases to 49.2 percent while the coal portion remains at 2.6 percent and natural gas falls to 48.2 percent. Considering just renewable resources, the percentages are 25 percent in 2030, 28 percent in 2040, and 31 percent in 2050, with the remainder of zero-emitting sources nuclear.

Under the 100 x 40 ZEV + Clean Grid scenario, zero-emitting generation increases to 85.7 percent in 2030, 94.7 percent in 2040, and 99.3 percent in 2050. Considering just renewable resources, the percentages are 33 percent in 2030, 43 percent in 2040, and 54 percent in 2050. It is noted that additional state policies, such as Renewable Portfolio Standards, could potentially increase the renewable percentages even higher, but these were not considered in this analysis.

## Economic Impacts

This section summarizes projected economic impacts of the modeled Clean Truck policy scenarios, including changes in annual operating costs for New Jersey fleets; impacts to New Jersey electric utilities and their customers; net societal benefits; and macroeconomic effects on jobs, wages, and gross domestic product from the transition to low-NOx and zero-emission trucks and buses. This section also estimates the required public and private investment in electric vehicle charging infrastructure to support the electric M/HD fleet under each scenario.

### *Costs and Benefits to Fleets*

For all the modeled Clean Truck policy scenarios, this analysis estimated annual incremental costs associated with purchase and use of M/HD ZEVs compared with baseline conventional vehicles with combustion engines that operate on petroleum fuels (gasoline, diesel). These costs include the incremental purchase cost of the new ZEVs added each year (instead of new combustion vehicles), the cost of installing the charging and hydrogen fueling infrastructure required by these new ZEVs, and net fuel and maintenance costs for all ZEVs in the fleet, both those newly purchased each year and those purchased in prior years and still in use.

Net fuel costs include reductions in purchases of diesel fuel and gasoline (due to fewer combustion vehicles), offset by the increased purchase of electricity and hydrogen to power ZEVs. Net maintenance costs include net savings in annual vehicle maintenance for the ZEVs in the fleet compared with combustion vehicles, offset by annual costs to maintain the charging and hydrogen fueling infrastructure needed to support in-use ZEVs.

14 For the social cost values used, see MJB&A, *Clean Trucks Analysis: Costs & Benefits of State-Level Policies to Require No- and Low-Emission Trucks, Technical Report—Methodologies & Assumptions*, May 2021, https://mjbradley.com/clean-trucks-analysis.

15 The Interagency Working Group developed GHG social cost estimates using a range of discount rates. These values are based on the 95th percentile results using a 3 percent discount rate, which is in the middle of the range of estimated values. The monetized value of cumulative GHG reductions under each policy scenario would be 72 percent lower if using the lowest published social cost values, and three times greater if using the highest published values.

16 For this analysis, coal-fired generation includes oil and biomass. Zero-emitting sources include nuclear and renewable sources such as wind, solar, and hydropower.

Figure 6 Projected Lifetime Incremental Costs for New Jersey ZEVs Compared with Combustion Vehicles

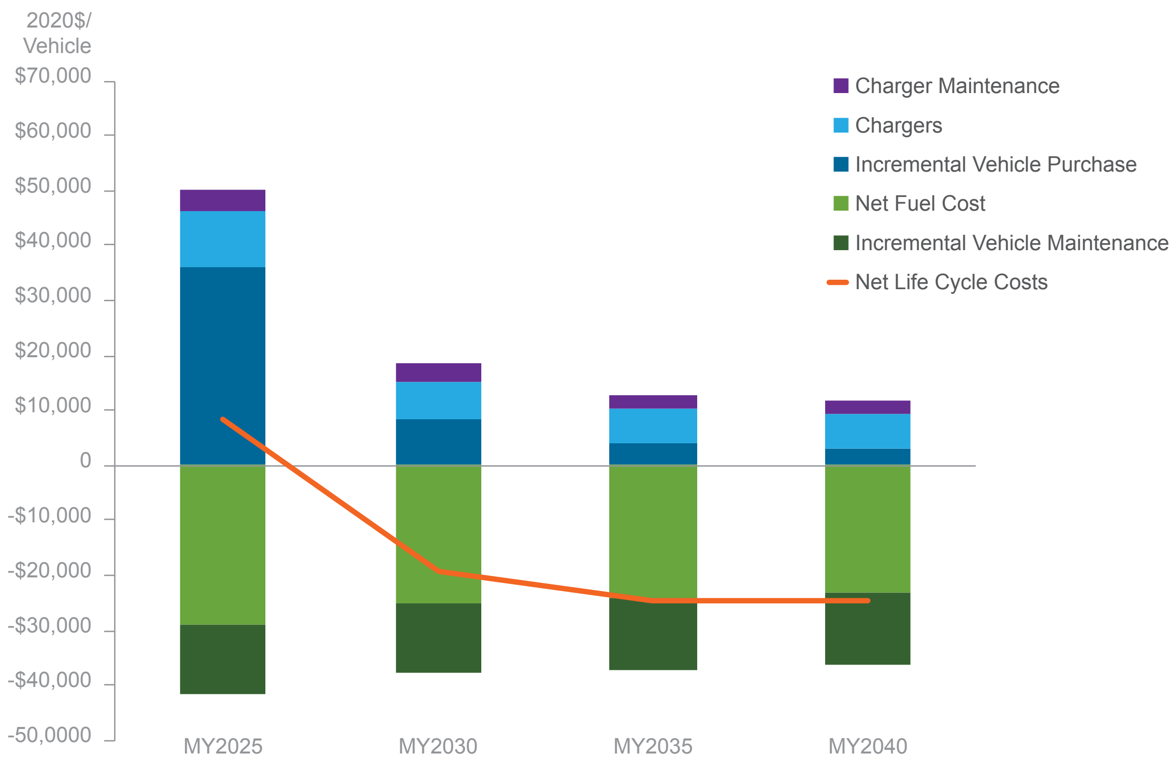



Figure 6 shows projected average lifetime incremental costs for new ZEVs purchased in New Jersey compared with lifetime costs for combustion vehicles purchased in the same model year; the bars show fleet average values for all Class 2b–8 ZEVs purchased each year under the 100 x 40 ZEV scenario. Incremental fuel and maintenance costs are discounted lifetime costs, assuming 21-year vehicle life, and 6 percent annual discount rate. Vehicle financing, which is often used by fleets when purchasing vehicles, was not considered in this analysis.

As shown, the average M/HD ZEV in New Jersey is projected to produce over $36,000 in discounted fuel and maintenance cost savings over its lifetime. For ZEVs purchased in the very near term, this savings may not be enough to offset the projected incremental cost of vehicle purchase and fueling infrastructure for some ZEVs, resulting in net increased lifetime costs compared with those of combustion vehicles. However, by 2030 incremental ZEV purchase costs are projected to fall significantly, such that the average ZEV will reach lifetime cost parity with combustion vehicles, when discounted lifetime fuel and maintenance savings are considered. By 2040, the average ZEV purchased that year is projected to produce almost $25,000 in discounted lifetime net savings (2020$) compared with the costs of an equivalent combustion vehicle.

It is important to reiterate that the values in Figure 6 are fleet average values, which mask a significant amount of variability across vehicle types and among different fleets of the same vehicle type. Also note that the utility impact analysis (in the next section) indicates that the cost of providing power to charge M/HD EVs is lower than expected utility revenue under current rate structures. This suggests that New Jersey could consider changes to rates that would not only be fairer for fleets, but also lower electricity costs for M/HD EV charging, thus reducing net fleet operating costs further than estimated here. However, this would reduce the potential benefits that would accrue to other ratepayers from M/HD vehicle charging (see discussion below).

M/HD ZEVs in some fleets will likely achieve lifetime cost parity with combustion vehicles much earlier than 2030, while others may lag. In addition, this analysis, and the values shown in Figure 6, assume no government incentives for vehicle purchase or development of fueling infrastructure. If existing and potential incentives are considered, or policies such as improved electricity rates for fleets, then actual net costs to fleets will be lower, resulting in cost parity sooner.

## *Electric Utility Impacts*

Current annual electricity sales to residential and commercial customers in New Jersey total 64.6 million MWh and are projected to grow to 77.8 million MWh in 2050.[17]

Under the ACT Rule policy scenario, additional annual electricity sales for M/HD EV charging are estimated to total 297,000 MWh in 2030, rising to 3.4 million MWh in 2050. This incremental load represents 0.4 percent and 5.0 percent of the total baseline electricity demand in 2030 and 2050, respectively. Incremental monthly peak charging demand under this scenario is estimated at 123 MW in 2030, rising to 1,583 MW in 2050.

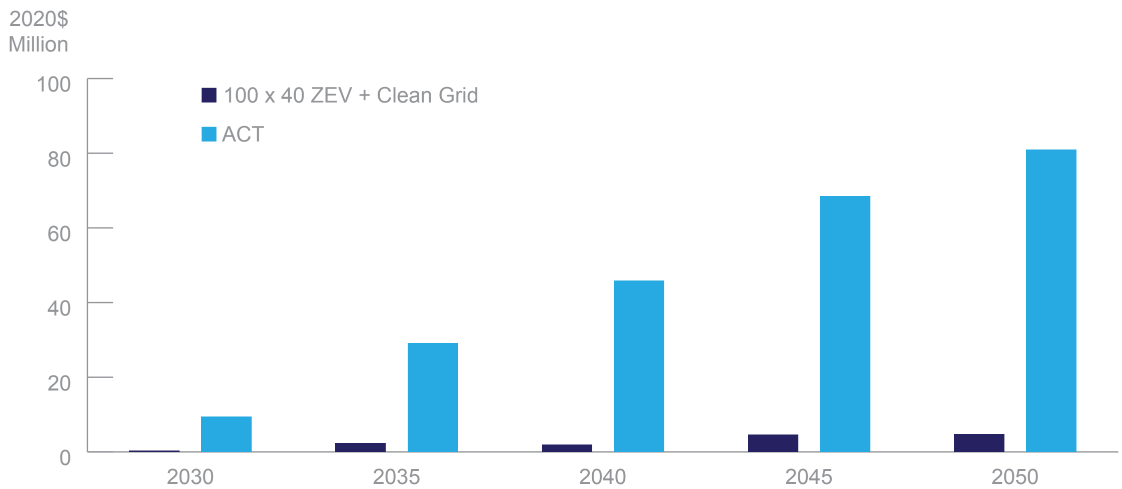
Under the 100 x 40 ZEV policy scenario, incremental peak charging demand is estimated at 185 MW in 2030, rising to 2,567 MW in 2050, and annual incremental electricity sales are estimated to be 616,000 MWh in 2030, rising to 6.8 million MWh in 2050 (0.8 percent and 8.8 percent of baseline electricity demand, respectively).

This analysis estimated the revenue that New Jersey electric utilities would receive from these incremental electricity sales, the marginal generation and transmission costs of providing this power, and the net revenue that utilities would earn (net revenue = revenue – marginal cost). The estimated marginal cost includes costs associated with procuring the necessary additional peak generation and transmission capacity to serve the load ($/MW) as well as marginal generation and transmission energy costs ($/MWh).

Figure 7 summarizes estimated annual utility net revenue from M/HD EV charging under the modeled Clean Truck policy scenarios. Under the ACT Rule scenario, annual utility net revenue is projected to be $300,000 in 2030, rising to $2.0 million in 2040 and $4.7 million in 2050. Under the 100 x 40 ZEV scenario, utility net revenue is projected to be $9.4 million in 2030, rising to $45.6 million in 2040 and $81 million in 2050.

17 This growth assumption is from the EIA 2021 Annual Energy Outlook. It does not include sales to large industrial customers.

Figure 7 Projected Annual Utility Net Revenue From M/HD EV Charging




In general, a utility's costs to maintain its distribution infrastructure increase each year with inflation, and these costs are passed on to utility customers in accordance with rules established by the New York State Department of Public Service via periodic increases in residential and commercial electric rates. However, projected utility net revenue from increased electricity sales for M/HD EV charging would lower distribution rates ($/kWh), since fixed annual distribution system costs would be spread over a larger base of energy sales.

This analysis indicates that under the 100 x 40 ZEV scenario, by 2050 incremental utility net revenue from M/HD EV charging could potentially reduce average residential and commercial electricity rates in New Jersey by as much as 0.8 percent ($0.002/kWh in 2020$). This could save the average New Jersey household $16 per year and the average commercial customer $69 per year on their electricity bills (2020$).[18]

## *Jobs, Wages, and GDP*

The transition from gasoline and diesel M/HD vehicles to ZEVs will have significant impacts on the U.S. economy, with substantial job gains in many industries (e.g., battery and electric component manufacturing, charging infrastructure construction, electricity generation), accompanied by fewer jobs in other industries (e.g., engine manufacturing, oil exploration and refining, gas stations, auto repair shops).

This analysis used the IMPLAN model to estimate these macroeconomic effects of the modeled New Jersey Clean Truck policy scenarios based on estimated changes in spending in various industries (relative to the baseline scenario). These estimates of spending changes by industry were developed from the fleet cost analysis. For example, under the modeled Clean Truck policy scenarios, more money will be spent to manufacture batteries and electric drive components for ZEVs, but less will be spent to manufacture gasoline and diesel engines, and transmissions. Similarly, less money will be spent by fleets to purchase petroleum fuels, but more will be spent to purchase electricity and hydrogen.

18 Figures are based on average annual electricity use of 7,858 kWh per residential customer and 34,074 kWh per commercial customer in New Jersey.

The IMPLAN analysis also includes the effects of induced economic activity due to consumers having more money to spend, thanks to return of utility net revenue in the form of lower electric rates, and net fleet cost savings returned as lower shipping costs for goods, resulting in lower consumer prices for those goods.

The IMPLAN analysis was run at the national level, but assuming only the industry spending changes (from application of the policy scenarios) occurring due to M/HD vehicle purchase and use in New Jersey. Estimated national effects would be significantly greater if the modeled policy scenarios were applied to the entire U.S. M/HD fleet.

Table 3 offers a summary of estimated macroeconomic effects of the modeled Clean Truck scenarios on jobs, GDP, and wages.

Compared with the baseline scenario, both adoption of the ACT + NOx Omnibus policy scenario or adoption of the 100 x 40 ZEV + Clean Grid scenario in New Jersey will increase national net jobs through 2035, while there will be a net loss of jobs in 2045. The annual loss by 2045 is largely due to the reductions in spending on diesel fuel and decreases in the costs of M/HDV ZEVs over time, resulting in decreased spending and investments in the out years. Both scenarios increase annual GDP in all years. For both scenarios in all years, the average wages for new jobs added to the economy are almost twice as high as the average wages for jobs that are replaced. This is because the largest number of added jobs are in electrical component manufacturing and in construction of charging infrastructure, requiring many well-paid electricians and electrical engineers, while the largest job losses are in vehicle repair—due to lower maintenance required by ZEVs—as well as relatively low-paid retail workers at gas stations.

**Table 3** Macroeconomic Effects of New Jersey Clean Truck Policy Scenarios

| Metric | | ACT + NOx Omnibus | | 100 x 40 ZEV + Clean Grid | |
|---|---|---|---|---|---|
| | | 2035 | 2045 | 2035 | 2045 |
| Net Change in Jobs | | 142 | (1,221) | 412 | (1,446) |
| Net Change in GDP 2020$ (million) | | $73 | $12 | $139 | $88 |
| Average Annual Compensation | Added Jobs | $96,606 | $95,799 | $96,400 | $94,638 |
| | Replaced Jobs | $47,223 | $50,224 | $46,413 | $49,287 |

Today many components used in electric and fuel cell vehicles—most notably batteries, but also many electric drivetrain components—are manufactured outside the United States and imported for final vehicle assembly. The percentage of imported content is higher for ZEV drivetrains today than for conventional drivetrains (gasoline and diesel engines, and transmissions). The scale of U.S. macroeconomic effects from the modeled Clean Truck policy scenarios will depend on how the nascent M/HD ZEV industry develops; for this analysis, MJB&A assumed that all incremental spending on ZEV batteries and electric drivetrain components would be in the United States, with no imported content. As such, the results summarized in Table 3 represent a high-end estimate of what is possible from the ZEV transition, with the right federal and state policy supports in place to incentivize development of U.S.-based ZEV component manufacturing. If vehicle manufacturers continue to rely primarily on imported batteries and electric drivetrain components, the net job and GDP gains will be lower than those summarized here.

This macroeconomic analysis only includes direct, indirect, and induced impacts from changes in M/HD vehicle manufacturing and use, and from consumer re-spending of net utility revenue and fleet cost savings returned as lower prices for electricity and shipped goods. It does not include any effects on freight industry growth and investment due to lower operating costs, or any macroeconomic effects associated with the estimated climate and air quality (health) benefits of the modeled Clean Truck policy scenarios.

## *Required Public and Private Investments*

On the basis of a detailed charging model that considers typical daily usage patterns for different vehicle types, this analysis assumes that most M/HD ZEVs in New Jersey will use overnight charging at their place of business, though about 10 percent will need to rely on a publicly accessible network of higher-power chargers.[19] The exception are combination trucks, 70 percent of which are assumed to require high-power public chargers since they are used primarily for long-haul freight operations.

Table 4 summarizes estimated charging infrastructure required to support M/HD electric trucks and buses under the Clean Truck policy scenarios.

**Table 4** Projected Charging Infrastructure Required for Clean Truck Policy Scenarios

| Metric | | ACT Rule | | | 100 x 40 ZEV | | |
|---|---|---|---|---|---|---|---|
| | | 2035 | 2045 | 2050 | 2035 | 2045 | 2050 |
| Cumulative Charge Ports | Depot | 64,181 | 189,474 | 232,440 | 89,844 | 283,773 | 351,294 |
| | Public 150 kW | 814 | 2,388 | 2,964 | 1,159 | 3,591 | 4,491 |
| | Public 500 kW | 145 | 384 | 483 | 535 | 1,944 | 2,645 |
| Cumulative Investment, 2020$ (million) | Depot | $291 | $819 | $1,088 | $446 | $1,356 | $1,833 |
| | Public | $216 | $512 | $673 | $360 | $1,049 | $1,433 |

Depot chargers will need to be 10–50 kW per port depending on vehicle type. The smaller 150 kW public chargers are needed primarily to support single-unit freight trucks, while the higher-capacity 500 kW public chargers are needed mostly for combination trucks.

As of Jine 2021, there were 111 publicly accessible charging stations in the state of New Jersey with a total of 485 direct current fast-charging (DCFC) ports (>50 kW).[20] Almost 70 percent of these DCFC ports are Tesla superchargers that can be used only by Tesla owners. Statewide, there are only 136 DCFC ports fully available to any vehicle.

Under the ACT Rule policy scenario, New Jersey's fleet owners will have to invest an average of $43 million per year (2020$) between 2025 and 2050 to purchase and install depot-based charging infrastructure. The government and private investors will need to invest an average of $27 million per year over the same time period to build out a publicly accessible charging network across the state to serve the EV M/HD truck fleet.

Under the 100 x 40 ZEV scenario, fleet investments in depot charging infrastructure from 2025 to 2050 will need to increase to an average of $73 million per year, and public and private investments in the public charging network will need to rise to an average of $57 million per year.

19 See the methodology report for a detailed discussion of M/HD EV charging needs.

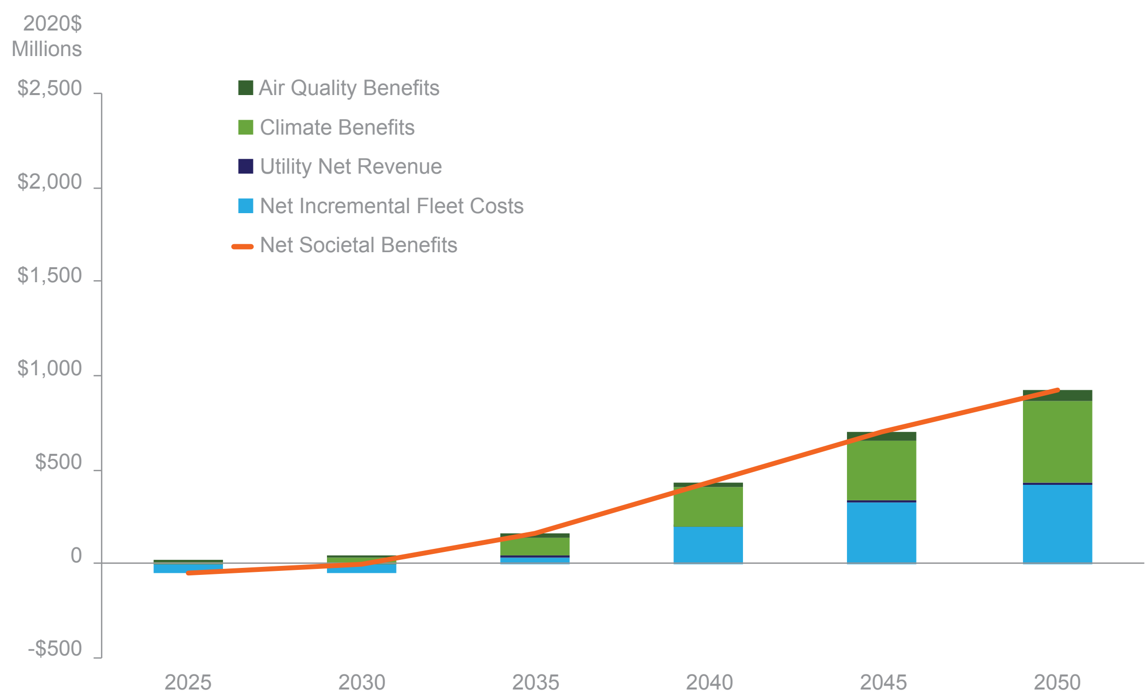
20 These numbers are from the U.S. Department of Energy's Alternative Fuel Data Center public charger database.

## *Net Societal Benefits*

The net societal benefits from the modeled New Jersey Clean Truck policy scenarios include the monetized value of public health and climate benefits, net cost savings for fleets, and net utility revenue from electricity sales for EV charging.

Figures 8–10 present projected annual net societal benefits under the ACT Rule, ACT + NOx Omnibus Rule, and 100 x 40 ZEV + Clean Grid scenarios, respectively. Under all three Clean Truck policy scenarios, near-term fleet costs are higher than fleet costs under the baseline.[21] However, after approximately 2030 all policy scenarios show annual net societal benefits, despite net fleet costs, due to growing utility net revenue in addition to public health and climate benefits. By 2035 under all three policy scenarios there is an annual net savings in fleet costs from operating ZEVs instead of diesel and gasoline trucks, and net societal benefits grow quickly.[22]

Figure 8 Projected Annual Net Societal Benefits From ACT Rule Policy Scenario




21 If an individual truck owner finances a vehicle, it would better equalize payments for increased vehicle price and fuel savings, resulting in a better balancing of cash flow. On a net fleet-wide basis, however, the cost of financing reduces total net fleet savings.

22 Note that fleet-wide annual net savings under the Clean Truck policy scenarios lag average ZEV life-cycle cost parity to combustion vehicles by about 5 years. This is because even after life-cycle cost parity is achieved, most ZEVs will still have higher up-front purchase costs (vehicle plus charger) than combustion vehicles; these higher costs are then paid back over the next few years via fuel and maintenance cost savings.

Figure 9 Projected Annual Net Societal Benefits From ACT + NOx Omnibus Policy Scenario

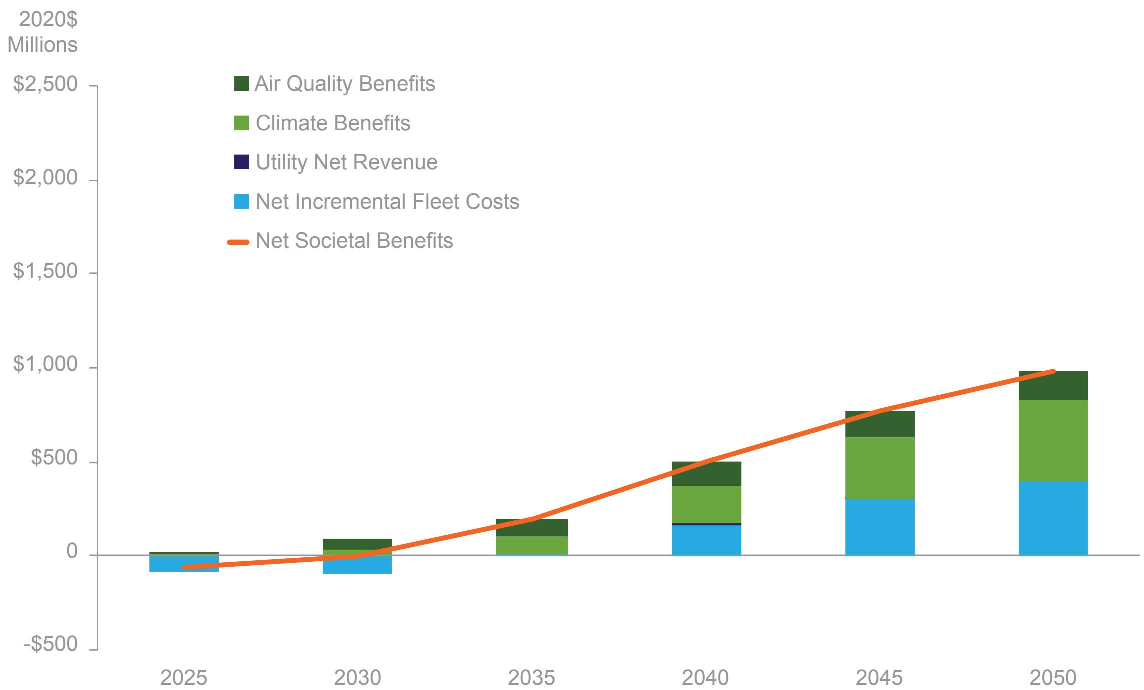
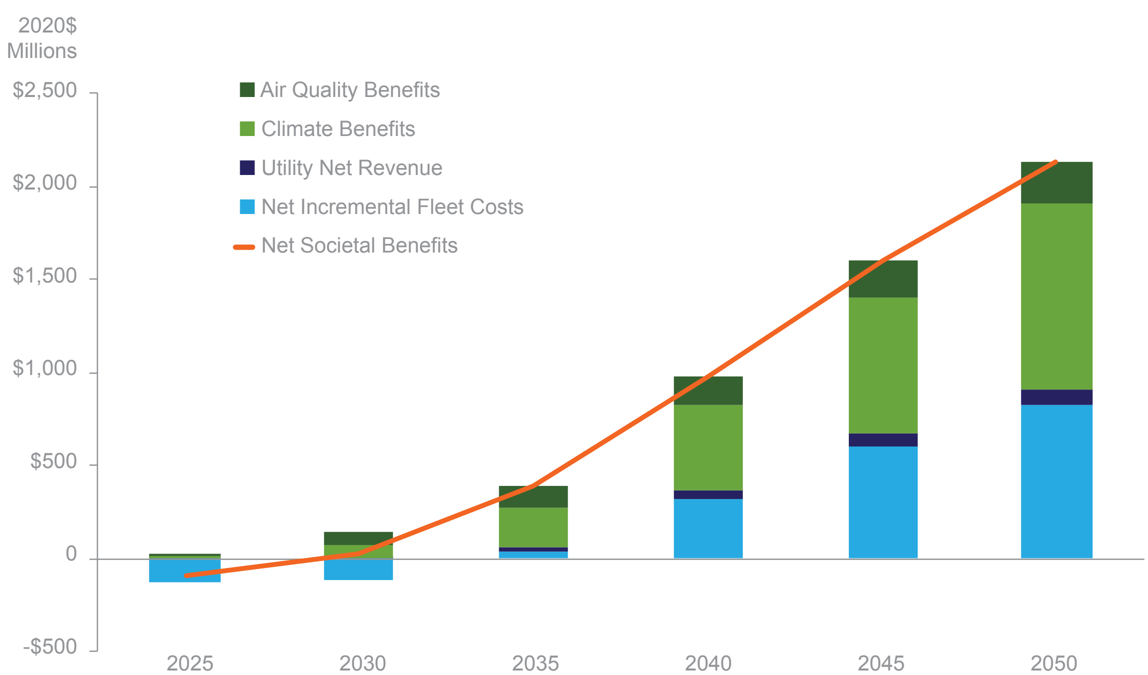



Figure 10 Projected Annual Net Societal Benefits From 100 x 40 ZEV + Clean Grid Policy Scenario



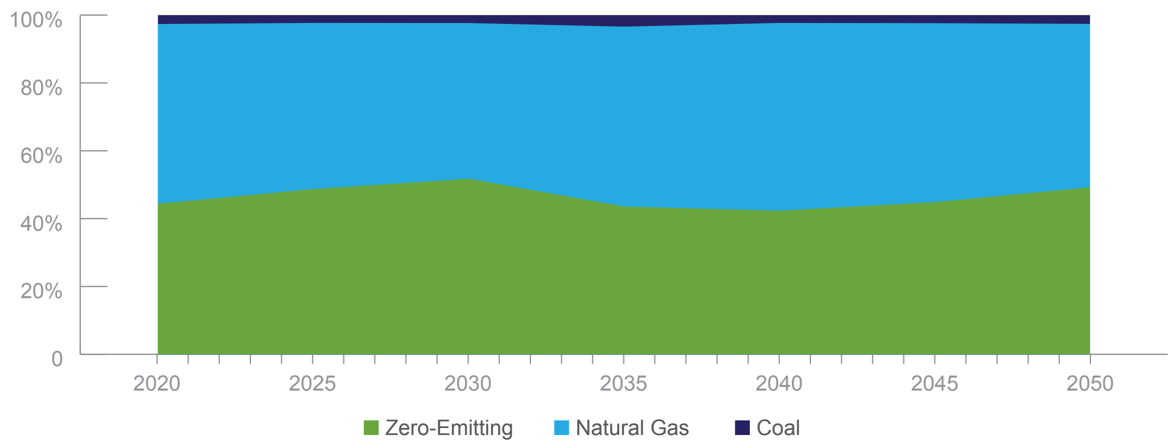
Under the ACT Rule scenario, by 2050 annual net societal benefits are estimated to be $920 million, including $421 million in net fleet savings and $5 million in utility net revenue. Cumulative estimated societal net benefits under this scenario total $8.9 billion between 2020 and 2050.

Under the ACT + NOx Omnibus scenario, by 2050 annual net societal benefits are estimated to be $979 million, including $394 million in net fleet savings and $5 million in utility net revenue. Cumulative estimated societal net benefits under this scenario total $9.8 billion between 2020 and 2050.

Under the 100 x 40 ZEV + Clean Grid scenario, by 2050 annual net societal benefits are estimated to be $2.1 billion, including $826 million in net fleet savings and $81 million in utility net revenue. Cumulative estimated societal net benefits under this scenario total $20.9 billion between 2020 and 2050.

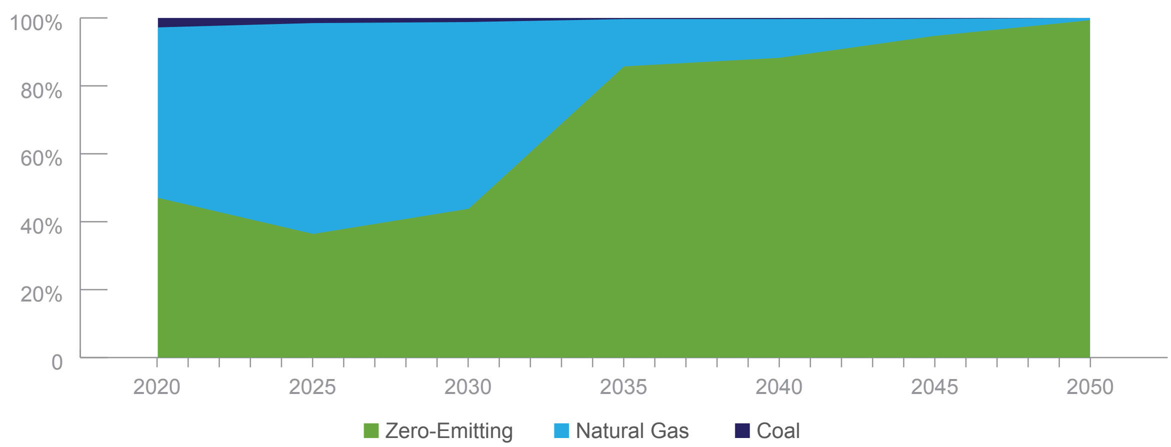
# APPENDIX
# New Jersey Grid and Energy Cost Assumptions

Figure A1 New Jersey Business as Usual Grid Mix Assumptions




These business-as-usual grid mix assumptions were applied to the baseline, ACT Rule, and ACT + NOx Omnibus policy scenarios.

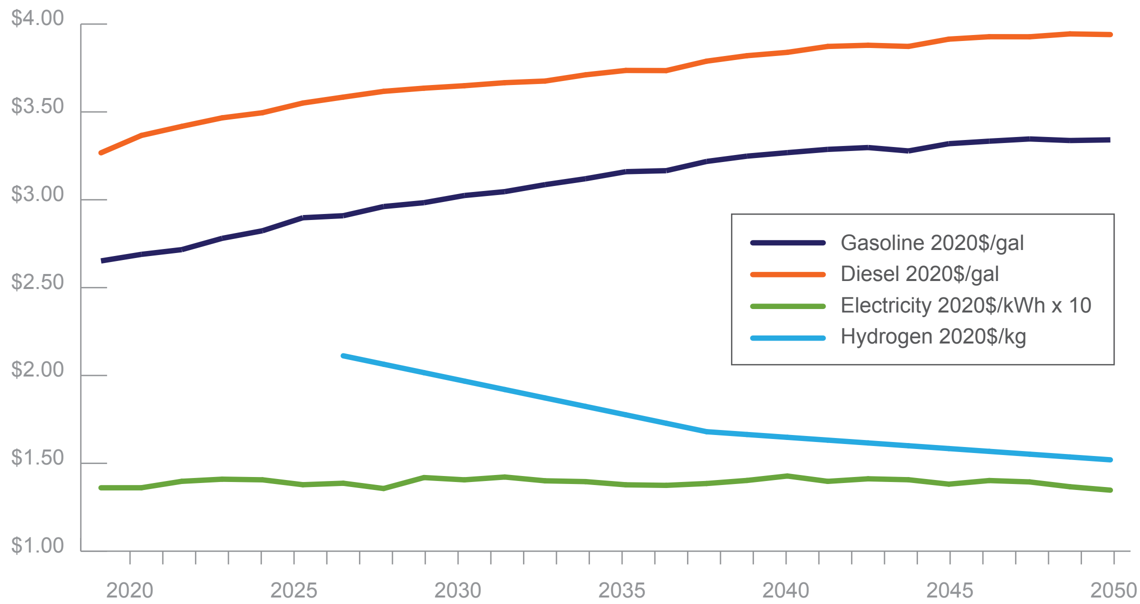
Figure A2 New Jersey Decarbonized Grid Mix Assumptions




These Decarbonized grid mix assumptions were applied to the 100 x 40 ZEV + Clean Grid policy scenario.

For simplicity, results from EPA's Integrated Planning Model for coal, oil, and biomass were combined under "coal," as noted in the accompanying methodology report. The zero-emitting category includes nuclear and renewable resources such as wind, solar, and hydropower. Analysis of new, state-specific electricity policies, such as from more stringent Renewable Portfolio Standards, was beyond the scope of this study but would be expected to increase the usage of these renewable resources.

Figure A3 New Jersey Average Fuel Costs



# Attachment 10

# California HVIP - Vehicles and Eligible Technologies



| Model | Category | OEM | Technology Type | Vehicle Incentives | Dealers | New or Conversion | Battery | Model Years | GVWR | Vehicle Types |
|---|---|---|---|---|---|---|---|---|---|---|
| Blue Bird Electric All American Bus – Activity | School Bus | Blue Bird | Battery Electric | $120,000 | A-Z Bus Sales, Inc. | New | 155 kWh | 2019, 2020, 2021 | 40 - 59 ft, Class 8 | Shuttle Bus, Transit Bus |
| Blue Bird Electric All American Bus – Activity | School Bus | Blue Bird | Battery Electric | $85,000 | A-Z Bus Sales, Inc. | New | 155 kWh | 2019, 2020, 2021 | 40 - 59 ft, Class 7 | Shuttle Bus, Transit Bus |
| Blue Bird Electric All American School Bus | School Bus | Blue Bird | Battery Electric | $198,000 | A-Z Bus Sales, Inc. | New | 150 kWh, 155 kWh | 2019, 2020, 2021 | Class 8 | Public School Bus |
| Blue Bird Electric All American School Bus | School Bus | Blue Bird | Battery Electric | $140,250 | A-Z Bus Sales, Inc. | New | 150 kWh, 155 kWh | 2019, 2020, 2021 | Class 7 | Public School Bus |
| Blue Bird Electric Vision Bus – Activity | School Bus | Blue Bird | Battery Electric | $85,000 | A-Z Bus Sales, Inc. | New | 155 kWh | 2019, 2020, 2021 | 30 - 39 ft, Class 6, Class 7 | Shuttle Bus, Transit Bus |
| Blue Bird Electric Vision School Bus | School Bus | Blue Bird | Battery Electric | $140,250 | A-Z Bus Sales, Inc. | New | 155 kWh | 2020, 2021 | Class 6, Class 7 | Public School Bus |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| BYD 6DR Class 6 Step Van Retrofit | Step & Panel Van | BYD Motors | Battery Electric | $42,500 | BYD Motors | New | | 2020 | Class 6 | Retrofit |
| BYD 6F Cab-Forward Truck | Straight Truck | BYD Motors | Battery Electric | $85,000 | BYD Motors | New | 221 kWh | 2020 | Class 6 | Straight Truck |
| BYD 6R Long Range Class 6 Battery-Electric Cab Chassis | Straight Truck | BYD Motors | Battery Electric | $85,000 | BYD Motors | New | 221 kWh | 2020 | Class 6 | Straight Truck |
| BYD 8R Class 8 Refuse Truck | Refuse | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 295 kWh | 2019, 2020 | Class 8 | Refuse |
| BYD 8TT Tandem-Axle Tractor | Tractor | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | | 2019, 2020 | Class 8 | Drayage Capable*, Tractor |
| BYD C10M 45? All-Electric Coach Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 446 kWh | 2020 | > 40 ft, Class 8 | Coach Bus |
| BYD C10MS 45? All-Electric Double-Decker Coach Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 446 kWh | 2019, 2020 | > 40 ft, Class 8 | Coach Bus |
| BYD C6M 23? All-Electric Coach Bus | Medium-Duty Bus | BYD Motors | Battery Electric | $60,000 | BYD Motors | New | 121 kWh | 2019, 2020 | 20 - 24 ft, Class 4, Class 5 | Coach Bus |
| BYD C8M 35? All-Electric Coach Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 313 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Coach Bus |
| BYD C9M 40? All-Electric Coach Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 352 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Coach Bus |

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|---|---|---|---|---|---|---|---|---|---|---|
| BYD K11M 60? Articulated All-Electric Transit Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 578 kWh 652 kWh | 2019, 2020 | > 40 ft, Class 8 | Transit Bus |
| BYD K7M 30? All-Electric Transit Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $85,000 | BYD Motors | New | 180 kWh, 196 kWh | 2020 | 30 - 39 ft, Class 7 | Transit Bus |
| BYD K7M-ER 30? All-Electric Transit Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $85,000 | BYD Motors | New | 180 kWh | 2020 | 30 - 39 ft, Class 7 | Shuttle Bus |
| BYD K9M 40? All-Electric Transit Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 324 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| BYD K9S 35? All-Electric Transit Bus | Heavy-Duty Bus | BYD Motors | Battery Electric | $120,000 | BYD Motors | New | 266 kWh, 350 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| ElDorado National AXESS 35? Fuel Cell Hybrid Transit Bus | Heavy-Duty Bus | ElDorado National | Hydrogen Fuel Cell | $240,000 | Creative Bus Sales, ElDorado National California | New | | 2019 | 30 - 39 ft, Class 8 | Transit Bus |
| ElDorado National AXESS 40? Fuel Cell Hybrid Transit Bus | Heavy-Duty Bus | ElDorado National | Hydrogen Fuel Cell | $240,000 | Creative Bus Sales, ElDorado National California | New | | 2019 | 30 - 39 ft, Class 8 | Transit Bus |
| EVT C Series 4×2 | Step & Panel Van | Envirotech Drive Systems Incorporated | Battery Electric | $60,000 | ADOMANI ZEV Sales, Inc. | New | 106.2 kWh, 90.8 kWh | 2019 | Class 4 | Panel Van |

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|---|---|---|---|---|---|---|---|---|---|---|
| EVT C Series Cutaway, Urban Cab Over | Straight Truck | Envirotech Drive Systems Incorporated | Battery Electric | $60,000 | ADOMANI ZEV Sales, Inc. | New | 77.8 kWh | 2019 | Class 4 | Straight Truck |
| Freightliner eCascadia Battery Electric Truck | Tractor | Freightliner | Battery Electric | $120,000 | Excel Truck Group, Houston Freightliner, Inc., Peach State Freightliner, Premier Truck Group of Salt Lake City, Truck Country of Iowa, Inc., Velocity Truck Centers | New | 475 kWh | 2020, 2021 | Class 8 | Drayage Capable*, Tractor |
| Freightliner eM2 Battery Electric Truck | Straight Truck | Freightliner | Battery Electric | $85,000 | Excel Truck Group, Houston Freightliner, Inc., Peach State Freightliner, Premier Truck Group of Salt Lake City, Truck Country of Iowa, Inc., Velocity Truck Centers | New | 315 kWh | 2020, 2021 | Class 6, Class 7 | Straight Truck |
| Freightliner MT50e Battery Electric Truck | Step & Panel Van | Freightliner | Battery Electric | $60,000 | Premier Truck Group of Salt Lake City, Velocity Truck Centers | New | 220 kWh | 2020 | Class 5 | Step Van, Straight Truck |
| Freightliner MT50e Battery Electric Truck | Step & Panel Van | Freightliner | Battery Electric | $85,000 | Premier Truck Group of Salt Lake City, Velocity Truck Centers | New | 220 kWh | 2020 | Class 6, Class 7 | Step Van, Straight Truck |
| Gillig 29? ePlus Battery Electric Low Floor Bus | Heavy-Duty Bus | Gillig | Battery Electric | $120,000 | Gillig | New | 296 kWh | 2020 | 25 - 29 ft, Class 8 | Transit Bus |
| Gillig 35? ePlus Battery Electric Low Floor Bus | Heavy-Duty Bus | Gillig | Battery Electric | $120,000 | Gillig | New | 444 kWh | 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| Gillig 40? ePlus Battery Electric Low Floor Bus | Heavy-Duty Bus | Gillig | Battery Electric | $120,000 | Gillig | New | 444 kWh | 2020 | 40 - 59 ft, Class 8 | Transit Bus |

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|---|---|---|---|---|---|---|---|---|---|---|
| GreenPower EV Star CarGo | Step & Panel Van | GreenPower Motor Company | Battery Electric | $60,000 | GreenPower Motor Company | New | 118 kWh | 2019, 2020, 2021 | Class 4 | Panel Van |
| GreenPower EV Star Cargo Plus | Straight Truck | GreenPower Motor Company | Battery Electric | $60,000 | GreenPower Motor Company | New | 118 kWh | 2021 | Class 4 | Straight Truck |
| GreenPower EV Star CC | Straight Truck | GreenPower Motor Company | Battery Electric | $60,000 | GreenPower Motor Company | New | 118 kWh | 2021 | Class 4 | Straight Truck |
| GreenPower EV Star Min-eBus | Medium-Duty Bus | GreenPower Motor Company | Battery Electric | $60,000 | Creative Bus Sales, GreenPower Motor Company | New | 118 kWh | 2019, 2020, 2021 | Class 4 | Shuttle Bus |
| GreenPower EV Star Plus | Medium-Duty Bus | GreenPower Motor Company | Battery Electric | $60,000 | GreenPower Motor Company | New | 118 kWh | 2020, 2021 | Class 4 | Paratransit, Shuttle Bus |
| GreenPower EV250 – 30? Low Floor Transit Bus | Heavy-Duty Bus | GreenPower Motor Company | Battery Electric | $120,000 | Creative Bus Sales, GreenPower Motor Company | New | 210 kWh | 2019, 2020, 2021 | 30 - 39 ft, Class 8 | Transit Bus |
| GreenPower EV350 – 40? Low Floor Transit Bus | Heavy-Duty Bus | GreenPower Motor Company | Battery Electric | $120,000 | Creative Bus Sales, GreenPower Motor Company | New | 320 kWh | 2019, 2020, 2021 | 40 - 59 ft, Class 8 | Transit Bus |
| GreenPower EV550 – 45? Double Decker Bus | Heavy-Duty Bus | GreenPower Motor Company | Battery Electric | $120,000 | Creative Bus Sales, GreenPower Motor Company | New | 478 kWh | 2019, 2020, 2021 | > 40 ft, Class 8 | Transit Bus |
| GreenPower SYNAPSE Shuttle Bus | Heavy-Duty Bus | GreenPower Motor Company | Battery Electric | $120,000 | Creative Bus Sales, GreenPower Motor Company | New | 200 kWh | 2019, 2020, 2021 | 30 - 39 ft, Class 8 | Shuttle Bus, Transit Bus |
| Kenworth K270E Battery Electric Truck | Straight Truck | Kenworth | Battery Electric | $85,000 | Inland-Kenworth US, NorCal Kenworth, Pape Kenworth | New | 141 kWh 282 kWh | 2020 | Class 7 | Straight Truck |

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|---|---|---|---|---|---|---|---|---|---|---|
| Kenworth K370E Battery Electric Truck | Straight Truck | Kenworth | Battery Electric | $85,000 | Inland-Kenworth US, Pape Kenworth | New | 141 kWh 282 kWh | 2020 | Class 7 | Straight Truck |
| Kenworth T680E Battery Electric Truck | Tractor | Kenworth | Battery Electric | $120,000 | Inland-Kenworth US, NorCal Kenworth, Pape Kenworth | New | 396 kWh | 2020 | Class 8 | Drayage Capable*, Tractor |
| Lightning Systems Coach Bus LEV Repower | Heavy-Duty Bus | Lightning Systems | Battery Electric | $60000 | Lightning Systems | Conversion | 640 kWh | 2021 | Class 8 | Coach Bus, Retrofit |
| Lightning Systems FE4-86/129 Bus (Ford E-450 with Lightning Electric Powertrain) | Medium-Duty Bus | Lightning Systems | Battery Electric | $60,000 | A-Z Bus Sales, Inc., Lightning Systems, Midway Ford Truck Center | New | 129 kWh, 86 kWh | 2019, 2020, 2021 | 25 - 29 ft, Class 4 | Paratransit, Shuttle Bus |
| Lightning Systems FE4-86/129 Truck (Ford E-450 with Lightning Electric Powertrain) | Straight Truck | Lightning Systems | Battery Electric | $60,000 | Lightning Systems, Midway Ford Truck Center | New | 129 kWh, 86 kWh | 2019, 2020, 2021 | Class 4 | Straight Truck |
| Lightning Systems FF5-128/160 Bus (Ford F-550 with Lightning Electric Powertrain) | Medium-Duty Bus | Lightning Systems | Battery Electric | $60,000 | A-Z Bus Sales, Inc., Lightning Systems, Midway Ford Truck Center | New | 128 kWh, 160 kWh | 2019, 2020, 2021 | 30 - 39 ft, Class 5 | Paratransit, Shuttle Bus |
| Lightning Systems FF59-96/128 Step Van (Ford F-59 with Lightning Electric Powertrain) | Step & Panel Van | Lightning Systems | Battery Electric | $85,000 | Lightning Systems, Midway Ford Truck Center | New | 96 kWh, 128 kWh | 2019 | Class 6 | Step Van |
| Lightning Systems FT3-43/86 Bus (Ford Transit T-350 with Lightning Electric Powertrain) | Medium-Duty Bus | Lightning Systems | Battery Electric | $45,000 | A-Z Bus Sales, Inc., Lightning Systems, Midway Ford Truck Center | New | 43 kWh, 86 kWh | 2019, 2020, 2021 | 20 - 24 ft, Class 3 | Paratransit, Shuttle Bus |
| Lightning Systems FT3-43/86 Cargo Van (Ford Transit T-350 with Lightning Electric Powertrain) | Step & Panel Van | Lightning Systems | Battery Electric | $45,000 | A-Z Bus Sales, Inc., Lightning Systems, Midway Ford Truck Center | New | 43 kWh, 86 kWh | 2019, 2020, 2021 | Class 3 | Panel Van |

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|---|---|---|---|---|---|---|---|---|---|---|
| Lightning Systems G65-96/128/160/192 Truck (Chevrolet/Isuzu 6500XD LCF with Lightning Electric Powertrain) | Straight Truck | Lightning Systems | Battery Electric | $85,000 | Forest City Auto Center, Lightning Systems, Midway Ford Truck Center | New | 96 kWh, 128 kWh, 160 kWh, 192 kWh | 2019, 2020 | Class 6 | Straight Truck |
| Lion Electric LION6 Battery Electric Truck | Straight Truck | Lion Electric | Battery Electric | $85,000 | The Lion Electric Co. | New | Up to 252 kWh | 2021 | Class 6 | Straight Truck |
| Lion Electric Lion8P Battery Electric Straight Truck | Straight Truck | Lion Electric | Battery Electric | $120,000 | The Lion Electric Co. | New | 336 kWh | 2019, 2021 | Class 8 | Straight Truck |
| Lion Electric Lion8T Battery Electric Truck | Tractor | Lion Electric | Battery Electric | $120,000 | The Lion Electric Co. | New | 653 kWh | 2021 | Class 8 | Drayage Capable*, Tractor |
| Lion Electric LIONA Mini School Bus | School Bus | Lion Electric | Battery Electric | $140,250 | The Lion Electric Co. | New | Up to 168 kWh | 2019, 2020, 2021 | Class 6 | Public School Bus |
| Lion Electric LIONC School Bus | School Bus | Lion Electric | Battery Electric | $140,250 | The Lion Electric Co. | New | 126 kWh, 168 kWh, 210 kWh | 2019, 2020, 2021 | Class 6, Class 7 | Public School Bus |
| Lion Electric LIOND School Bus | School Bus | Lion Electric | Battery Electric | $198,000 | The Lion Electric Co. | New | Up to 210 kWh | 2019, 2020, 2021 | Class 8 | Public School Bus |
| Lion Electric LIONM Paratransit Bus | Medium-Duty Bus | Lion Electric | Battery Electric | $85,000 | The Lion Electric Co. | New | 160 kWh, 80 kWh | 2020 | Class 6 | Paratransit |
| Lion Electric LIONM Shuttle Bus | Medium-Duty Bus | Lion Electric | Battery Electric | $85,000 | The Lion Electric Co. | New | | 2020 | Class 6 | Shuttle Bus |

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| Mack LR Electric | Refuse | Mack Trucks | Battery Electric | $120,000 | Affinity Truck Center, TEC of California, Inc. | New | 264 kWh | 2021 | Class 8 | Refuse, Straight Truck |
| Micro Bird D-Series Electric Shuttle Bus on E450 Platform | Medium-Duty Bus | Micro Bird | Battery Electric | $60,000 | A-Z Bus Sales, Inc. | New | 88 kWh | 2019, 2021 | Class 4 | Shuttle Bus |
| Micro Bird G5 Electric School Bus on E450 Platform | School Bus | Micro Bird | Battery Electric | $99,000 | A-Z Bus Sales, Inc. | New | 88 kWh | 2019, 2021 | Class 4, Class 5 | Public School Bus |
| Motiv E-450 – Box Truck | Straight Truck | Motiv Power Systems | Zero Emission | $60,000 | Bergey's Ford, Inc, Big Valley Ford Lincoln, Larry H. Miller Ford - Draper, South Bay Ford | New | 127 kWh | 2021 | Class 4 | Straight Truck |
| Motiv E-450 – Utility Truck | Straight Truck | Motiv Power Systems | Zero Emission | $60,000 | Bergey's Ford, Inc, Big Valley Ford Lincoln, Larry H. Miller Ford - Draper, South Bay Ford | New | 127 kWh | 2021 | Class 4 | Straight Truck, Utility |
| Motiv on F-53 Platform – Hometown Trolley | Medium-Duty Bus | Motiv Power Systems | Zero Emission | $85,000 | Creative Bus Sales | New | 127 kWh | 2020, 2021 | Class 6 | Shuttle Bus |
| Motiv on Ford E-450 Platform – School Bus | School Bus | Motiv Power Systems | Zero Emission | $99,000 | A-Z Bus Sales, Inc., Creative Bus Sales | New | 127 kWh | 2019, 2020, 2021 | Class 4 | Public School Bus |
| Motiv on Ford E-450 Platform – Shuttle Bus | Medium-Duty Bus | Motiv Power Systems | Zero Emission | $60,000 | A-Z Bus Sales, Inc., Creative Bus Sales, RO Bus Sales | New | 127 kWh | 2019, 2020, 2021 | Class 4 | Paratransit, Shuttle Bus |
| Motiv on Ford E-450 Platform – Step Van | Step & Panel Van | Motiv Power Systems | Zero Emission | $60,000 | Bergey's Ford, Inc, Big Valley Ford Lincoln, Larry H. Miller Ford - Draper, South Bay Ford | New | 127 kWh | 2019, 2021 | Class 4 | Step Van |

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|---|---|---|---|---|---|---|---|---|---|---|
| Motiv on Ford F-53 Platform – Winnebago | Medium-Duty Bus | Motiv Power Systems | Zero Emission | $85,000 | Big Valley Ford Lincoln, South Bay Ford | New | 127 kWh | 2019, 2020, 2021 | Class 6 | Shuttle Bus |
| Motiv on Ford F-59 Platform – Step Van | Step & Panel Van | Motiv Power Systems | Zero Emission | $60,000 | Bergey's Ford, Inc, Big Valley Ford Lincoln, Larry H. Miller Ford - Draper, South Bay Ford, Work Truck Direct | New | 127 kWh | 2020, 2021 | Class 5 | Step Van |
| Motiv on Ford F-59 Platform – Step Van | Step & Panel Van | Motiv Power Systems | Zero Emission | $85,000 | Bergey's Ford, Inc, Big Valley Ford Lincoln, Larry H. Miller Ford - Draper, South Bay Ford, Work Truck Direct | New | 127 kWh | 2019, 2020, 2021 | Class 6 | Step Van |
| Motor Coach Industries D45 CRTe Battery Electric Bus | Heavy-Duty Bus | Motor Coach Industries | Battery Electric | $120,000 | Motor Coach Industries | New | 544 kWh | 2020 | 40 - 59 ft, Class 8 | Coach Bus, Shuttle Bus, Transit Bus |
| Motor Coach Industries D45 CRTe LE Battery Electric Bus | Heavy-Duty Bus | Motor Coach Industries | Battery Electric | $120,000 | Motor Coach Industries | New | 389 kWh | 2020 | 40 - 59 ft, Class 8 | Coach Bus, Shuttle Bus, Transit Bus |
| Motor Coach Industries J4500e Battery Electric Bus | Heavy-Duty Bus | Motor Coach Industries | Battery Electric | $120,000 | Motor Coach Industries | New | 544 kWh | 2020 | 40 - 59 ft, Class 8 | Coach Bus, Shuttle Bus, Transit Bus |
| Navistar (IC) CE Electric School Bus | School Bus | Navistar IC Bus | Battery Electric | $140,250 | Creative Bus Sales | New | 296 kWh | 2020, 2021 | Class 7 | Public School Bus |
| New Flyer Fuel Cell Electric XHE40 Transit Bus | Heavy-Duty Bus | New Flyer | Hydrogen Fuel Cell | $240,000 | New Flyer of America | New | 100 kWh | 2019 | 30 - 39 ft, Class 8 | Transit Bus |

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|---|---|---|---|---|---|---|---|---|---|---|
| New Flyer Fuel Cell Electric XHE60 Transit Bus | Heavy-Duty Bus | New Flyer | Hydrogen Fuel Cell | $240,000 | New Flyer of America | New | 150 kWh | 2019 | > 40 ft, Class 8 | Transit Bus |
| New Flyer XCELSIOR XE 35? All-Electric Transit Bus | Heavy-Duty Bus | New Flyer | Battery Electric | $120,000 | New Flyer of America | New | | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| New Flyer XCELSIOR XE 40 All-Electric Transit Bus | Heavy-Duty Bus | New Flyer | Battery Electric | $120,000 | New Flyer of America | New | | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| New Flyer XCELSIOR XE 60 Transit Bus | Heavy-Duty Bus | New Flyer | Battery Electric | $120,000 | New Flyer of America | New | | 2019, 2020 | > 40 ft, Class 8 | Transit Bus |
| Peterbilt 220EV Battery Electric Truck | Straight Truck | Peterbilt | Battery Electric | $85,000 | Arata Equipment Co., Coast Counties Peterbilt, Dobbs Peterbilt, Golden State Peterbilt, Heil Environmental, Rush Truck Centers | New | 141 kWh 209 kWh 282 kWh | 2020 | Class 7 | Straight Truck |
| Peterbilt 520EV Battery Electric Truck | Refuse | Peterbilt | Battery Electric | $120,000 | Arata Equipment Co., Coast Counties Peterbilt, Dobbs Peterbilt, Golden State Peterbilt, Heil Environmental, Rush Truck Centers | New | 396 kWh | 2020 | Class 8 | Refuse, Straight Truck |
| Peterbilt 579EV Battery Electric Truck | Tractor | Peterbilt | Battery Electric | $120,000 | Arata Equipment Co., Coast Counties Peterbilt, Dobbs Peterbilt, Golden State Peterbilt, Heil Environmental, Rush Truck Centers | New | 396 kWh | 2020 | Class 8 | Drayage Capable*, Tractor |

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| Phoenix Motorcars E450 Chassis | Straight Truck | Phoenix | Battery Electric | $60,000 | Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2020 | Class 4 | Straight Truck |
| Phoenix Motorcars ZEUS 300 Passenger Shuttle | Medium-Duty Bus | Phoenix | Battery Electric | $60,000 | Creative Bus Sales, Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2019 | Class 4 | Shuttle Bus |
| Phoenix Motorcars ZEUS 400 Shuttle | Medium-Duty Bus | Phoenix | Battery Electric | $60,000 | Creative Bus Sales, Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2019, 2020 | 25 - 29 ft, Class 4 | Shuttle Bus |
| Phoenix Motorcars ZEUS 400 Transit Bus | Medium-Duty Bus | Phoenix | Battery Electric | $60,000 | Creative Bus Sales, Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2020 | 25 - 29 ft, Class 4 | Paratransit, Shuttle Bus |
| Phoenix Motorcars ZEUS 500 Cargo Truck | Straight Truck | Phoenix | Battery Electric | $60,000 | Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2020 | Class 4 | Straight Truck |

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|---|---|---|---|---|---|---|---|---|---|---|
| Phoenix Motorcars ZEUS 500 Flatbed Truck | Straight Truck | Phoenix | Battery Electric | $60,000 | Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2019, 2020 | Class 4 | Straight Truck |
| Phoenix Motorcars ZEUS 500 Utility Truck | Straight Truck | Phoenix | Battery Electric | $60,000 | Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2019, 2020 | Class 4 | Straight Truck, Utility |
| Phoenix Motorcars ZEUS 600 Type A School Bus | School Bus | Phoenix | Battery Electric | $90,000 | Creative Bus Sales, Phoenix Electric Sales | New | 63 kWh, 94 kWh, 125 kWh, 156 kWh | 2019, 2020 | Class 4 | Public School Bus |
| Proterra 35? Catalyst E2 | Heavy-Duty Bus | Proterra | Battery Electric | $120,000 | Proterra | New | 440 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| Proterra 35? Catalyst XR | Heavy-Duty Bus | Proterra | Battery Electric | $120,000 | Proterra | New | 220 kWh | 2019, 2020 | 30 - 39 ft, Class 8 | Transit Bus |
| Proterra 40? Catalyst E2 | Heavy-Duty Bus | Proterra | Battery Electric | $120,000 | Proterra | New | 440 kWh | 2019, 2020 | 40 - 59 ft, Class 8 | Transit Bus |

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|---|---|---|---|---|---|---|---|---|---|---|
| Proterra 40? Catalyst E2 Max | Heavy-Duty Bus | Proterra | Battery Electric | $120,000 | Proterra | New | 660 kWh | 2019, 2020 | 40 - 59 ft, Class 8 | Transit Bus |
| Proterra 40? Catalyst XR | Heavy-Duty Bus | Proterra | Battery Electric | $120,000 | Proterra | New | 220 kWh | 2019, 2020 | 40 - 59 ft, Class 8 | Transit Bus |
| ROUSH CleanTech Ford F-650 Battery Electric Vehicle | Straight Truck | ROUSH CleanTech | Battery Electric | $85,000 | Bergey's Ford, Inc,<br>Big Valley Ford Lincoln,<br>Midway Ford Truck Center,<br>Peach State Freightliner,<br>Rush Truck Centers,<br>South Bay Ford,<br>Tom's Truck Center,<br>Velocity Truck Centers | new | 138 kWh | 2020 | Class 6 | Straight Truck, Utility |
| SEA 155 EV on HINO 155 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 4 | Straight Truck |
| SEA 195 EV on HINO 195 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 4, Class 5 | Straight Truck |
| SEA 238 EV on HINO 238 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 6 | Straight Truck |
| SEA 258 EV on HINO 258 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 6 | Straight Truck |
| SEA 268 EV on HINO 268 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 6 | Straight Truck |
| SEA 338 EV on HINO 338 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric,<br>Tom's Truck Center | New | 136 kWh | 2020 | Class 7 | Straight Truck |

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| SEA 4500 EV on GM 4500 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | Forest City Auto Center, SEA Electric | New | 136 kWh | 2020 | Class 4 | Straight Truck |
| SEA 5500 EV on GM 5500 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | Forest City Auto Center, SEA Electric | New | 136 kWh | 2020 | Class 5 | Straight Truck |
| SEA 6500 EV on GM 6500 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | Forest City Auto Center, SEA Electric | New | 136 kWh | 2020 | Class 6 | Straight Truck |
| SEA E-450 EV on FORD E-450 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | A-Z Bus Sales, Inc., Nations Bus Corporation | New | 100 kWh | 2020 | Class 4 | Shuttle Bus |
| SEA F-450 EV on FORD F-450 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, Tom's Truck Center | New | 136 kWh | 2020 | Class 4 | Shuttle Bus, Straight Truck |
| SEA F-550 EV on FORD F-550 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, Tom's Truck Center | New | 138 kWh | 2020 | Class 5 | Shuttle Bus |
| SEA F-650 EV on FORD F-650 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric, Tom's Truck Center | New | 160 kWh | 2020 | Class 6 | Shuttle Bus |
| SEA F-750 EV on FORD F-750 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $120,000 | SEA Electric, Tom's Truck Center | New | 160 kWh | 2020 | Class 8 | Straight Truck |
| SEA F53 EV on FORD F-53 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, South Bay Ford, Tom's Truck Center | New | 136 kWh | 2020 | Class 5 | Straight Truck |
| SEA F53 EV on FORD F-53 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric, South Bay Ford, Tom's Truck Center | New | 136 kWh | 2020 | Class 6 | Straight Truck |

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|---|---|---|---|---|---|---|---|---|---|---|
| SEA F59 EV on FORD F-59 with SEA-DRIVE® Power System | Step & Panel Van | SEA Electric | Battery Electric | $85,000 | SEA Electric, South Bay Ford, Tom's Truck Center | New | 136 kWh | 2020 | Class 6 | Step Van, Straight Truck |
| SEA FTR EV on ISUZU FTR with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric, Tom's Truck Center | New | 160 kWh | 2020 | Class 6 | Straight Truck |
| SEA M2 106 EV-on Freightliner M2 106 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $120,000 | SEA Electric | New | 216 kWh | 2020 | Class 8 | Straight Truck |
| SEA MT45 EV-on Freightliner MT45 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric | New | 136 kWh | 2020 | Class 4, Class 5 | Straight Truck |
| SEA MT55 EV-on Freightliner MT55 with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $85,000 | SEA Electric | New | 136 kWh | 2020 | Class 7 | Straight Truck |
| SEA NPR EV on ISUZU NPR with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, Tom's Truck Center | New | 136 kWh | 2020 | Class 4 | Straight Truck |
| SEA NQR EV on ISUZU NQR with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, Tom's Truck Center | New | 136 kWh | 2020 | Class 5 | Straight Truck |
| SEA NRR EV on ISUZU NRR with SEA-DRIVE® Power System | Straight Truck | SEA Electric | Battery Electric | $60,000 | SEA Electric, Tom's Truck Center | New | 136 kWh | 2020 | Class 4, Class 5 | Straight Truck |
| Thomas Built eC2 Jouley School Bus | School Bus | Thomas Built | Battery Electric | $140,250 | BusWest | New | 226 kWh | 2019, 2020 | Class 7 | Public School Bus |

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|---|---|---|---|---|---|---|---|---|---|---|
| Van Hool NV CX45E Battery Electric Bus | Heavy-Duty Bus | Van Hool NV | Battery Electric | $120,000 | ABC Bus, Inc. | New | 676 kWh | 2020, 2021 | Class 8 | Coach Bus, Shuttle Bus, Transit Bus |
| Volvo VNR Electric | Tractor | Volvo | Battery Electric | $120,000 | Affinity Truck Center, TEC of California, Inc. | New | 264 kWh | 2021 | Class 8 | Drayage Capable*, Tractor |
| Volvo VNR Electric Straight Truck | Straight Truck | Volvo | Battery Electric | $85,000 | Affinity Truck Center, TEC of California, Inc. | New | 336 kWh | 2021 | Class 7 | Straight Truck |
| Workhorse C-1000 Extended Range Battery Electric Step Van | Step & Panel Van | Workhorse Group Inc. | Battery Electric | $45,000 | Workhorse Technologies Inc. | New | 105 kWh | 2020, 2021 | Class 3 | Step Van |
| Workhorse C-1000 Standard Range Battery Electric Step Van | Step & Panel Van | Workhorse Group Inc. | Battery Electric | $45,000 | Workhorse Technologies Inc. | New | 70.4 kWh | 2020, 2021 | Class 3 | Step Van |
| Workhorse C-650 Extended Range Battery Electric Step Van | Step & Panel Van | Workhorse Group Inc. | Battery Electric | $45,000 | Workhorse Technologies Inc. | New | 70 kWh | 2020, 2021 | Class 3 | Step Van |
| Workhorse C-650 Standard Range Battery Electric Step Van | Step & Panel Van | Workhorse Group Inc. | Battery Electric | $45,000 | Workhorse Technologies Inc. | New | 35 kWh | 2020 | Class 3 | Step Van |
| Xos SV01 Battery-Electric Truck | Step & Panel Van | Xos | Battery Electric | $85,000 | Rivordak | New | 90 kWh, 120 kWh, 150 kWh, 180 kWh | 2019, 2020 | Class 6 | Step Van |

# Attachment 11

International Energy Analysis Department
Energy Analysis and Environmental Impacts Division
Lawrence Berkeley National Laboratory

# Why Regional and Long-Haul Trucks are Primed for Electrification Now

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March 2021

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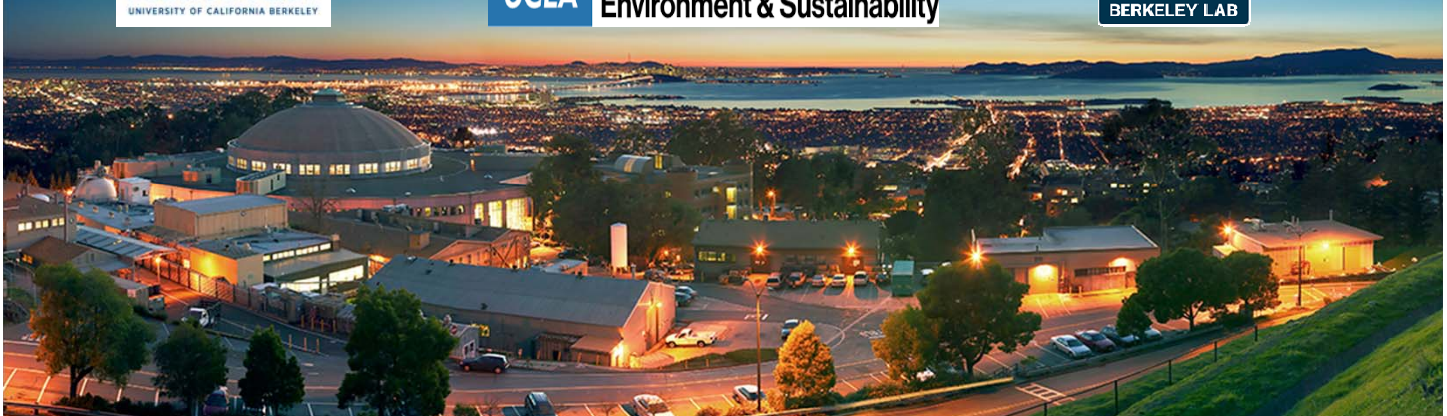

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**Why regional/long-haul trucks are primed for electrification now**

A. Phadke[*], A. Khandekar[*], N. Abhyankar[*], D. Wooley[#], D. Rajagopal[&,%]

## Abstract

Zero emission freight trucks are needed to both improve public health and reduce global greenhouse gas emissions but at the same time are generally believed to be uneconomical. However, recent dramatic declines in battery prices and improvement in their energy density have created opportunities for battery-electric trucking today that were seldom anticipated just a few years ago. At the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about 13% lower total cost of ownership (TCO) per mile, about 3-year payback and net present savings of about US $200,000 over a 15-year lifetime. This is achieved with only a 3% reduction in payload capacity. Even this small penalty can be reversed cost-effectively through light-weighting, in any case, only matters for a small fraction of trucks which regularly utilize their maximum payload. Electric trucks appear poised to also meet the performance demands for a large share of regional and long-haul trucking today. The estimated average distance traveled between 30-minute driver breaks is 150 miles and 190 miles for regional-haul and long-haul trucks respectively in the US. Thirty minutes of charging using 500 kW or mega-Watt scale fast-chargers would add sufficient range without impairing operations and economics of freight movement. However, as with almost any clean technology, higher upfront capital costs of both vehicles and charging infrastructure are major barriers when electric trucking is in its infancy. Without strong policy support, coordinated investments in both vehicle manufacturing and fuel infrastructure will not be forthcoming on the scale needed to harness the true potential of battery electric trucks.

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## Executive Summary

Globally, heavy-duty vehicles (primarily trucks) are estimated to comprise only about 11% of the motor vehicles, yet account for close of half the total $CO_2$ emissions from motor vehicles and 71% of vehicle particulate emissions (PM) (Kodjak, 2015). The latter are responsible for the vast majority of air pollution related deaths worldwide ( Landrigan et al., 2017) . Furthermore, low-income communities everywhere bear a disproportionate proportion of the health burden from freight movement. For instance, it is estimated that in California, African American, Latino, and Asian Californians experience respectively 43, 39, and 21% higher level of $PM_{2.5}$ pollution from cars, trucks, and buses relative to white Californians (Union of Concerned Scientists, 2019). Zero emission freight trucks are critical to both reducing global greenhouse gas emissions and improving public health. This paper shows that recent dramatic improvements in battery technology have primed heavy-duty trucks for near-term electrification.

At the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about 13% lower total cost of ownership (TCO) per mile, about 3-year payback and net present savings of about US $200,000 over a 15-year lifetime. This is achieved with only a 3% reduction in payload capacity. Even this small penalty can be reversed cost-effectively through light-weighting, which in any case, only matters for a small fraction of trucks which regularly utilize their maximum payload. This accounts for a 3% reduction in payload capacity, though that loss can be avoided cost-effectively through light-weighting and is only consequential for a small fraction of operations that regularly utilize the truck's maximum payload. Battery prices are projected to decline to about $60 per kWh by 2030 accompanied by further improvement in energy density and efficiency. These advances, combined with state or federal polices to monetize pollution reduction benefits, could make electric truck TCO over 40% lower relative to TCO for diesel today.

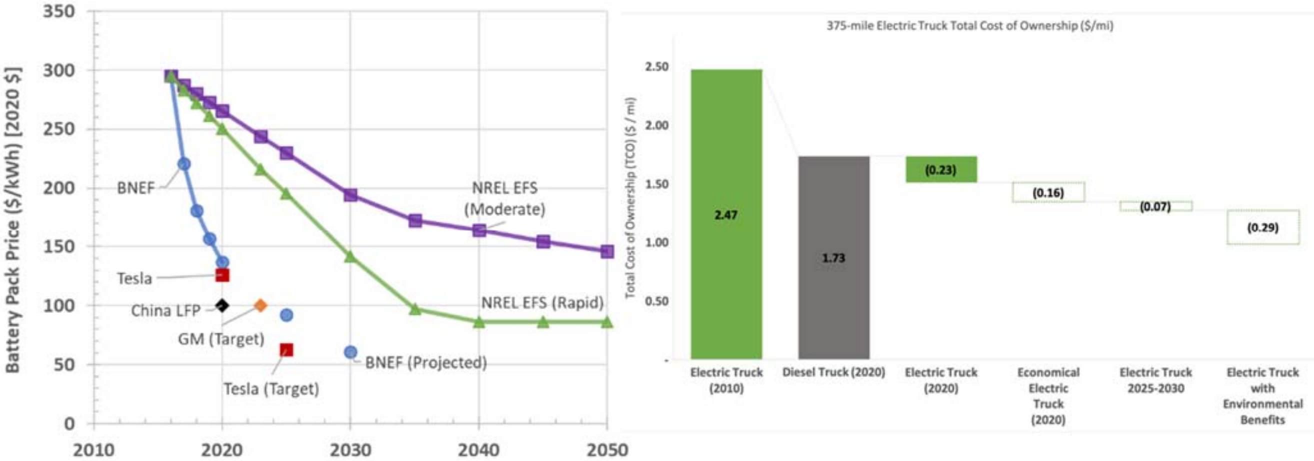
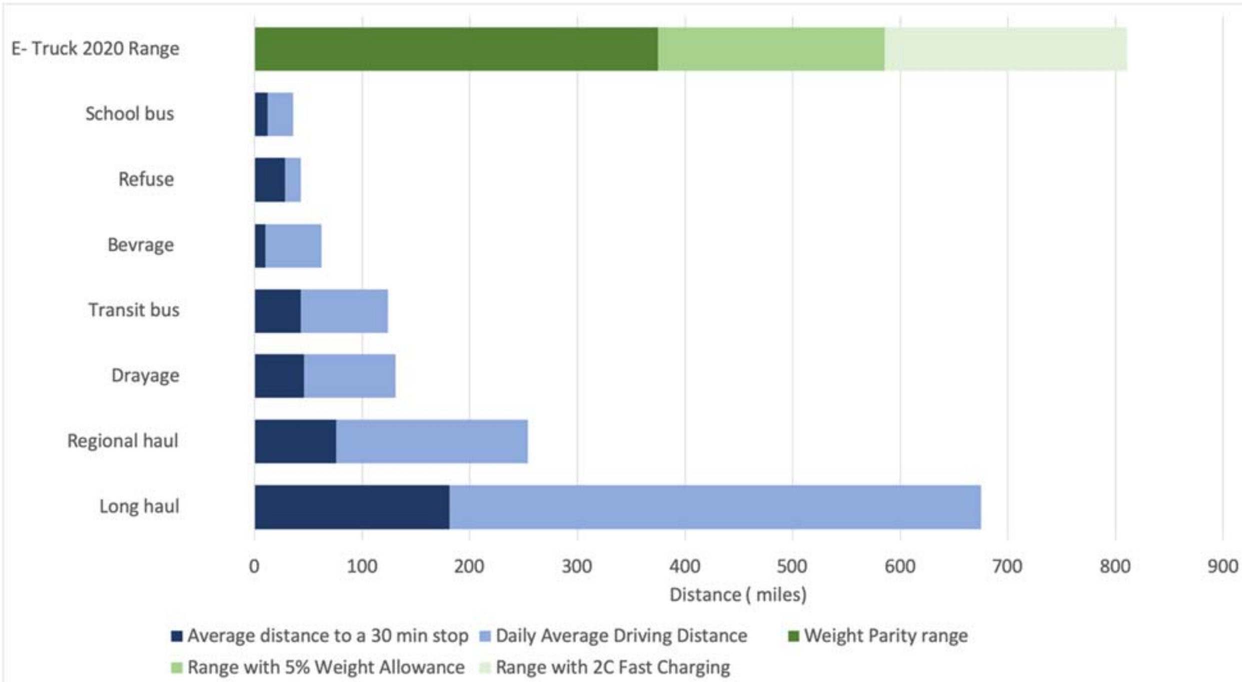



**Figure ES1: Electric trucks can offer significant savings due to dramatic decline battery prices and opportunities for economical charging**. The graph on left shows the estimated actual prices from 2010 to 2020 by BNEF (solid blue line with circular markers) and projections by BNEF going forward (blue circular markers without a solid line). It also shows projections made by National Renewable Energy Laboratory (NREL) as of 2017 looking into the future under two different scenarios of cost reduction (Moderate and Rapid) as well as a few additional data points such as individual targets for GM and Tesla. Figure on the right shows the total cost of ownership under different scenarios we estimate in this report. ***Data Sources***: Battery pack prices - National Renewable Energy Laboratory, Electrification Futures Study [EFS] (Jadun et al., 2017) and (BNEF, 2020).




**ES2: Electric trucks can have sufficient range for most applications without materially compromising payload.** Figure depicts a comparison of average daily distance for different vehicle types, their average distance to a 30-minute or longer stop and our estimate of potential range for a 375-mile Class 8 Truck with 5% additional weight allowance for the battery and 2C fast charging availability Source: For data on driving distances refer (Oak Ridge National Laboratory, 2019).

As vehicle battery costs have fallen, so has their weight and size. These physical changes accompany a steadily rising energy density. As a result, electric trucks with a range up to 375 miles (300 miles at 80% maximum depth of discharge (DoD)) might entail little to no reduction in payload carrying capacity. An often-overlooked fact is that the electric drive train is substantially lighter relative to a diesel drive train, which offsets a significant amount of battery pack weight. Lightweighting and improved aerodynamics using commercially available technology can enable additional range up to 450 miles. (North American Council for Freight Efficiency, 2015). Further, since most truck trips tend to be limited by volumetric capacity of payload as opposed to payload weight, a 5% payload weight penalty for reducing fuel cost significantly is likely to be acceptable for most trucks. Additionally, the Federal Motor Carrier Safety Administration (FMCSA) has several restrictions on the hours of driving by truck drivers (FMCSA 2015). For example, the maximum continuous driving without a 30 minute mandatory break is 8 hours (which translates to a distance of about 450 miles) and a range of 500 miles will be sufficient to cover the maximum allowed continuous driving.

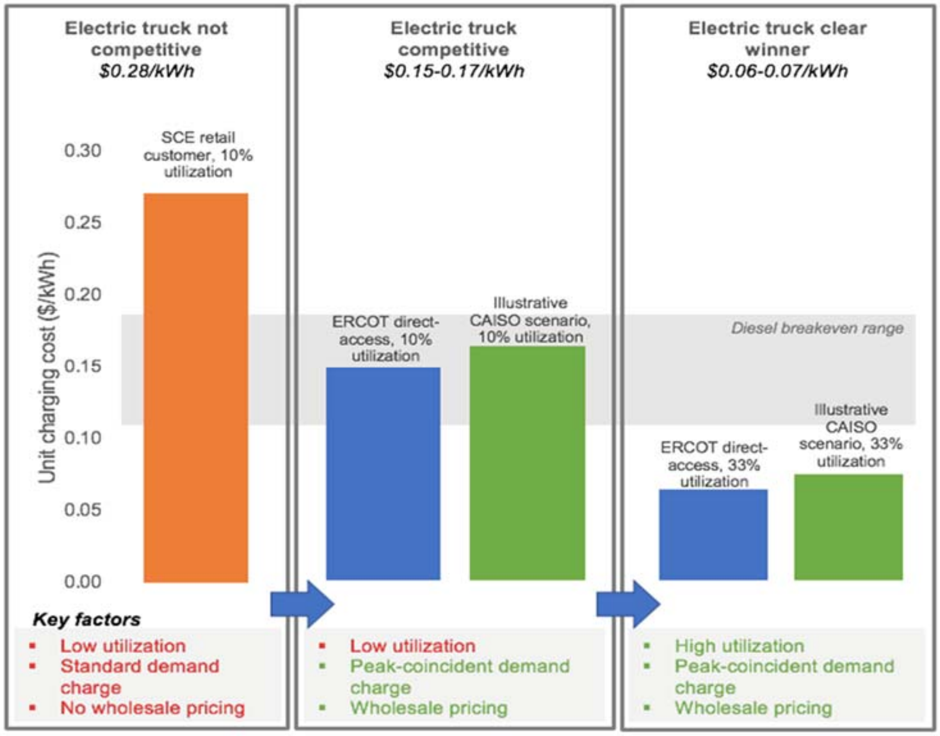
Additional FMCSA driving limits include the 14-hour "driving window" limit, 11-hour driving limit, and 60-hour/7-day and 70-hour/8-day duty limits. The maximum driving allowed in a 14-hour driving window is 11 hours, after which a mandatory break of 10 hours is required. Range of 200 to 400 miles can be added (with 1C and 2C charging rate) in a 30-minute break sufficient to cover the remaining allowed three hours of driving (distance of about 170 miles). Note the scenario described above is to show that a 500-mile range electric truck has sufficient range to enable the maximum allowed driving. For a typical driving schedule, a 300-mile range might be sufficient. For example, a representative duty cycle for long haul trucks estimated by DOE-NREL indicates more than a 30-minute break after 3-4 hours (less than 250 miles) of driving which is followed by another 3-4 hours of driving after which there is more than 10-hour break with a total distance of about 500 miles. ORNL 2019 finds that the average distance to a 30-minute stop which can be used to add significant range with fast charging is 190 miles and 150 miles for a long haul and regional haul trucks, which constitute the majority (about 70%) of the diesel consumed and emissions by trucking. For these reasons, we argue that electric trucks can have sufficient range for most applications in the near future.

Although electric trucks present an enormous opportunity both from economic, environmental, and environmental justice standpoints, major barriers need to be addressed to fully realize their potential and an appropriate policy ecosystem is required to stimulate and facilitate the transition from diesel to electric long-haul trucking. First, as is often the case in early stages of clean energy technology commercialization, electric trucks carry higher up-front costs than conventional trucks (for both vehicles and charging infrastructure). This is due to lack of scale economies and market uncertainty. For instance, simple calculations suggest that the 13% lower TCO notwithstanding, at the current battery price of $135/kWh, a 375-mile range truck with a 797-kWh battery pack has an upfront cost that is 75% greater relative to a diesel truck, which experience suggests is a major barrier to adoption. This price differential is not expected to last long, but strongly suggests the need for early-adopter subsidies to drive sales, and lower capital costs through manufacturing economies of scale.

Second, as battery costs decline, charging related costs are beginning to loom larger. Whereas a decade ago, when battery costs were in excess of $1000/kWh, charging-related costs would have accounted for about 15% to 18% of the TCO, today they account for 25% to 30% and increase further as battery prices decline. Figure ES3 shows the effect of electricity price retail price demand charges and at wholesale prices without "demand" charges which are levied based maximum instantaneous power consumption during a specified billing period and are distinct from energy charges. Electricity prices, especially demand charges, but also energy charges, that do not reflect the true cost to the system is a barrier to electrification of commercial vehicle fleets in general but especially for long-haul trucks. There is a need for electricity tariffs that send the right price signals for truck charging and avoid without imposing unfair costs or truck owners or other customers

Third, it will take time to achieve high utilization rates for vehicle charging infrastructure, which is essential to realizing a low levelized cost of infrastructure per unit of delivered electricity to vehicles. Figure ES3 shows the effect of low and high utilization of charge infrastructure on total cost of charging, which is the sum of the cost of electricity and the levelized cost of infrastructure.

Realizing the full economic potential of electric trucks therefore requires surviving a long period of infancy marked by low demand for vehicles and charging, and consequently, higher cost of new vehicles and slow return on charging infrastructure. Faced with such barriers, absent public intervention, private investments in electric trucks will occur at a level lower than is socially optimal. Given the importance of addressing pollution from trucking, strong policy support for the coordinated and large-scale investments in vehicle technologies and fuel infrastructure is warranted to harness the economic and environmental potential of battery electric trucks. Binding targets for vehicle sales, supported by targeted subsidies indexed both to international battery prices and cumulative sales can deliver the scale of adoption needed to launch this new industry on a sustainable future trajectory.




ES3: Rational electricity tariffs and improved charging infrastructure utilization can significantly improve the economics of electric trucks (Phadke et al., 2019).

## 1. Introduction

Globally, heavy-duty vehicles are estimated to comprise only about 11% of the motor vehicles, yet account for close of half the total CO2 emissions from motor vehicles and 71% of vehicle particulate emissions (PM) (Kodjak, 2015). The latter are responsible for the vast majority of air pollution related deaths worldwide (Landrigan et al., 2017). For instance, in the U.S., heavy duty trucks comprise 5% of the on-road traffic but account for 30% and 36% of vehicle CO2 emissions and particulate emissions respectively (Kodjak, 2015) while trucking as a whole account for 83% of all freight related CO2 emissions (Schipper et al., 2011). Heavy-duty trucking's share to the environmental footprint of developing countries is even greater. For instance, in India which has low car ownership per capita relative to higher income countries, the such truck comprise 5% of the vehicle fleet but comprise 71% of $CO_2$, 74% of PM and 55% of $NO_x$ emissions from on-road vehicles (Apte et al., 2017; Guttikunda & Mohan, 2014; Kodjak, 2015). Furthermore, world over low-income groups world-wide bear a disproportionate proportion of the environmental burden from freight movement. For instance, it is estimated that in California, African American, Latino, and Asian Californians experience respectively 43, 39, and 21% higher level of $PM_{2.5}$ pollution from cars, trucks, and buses relative to white Californians (Union of Concerned Scientists, 2019). Zero emissions trucks can significantly improve health outcomes for vulnerable populations.

Of the two leading zero emissions vehicle (ZEV) technologies – battery electric vehicles and hydrogen fuel cell vehicles, the focus here is on the former, which has experienced the most dramatic improvements on multiple fronts.[1] Battery cost and energy density have historically been barriers for heavy-duty battery electric vehicles (including medium and heavy-duty trucks and transit buses). But today the situation is dramatically different.

[1] According to the California Air Resources Board (CARB), for short and medium haul trucks, the total cost of ownership (TCO) for battery electric trucks is less than half that of hydrogen fuel cell trucks in the short to medium term (2018-24) and somewhat higher in the long term (2030) (California Air Resources Board 2019). Although we do not estimate the TCO of hydrogen fuel cell trucks in this analysis, our TCO estimates for 375-mile long-haul electric trucks ($1.51/mile) is substantially lower than CARB TCO estimate for hydrogen fuel cell trucks for regional delivery ($2.3/mile and $1.5/mile) for the short and medium term (2018-24)

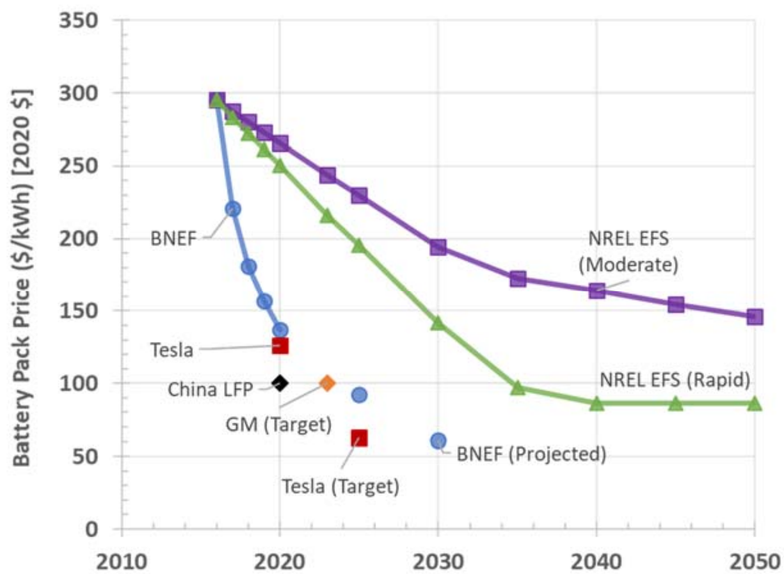



**Figure 1.** Battery prices have been consistently reducing more rapidly than projections(Jadun et al., 2017), (BNEF, 2020). Figure shows the estimated actual prices from 2010 to 2020 by BNEF (solid blue line with circular markers) and projections by BNEF going forward (blue circular markers without a solid line). It also shows projections made by National Renewable Energy Laboratory (NREL) as of 2017 looking into the future under two different scenarios of cost reduction (Moderate and Rapid) as well as a few additional data points such as individual targets for GM and Tesla. ***Data Sources***: Battery pack prices - National Renewable Energy Laboratory, Electrification Futures Study [EFS] (Jadun et al., 2017) and (BNEF, 2020).

One major recent development is the decline in battery prices. By 2020, lithium-ion battery costs had declined to roughly $136/kWh, an 85% decline relative to prices in 2010 (Figure 1) and are projected to reach a price of $55 per kWh in 2030 (Holland, 2018). Data from China, which has the most amount of heavy-duty electric vehicles (primarily buses) shows that battery prices for buses and other heavy duty vehicles are somewhat lower than the average battery prices for light-duty EVs in China and globally (BNEF, 2020). While some of this difference in the average price of battery pack price for HDVs in China and rest of the world is attributable to use of different types of battery chemistries[2] the production of heavy-duty EVs in China is much greater than any other country in the world. Therefore, with economies of scale the price of battery packs for HDVs is likely to come close price of battery

[2] China currently relies more on Lithium Iron Phosphate (LFP) which is among the cheaper types of chemistries in use today when compared to say, Lithium Nickel Cobalt Aluminum Oxide (NCA) or Lithium Nickel Manganese Cobalt (NMC))

packs for passenger EVs as is the case in China, as pointed out by others as well (See California Air Resources Board, 2019; Hall & Lutsey, 2019).

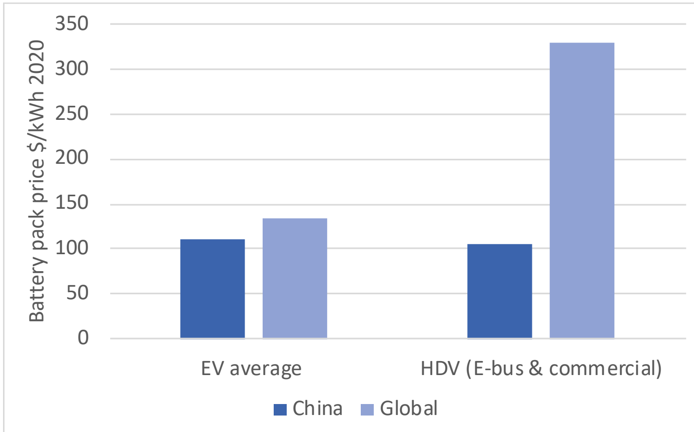



Figure 2: A comparison of average EV battery prices globally and in China across all vehicle types and specifically, prices for batteries in heavy-duty vehicles. Source: (BNEF, 2020)

A second related development concerns battery weight, an especially significant factor for long-haul trucks, which are subject to maximum gross vehicle weight limits. In the US, federal laws limit maximum gross vehicle weights to 80,000 pounds on interstate highways (Federal Highway Administration, 2019) of which the tractor itself accounts for about 17,000 pounds (US Department of Energy, 2010), thus leaving about 63,000 pounds for revenue-generating payload. A widespread concern is that battery weight of an EV results in a reduction in allowed payload capacity, a factor that discourages EV adoption. As with battery cost, however, energy density at the cell-level (and by extension at the pack level) has also been improving steadily, resulting in significant reductions in battery weight. (Field, 2020). While the lower energy density of batteries and higher weight (relative to diesel engine and fuel) is perceived as a market barrier, critics of battery electric trucks often overlook the offsetting weight reduction from elimination of engine, cooling system, transmission and accessories. These parts account for about a quarter of the weight of a diesel tractor, which battery packs nearly eliminate. As described below, the weight difference between and battery electric and diesel trucks is small (resulting in a potential payload loss of about 5%) and is likely to fall lower as light-weighting techniques are employed. Moreover, data from the North American Council for Freight Efficiency shows that the average truck payload is less than 45,000 pounds (~70% of the maximum payload capacity) (North American Council for Freight Efficiency & Rocky Mountain Institute, 2018). Hence, for most cargo movement, payload is no longer a constraint for battery electric trucks.

A reason that attracts attention to battery electric trucks is the decreasing cost and carbon emissions of electric power. While electric trucks certainly reduce exposure of vulnerable populations to diesel pollution, their life cycle environmental benefits depend in large part on the source of electricity used for charging the batteries. In this context, a third key development is the fact that decline in battery prices is complemented by the steep drop in cost of electricity generation from clean renewables such as solar and wind, and the corresponding decline in GHG pollution of the average grid electricity. In fact, costs of renewable electricity have declined to such an extent that it is cheaper than or in parity with the levelized cost of generation from new coal plants (Lazard, 2018). Given current national and international ambitions to decarbonize the electric grid and growing prospects for deep CO2 reduction by the 2030's, electric trucks offer a pathway to near elimination of air pollution and GHG emissions from road freight operations. However, as we point of later aligning retail tariffs with generation prices is an area that needs policy attention.

There is also growing evidence that fast charging can be accomplished without significant impact on battery life. Studies comparing the impact of fast charging[3] and slow charging on battery cells degradation found a significant decrease in cycle life with fast-charging relative to slow charging only at temperatures above 30 degree Centigrade (Den Boer et al., 2013; Teslarati, 2017; The Tesla team, 2019). Controlling battery temperature through battery management systems and better cooling, a practice that is becoming widespread in commercial EVs, mitigates battery degradation concerns. A 1 Megawatt (MW) fast charger can deliver about 500 kilowatt-hours (kWh) in 30 minutes which at an energy economy of 2 kWh per mile amounts to 250 miles worth recharge. Additionally, actual data on commercial fleet operations reported by National Renewable Energy Laboratory's (NREL) Fleet DNA tool suggests that the 80$^{th}$ percentile of daily distance travelled by long-haul tractors is about 600 miles and that the average distance to a 30-minute stop is less than 200 miles (Oak Ridge National Laboratory, 2019). As heavy-duty battery electric trucks continue to improve it is likely that even faster charging rates and range improvement will become common (due to gradually increasing battery energy-density and decreasing HDV vehicle weight). Extreme

[3] Charging and discharging rates are often referred to in terms of C-rates. Basically, the C-rate denotes the number of times it can be fully charged in 1 hour. A 50kWhr battery when charged from zero to full charge in 1hour is said to be charged at the 1C rate while if it is fully charged in only 30 minutes it is referred to as 2C charging because it can be fully charged twice in 1 hour. If it is charged from zero to full in 2 hours it is 0.5C charging. Charging a 500kWhr battery at 0.5C 1C, and 2C rates will require 250KW, 500kW and 1MW fast charger respectively. Charging a 1000 kWh battery at 0.5C 1C, and 2C rates will require 500kW, 1MW and 2 MW fast charger respectively.

fast charging is one important aspect that is still in its infancy that needs targeted investments and incentives at this stage.

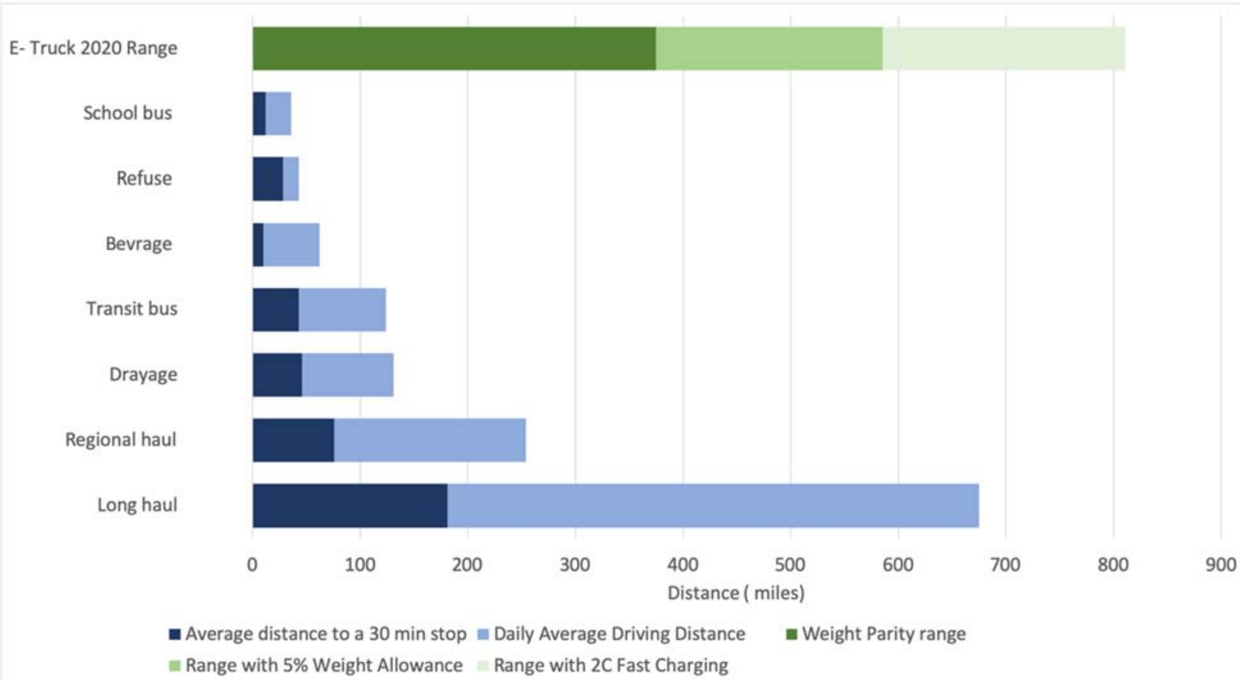



Figure 3: Comparison between average daily distance for different vehicle types, their average distance to a 30-minute or longer stop and our estimate of potential range for a 375-mile Class 8 Truck with 5% additional weight allowance for the battery and 2C fast charging availability. Source: For data on driving distances refer (Oak Ridge National Laboratory, 2019).

Multiple studies have examined the potential for electrification (Çabukoglu et al., 2018; California Air Resources Board, 2019; B. A. Davis & Figliozzi, 2013; Den Boer et al., 2013; Earl et al., 2018; Gopal et al., 2017; Karali et al., 2019; Lee & Thomas, 2017; Liimatainen et al., 2019; Mareev et al., 2017; Moultak et al., 2017; Sen et al., 2017; Sripad & Viswanathan, 2019; Taefi et al., 2017; Talebian et al., 2018; Tanco et al., 2019; Zhou et al., 2017). Several assume battery-electric trucks to be an infeasible option for replacing conventional diesel trucks, particularly long-haul trucks on account of large battery capacity requirements, range anxiety, and uncertainty related to availability of charging infrastructure (Çabukoglu et al., 2018; Den Boer et al., 2013; Earl et al., 2018; Lee & Thomas, 2017; Liimatainen et al., 2019; Moultak et al., 2017; Taefi et al., 2017; Talebian et al., 2018; Zhou et al., 2017). Of studies that actually evaluate the economic performance of electric trucks (California Air Resources Board, 2019; Den Boer et al., 2013; Earl et al., 2018; Lee & Thomas, 2017; Mareev et al., 2017; Sen et al., 2017; Sripad & Viswanathan, 2019; Taefi et al., 2017; Tanco et al., 2019; Zhou et al., 2017), several consider or conclude battery-electric trucks to be a solution for only light- and medium-duty trucks with a low daily range of less than ~250 miles (Den Boer et al., 2013; Lee & Thomas, 2017; Moultak et al., 2017; Taefi et al., 2017; Tanco et al., 2019; Zhou et al., 2017). Certain studies deem long-haul electric trucks, which have greater than 250-mile daily range, unviable specifically because of range anxiety due to a lack of fast charging (Karali et al., 2019; Moultak et al., 2017; Talebian et al., 2018). However, a few more recent studies analyze battery-electric trucks as an option for long-haul transportation (California Air Resources Board, 2019; Sripad & Viswanathan, 2019; Tanco et al., 2019).

Different from many earlier studies, this work relies on bottom-up cost, weight and performance estimation and latest market data to improve on the existing long-haul electric truck literature. We estimate the TCO of an electric truck compared to a diesel truck based on bottom-up truck technical specifications generated from a vehicle dynamic model (detailed in the methods and data section). We fully account for recent trends toward lower-cost, higher-energy-density batteries. We include additional cost reduction potential from monetizing air pollution and GHG reductions. Our charging costs account for levelized cost of fast-charging infrastructure and demand charges as part of electricity cost. Finally, we provide detailed comparisons of the weights of diesel versus electric long-haul trucks based on the Tesla semi, with consideration of commercially available light weighting options. The results provide the most comprehensive techno-economic analysis of long-haul electric trucking to date.

## 2. Methods and Data

We investigate the potential for a Class 8 electric truck to seamlessly replace a Class 8 diesel truck based on economics and performance. Class 8 trucks were chosen as the reference model for this analysis because they consume nearly 20% of all energy consumed by the U.S. transport sector(S. C. Davis et al., 2017). Furthermore, the CALSTART Zero-emissions technology inventory list up to 31 existing models of heavy-duty battery electric trucks with 23 more announced to be launched. For reference, there are 3 existing models and 6 announced models of hydrogen fuel-cell electric trucks (CALSTART 2020). The diesel truck model for this estimation is the Volvo VNL 400 (Legacy Truck Centers, 2019) truck, and the electric truck model is the Tesla Semi (Tesla, 2019).

Below, Section A describes the battery pack capacity estimation for a Class 8 electric truck using our vehicle dynamic model. Section B describes our TCO estimation. Section C shows the analysis for estimating the weight of the battery pack for a commercially available Class 8 truck. It is worth emphasizing that our study draws on both bottom-up estimations and industry claims: we analyze TCO based on a bottom-up battery pack size estimate from the vehicle dynamic model, whereas the battery pack weight estimation is based on existing commercial trucks (in this case the Tesla Semi). The entire set of calculations is carried out in a spreadsheet and is available for download along with this report.

## 2.1 Vehicle Dynamic Model

We use the vehicle dynamic model represented in Equation 1 to estimate required battery pack size ($E_p$, in kWh) based on the standard performance requirements of a Class 8 diesel truck.

$$E_p = \left[\frac{\left(\frac{1}{2}\rho * C_d * A * v_{rms}^3 + C_{rr} * W_T * g * v + t_f * W_T * g * v * Z\right)}{\eta_{bw}} + \left(\frac{1}{2} W_T * v * a\left(\frac{1}{\eta_{bw}} - \eta_{bw} * \eta_{brk}\right)\right)\right] * \frac{D}{v} \quad (1)$$

Table 2 lists the parameters used to estimate the battery pack size.

**Table 2.** Vehicle Dynamic Model Input Parameters (Derived from Sripad and Viswanathan, 2017)

| **Category** | **Parameter** | **Representation in Equation 1** | **Value** | **Unit** |
|---|---|---|---|---|
| **Body (Alternative Fuels Data Center, 2020)** | Gross vehicle weight (including payload and battery pack) | $W_T$ | 36,000 | kg |
| | Coefficient of drag | $C_d$ | 0.45 | |
| | Coefficient of rolling resistance | $C_{rr}$ | 0.0063 | |
| | Braking efficiency | $\eta_{brk}$ | 0.97 | |
| | Drivetrain efficiency | - | 0.90 | |
| | Battery discharge efficiency | - | 0.95 | |
| | Battery-to-wheels efficiency (product of battery discharge efficiency, drivetrain efficiency, and braking efficiency) | $\eta_{bw}$ | 0.83 | |

| Category | Parameter | Representation in Equation 1 | Value | Unit |
|---|---|---|---|---|
| | Frontal area of truck | $A$ | 7.20 | $m^2$ |
| Use Characteristics | Daily driving distance | $D$ | 300 or 400 | miles |
| | Average velocity (Sripad & Viswanathan, 2017) | $v$ | 19 | m/s |
| | Root mean square velocity (Sripad & Viswanathan, 2017) | $v_{rms}$ | 22 | m/s |
| | Average acceleration/deceleration (Sripad & Viswanathan, 2017) | $a$ | 0.112 | $m/s^2$ |
| | Road grade (Sripad & Viswanathan, 2017) | $r$ | 1% | |
| | Fraction of time driven on road grade $r$ (Sripad & Viswanathan, 2017) | $t_f$ | 15% | |
| | Average road gradient ($r$/100) (Sripad & Viswanathan, 2017) | $Z$ | 0.0001 | |
| Environmental Characteristics | Air density | $\rho$ | 1.20 | $kg/m^3$ |
| | Acceleration due to gravity | $g$ | 9.8 | $m/s^2$ |

## 2.2 Total Cost of Ownership Model

We address TCO primarily on a per-mile basis, summing the unit capital cost, unit maintenance cost, unit fuel cost, and unit general operation costs (Equation 2). We assume the fuel cost of an electric truck comprises electricity cost and the levelized cost of the charging equipment (Equation 3). We compute the unit capital cost of an electric truck as the unit capital cost of a diesel truck plus the capital cost of the battery and electric power train minus the cost of the avoided diesel truck components such as the power train, fuel and fuel tank etc.

$$\text{Unit cost of ownership} = \text{unit capital cost} + \text{unit fuel cost} + \text{unit maintenance cost} + \text{unit operation costs} \quad (2)$$

$$\text{Unit fuel cost (electric truck)} = \text{unit electricity cost} + \text{unit cost of charging equipment} \quad (3)$$

*Unit capital cost (electric truck) = unit capital cost (diesel truck) + Battery and related component costs – avoided diesel truck component costs (4)*

The cost of electric powertrains is less than one third the cost of diesel powertrains—savings that are not considered by previous studies. The major component of the incremental capital cost of an electric truck is the battery cost, which we base on the battery pack size generated from the vehicle dynamic model. We amortize incremental capital cost to estimate per-mile incremental capital cost, which is primarily driven by battery prices and the range of electric trucks (which determines the battery size). We estimate operations, maintenance, and diesel fuel costs based on empirical data. Table 3 summarizes the parameters used for estimating all the components of Equation 2. We account for depreciation of battery and factor in the cost of replacement cost, but we ignore the depreciation of the vehicle as a whole. This is likely conservative with respect to EVs given that they incur lower maintenance and repair expenses and consequently a potentially longer asset life. In any case, there has been insufficient experience to estimate a distinct EV depreciation schedule except for the battery pack alone which can be approximated based on total charge and discharge cycles.

To estimate electric truck fuel costs, we draw on a complementary bottom-up estimate of charging cost (Phadke et al., 2019) that includes electricity and fast-charging infrastructure costs. The unit cost of the charging equipment is the minimum price per unit of energy delivered (kWh) that a charging service provider should charge consumers to break even on the investment in charging equipment and grid interconnection. The unit cost is a function of 1) the useful service life of the charging equipment, and 2) the utilization rate in terms of average kWh/day delivered. We do not explicitly conduct these analyses in this paper but rather draw on the model of Phadke et al., 2019. These results, which comprise the components of Equation 3, are summarized in Table 3.

In addition to a base case scenario, which uses current international battery pack price (as estimated and reported by BNEF), we evaluate cost and performance given plausible future developments on multiple fronts. We consider the effects of an aerodynamically superior design of the truck with a 45% lower drag co-efficient (declining from 0.45 to 0.25) which improves fuel economy by about 10% from 2.1 kWh/mi to 1.9 kWh/mi. We also consider the potential for charging at lower cost by ~60% ($0.1/kWh as opposed to $0.16/kWh in the base case) by procuring electricity at prices that more closely track wholesale electricity price as opposed to cost of retail service. We also evaluate the effect of a decline in battery price from $135 per kWh to $60 per kWh. Lastly, we allow for the monetization of air pollution/GHG emissions benefits from avoided emissions, which further reduces the TCO.

**Table 3.** Input Parameters for TCO Model

| | | |
|---|---|---|
| **Unit capital cost components**[4] | | |
| 2020 Battery pack cost (Holland, 2018) | $135 (2030 Price $60) | $/kWh |
| Battery life[5] | 2,000 | cycles |
| Battery size | 375 or 500 | kWh |
| Annual mileage[6] | 78,0000 or 104,000 | miles/year |
| Life of truck (Ritter, 2018) | 15 | years |
| Cost of truck without battery and allied drivetrain | $85,000 | $ |
| Real discount rate[7] | 6.9% | |
| **Unit fuel cost components** | | |
| Fuel efficiency of electric truck[8] | 2.1 | kWh/mile |
| Fuel efficiency of diesel truck (Alternative Fuels Data Center, 2020) | 5.9[9] | miles/gallon |
| Amortized charging infrastructure cost[10] | $0.03 | $/kWh |
| Electricity price[10] | $0.13 | $/kWh |
| Diesel price (EIA, 2019) | $3.30 | $/gallon |
| **Unit maintenance cost components** | | |
| Diesel maintenance cost | $12,000–$30,000 | $/year |
| Electric maintenance cost[11] | $6,500 | $/year |
| Battery replacement cost (year 7) (Holland, 2018) | $100[12] | $/kWh |
| **Unit operation cost components** | | |
| General operation costs | $0.76 | $/mile |

[4] Taxes on vehicles and components are excluded from this analysis and recognize that with higher upfront cost and component costs, electric vehicles could come out a bit costlier, but our sensitivity analyses will show that taxes are unlikely to change the basic conclusions.

[5] Based on expert input

[6] Assuming an average daily driving distance of 300 miles for a 375-mile range truck and 400-miles for a 500-mile range truck so as to achieve an average daily depth of discharge of battery of 80% and 260 days of driving for any truck

[7] Derived assuming nominal discount rate of 9%

[8] Result of VDM; validated by industry numbers

[9] Latest models of diesel trucks have high fuel economy but we anticipate such trucks to be costlier as well and we intend to addressed this in sensitivity analysis.

[10] Derived from Phadke et. al. 2019

[11] Estimated based on Cannon (2016)

[12] It is worth pointing out that diesel trucks need an engine rebuild after about 500,000 miles which makes our estimate conservative

## 2.3 Class 8 Truck Battery Pack Weight Estimation

Four components contribute to the weight of a standard battery pack module used in vehicles: 1) cells, which store energy; 2) busbars, which act as the transmission system for the battery pack; 3) cooling tubes, which maintain optimal ambient temperature within the pack; and 4) an outer case for protecting the pack against physical damage. Here we estimate the weight of a 797- and a 1,062-kWh pack, which are estimated to be the size of the battery pack used to power the 375- and the 500-mile-range Tesla Semi models. To derive the weight of the semi packs, we use the component weights for a 100-kWh Tesla Model S battery pack (Table 4).

**Table 4.** Input Parameters for Battery Pack Weight Estimate

| | | |
|---|---|---|
| Battery pack size (Carbuzz, 2019) | 100 | kWh |
| Tesla Model S battery pack weight | 619 | kg |
| Tesla Model S battery pack dimensions | 91 x 59 x 4.5 | in |
| Specific energy of each cell | 250 | Wh/kg |
| Total number of battery modules | 16 | |
| Individual battery module weight(HSR Motors, 2019) | 26.1 | kg |
| Energy stored per module(HSR Motors, 2019) | 5.2 | kWh |

The difference between the total module weight (418 kg) and the total cell weight (400 kg) gives the total weight of the busbars and cooling tubes (18 kg). The difference between the total pack weight (619 kg) and the total module weight (418 kg) gives the weight of the protective case (201 kg). Assuming that 50% of the busbar and cooling tube weight is from busbars and 50% is from cooling tubes, we calculate the per-unit weights of individual battery pack components (Table 6).

**Table 5.** Per-Unit Weight of Individual Battery Pack Components

| | | |
|---|---|---|
| Cooling tubes | 0.09 | kg/kWh |
| Busbars | 0.09 | kg/kWh |
| Battery cell | 4 | kg/kWh |

To estimate the weight of our semi battery packs, we make the following assumptions:

- Weight of battery cells is scaled by battery pack capacity
- Weight of cooling tubes is scaled by battery pack capacity with a 5% weight reduction from design changes
- Weight of busbars is scaled by battery pack capacity and then reduced by 50% to account for higher voltage[13]
- Weight of the protective case is scaled with battery pack surface area (semi battery pack dimensions are 99x78x20 in, giving a surface area ratio of 2.14)

Table 6 shows the resulting battery pack component weights for a 797- and 1,062-kWh pack.

**Table 6.** Component Weights for a Semi Truck Battery Pack

| | 797-kWh pack | 1062-kWh pack | |
|---|---|---|---|
| Cells | 3,187 | 4,250 | kg |
| Cooling tubes | 67 | 89 | kg |
| Busbars | 35 | 47 | kg |
| Protective case | 127 | 202 | kg |
| **Total weight** | **3,416** | **4,587** | **kg** |

A final element of our weight calculation was to estimate the impact of light-weighting on total truck weight. The main light-weighting strategy that is suitable and currently available for Class 8 trucks is to convert components from a heavier material to a lighter material. There are many possibilities for such conversion--for example, converting cab sheet metal from steel to aluminum or lightweight steel, or converting aerodynamic roof hoods from aluminum to plastic. Another strategy for light-weighting is to combine different components to reduce the need for fasteners and other material interfaces. While light-weighting may not improve *individual* truck efficiency dramatically, it has driven a significant improvement in operational efficiency of *fleets*, where larger payload capacity per truck led to smaller fleet sizes needed to deliver the same quantity of payload (North American Council for Freight Efficiency, 2015).

[13] [consider dropping a footnote to explain why the weight of the busbars drop in half due to higher voltage - seems counterintuitive]

Although we focus on determining TCO from the truck owner's point of view, we also analyze additional benefits that could be realized if environmental externalities from diesel trucking can be monetized. In this paper the externalities we consider are costs of air pollution and greenhouse gas (GHG) emissions. Depending on existing markets or compensation mechanisms, such externalities may or may not be able to be included in the TCO. The degree to which truck electrification mitigates diesel trucking externalities depends on the fuel used for electricity generation. Here we primarily consider scenarios with electricity entirely powered by coal and gas, compared to 90% renewable energy (with the remaining 10% of electricity assumed to be powered by gas), as well as scenarios incorporating the current power mix of the United States and of California. These elements are summarized in Table 7.

**Table 7.** Input Parameters for Additional Benefits of Electrification

| | | |
|---|---|---|
| **Unit air pollution cost components** | | |
| Air pollution damages from heavy diesel on-road vehicles (Goodkind et al., 2019) | $58 | $billion/year |
| Air pollution damages from coal-based electricity generation (Goodkind et al., 2019) | $118 | $billion/year |
| Air pollution damages from gas-based electricity generation (Goodkind et al., 2019) | $5 | $billion/year |
| Coal-fired generation (EIA, 2020e) | 1733 | billion kWh/year |
| Gas-fired generation (EIA, 2020e) | 1014 | billion kWh/year |
| Fraction of on-road pollution contributed by Class 8 trucks[14] | 56% | |
| Miles driven by Class 8 trucks (Bureau of Transportation Statistics, 2017) | 164 | billion miles/year |
| **Unit GHG emissions cost components** | | |
| Diesel consumed by Class 8 trucks (Bureau of Transportation Statistics, 2017) | 28,884 | million gallons/year |
| Social cost of carbon (EPA, 2017) | $52 | $/tonne CO2, 2019 dollars |
| Emissions intensity from coal-fired electricity (EIA, 2020c, 2020a) | 210 | lb CO2/million btu |

[14] Estimated based on Goodkind et al. and California ARB[44]

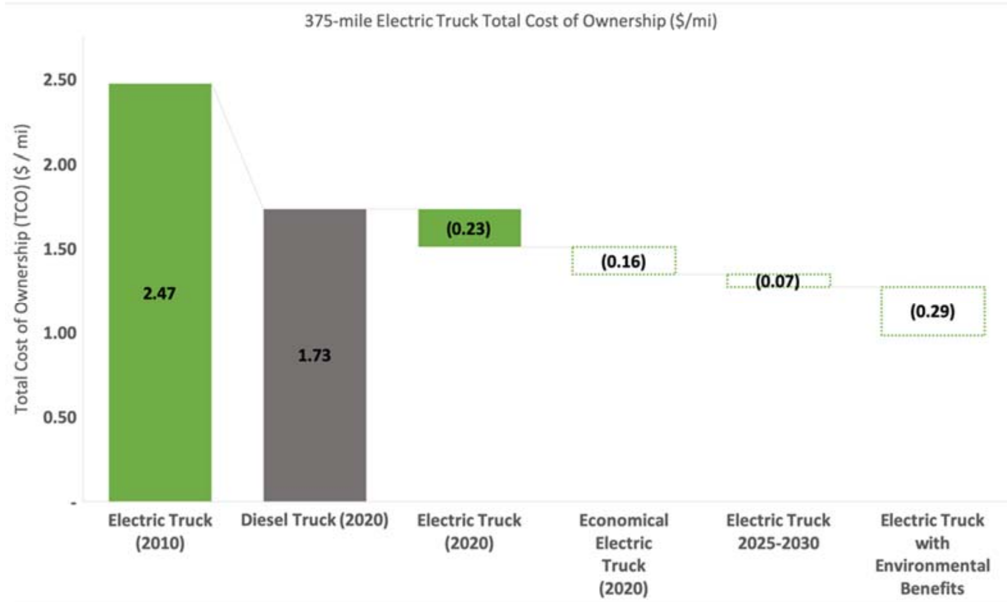
| | | |
|---|---|---|
| Emissions intensity from gas-fired electricity (EPA Center for Corporate Climate eadership, 2018) | 117 | lb CO2/million btu |
| Emissions intensity of US power mix (Carnegie Mellon University, 2019) | 943 | lb CO2/MWh |
| Emissions intensity of CA power mix (EIA, 2019) | 474 | lb CO2/MWh |
| Coal plant heat rate (EIA, 2020d) | 10,465 | Btu/kWh |
| Gas plant heat rate (EIA, 2020d) | 7,707 | Btu/kWh |
| Methane leakage rate (Alvarez et al., 2018) | 2.3% | % of US gas production |
| Total electricity losses across T&D system(EIA, 2020b) and in AC/DC power conversion[15] | 14.5% | |

## 3. Results

### 3.1 Total Cost of Ownership

Figure 4 shows the TCO comparison for both the 375-mile range and 500-mile range Class-8 electric truck relative to diesel. At the current international battery pack price of $135 per kilowatt-hour, a Class 8 truck electric truck with 375-mile range (300-mile range at 80% maximum DoD of battery) with a 797-kWh battery pack offers about 13% lower per mile TCO ($1.51/mi for electric compared to $1.73 for diesel) (Figure 2). This implies a net savings of about $200,000 over its lifetime for a less than 3% increase in the tractor weight given currently available light-weighting options.

[15] Industry interview



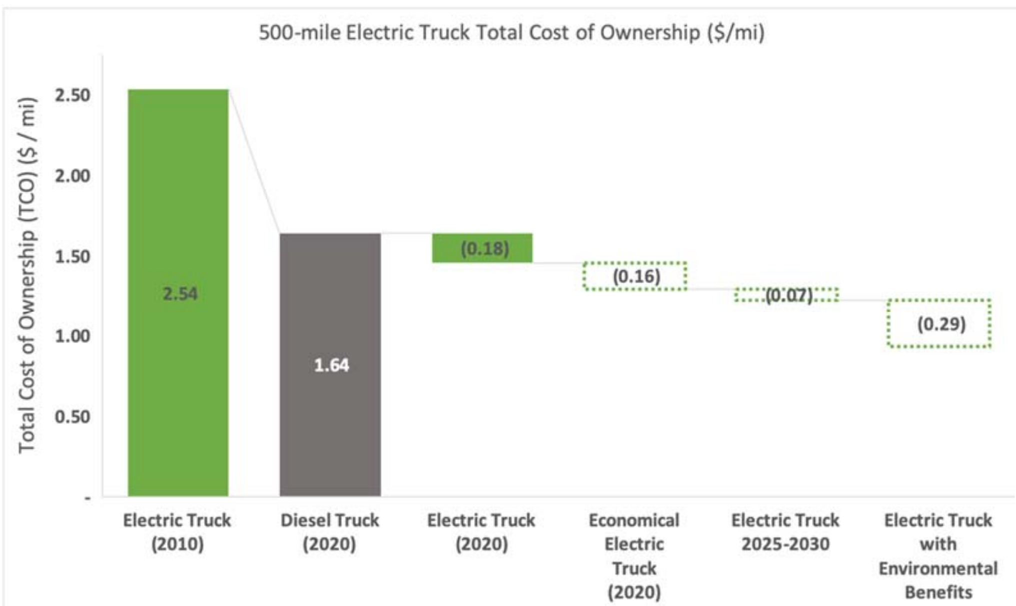




**Figure 4 (Top)** TCO comparison for 375-mile (797 kWh battery pack truck) operated 300 miles per day for 260 days per year. (**Bottom**) TCO comparison for 500-mile (1062 kWh battery pack truck) operated 400 miles per day for 260 days per year. The battery cost in 2020 is $135/kWh. The economical electric truck scenario assumes an aerodynamically better design which improves fuel economy coupled with a lower total charging cost ($0.1/kWh compared to $0.16 in base case). The electric truck in 2025-30 scenario tacks a decline in battery prices to $60 per kWh from the $135 per kWh on to the economical truck scenario. Lastly, this is combined with monetization of air pollution/GHG emissions benefits from avoided emissions, which further reduces the TCO.

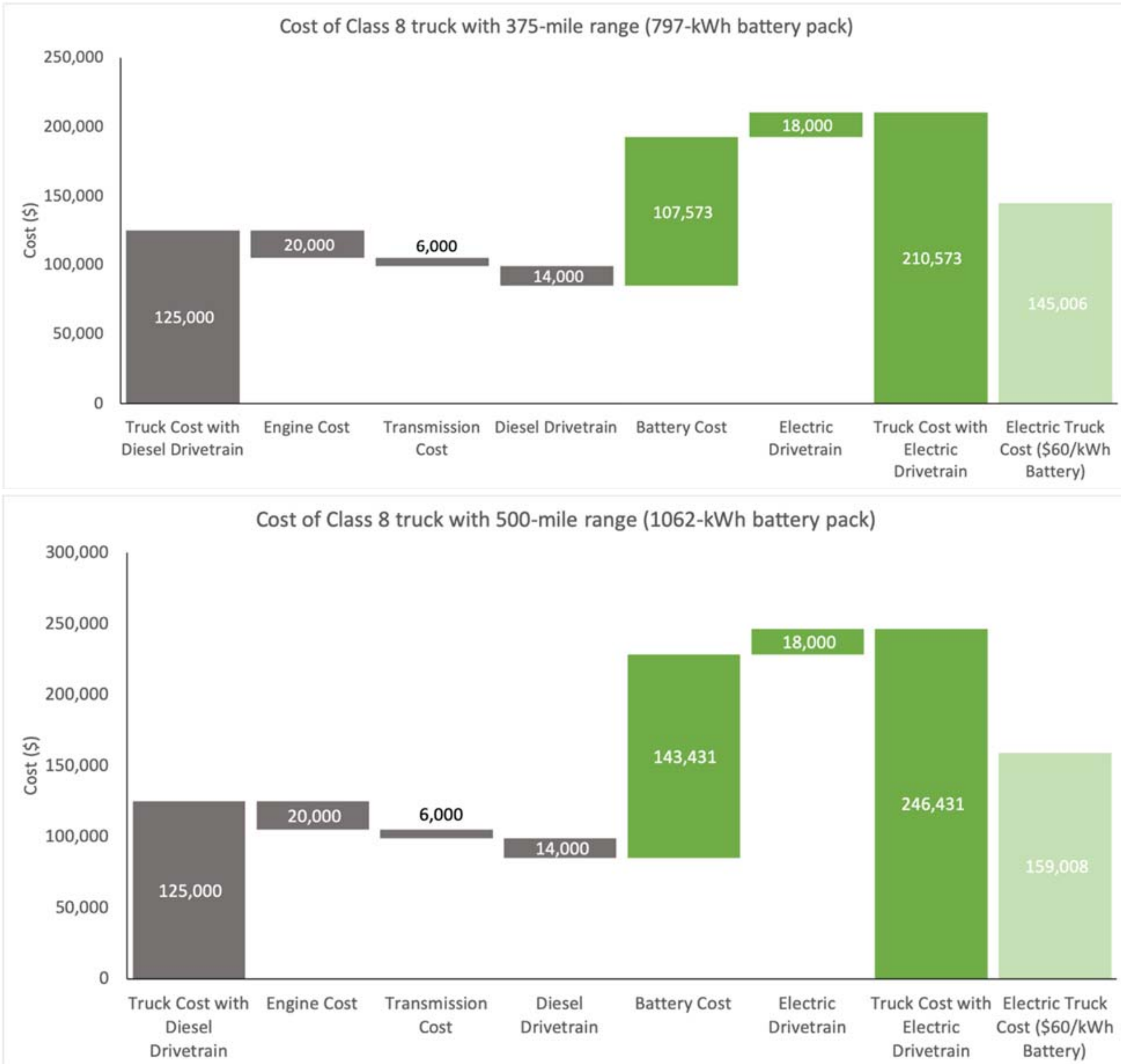



**Figure 5** Capital cost of a Class 8 diesel truck compared with a Class 8 battery-electric truck with 375-mile range and 797-kWh battery (top) and 500-mile range and 1,062-kWh battery (bottom), with battery costs of $135/kWh (dark green) and $60/kWh (light green).

Figure 5 shows how we arrive at our estimate of the upfront cost of the electric truck. We begin with a diesel truck price of $125,000 and first subtracting out the cost of engine, transmission and drive train ($20,000, $6000 and $14000 respectively) which are not required in an electric truck. Next, we add to this the battery cost, which is simply the product of battery price per kWh and battery size ($107,753 and $143,341 for the 375-mile (797 kWh) and 500-mile (1062 kWh) trucks @ $135/kWh) and drive train cost ($18,000). This yields an estimated cost of $210,573 and $246,431 respectively for the 375- and 500-

mile trucks. These are respectively 69% and 97% greater relative to the upfront cost of the diesel truck.

For the 375-mile truck, the excess upfront cost translates to about $0.12 per mile (levelized). However, electric trucks save $0.11/mile on maintenance costs and $0.23/mile on fuel costs, yielding a net reduction of $0.23 per mile which explains the about 13% reduction relative to $1.73 per mile TCO of diesel, which can be seen in Figure 4. We assume other costs such as general operation costs such as driver wages, insurance, tire replacements, permits, and tolls are identical for diesel and EVs and ignore difference in end-of-life value.

We next describe our bottom-up weight estimates for battery and other drivetrain components based on the publicly available specifications for Volvo and Tesla for their Class 8 trucks. We break down truck weight for vehicles commercially available on the market based on Tesla's 375- and 500-mile range (797- and 1,062-kWh battery capacity) trucks with our conservative efficiency assumption of 2.1 kWh/mile (Tesla claims less than 2 kWh/mile). Figure 6 compares the weight of a Class 8 diesel truck and the weight of Class 8 electric trucks with 375-mile (top) and 500-mile (bottom) ranges. The figure assumes a packing fraction (ratio of cell weight to battery weight) of 0.88, which represents an improvement over the 100-kWh Tesla Model S packing fraction (0.65) owing to the lower surface-area-to-volume ratio of higher-capacity battery packs. The incremental truck weights are estimated by adding the weight of the battery and electric powertrain and subtracting the weight of the diesel powertrain components. The light green bar segments show the potential for reducing truck weight using lighter materials, such as aluminum, instead of steel for the truck body.

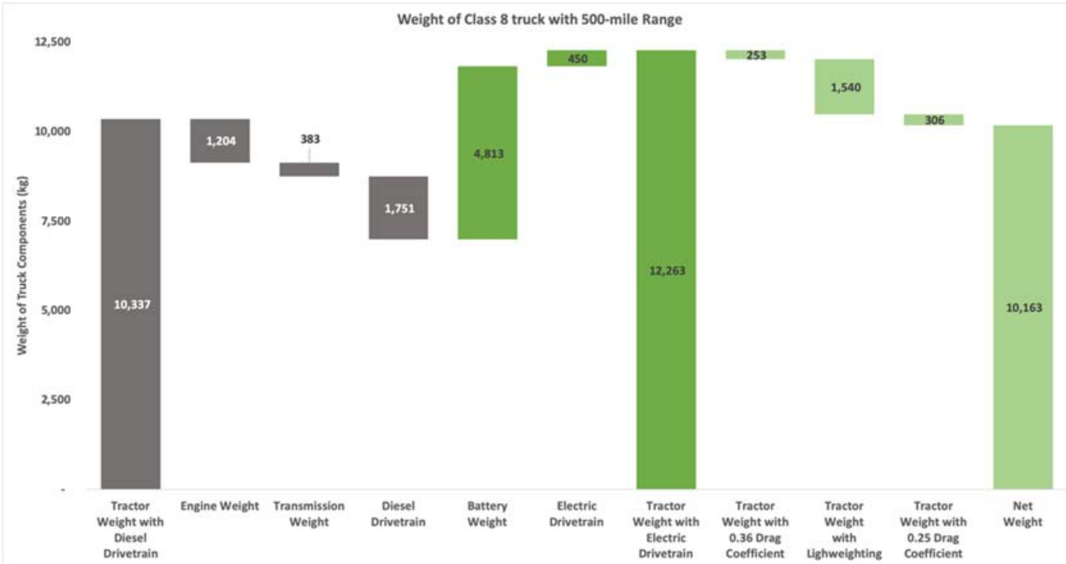


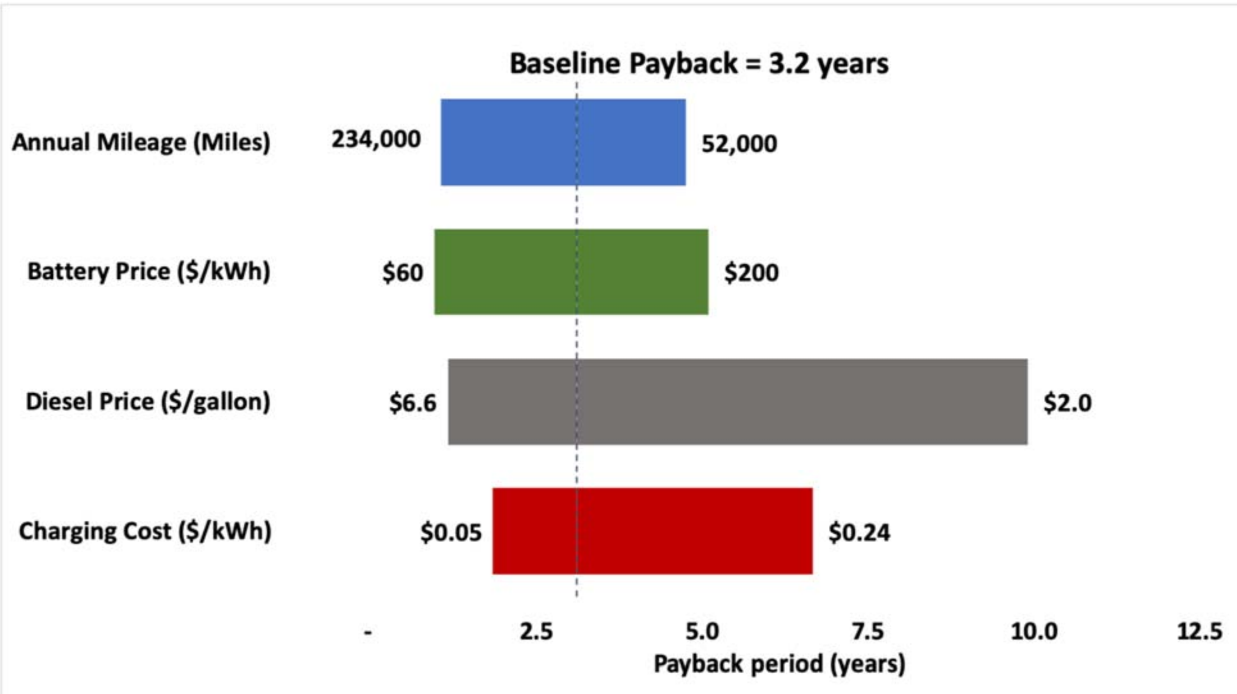

**Figure 6.** Weight of a Class 8 diesel truck compared with a Class 8 battery-electric truck with 375-mile range and 797-kWh battery (top) and 500-mile range and 1,062-kWh battery (bottom), cell specific energy of 250 Wh/kg and packing fraction of 0.88.

Our calculations suggest that the tractor of 375-mile range electric truck is about 3% (~ 300 kg) heavier relative to a diesel truck. However, adoption of even moderate light-weighting options can lead to an increase of 9% in total net payload capacity. For 500-mile electric trucks, the tractor is about 19% heavier relative to diesel tractor but which can be reduced to only 2% heavier by applying commercially available light weighting options resulting into only a minor reduction payload capacity.[16]

Electric trucks with a range up to 300 miles will not require any compromise of the payload capacity because lower weight of the electric powertrain compared to diesel compensates for the additional weight of the battery. Light-weighting (reduction up to 1.5 metric tonnes) and improved aerodynamics using commercially available technology can enable additional range up to 450 miles. Further, since most trucks reach their volume limit before reaching their weight limit, accepting a 5% weight penalty for reducing fuel cost significantly is likely to acceptable for most trucks; together this will allow for large enough batteries to reach ranges up to 600 miles (see ES2). Fast charging during 30-minute driver rest stop can add significant battery range (a 30-minute break is taken every 190 miles and 150 miles for a long haul and regional haul trucks respectively). For these reasons we believe that electric trucks will have sufficient range for most applications in the near future (see ES2 B).

[16] If trucks were to indeed achieve a fuel efficiency similar to those claimed by Tesla, then the battery size, weight, and cost could be about 20% lower than estimated here.

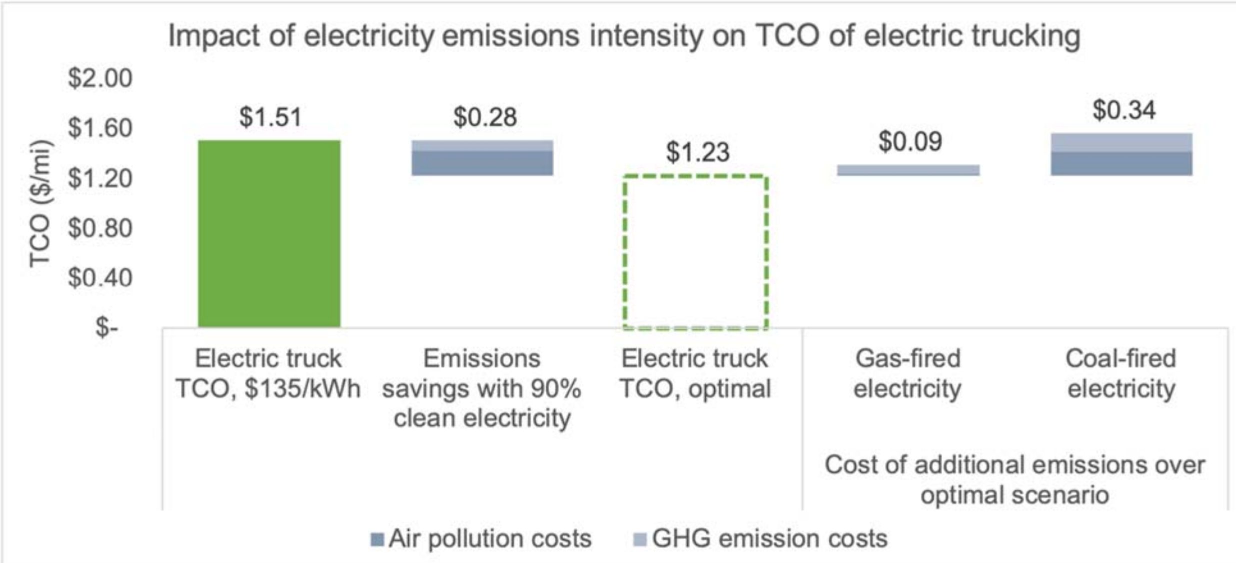
The mean baseline payback period for truck electrification for a 375-mile truck is 3.2 years (Figure 8). Figure 8 also shows the sensitivity of payback period to key parameters. When annual mileage and battery price are varied individually, payback period ranges between 1.0 and 5.1 years. When charging cost is varied individually, it ranges between 1.8 and 6.7 years. When diesel price is varied individually, it ranges between 1.2 and 9.9 years The Discussion section addresses variation in charging cost further.




*Battery price range $200 - $60

**Figure 8.** Sensitivity of the electrification payback period, not including any additional environmental benefits, to different parameters: each parameter is varied individually while the other parameters are held at their baseline values listed in Table 6. Baseline values are 78,000 miles/year driven, $135/kWh battery cost, $3.3/gal diesel, and $0.16/kWh charging cost (which includes both the electricity cost and the levelized cost of charger per kWh of electricity delivered). Sensitivity range for charging cost is based on Phadke et al. 2019; for diesel is based on 50% and 200% of baseline; for battery price is based on 2017 prices and projected 2020-26 prices;

Indeed, electricity emissions intensity (in terms of both air pollution and GHGs) determines the level of net environmental benefits for electric trucks relative to diesel (see Figure 9).



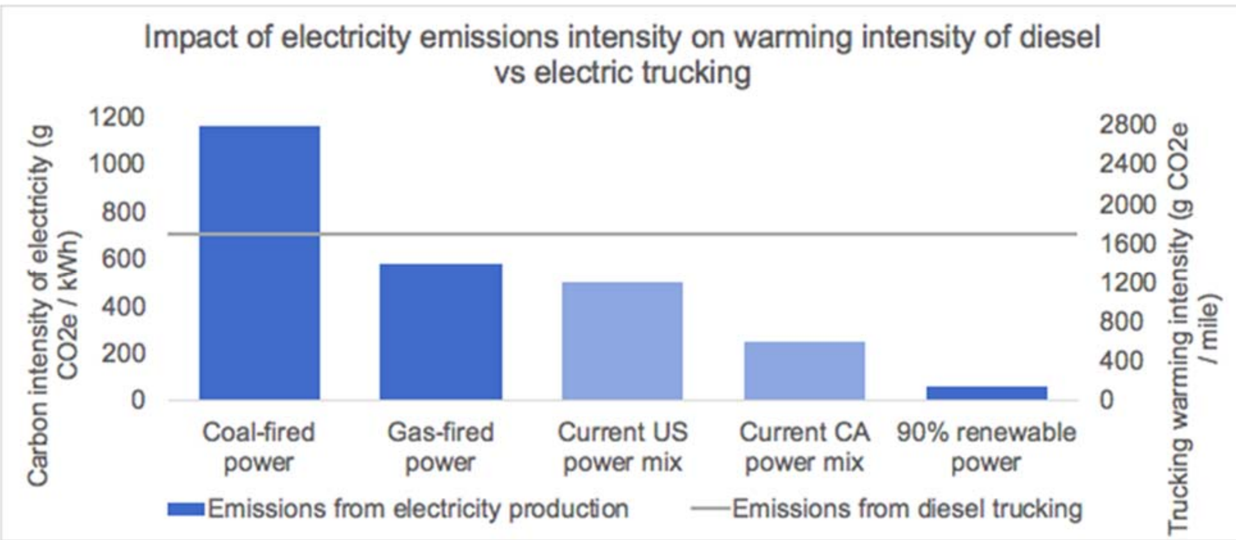




**Figure 9.** (Top) Impact of electricity emissions intensity (from 90% clean electricity, gas-fired electricity, and coal-fired electricity) on 375-mile electric truck TCO, assuming air pollution and GHG emissions costs can be monetized. (Bottom) Comparison of warming intensity of trucking for diesel trucking and electric trucking powered by electricity from coal, gas, and 90% renewable energy, and by the current power mix in the US and in California.

While savings on air pollution and GHGs from electrification are $0.28/mi in a scenario where electricity sources are 90% clean, savings drop to $0.20/mi when electricity comes from gas, and savings become negative (costs rise) by $0.05/mi when electricity comes from coal. In terms of global warming, diesel trucking contributes more warming (in terms of g CO2e/mile) than electrified trucking powered by either gas or 90% clean energy. However, electric trucks powered by gas-fired electricity only save 18% of GHG emissions over diesel trucking, and electric trucking powered by coal produces 64% more GHG emissions than diesel trucking on a per-mile basis.

## 4. Discussion

The comparison of diesel and electric Class 8 long-haul trucks based both on a bottom-up estimation and market-data shows the following. A Class 8 truck electric truck with 375-mile maximum range with a daily average utilization of 300 miles offers about 13% lower per mile TCO and a 3- to 4-year payback for a net savings of about $200,000 over its lifetime, all for about a 3% reduction in payload capacity. Even this reduction in payload capacity could be avoided cost-effectively through light-weighting, and is not a major concern beyond the small fraction of operators which consistently use the trucks maximum payload limit. Based on this our primary conclusion is that that replacing long-haul diesel trucks with electric trucks is both technically feasible and economically viable.

A key lesson is that a low cost of fast-charging (both the amortized cost of charging infrastructure and cost of electricity combined) is central to the economic case for truck electrification, and therefore, getting the charging cost right is critical. As detailed in Phadke et al. 2019 and illustrated in Figure 10, clean, low-cost generation is become abundant across several hours of the day. For instance, most hours of the year in both ERCOT and CAISO have low wholesale electricity prices (see Figure 10). Dynamic electricity tariffs are necessary for the trucking industry to take full advantage of those prices. While static tariffs have fixed price schedules and non-peak-coincident demand charges, dynamic tariffs track wholesale electricity prices, and more importantly, have demand charges coincident with system peak demand. Dynamic tariffs align pricing with the real-time state of the grid and incentivize trucks to charge during low-priced times when the grid is unconstrained. Static tariffs—particularly non-peak-coincident demand charges—can unnecessarily impede truck charging by imposing a high per-kW charge even when charging happens when the grid is unconstrained and generation prices are low.

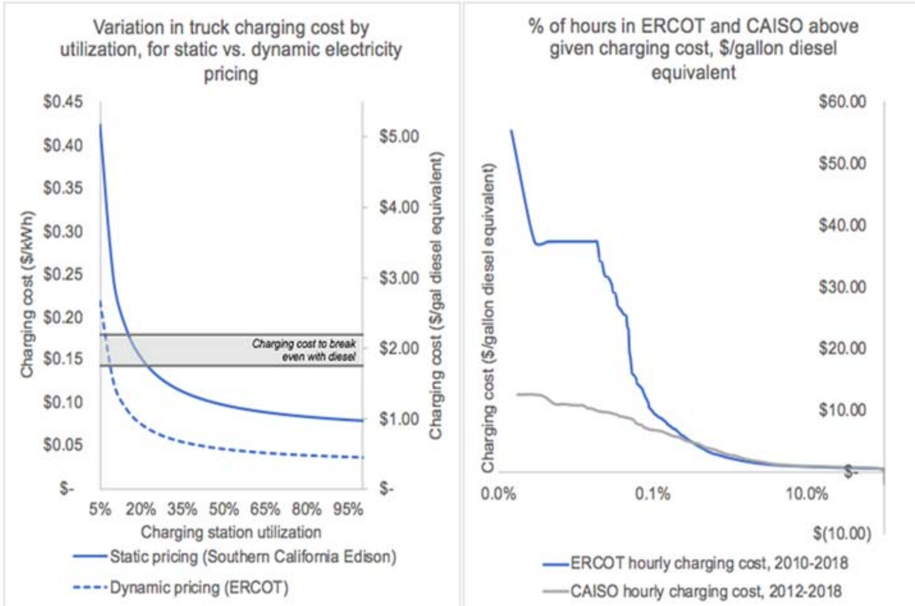



Figure 10. *Excerpt from Phadke et al. (2019)* Variation in truck charging cost by utilization, for static vs. dynamic, system-reflective electricity pricing (left). Proportion of hours in ERCOT (2010–2018) and CAISO (2012–2018) above given charging cost (right). Note: Diesel breakeven range is based on $3.30/gal diesel, battery costs are between $150/kWh (top of range) and $100/kWh (bottom of range), and truck efficiency is assumed to be 5.9 mi/gal (diesel) or 2.1 kWh/mi (electric).

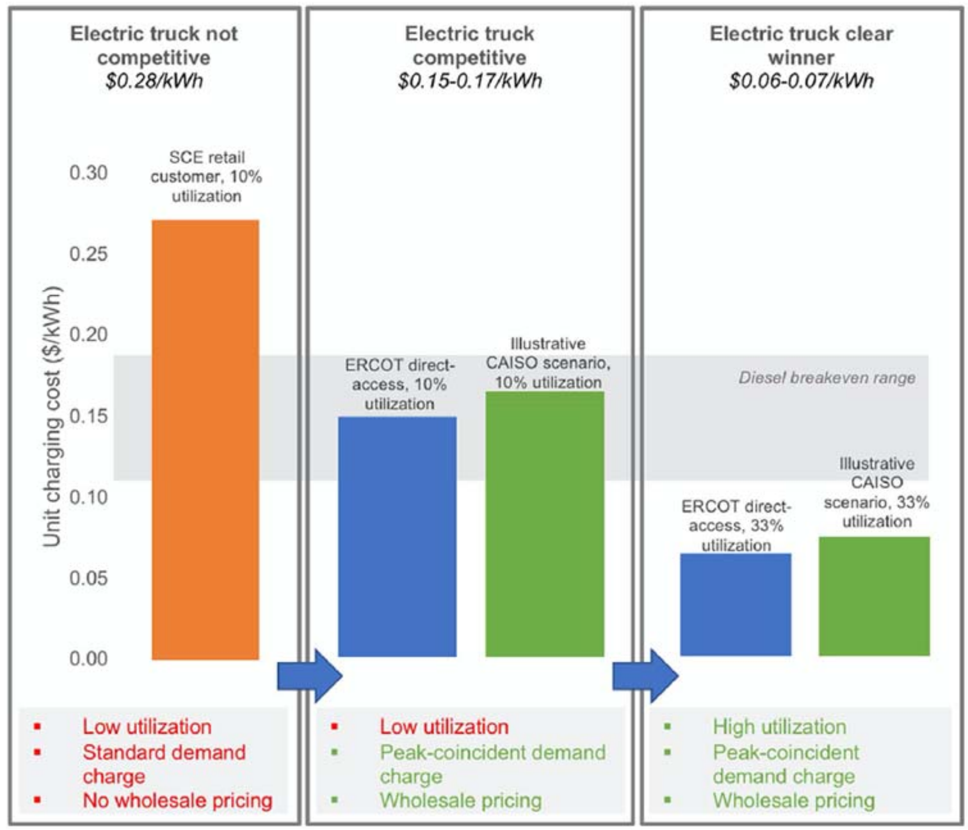



**Figure 9.** Pathway from conditions that result in non-competitive electric trucks (low utilization, standard non-peak-coincident demand charges, and no wholesale pricing) to conditions that result in increasingly competitive electric trucks (peak-coincident demand charges, wholesale pricing, and—eventually—high utilization). Diesel breakeven figures reflect battery costs between $170/kWh and $100/kWh, and $3.16/gal diesel costs.

Figure 11: *Excerpt from Phadke et al. 2019* Rationale electricity tariffs and improved charging infrastructure utilization can significantly improve the economics of electric trucks

We held diesel and electricity prices fixed in this analysis. While modest real increases in diesel prices are being projected (EIA, 2019), we assume no increase on account of high rates of vehicle electrification—the scenario we implicitly address in this paper—could reduce petroleum demand enough to decrease diesel prices. For similar reasons, we do not assume escalating electricity prices. Given uncertainties surrounding grid decarbonization scenarios, falling renewables prices, electrification rates, and electricity policy, we do not attempt to predict changes in electricity prices over time and instead compare electricity to diesel on today's terms.

Environmentally, the benefits of truck electrification can be substantial, but depend on the emissions intensity of electricity. The only scenario in which truck electrification has negative incremental environmental benefits relative to diesel is when the electricity is entirely from coal-based generation while, and not surprisingly, maximum benefits accrue when electricity is exclusively from clean renewables. Gas-fired power, while substantially less emitting than coal and diesel in terms of air pollution, is only marginally better than diesel trucking in terms of GHG emissions when accounting for methane leakage.

The investment trend in the US electricity sector is away from coal and towards increasing renewable energy and natural gas. From 2008-2018, 45% of new capacity additions were gas, and 44% were wind or solar. Only 7% of new capacity in this period was coal, and no new coal capacity has been added since 2015. Looking forward, 50% of capacity under construction is gas, and 44% is wind or solar; similar ratios hold for permitted capacity. (Wind and solar account for over 60% of capacity in earlier stages of development, with gas only 17-26%.)[32] Furthermore, 10 states, as well as Washington, D.C., and Puerto Rico, have 100% clean energy or renewable energy targets.[27] As such, new trucking load will likely be met with increasing investment in gas and renewables, meaning that long-run marginal emissions from electric trucking are expected to be less than that of diesel trucking.

In sum, today there is reason for optimism that long-haul truck electrification can be achieved at a TCO lower than diesel truck TCO without compromising on payload capacity. Future technical research needs to focus on estimating charging infrastructure needs to support an electrified trucking network and developing strategies for charging under different given fleet performance criteria and grid conditions.

An appropriate policy ecosystem is required to stimulate and facilitate the transition from diesel to electric long-haul trucking. As is the case with almost any clean technology, higher upfront costs (for both vehicles and charging infrastructure), due to lack of scale economies and market uncertainty, are greater at the early stages of adoption and are a major market barrier. For instance, notwithstanding the 13% lower TCO of electric trucks (for a 375-mile range truck with a 797-kWh battery pack), they are costlier upfront by 75% upfront, which is major barrier. As battery costs decline, charging related costs are beginning to loom larger. Whereas a decade ago, when battery prices were close $1000/kWh, charging-related cost would have accounted for about 15% to 18% of the TCO of heavy-duty trucks, today they account for 25% to 30%. Recall Figure ES3 which shows how the utilization of charge infrastructure determines the total cost of charging (the sum of cost of electricity and levelized cost of infrastructure) and early stage of adoption will necessarily be characterized by low utilization of charging infrastructure.

Realizing the full economic potential of electric trucks requires surviving a period of infancy of this industry marked by low demand for vehicles and charging, and consequently, higher cost of new vehicle manufacturing and slower return on charging infrastructure. Faced with such barriers, absent public intervention, private investments in electric truck will occur at a level lower than is socially optimal. While this is characteristic of any infant industry, given the importance of addressing pollution from trucking, without strong policy support the coordinated and large-scale investments in vehicle technologies and fuel infrastructure will not be forthcoming on the scale needed to harness the true potential of battery electric trucks. Binding targets for vehicle sales supported by targeted incentives that are indexed both to international battery prices and cumulative sales can help in this regard. There is also a need to rationalize electricity tariffs so that they send the right price signals for truck charging without imposing undue burden on the rest of the system.

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# Attachment 12

| SCAC | # of Trucks | Company Name | Location | Truck Ownership | Employment Model | Notes | Notes | Website |
|---|---|---|---|---|---|---|---|---|
| IMRF | 202 | International Motor Freight | Port Newark, NJ | Company | W-2 | GC works there | | |
| SLSN | 182 | Salson Logistics | Port Newark, NJ | Company | W-2 | recon target confirm w2 | | |
| CPGP | 145 | ContainerPort Group | Chicago, IL | Individual | 1099 | NYDOL | | |
| IRNB | 143 | Ironbound Express | Port Newark, NJ | Individual | 1099 | | | |
| ZMTL | 136 | Zimmerman Trucking | Mifflentown, PA | | | flatbeds and dryvans, no sign of container busines | | |
| RKNE | 127 | Roadone Intermodal Logistics | Kearny, NJ | Individual | 1099? | OO application on line, also 3 NY locations, NYDOL | | http://www.roadone.com/join/ |
| BTTM | 118 | Bridge Terminal Transport | Port Newark, NJ | Individual | 1099 | NYDOL | | |
| SFWY | 113 | Safeway Trucking Corp/East Coast Warehouse | Elizabeth, NJ | Individual | 1099? | Teamster 863 in Warehouse (300+), | dispatcher advised company drivers but website lists oo's | vw.eastcoastwarehouse.com/EmploymentOpportunities.aspx |
| LBKT | 104 | Linden Bulk Transportation | Linden, NJ | | | Specialize in hazmat and bulk but also do retail | | http://www.lindenbulk.com/ |
| EDFF | 103 | CTW/Evans Delivery | Schuylkill Haven, PA | Individual | 1099 | NYDOL | | |
| HMGQ | 93 | H&M Intermodal | Iselin, NJ | Individual | 1099 | teamsters at various other locations | OO's confirmed no company drivers | https://www.hmit.net/owner_operator.htm |
| SIQM | 91 | | | | | | | |
| APTW | 85 | All Points Transport | Newark, NJ | Individual | 1099 | | | |
| CWAS | 85 | | | | | | | |
| BBTO | 79 | BBT Trucking Company | Newark, NJ | Individual | 1099 | | | |
| MCSJ | 79 | Marine Container Services, Inc. | Newark, NJ | Company | W-2 | Teamsters Local 641 | | |
| IRSC | 78 | Intransit Container | Worchester, MA | | | | | http://www.goici.net/ |
| BESR | 75 | Best Transportation | Port Newark, NJ | Company | W-2 | | | |
| EKTI | 75 | E&K Trucking | Port Newark, NJ | Individual | 1099 | | | http://www.enk-trucking.com/aboutus.html |
| FMIF | 74 | Toll Global Forwarding | Carteret, NJ | Company | W-2 | some IC's | | |
| ABIN | 72 | Allied Brothers Intermodal | | | | | | |
| AQUA | 71 | Aqua Gulf Express | Newark, NJ | | Hybrid | "A combo of company drivers/equipment and OO's" | | http://www.aquagulf.com/services/ |
| INSK | 71 | Interstate Transport | St. Petersburg, FL | | | | | |
| TFIV | 70 | | | | | | | |
| DFDO | 69 | Diamond Freight Distribution | Newark, NJ | Individual | 1099 | | | |
| RVTN | 69 | | | | | | | |
| SDHJ | 68 | | | | | | | |
| RPMC | 66 | | | | | | | |
| WUSA | 64 | World Logistics | Allentown, NJ | Individual | 1099 | | | |
| NARO | 61 | Naro Enterprises | | | | | | |
| PTHI | 61 | Proud 2 Haul | Kearny, NJ | Individual | 1099 | 1099 NJ organizing target | | |
| vnnt | 61 | V Ann Trucking | | | | | | |
| WENP | 60 | Werner Enterprises | Omaha, NE | | | | | http://www.werner.com/ |
| FDRQ | 59 | | | | | | | |
| LGOA | 59 | Logistics One | Saratoga Springs, NY | | | http://www.logisticsone.com/driving_jobs.php | | |
| WEXI | 59 | West End Express | Dayton, NJ | Individual? | 1099? | | | |
| AAPJ | 56 | Asa Apple | Carteret, NJ | Company? | W-2? | "full time-company paid drivers" | | http://www.asaapple.com/svcs_trucking.htm |
| MTIP | 56 | MTI Inc | | | | | | |
| CKKI | 55 | C&K Trucking | Chicago, IL | Individual | 1099 | | | |
| BTT | 54 | ? Typo for BTT? | | | | | | |
| BDAY | 51 | Big Daddy Drayage | Newark, NJ | Individual | 1099 | PDF 18 Truth in Leasing Litigation | | http://www.bigdaddydrayage.com/ |
| CXAQ | 51 | | | | | | | |
| HRVN | 51 | Harvest Trans | Newark, NJ | Hybrid? | | Failing 3 of 5 FMCSA, 51% OOS | | |
| PFGJ | 51 | | | | | | | |
| TOYS | 51 | Toys R Us | | | | | | |
| CMRL | 50 | Commercial Transportation, Inc CTI | Norfolk, VA | | | | | http://www.ctitrans.com/ |
| HWTJ | 49 | Heavy Weight Transport | ;nal Hill, CA and Kearny NJ | | | specialize in overweight | | http://www.heavyweighttransportinc.com/default.htm |
| LCYS | 49 | Lacys Express | Pedricktown, NJ | | | specialize in tankhaul and hazmat | | |
| LDWY | 48 | Landstar Inway | | | | US DOT 216939 | | |
| LOJF | 47 | | | | | | | |
| AVDW | 46 | | | | | | | |
| DBKE | 46 | | | | | | | |
| GSFR | 46 | | | | | | | |
| QLYC | 46 | | | | | | | |
| AIPA | 45 | ARL Transport LLC (2 addl NY locations) | Buffalo, NY | Individual | 1099 | 561 Leased, Possible NYDOL target | OO's confirmed but no truck needed, drive company truck as 1099? | |
| EXTT | 44 | | | | | | | |
| MDII | 44 | | | | | | | |
| MXIH | 44 | | | | | | | |
| EPIG | 43 | | | | | | | |
| HSES | 42 | | | | | | | |
| AACO | 41 | | | | | | | |
| SARC | 40 | | | | | | | |
| ZAMC | 40 | | | | | | | |
| BOZI | 39 | | | | | | | |
| PTBY | 39 | | | | | | | |
| TFXI | 39 | | | | | | | |
| TKGR | 39 | | | | | | | |
| TSMT | 39 | | | | | | | |
| EMLA | 38 | | | | | | | |
| EYUS | 38 | | | | | | | |
| HDEK | 38 | | | | | | | |
| OWEI | 38 | | | | | | | |
| PSTH | 38 | | | | | | | |
| RTIF | 38 | | | | | | | |
| MMKY | 37 | | | | | | | |
| RGLS | 37 | | | | | | | |
| FCCC | 36 | | | | | | | |
| JPNS | 36 | | | | | | | |
| NOSV | 36 | | | | | | | |
| ADVP | 35 | | | | | | | |
| LLLC | 35 | | | | | | | |
| SLTW | 35 | | | | | | | |
| CAIO | 34 | | | | | | | |
| FOTO | 34 | | | | | | | |
| FXIM | 34 | | | | | | | |
| HAFG | 34 | | | | | | | |
| MSHY | 34 | | | | | | | |
| TNAS | 34 | | | | | | | |
| DIPN | 33 | | | | | | | |
| DTLI | 33 | | | | | | | |
| MATI | 33 | | | | | | | |
| VHLC | 33 | | | | | | | |
| GFSM | 32 | | | | | | | |
| MRWC | 32 | | | | | | | |
| RESN | 32 | | | | | | | |
| TSIL | 32 | | | | | | | |
| FICL | 31 | | | | | | | |
| GCRI | 31 | | | | | | | |
| KKCE | 31 | | | | | | | |
| LRGR | 31 | | | | | | | |
| PKCQ | 31 | | | | | | | |
| DYDS | 30 | | | | | | | |
| HZNF | 30 | | | | | | | |
| TSXL | 30 | | | | | | | |
| WLEH | 30 | | | | | | | |
| ACIO | 29 | | | | | | | |
| BKYI | 29 | | | | | | | |
| BYKS | 29 | | | | | | | |
| IQLG | 29 | | | | | | | |
| PJTJ | 29 | | | | | | | |
| WHVH | 29 | | | | | | | |
| BRDY | 28 | Bridgeside Inc. (div of Distribution Man... | Staten Island, NY | Individual | 1099? | Possible NYDOL target, confirmed they are hiring oo's | | |
| MTPC | 28 | | | | | | | |
| ALIC | 27 | | | | | | | |
| CBXT | 27 | | | | | | | |
| EZTS | 27 | | | | | | | |
| KMTA | 27 | | | | | | | |
| TOII | 27 | | | | | | | |
| CBYQ | 26 | | | | | | | |
| UNMC | 26 | | | | | | | |
| CNXN | 25 | | | | | | | |
| DEME | 25 | | | | | | | |
| EGSY | 25 | Eagle Systems | Brewerton, NY | Individual | 1099 | 334 leased/ Possible NYDOL target | | |
| GSKP | 25 | | | | | | | |
| JWEL | 25 | | | | | | | |
| MECA | 25 | | | | | | | |
| METN | 25 | | | | | | | |
| SKRO | 25 | | | | | | | |
| SRFP | 25 | Sea-Transfer Corp | Bronx, NY | Company | W2? | Possible NY organizing target recon confirm w2 | | |
| SPTJ | 24 | | | | | | | |
| WPTO | 24 | | | | | | | |
| CVKG | 23 | | | | | | | |
| JEDT | 23 | | | | | | | |
| MGTY | 23 | | | | | | | |
| MRPJ | 23 | | | | | | | |
| NICS | 23 | | | | | | | |
| RVTO | 23 | | | | | | | |
| DWVL | 22 | | | | | | | |
| GTMD | 22 | | | | | | | |
| HRLP | 22 | | | | | | | |
| MCET | 22 | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PGXS | 22 | | | | | |
| QWDC | 22 | | | | | |
| ACHC | 21 | | | | | |
| AWPC | 21 | | | | | |
| HDXN | 21 | | | | | |
| JTPG | 21 | | | | | |
| NART | 21 | | | | | |
| CGXJ | 20 | | | | | |
| DRYR | 20 | | | | | |
| JHOL | 20 | | | | | |
| LMDI | 20 | | | | | |
| NCTA | 20 | | | | | |
| CASR | 19 | | | | | |
| FBPE | 19 | | | | | |
| JONS | 19 | | | | | |
| JWLL | 19 | | | | | |
| LJCT | 19 | | | | | |
| MRZC | 19 | | | | | |
| SABS | 19 | | | | | |
| STSB | 19 | | | | | |
| Becr | 18 | | | | | |
| BNBS | 18 | | | | | |
| PCCT | 18 | Pacer NJ | | | | |
| PICF | 18 | | | | | |
| SPMO | 18 | | | | | |
| WHAG | 18 | | | | | |
| djro | 17 | | | | | |
| DLKA | 17 | | | | | |
| ECEN | 17 | | | | | |
| ITZO | 17 | | | | | |
| KEJB | 17 | | | | | |
| MRAP | 17 | | | | | |
| MUKE | 17 | | | | | |
| OCTJ | 17 | | | | | |
| PLGM | 17 | | | | | |
| TTOS | 17 | | | | | |
| ADFJ | 16 | | | | | |
| CXIQ | 16 | | | | | |
| ETCO | 16 | | | | | |
| Eylc | 16 | | | | | |
| GCOK | 16 | | | | | |
| MTBL | 16 | | | | | |
| NYLG | 16 | | | | | |
| SNJH | 16 | | | | | |
| VMTK | 16 | | | | | |
| WRLP | 16 | | | | | |
| AFNG | 15 | | | | | |
| ASVM | 15 | | | | | |
| BOXT | 15 | | | | | |
| CJLT | 15 | | | | | |
| FEHO | 15 | | | | | |
| HLSH | 15 | | | | | |
| LXKC | 15 | | | | | |
| OTDV | 15 | | | | | |
| RHOY | 15 | | | | | |
| RTPG | 15 | | | | | |
| sjts | 15 | | | | | |
| UNDG | 15 | | | | | |
| ADRJ | 14 | | | | | |
| GDIB | 14 | | | | | |
| GMBQ | 14 | | | | | |
| INPE | 14 | | | | | |
| JDFD | 14 | | | | | |
| PKRQ | 14 | | | | | |
| TIMN | 14 | | | | | |
| TPSP | 14 | | | | | |
| ACJT | 13 | | | | | |
| BKTG | 13 | | | | | |
| BZTR | 13 | | | | | |
| COUR | 13 | | | | | |
| CWAQ | 13 | | | | | |
| DAYR | 13 | | | | | |
| DVXJ | 13 | | | | | |
| ECXE | 13 | | | | | |
| ESKT | 13 | | | | | |
| GAOT | 13 | | | | | |
| GBTC | 13 | | | | | |
| GCP1 | 13 | | | | | |
| MNHT | 13 | | | | | |
| OPSP | 13 | | | | | |
| PMLI | 13 | | | | | |
| SHDL | 13 | | | | | |
| SNUS | 13 | | | | | |
| WSLH | 13 | | | | | |
| apbb | 12 | | | | | |
| BRMY | 12 | | | | | |
| CRXI | 12 | | | | | |
| CZOL | 12 | | | | | |
| DCEC | 12 | | | | | |
| DNTS | 12 | | | | | |
| ETCQ | 12 | | | | | |
| EXPC | 12 | | | | | |
| HNYI | 12 | | | | | |
| KTRB | 12 | | | | | |
| LIBP | 12 | | | | | |
| NHTA | 12 | | | | | |
| RJPI | 12 | | | | | |
| RYCB | 12 | | | | | |
| SYEC | 12 | | | | | |
| SZMT | 12 | | | | | |
| TXED | 12 | | | | | |
| ADJQ | 11 | | | | | |
| ARPF | 11 | | | | | |
| BKON | 11 | | | | | |
| CCVP | 11 | | | | | |
| CNLJ | 11 | | | | | |
| CSQP | 11 | | | | | |
| GRTW | 11 | | | | | |
| GWLG | 11 | | | | | |
| IDTN | 11 | | | | | |
| LBPM | 11 | | | | | |
| LSIB | 11 | | | | | |
| MELP | 11 | | | | | |
| MMTK | 11 | | | | | |
| NJTA | 11 | | | | | |
| NYET | 11 | | | | | |
| OVCS | 11 | | | | | |
| PATG | 11 | | | | | |
| PCOA | 11 | | | | | |
| PIEG | 11 | | | | | |
| TWNO | 11 | | | | | |
| ALRA | 10 | | | | | |
| BLKY | 10 | | | | | |
| COPB | 10 | Cope Bestway Express, Inc. | Cheektowaga, NY | Hybrid? | Hybrid? | 21 owned/23 leased trucks |
| ESAI | 10 | | | | | |
| ETEI | 10 | | | | | |
| EWSE | 10 | | | | | |
| FNEC | 10 | | | | | |
| FTIV | 10 | | | | | |
| GNRQ | 10 | | | | | |
| GNXB | 10 | | | | | |
| GTXN | 10 | | | | | |
| HZEG | 10 | | | | | |
| JANP | 10 | | | | | |
| JILD | 10 | | | | | |
| JJST | 10 | | | | | |
| MRMC | 10 | | | | | |
| NREP | 10 | | | | | |
| PFIV | 10 | | | | | |
| PICB | 10 | | | | | |
| PXIN | 10 | | | | | |
| SFNN | 10 | | | | | |
| SREL | 10 | | | | | |
| SYTH | 10 | | | | | |

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|---|---|
| TOKN | 10 |
| TSLL | 10 |
| VECS | 10 |
| VTXE | 10 |
| ACFE | 9 |
| ALQQ | 9 |
| ALWE | 9 |
| APCW | 9 |
| AQRT | 9 |
| BRCL | 9 |
| bxcl | 9 |
| Cokm | 9 |
| COSJ | 9 |
| CQQO | 9 |
| EEUI | 9 |
| ETPI | 9 |
| FLNP | 9 |
| GXRY | 9 |
| IBIT | 9 |
| KSTP | 9 |
| KWRS | 9 |
| MXKL | 9 |
| PMXV | 9 |
| QPSI | 9 |
| RRUK | 9 |
| TWME | 9 |
| UTIH | 9 |
| VEXC | 9 |
| AAGL | 8 |
| ADCR | 8 |
| AGXI | 8 |
| APSH | 8 |
| BWTS | 8 |
| CDBT | 8 |
| CJRS | 8 |
| DMAP | 8 |
| FDSD | 8 |
| GVLO | 8 |
| HAIN | 8 |
| HBLD | 8 |
| HRKG | 8 |
| IEXC | 8 |
| JBHT | 8 |
| JLPQ | 8 |
| JWAC | 8 |
| KSSR | 8 |
| LHTB | 8 |
| MNER | 8 |
| NPMA | 8 |
| QKWT | 8 |
| RNSL | 8 |
| ROSD | 8 |
| SNNS | 8 |
| SSWR | 8 |
| TAKP | 8 |
| TNLL | 8 |
| TPQA | 8 |
| TRTC | 8 |
| TVEO | 8 |
| UCLR | 8 |
| UTSC | 8 |
| VNCS | 8 |
| WCON | 8 |
| ABAP | 7 |
| AGDI | 7 |
| AIBB | 7 |
| APCS | 7 |
| AROY | 7 |
| BEIH | 7 |
| BNKW | 7 |
| CIAC | 7 |
| DECJ | 7 |
| EROK | 7 |
| FNHW | 7 |
| GBPK | 7 |
| GTTY | 7 |
| HORW | 7 |
| HTTQ | 7 |
| JMDI | 7 |
| KNSI | 7 |
| KRBB | 7 |
| LGWK | 7 |
| LING | 7 |
| MGDP | 7 |
| MNTB | 7 |
| MSYN | 7 |
| mvri | 7 |
| NOEF | 7 |
| OLHI | 7 |
| PODP | 7 |
| ROMC | 7 |
| SJTJ | 7 |
| TKDT | 7 |
| ZTPN | 7 |
| ACQJ | 6 |
| AEDQ | 6 |
| AFSG | 6 |
| ANEJ | 6 |
| BTOC | 6 |
| COIL | 6 |
| DNSJ | 6 |
| ECUK | 6 |
| EFCS | 6 |
| FFSQ | 6 |
| JJSN | 6 |
| JMYS | 6 |
| KALD | 6 |
| KKLI | 6 |
| LJTH | 6 |
| LKEQ | 6 |
| LOXL | 6 |
| MTZQ | 6 |
| MXIC | 6 |
| RIEN | 6 |
| RLKG | 6 |
| RORL | 6 |
| RSHC | 6 |
| SCWW | 6 |
| Ssnj | 6 |
| TAPW | 6 |
| TSVJ | 6 |
| WNAV | 6 |
| YOMI | 6 |
| ZPTN | 6 |
| ACVT | 5 |
| ACZC | 5 |
| AMCD | 5 |
| ANTY | 5 |
| axnn | 5 |
| BRME | 5 |
| CGBP | 5 |
| CMPY | 5 |
| CNXL | 5 |
| COFI | 5 |
| CTKI | 5 |
| DMCO | 5 |
| EXGL | 5 |
| FSGQ | 5 |
| GLNT | 5 |
| GLTN | 5 |
| GVSM | 5 |
| GWTM | 5 |
| HACH | 5 |
| HOPF | 5 |

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|---|---|---|---|
| JFVT | 5 | | |
| JRTN | 5 | | |
| KAEI | 5 | | |
| KLVL | 5 | | |
| KRLK | 5 | | |
| KSHE | 5 | | |
| LBBL | 5 | | |
| LEIW | 5 | | |
| LQCG | 5 | | |
| METS | 5 | | |
| MVHD | 5 | | |
| MWOA | 5 | | |
| NEIN | 5 | | |
| NEWO | 5 | | |
| NFWF | 5 | | |
| NWSD | 5 | | |
| OMWI | 5 | | |
| PODL | 5 | | |
| PTNJ | 5 | | |
| PWRE | 5 | | |
| QTIB | 5 | | |
| QTPS | 5 | | |
| RDRN | 5 | | |
| RLCS | 5 | | |
| SAPQ | 5 | | |
| SHDV | 5 | | |
| SHPS | 5 | | |
| SNPH | 5 | | |
| TBEM | 5 | | |
| TCGA | 5 | | |
| TFFS | 5 | | |
| TGPQ | 5 | | |
| TNYQ | 5 | | |
| TSAI | 5 | | |
| TXSN | 5 | | |
| USON | 5 | | |
| VIIC | 5 | | |
| WBCW | 5 | | |
| WEVH | 5 | | |
| XTGL | 5 | | |
| ADYO | 4 | | |
| AGBV | 4 | | |
| AMDI | 4 | | |
| AOQS | 4 | | |
| ARDE | 4 | | |
| ASEI | 4 | | |
| ASIM | 4 | | |
| BHXL | 4 | | |
| BJIN | 4 | | |
| BLBI | 4 | | |
| BSPO | 4 | | |
| BWHO | 4 | | |
| BWNV | 4 | | |
| CCXP | 4 | Cal Cartage | Savannah, GA |
| CKLM | 4 | | |
| CLZG | 4 | | |
| CYLJ | 4 | | |
| EPCQ | 4 | | |
| ESFT | 4 | | |
| EVLS | 4 | | |
| EXSY | 4 | | |
| feco | 4 | | |
| FEXJ | 4 | | |
| FTTH | 4 | | |
| FVAS | 4 | | |
| GMMA | 4 | | |
| GNEI | 4 | | |
| GSCH | 4 | | |
| GSWH | 4 | | |
| HAWG | 4 | | |
| ILWH | 4 | | |
| IMFI | 4 | | |
| INMO | 4 | | |
| ITCF | 4 | | |
| jadv | 4 | | |
| JLBI | 4 | | |
| JOHR | 4 | | |
| JYTO | 4 | | |
| KALA | 4 | | |
| KTFN | 4 | | |
| LGNI | 4 | | |
| LNRH | 4 | | |
| MDSK | 4 | | |
| Midl | 4 | | |
| MJEG | 4 | | |
| MPRI | 4 | | |
| MRPE | 4 | | |
| PAPD | 4 | | |
| PPXN | 4 | | |
| RDWY | 4 | | |
| RSDN | 4 | | |
| SETP | 4 | | |
| SKHA | 4 | | |
| SOEJ | 4 | | |
| SOMH | 4 | | |
| STZG | 4 | | |
| SVBH | 4 | | |
| TCSE | 4 | | |
| TLQV | 4 | | |
| TMDC | 4 | | |
| TTTJ | 4 | | |
| TXEH | 4 | | |
| TXRW | 4 | | |
| VXLL | 4 | | |
| WULI | 4 | | |
| wwpc | 4 | | |
| AADD | 3 | | |
| ABWP | 3 | | |
| AERM | 3 | | |
| AETG | 3 | | |
| AEXE | 3 | | |
| AGGL | 3 | | |
| AOKC | 3 | | |
| AVNN | 3 | | |
| AWTC | 3 | | |
| BFXR | 3 | | |
| BRTI | 3 | | |
| BSFN | 3 | | |
| bsre | 3 | | |
| CAIA | 3 | | |
| Cbup | 3 | | |
| CLEQ | 3 | | |
| CNQP | 3 | | |
| CPFR | 3 | | |
| CXTV | 3 | | |
| DAEA | 3 | | |
| DBDI | 3 | | |
| DBKP | 3 | | |
| DISV | 3 | | |
| DOTO | 3 | | |
| FDLO | 3 | | |
| GBOT | 3 | | |
| HALS | 3 | | |
| HGNS | 3 | | |
| HKEP | 3 | | |
| IMGI | 3 | | |
| JCPD | 3 | | |
| JGXL | 3 | | |
| JRDP | 3 | | |
| JSXQ | 3 | | |
| KCRG | 3 | | |
| KERA | 3 | | |
| KKRE | 3 | | |
| LIGS | 3 | | |

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|---|---|
| LNAF | 3 |
| LOWY | 3 |
| lsag | 3 |
| MLXD | 3 |
| MNMN | 3 |
| MRNQ | 3 |
| MSGV | 3 |
| MXTC | 3 |
| MYRG | 3 |
| NJEN | 3 |
| NVSO | 3 |
| Pcap | 3 |
| PJTP | 3 |
| POBL | 3 |
| POSL | 3 |
| PRKM | 3 |
| QEIC | 3 |
| RBCT | 3 |
| RBNE | 3 |
| RMDQ | 3 |
| RSBI | 3 |
| RTPK | 3 |
| RVIO | 3 |
| SBHK | 3 |
| SLUA | 3 |
| SMLU | 3 |
| SVEG | 3 |
| SXSJ | 3 |
| TDIW | 3 |
| TDSE | 3 |
| TWQI | 3 |
| UACL | 3 |
| UBFS | 3 |
| UNDH | 3 |
| UOBT | 3 |
| UTPI | 3 |
| VTIK | 3 |
| WASS | 3 |
| WLEF | 3 |
| ADDI | 2 |
| AGTK | 2 |
| APFK | 2 |
| ARXA | 2 |
| ASGW | 2 |
| ATFJ | 2 |
| ATVP | 2 |
| BAXI | 2 |
| BCFF | 2 |
| BMTA | 2 |
| BRKB | 2 |
| BRRH | 2 |
| BRRI | 2 |
| BRTW | 2 |
| CBXD | 2 |
| CFNE | 2 |
| CGFS | 2 |
| CHJH | 2 |
| CIIY | 2 |
| CJTR | 2 |
| CLXH | 2 |
| CRGG | 2 |
| CRIR | 2 |
| CXLC | 2 |
| DCPM | 2 |
| DMTG | 2 |
| DTDI | 2 |
| DVCO | 2 |
| FAWW | 2 |
| FECJ | 2 |
| FHDS | 2 |
| FLXI | 2 |
| FVSO | 2 |
| GICO | 2 |
| GNOS | 2 |
| HCEA | 2 |
| HEXI | 2 |
| HHLP | 2 |
| HJBT | 2 |
| HXLL | 2 |
| INLA | 2 |
| JKNP | 2 |
| Jodp | 2 |
| JVCT | 2 |
| JZEL | 2 |
| KBLR | 2 |
| KKGI | 2 |
| KLQC | 2 |
| KTXP | 2 |
| KYCO | 2 |
| LELM | 2 |
| LITM | 2 |
| LOUK | 2 |
| LTFT | 2 |
| LTSP | 2 |
| LWEJ | 2 |
| MADL | 2 |
| MCRS | 2 |
| MCTD | 2 |
| MDNW | 2 |
| MDVC | 2 |
| MJKO | 2 |
| MNZT | 2 |
| MTTB | 2 |
| NCDI | 2 |
| NWCF | 2 |
| OSIQ | 2 |
| PAFS | 2 |
| PCXA | 2 |
| PNKO | 2 |
| PTRD | 2 |
| RCHM | 2 |
| RMLI | 2 |
| RMRP | 2 |
| RPMR | 2 |
| RWLI | 2 |
| RWYL | 2 |
| SAQW | 2 |
| SBDM | 2 |
| sfsc | 2 |
| SKIV | 2 |
| SQPG | 2 |
| SRFE | 2 |
| SWES | 2 |
| SWIB | 2 |
| TPNI | 2 |
| TRLL | 2 |
| TTUS | 2 |
| WADE | 2 |
| WDTF | 2 |
| WLLJ | 2 |
| XSTP | 2 |
| ABXO | 1 |
| ACIU | 1 |
| ADXO | 1 |
| AJGT | 1 |
| AJSQ | 1 |
| ALYN | 1 |
| AMMF | 1 |
| ANYC | 1 |
| APAY | 1 |
| AWIA | 1 |
| AWLE | 1 |
| BCSW | 1 |
| BGME | 1 |

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|---|---|
| BHIN | 1 |
| BICQ | 1 |
| BN | 1 |
| BNFP | 1 |
| BOMN | 1 |
| BRXL | 1 |
| BSVF | 1 |
| BWND | 1 |
| BWTL | 1 |
| BXPH | 1 |
| CAUA | 1 |
| CEQJ | 1 |
| CHBP | 1 |
| COFF | 1 |
| COLB | 1 |
| CTLB | 1 |
| CUPI | 1 |
| DAIC | 1 |
| dakd | 1 |
| DALK | 1 |
| DCHP | 1 |
| DFBL | 1 |
| DGEC | 1 |
| DJCQ | 1 |
| DWDK | 1 |
| DYAC | 1 |
| ECOW | 1 |
| ECSJ | 1 |
| ECTK | 1 |
| EGJL | 1 |
| EHAW | 1 |
| ELSW | 1 |
| ERUY | 1 |
| ESIY | 1 |
| EXNL | 1 |
| FLHP | 1 |
| FRAP | 1 |
| FTTF | 1 |
| FULC | 1 |
| GCAB | 1 |
| GDKI | 1 |
| GDMP | 1 |
| GGSQ | 1 |
| GLDJ | 1 |
| GLFI | 1 |
| GLLE | 1 |
| GMAD | 1 |
| GNJY | 1 |
| GRSJ | 1 |
| GTIP | 1 |
| GTKC | 1 |
| GTXH | 1 |
| HCTM | 1 |
| HDEI | 1 |
| HDVF | 1 |
| HELI | 1 |
| HHEP | 1 |
| HHLA | 1 |
| HTIJ | 1 |
| JDAK | 1 |
| JFSV | 1 |
| JJIL | 1 |
| JMTN | 1 |
| JTXA | 1 |
| KBTM | 1 |
| KMTJ | 1 |
| KNST | 1 |
| LBIT | 1 |
| lcav | 1 |
| ldya | 1 |
| LIBA | 1 |
| LLGQ | 1 |
| LWLL | 1 |
| LYNI | 1 |
| MAIF | 1 |
| MAMP | 1 |
| MBNO | 1 |
| MCLC | 1 |
| MCMF | 1 |
| MFRN | 1 |
| MKMH | 1 |
| MMSL | 1 |
| MNGP | 1 |
| MNOL | 1 |
| MQNT | 1 |
| MTRO | 1 |
| MVTJ | 1 |
| MXCQ | 1 |
| MZTG | 1 |
| NFCE | 1 |
| NITC | 1 |
| NOLD | 1 |
| NRHS | 1 |
| NWDR | 1 |
| NYML | 1 |
| NYPI | 1 |
| odmi | 1 |
| OWIE | 1 |
| OWTP | 1 |
| PADD | 1 |
| PBGN | 1 |
| PCLO | 1 |
| PDMC | 1 |
| PEDN | 1 |
| PHNG | 1 |
| PPSK | 1 |
| PTAG | 1 |
| QTCR | 1 |
| RAJL | 1 |
| RAQC | 1 |
| RCVC | 1 |
| RDLS | 1 |
| RILG | 1 |
| RITY | 1 |
| RLTA | 1 |
| ROFT | 1 |
| RPLL | 1 |
| RRXI | 1 |
| RTKV | 1 |
| RVLH | 1 |
| RXCO | 1 |
| RXMQ | 1 |
| RYLG | 1 |
| sbtj | 1 |
| SCIL | 1 |
| SDHL | 1 |
| SDTV | 1 |
| SKZL | 1 |
| SLEM | 1 |
| SMOK | 1 |
| SNZV | 1 |
| SRCS | 1 |
| STFP | 1 |
| SVED | 1 |
| SYTP | 1 |
| SYXE | 1 |
| TACL | 1 |
| TEDJ | 1 |
| TFBI | 1 |
| TGSS | 1 |
| THEQ | 1 |
| TKLE | 1 |
| TQCG | 1 |
| TRNJ | 1 |

| | |
|---|---|
| TRSP | 1 |
| TUAA | 1 |
| TWPF | 1 |
| TWTY | 1 |
| TXOQ | 1 |
| UDST | 1 |
| UNST | 1 |
| USTP | 1 |
| VIQP | 1 |
| VNTL | 1 |
| VSGE | 1 |
| WATN | 1 |
| WIIQ | 1 |
| WLXC | 1 |
| WORI | 1 |
| | |
| NO SCAC | 554 |
| | 11535 |

| SCAC | # of Trucks | Company Name | Location | Truck Ownership | Employment Model | Notes | Notes | Website |
|---|---|---|---|---|---|---|---|---|
| FMIF | 74 | Toll Global Forwarding | Carteret, NJ | Company | W-2 | Teamsters Local 469 some IC's | | |
| MCSJ | 79 | Marine Container Services, Inc. | Newark, NJ | Company | W-2 | Teamsters Local 641 | | |
| | | | | | | | | |
| SLSN | 182 | Salson Logistics | Port Newark, NJ | Company | W-2 | also 30 drivers in CA | | |
| IMRF | 202 | International Motor Freight | Port Newark, NJ | Company | W-2 | | | |
| BESR | 75 | Best Transportation | Port Newark, NJ | Company | W-2 | | | |
| AQUA | 71 | Aqua Gulf Express | Newark, NJ | | Hybrid | "A combo of company drivers/equipment and OO's" | | |
| AAPJ | 56 | Asa Apple | Carteret, NJ | Company? | W-2? | "full time-company paid drivers" | | http://www.asaapple.com/svcs_trucking.htm |
| SRFP | 25 | Sea-Transfer Corp | Bronx, NY | Company | W2? | recon confirm w2, also NJ location | | http://www.aquagulf.com/services/ |
| | | | | | | | | |
| RKNE | 145 | ContainerPort Group | Chicago, IL | Individual | 1099 | NYDOL | | http://www.roadone.com/join/ |
| SFWY | 143 | Ironbound Express | Port Newark, NJ | Individual | 1099 | | dispatcher advised company drivers but website lists oo's | vw.eastcoastwarehouse.com/EmploymentOpportunities.aspx |
| WEXI | 136 | Zimmerman Trucking | Mifflentown, PA | | | flatbeds and dryvans, no sign of container busines | | |
| BRDY | 127 | Roadone Intermodal Logistics | Kearny, NJ | Individual | 1099? | OO application on line, also 3 NY locations, NYDOL | | |
| CPGP | 118 | Bridge Terminal Transport | Port Newark, NJ | Individual | 1099 | NYDOL | | |
| IRNB | 113 | eway Trucking Corp/East Coast Wareho | Elizabeth, NJ | Individual | 1099? | Teamster 863 in Warehouse (300+), | | |
| BTTM | 104 | Linden Bulk Transportation | Linden, NJ | | | Specialize in hazmat and bulk but also do retail | | |
| EDFF | 103 | CTW/Evans Delivery | Schuylkill Haven, PA | Individual | 1099 | NYDOL | | |
| HMGQ | 93 | H&M Intermodal | Iselin, NJ | Individual | 1099 | teamsters at various other locations | OO's confirmed no company drivers | https://www.hmit.net/owner_operator.htm |
| APTW | 91 | | | | | | | |
| BBTO | 85 | All Points Transport | Newark, NJ | Individual | 1099 | | | |
| EKTI | 85 | | | | | | | http://www.enk-trucking.com/aboutus.html |
| DFDO | 79 | BBT Trucking Company | Newark, NJ | Individual | 1099 | | | |
| WUSA | 78 | Intransit Container | Worchester, MA | | | | | |
| PTHI | 75 | E&K Trucking | Port Newark, NJ | Individual | 1099 | | | |
| CKKI | 72 | Allied Brothers Intermodal | | | | | | |
| BDAY | 71 | Interstate Transport | St. Petersburg, FL | | | | | http://www.bigdaddydrayage.com/ |
| AIPA | 70 | | | | | | OO's confirmed but no truck needed, drive company truck as 1099? | |
| EGSY | 69 | Diamond Freight Distribution | Newark, NJ | Individual | 1099 | | | |
| ZMTL | 69 | | | | | | | |
| LBKT | 68 | | | | | | | http://www.lindenbulk.com/ |
| SIQM | 66 | | | | | | | |
| CWAS | 64 | World Logistics | Allentown, NJ | Individual | 1099 | | | |
| IRSC | 61 | Proud 2 Haul | Kearny, NJ | Individual | 1099 | 1099 NJ organizing target | | http://www.goici.net/ |
| ABIN | 61 | Naro Enterprises | | | | | | |
| INSK | 61 | V Ann Trucking | | | | | | |
| TFIV | 60 | Werner Enterprises | Omaha, NE | | | | | |
| RVTN | 59 | West End Express | Dayton, NJ | Individual? | 1099? | | | |
| SDHJ | 59 | | | | | | | |
| RPMC | 59 | Logistics One | Saratoga Springs, NY | | | http://www.logisticsone.com/driving_jobs.php | | |
| NARO | 56 | MTI Inc | | | | | | |
| vnnt | 55 | C&K Trucking | Chicago, IL | Individual | 1099 | | | |
| WENP | 54 | ? Typo for BTT? | | | | | | http://www.werner.com/ |
| FDRQ | 51 | Big Daddy Drayage | Newark, NJ | Individual | 1099 | PDF 18 Truth in Leasing Litigation | | |
| LGOA | 51 | | | | | | | |
| MTIP | 51 | Harvest Trans | Newark, NJ | Hybrid? | | Failing 3 of 5 FMCSA, 51% OOS | | |
| BTT | 51 | | | | | | | |
| CXAQ | 51 | Toys R Us | | | | | | |
| HRVN | 50 | Commercial Transportation, Inc CTI | Norfolk, VA | | | | | |
| PFGJ | 49 | Heavy Weight Transport | ;nal Hill, CA and Kearny NJ | | | specialize in overweight | | |
| TOYS | 49 | Lacys Express | Pedricktown, NJ | | | specialize in tankhaul and hazmat | | |
| CMRL | 48 | Landstar Inway | | | | US DOT 216939 | | http://www.ctitrans.com/ |
| HWTJ | 45 | ARL Transport LLC (2 addl NY locations) | Buffalo, NY | Individual | 1099 | 561 Leased, Possible NYDOL target | | http://www.heavyweighttransportinc.com/default.htm |
| LCYS | 28 | Bridgeside Inc. (div of Distribution Man... | Staten Island, NY | Individual | 1099? | Possible NYDOL target, confirmed they are hiring oo's | | |
| LDWY | 25 | Eagle Systems | Brewerton, NY | Individual | 1099 | 334 leased/ Possible NYDOL target | | |
| | | | | | | | | |
| LOJF | 47 | | | | | | | |
| AVDW | 46 | | | | | | | |
| DBKE | 46 | | | | | | | |
| GSFR | 46 | | | | | | | |
| QLYC | 46 | | | | | | | |
| EXTT | 44 | | | | | | | |
| MDII | 44 | | | | | | | |
| MXIH | 44 | | | | | | | |
| EPIG | 43 | | | | | | | |
| HSES | 42 | | | | | | | |
| AACO | 41 | | | | | | | |
| SARC | 40 | | | | | | | |
| ZAMC | 40 | | | | | | | |
| BOZI | 39 | | | | | | | |
| PTBY | 39 | | | | | | | |
| TFXI | 39 | | | | | | | |
| TKGR | 39 | | | | | | | |
| TSMT | 39 | | | | | | | |
| EMLA | 38 | | | | | | | |
| EYUS | 38 | | | | | | | |
| HDEK | 38 | | | | | | | |
| OWEI | 38 | | | | | | | |
| PSTH | 38 | | | | | | | |
| RTIF | 38 | | | | | | | |
| MMKY | 37 | | | | | | | |
| RGLS | 37 | | | | | | | |
| FCCC | 36 | | | | | | | |
| JPNS | 36 | | | | | | | |
| NOSV | 36 | | | | | | | |
| ADVP | 35 | | | | | | | |
| LLLC | 35 | | | | | | | |
| SLTW | 35 | | | | | | | |
| CAIO | 34 | | | | | | | |
| FOTO | 34 | | | | | | | |
| FXIM | 34 | | | | | | | |
| HAFG | 34 | | | | | | | |
| MSHY | 34 | | | | | | | |
| TNAS | 34 | | | | | | | |
| DIPN | 33 | | | | | | | |
| DTLI | 33 | | | | | | | |
| MATI | 33 | | | | | | | |
| VHLC | 33 | | | | | | | |
| GFSM | 32 | | | | | | | |
| MRWC | 32 | | | | | | | |
| RESN | 32 | | | | | | | |
| TSIL | 32 | | | | | | | |
| FICL | 31 | | | | | | | |
| GCRI | 31 | | | | | | | |
| KKCE | 31 | | | | | | | |
| LRGR | 31 | | | | | | | |
| PKCQ | 31 | | | | | | | |
| DYDS | 30 | | | | | | | |
| HZNF | 30 | | | | | | | |
| TSXL | 30 | | | | | | | |
| WLEH | 30 | | | | | | | |
| ACIO | 29 | | | | | | | |
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# Attachment 13

# TRUCK DRIVER MISCLASSIFICATION:
## Climate, Labor, and Environmental Justice Impacts

**AUGUST 2019**

UC BERKELEY
LABOR
CENTER

Sam Appel
Carol Zabin

# Introduction

The next great challenge for California climate policy lies in the transportation sector. Vehicles account for fully 40% of all greenhouse gas emissions in California, the most of any economic sector in our state, and consistent and significant reductions in vehicle emissions remain elusive.

In the transportation sector, commercial trucking is a critical focus area for climate policy. Heavy-duty vehicles emit a fifth of all transportation-related greenhouse gases. They also produce toxic air pollutants that significantly increase risk of cancer and other severe health challenges for California residents, particularly in low-income communities of color.

To meet these challenges, California has passed and continues to develop new policies designed to accelerate the adoption of low- and zero-emissions vehicles in the commercial trucking subsector. These policies set increasingly stringent emissions standards for commercial trucks over time and provide incentives to buy down the cost of new vehicles and retrofits in advance of these mandates.

This report analyzes a major barrier to successful implementation of new clean truck standards: the common trucking industry practice of classifying (and often misclassifying) truck drivers as independent contractors rather than employees.

Contracting out truck driving shifts the costs of truck ownership and operation from trucking companies to individual truck drivers. Contract truck drivers, particularly misclassified contractors, earn low incomes and face high capital costs. While regulatory compliance costs for large trucking firms represent a small percent of total revenue, contract truck drivers face compliance expenses far in excess of their yearly income. Under the contractor business model, truck drivers least equipped financially to buy and maintain clean vehicles bear the financial burden of attaining the state's climate goals in this sector.

This report describes the fundamental misalignment of the contractor business model in trucking with California's climate goals. The report proceeds by discussing:

- California's policies to reduce heavy-duty truck emissions.
- The environmental, public health, and environmental justice impacts of non-compliance with emissions standards.
- The nature of the contractor business model, evidence of the widespread misclassification of independent contractors, and the consequent low incomes of truck drivers.
- The direct link between low road industry practices and the failure to meet emissions standards.[1]
- Policy principles that can address the climate, economic justice, and environmental justice challenges in the commercial trucking industry.

Currently, the low road labor practice of misclassifying workers in the trucking industry undermines climate action by shifting the costs of emission reductions to the most economically vulnerable actors in the industry: contract truck drivers. Because drivers are unequipped to meet emissions standards, communities impacted by truck pollution continue to suffer the effects. With the correct policy levers in place, California policymakers have an opportunity to support a trucking industry that complies with climate policy and that upholds employment and labor laws for California workers.

## Key Findings

This report documents the direct relationship between truck driver misclassification and climate and clean air impacts. It also presents win-win policies to protect California's climate, workers, and pollution-burdened communities. This report makes the following key findings:

- Low road labor practices are widespread in trucking, particularly in the contractor industry segment. Since trucking deregulation in the 1980s, a destructively competitive market environment has forced companies to cut costs, including by reducing compensation to truck drivers.

- High prevalence of truck driver misclassification is found in local freight trucking, local pickup and delivery, and the long-haul trucking segments of the California trucking industry.

- Drivers that meet the legal standard to be classified as employees but are misclassified as independent contractors earn very low wages and must finance expensive vehicles with high interest loans to comply with clean vehicle rules.

- As a result of the capital barriers contractors face, this segment of the trucking industry has the lowest compliance rates with California's current clean vehicle regulations, with compliance rates of 61% with the landmark Truck and Bus Rule, compared to 83% for large firms that directly employ truck drivers. Non-compliant trucks in the contractor segment represent 44% of all non-compliant trucks, a significantly greater share than their share of all operating trucks.

Contract trucking and misclassification impede compliance with California's climate and clean air goals. These low road labor practices drive up toxic pollution emissions, which disproportionately affect health outcomes of low-income communities of color. Without further action, contracting and misclassification will hinder the critical and imminent transition to zero-emissions trucks. This report highlights the opportunity for California to build the high road to an equitable low-carbon transition in the truck transportation sector.

## Statewide Clean Truck Policies: Progress and Impacts to Date

California heavy-duty on-road truck emissions are regulated by the Air Resources Board (CARB). CARB classifies heavy-duty trucks as those with a gross vehicle weight rating (GVWR) of 14,000 pounds or more.[2] CARB regulates emissions through a variety of regulatory mechanisms, including requirements on vehicle operations, such as limits on the amount of time vehicles can spend idling; and engine emission standards on fleets, or classes of vehicles, managed and in use by operators, such as particulate matter (PM) emission requirements on commercial trucks.[3]

CARB's fleet requirements are the most important of the policies affecting the heavy-duty sector, as these drive the greatest reductions in air pollution.[4] These policies will also be essential to transitioning commercial vehicles to zero greenhouse gas emissions technology over the coming years, as regulations move from sales and manufacturer requirements to fleet requirements. Fleet requirements mandate specific emissions control measures from vehicle operators and are often customized for industry segments. Rules include the Drayage Truck Regulation for port trucks, the Innovative Clean Transit Rule for transit buses, and the Truck and Bus Regulation. All require the periodic purchase or retrofit of vehicles to meet specified and increasingly stringent emissions reductions standards.

California's most far reaching heavy-duty fleet requirement is the 2008 Truck and Bus Rule. The rule is an engine and vehicle standard that applies to all privately and federally owned trucks and buses over 14,000 pounds GVWR operating in California. It requires that owners or lessees of trucks adopt newer trucks (with a progressively more recent Mile Year (MY) engine) or Diesel Particulate Filters (or DPF, which filter PM exhaust before emission) by specific dates.[5] Trucks are considered *out-of-compliance* with the rule if they operate with engines older than the Mile Year requirements, or without a functioning DPF.

The stated intent of the Truck and Bus Rule is to accelerate the replacement of "older, high-emitting, heavy-duty trucks with long service lives" and thereby reduce pollution emissions to levels that conform to Federal Clean Air Act requirements.[6] The rule is a centerpiece of the California State Implementation Plan (SIP)—the statewide strategy to achieve federal Clean Air Act compliance, and is described by CARB as "one of the most…important tools to reduce smog-forming and toxic emissions and protect public health in disadvantaged communities."[7]

### Regulated Entities

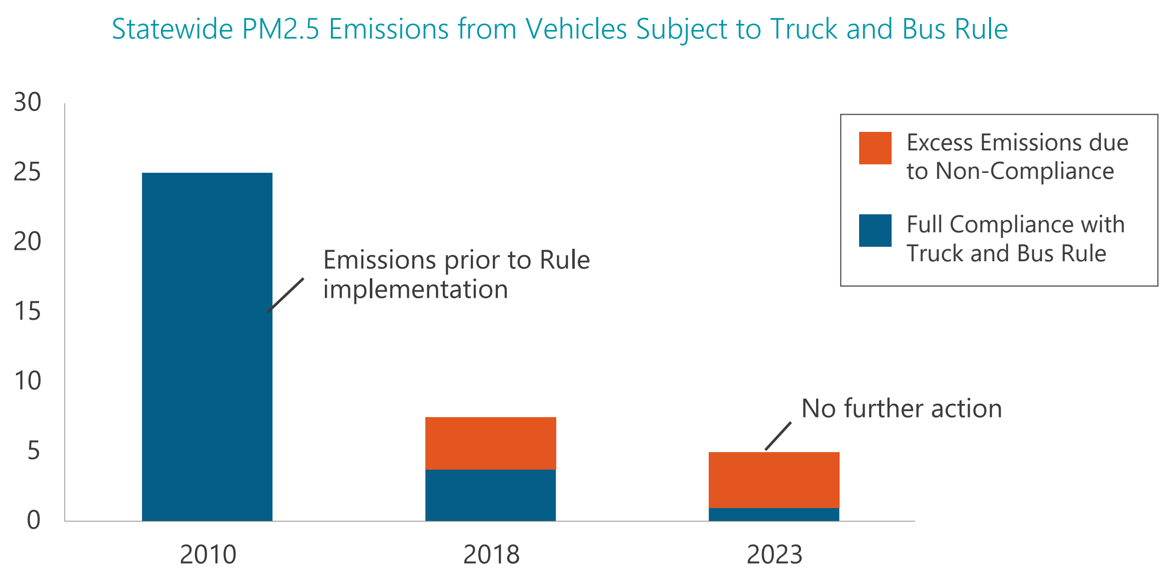
For the purposes of California fleet requirements, the owner or lessee of a vehicle registered with the Department of Motor Vehicles (of California or any other state) is the entity regulated by vehicle rules. If a vehicle is leased, the regulated entity is the lessee if the lease duration is longer than one year, or the lender, if the lease duration is less than one year.[8]

When contract truck drivers own their truck or lease it, and possess Motor Carrier authority, which is often the case among misclassified truck drivers as described below, they become the responsible entity for maintaining insurance, ensuring environmental compliance, and other statutory requirements of commercial motor carriers.[9] Conversely, for trucking companies that employ their drivers and own vehicles in operation, the company becomes the regulated entity for fleet rules.

## (Non) Compliance: Environmental and Environmental Justice Outcomes

The Truck and Bus Rule has very successfully and significantly reduced emissions of key air pollutants and sets a precedent for more comprehensive fleet rules in California. As shown in Exhibit 1, current total statewide particulate matter emissions (PM 2.5) from vehicles subject to the rule are approximately 70% lower than before the rule was implemented in 2010. Likewise, statewide NOx emissions are approximately 50% lower now than before implementation.[10] Comparable data are not available on the impact of this rule on greenhouse gas emissions, because the rule addresses only toxic air pollutants. New rules will make explicit the goal of greenhouse gas emissions reductions in addition to traditional air pollutants.

### Exhibit 1. Emissions of Particulate Matter 2.5 and Diesel Rule Compliance




Despite this significant progress for air quality, however, industry noncompliance still undermines the potential benefits of a fully implemented Truck and Bus Rule. As shown in Exhibit 1, CARB compliance data show that in December 2018, PM 2.5 emissions statewide were still approximately double the amount expected if all covered trucks complied with the rule. And as of July 2019, 182,176 trucks registered in California were out-of-compliance with the rule. Evidence presented in this report suggests that contractors drive a significant share of non-compliant vehicles.

The impact of non-compliance on air quality is significant. According to CARB, diesel particulate matter emitted by vehicles subject to the Truck and Bus Rule accounts for 70% of cancer risk from toxic air contaminants in California. The medical burden of diesel PM-related illnesses costs the state $29 billion annually in healthcare spending. This disproportionately harms low-income communities of color.[11]

EPA research shows that environmental outcomes depend on both maintenance and operation of cleaner trucks. This research estimates that inadequate maintenance and tampering causes 89% greater PM emissions in internal combustion trucks than properly maintained vehicles, even in newer model (cleaner) trucks that meet federal standards.[12]

### Future Climate Policies: California's Fleet Requirements

CARB and California lawmakers are considering several new fleet rules that, like the Truck and Bus Rule, will require substantial industry changes to accelerate the adoption of zero-emission and electric vehicles. The first set of these new fleet rules is already in place in the public sector. CARB's 2018 and 2019 Innovative Clean Transit Rule and Airport Shuttlebus Regulation have established the foundation for industry transition. CARB's Advanced Clean Trucks rulemaking and Senate Bill 44, currently being considered by the State Senate, would require fleet transitions on the scale of the Truck and Bus Rule beginning in the early 2020s.

Successful implementation of these new rules will require that the state address the underlying barriers to adoption posed by the structure of the commercial trucking industry. If, for instance, non-compliance rates in the new rules parallel Truck and Bus Rule non-compliance rates, hundreds of thousands of trucks will not meet fleet electrification goals.

## The Contractor Business Model and Employee Misclassification in the Commercial Trucking Sector

Low road labor practices in the trucking industry impede compliance with clean truck standards. The following sections document low road practices such as the prevalence of contracting in the trucking industry, the persistent problems of misclassification, and the consequent low incomes of misclassified contract truck drivers.

### Origins and Role of Contracting in Trucking

The industry practice of truck driver misclassification began in the early 1980s, following the passage of the 1980 federal Motor Carrier Act (MCA). The MCA deregulated the US trucking industry, ending a 40-year period of trucking market oversight by the US Interstate Commerce Commission and eliminating price controls and restrictions on market entrants.[13] The competitive forces unleashed by deregulation changed the industry dramatically, bankrupting thousands of companies and forcing remaining and new companies to adopt cost-saving business strategies.[14]

The trucking firm practice of contracting with drivers for their services became a standard strategy across many parts of the commercial trucking industry by the mid-1990s. Contracting allows companies in many instances to shift responsibility for equipment to truck drivers, reduce payroll expenses such as employment taxes and employee fringe benefits, and retain the same effective control over the transporting of loads.[15] Some trucking firms transformed their business model after deregulation entirely, becoming brokers by selling their trucks to former employee drivers and leasing those drivers' services on an exclusive basis. Other firms partially or mostly retained their truck drivers as employees.[16]

Broadly speaking, deregulation led to significant deterioration of working conditions in the US trucking industry. For twice as much measurable output today, long-haul truckers now make 40% less in wages than they did in the late 1970s, when trucking was considered highly desirable blue-collar work. Union bargaining power decline as a result of deregulation also contributed to wage stagnation in the sector: whereas 57% of truck drivers were unionized in 1980, just over 10% were unionized in 1997, the date of the most recent study of unionized workers.[17]

## Misclassification of Contract Truck Drivers

Truck drivers that are contracted by trucking companies to transport loads may be legitimate independent contractors or misclassified employees. The term "contract truck drivers" used here describes drivers who lease or own their own truck and are paid by trucking firms as independent contractors. The term includes both legitimate independent contractors and misclassified employees.

Legitimate independent contractors constitute a significantly different population of truck drivers from misclassified contract truck drivers. Legitimate independent contractors often work in specialized segments of the trucking industry, handle specialized cargo, arrange their own business with shippers, and work unaffiliated with one company on an exclusive basis.

The Transportation Research Board (TRB), a research unit of the National Academies of Sciences, identifies the following traits that distinguish independent contractors from "dependent" contract drivers in the commercial trucking industry:

> While an independent contractor operates under its own authority[18], locates its own freight, and manages its own financial and operational affairs, a dependent contractor operates under another motor carrier's authority, hauls that motor carrier's freight, and that motor carrier manages its affairs to a significant degree.[19]

What TRB describes as a "dependent" contract truck driver corresponds to the definition of misclassified workers under current California law. Misclassification is itself the predicate to a violation of federal or state law (usually tax and employment laws) that occurs when an employer classifies a worker as an independent contractor when the legal definition for employee status is met.[20]

There is a history of jurisprudence on employee misclassification in federal and state courts and regulatory agencies, notably in the California Court of Appeals *Borello* decision, the much discussed California Supreme Court *Dynamex* decision, regional National Labor Relations Board decisions, and the California Department of Labor Standards Enforcement (DLSE) office.[21] While the test used by various agencies and courts varies, the main traits that confer legal status as an employee rather than an independent contractor are: drivers lease their services to *one company* over a significant period of time; they *do not completely direct their own work*; they *do not establish business relationships with shippers*, control their workload, or the rates they are paid. Legitimate independent contractors can be distinguished because they "operate under their own legal authority to provide freight services to customers (which could include shippers, freight brokers, or other motor carriers)."[22]

It is important to note that industry jargon including the terms 'Independent Owner Operator' and 'dependent contractor' are not legally definitive and can easily obscure the actual control relationship between a truck driver and their employer. Independent contractors are either legitimately engaged as such or they are misclassified employees.

When businesses willfully misclassify employees as independent contractors to avoid compliance with labor standards and tax laws, they in turn place themselves in violation of many other state and federal laws.[23] Misclassified truck drivers work without any of the typical employment rights to overtime pay, sick leave, workers compensation, disability benefits, and other rights and benefits that employees are legally entitled to.[24] Misclassified workers also may not seek recourse through collective action to improve their employment conditions, since organizing and bargaining by contractors may constitute violations of anti-trust laws.[25]

All told, illegally classifying employees as independent contractors allows trucking firms to evade labor and employment laws and offload as much as 30% of payroll, equipment, and benefits costs onto drivers.[26]

## Misclassification by Industry Segment

Misclassification is concentrated in specific segments of the commercial trucking industry. Trucking industry analysts typically segment the industry by major freight and service types, including the ownership of the transported goods (private versus for-hire carriers); the distance the load travels (local freight versus long-distance); and whether the load fills the whole truck or whether partial loads are assembled to fill a truck (Truck Load versus Less than Truck Load).

Private carriers, who haul their own goods and whose primary business is not trucking, represent approximately 40–50% of total trucking industry revenue and jobs, and misclassification is rare in this segment.[27] Private carriers include large retailers, manufacturers, distributors, agricultural companies, and construction companies, as well as small retailers such as a locally owned florist or laundry business.

By contrast, for-hire carriers are trucking companies that sell their services to other companies and entities, and commonly use contract truck drivers.[28] The for-hire segment includes both long-haul trucking and short-haul trucking. Each of these sub-segments is plagued by significant misclassification problems.

Since misclassification is illegal, limited data exist on its extent, but it is clear that misclassification is concentrated in segments where the use of contract truck drivers is prevalent. Using the markers of misclassification described by courts and the Transportation Research Board (above), the following are segments where misclassification is prevalent.[29]

### Short-Haul Trucking

Short-haul trucking carriers typically operate a dry van trailer within California state lines. The primary lines of business in short-haul or local freight trucking include package delivery, port trucking, and local delivery jobs ranging across a wide variety of assignments.[30] More than 90% of all local freight industry establishments in California are estimated to be contract truck drivers.[31] Very low barriers to entry and relatively less need for reliability in local freight trucking create especially competitive markets in this segment. These market forces, more than in any other segment, push carriers towards independent contracting arrangements.[32]

In the package delivery segment of short-haul trucking, firms such as FedEx Ground, Amazon, and XPO Logistics all use contract truck drivers, and studies and lawsuits have documented evidence of widespread misclassification at these companies.[33] However, it is important to note that package delivery also includes some high road trucking companies such as package giants UPS and USPS, which employ their workers, comply with labor and tax laws, and provide family-supporting wages and benefits.[34]

In the port trucking segment, known as port drayage, industry analysts have documented the most egregious record of misclassification in the trucking industry, along with other forms of labor exploitation and human rights abuses.[35] Monaco and Grober estimate that 85–90% of port driving operations are carried out by contractors.[36] A number of academic studies analyzing ports across the country suggest that between 75% and 85% of workers likely meet core misclassification criteria.[37] Port drivers have filed more than 1,000 claims with the California Division of Labor Standards Enforcement (DLSE) for violations related to misclassification. The Labor Commissioner has issued 448 decisions in these cases and found drivers were owed more than $50 million in damages collectively.[38]

Trucking industry analysts expect vehicle automation to fundamentally change work patterns across the trucking industry; however for the short-haul trucking segment, automation is expected to result in significant driver employment growth over the next 10 to 20 years, especially in sub-segments that are prone to low road employment and misclassification.[39]

### Long-Haul Trucking

Long-haul trucking carriers typically carry loads farther than 450 miles and deliver loads across states or across the country.[40] Industry analysts have identified this segment as one with high concentrations of misclassified truck drivers.[41] A 2010 national study using a representative sample of drivers by the National Institute on Occupational Safety and Health (NIOSH) found that approximately 28% of long-haul drivers are leased contractors without their own operating authority.[42] These drivers meet TRB-suggested criteria for "dependent contractors" who would likely be considered misclassified under a number of legal tests, including current California law. This 28% figure is similar to a 1998 survey by Belzer, and estimates by the North American Council for Freight Efficiency.[43]

### Income of Misclassified Drivers

Misclassified contract truck drivers earn exceedingly low incomes after expenses of truck loans or leases, fuel, maintenance, repairs, and payment of self-employment taxes, and workers compensation contributions are considered. Misclassified contract drivers in port trucking earn gross incomes averaging $28,783 before taxes, while employee port drivers earn an average of $35,000 annually.[44] Median wages of long-haul employee drivers in the full Truck Load category were slightly above $53,000 in 2018, while median wages for contractors in this segment were $44,520.[45] Package delivery employees earned median wages of $35,610 in 2017, according to BLS data, while an industry periodical estimates that in 2018 misclassified package deliverers at one large national carrier earned approximately $40,000 annually before the cost of equipment, fuel, maintenance, and other business costs.[46] A 2007 study of the same national carrier found that these business costs amount to approximately $10,000 per year.[47]

These figures do not provide data on the hourly rates earned by misclassified contractors. In many segments, truck drivers work significantly more than 40 hours per week, and net hourly wages in these cases are below California's minimum wage.[48]

# Environmental Consequences of Contracting and Misclassification

The environmental consequences of low road labor practices in the trucking industry are significant. Evidence suggests that non-compliance with clean truck standards is concentrated in the contract driver segments of the industry, where several specific barriers to compliance are common.

## Concentration of Non-Compliant Trucks in the Contractor Segment

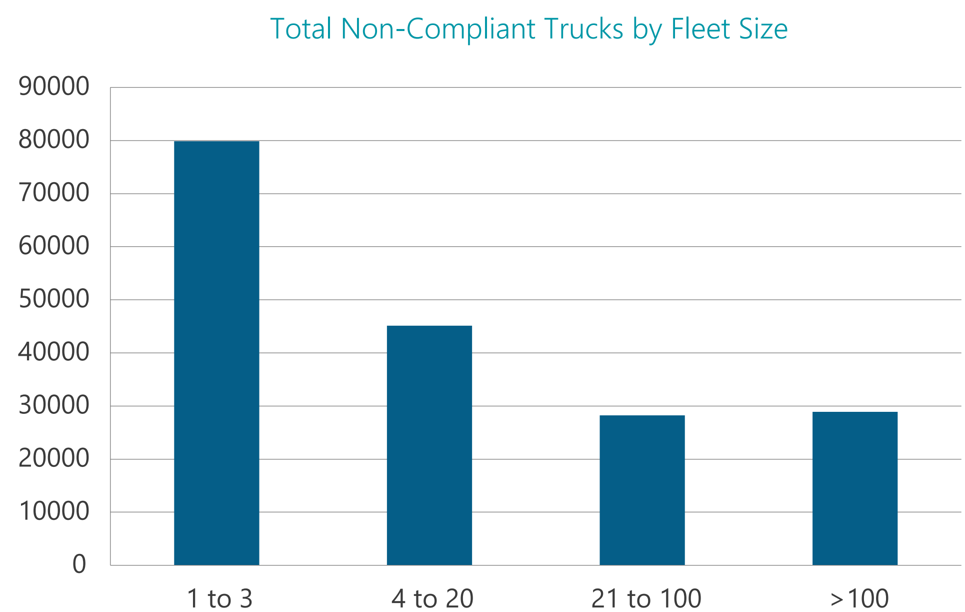
Exhibit 2 presents Truck and Bus Rule compliance data from July 2019. Data are differentiated by fleet size, which indicates the number of trucks operating under the ownership of a single trucking establishment (as described in the section on 'regulated entities'). Fleets with 1 to 3 trucks include contract truck drivers (both legitimate independent contractors and misclassified employees) and very small private fleets.

## Exhibit 2: Truck and Bus Rule Compliance Statistics, July 2019

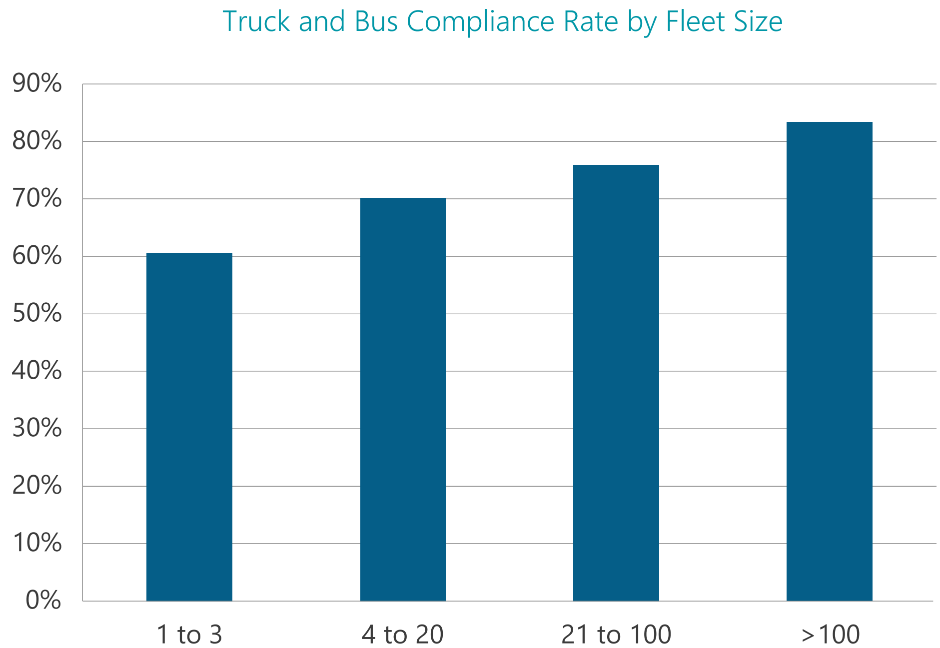
| Fleet Size (# of Trucks) | Total Non-Compliant | Share of Non-Compliant Trucks |
|---|---|---|
| 1 to 3 | 79884 | 44% |
| 4 to 20 | 45143 | 25% |
| 21 to 100 | 28227 | 15% |
| >100 | 28922 | 16% |
| Total | 182176 | — |

CARB data provide clear evidence that non-compliance is concentrated in the contractor segment of the commercial trucking industry. As shown in Exhibits 2 and 3, fleets with 1 to 3 trucks, where contract truck drivers are found, boast the largest share of non-compliant trucks, with 44% of all non-compliant trucks. [49] Although 1 to 3 truck fleets represent nearly half of non-compliant trucks, they comprise only one fifth of total trucks in operation in California, and only a third of the number of trucks operating for fleets of 100 trucks or more, according to most recently available data.[50] Exhibit 4 shows that fleets with 1 to 3 trucks have the lowest compliance rate with the rule among all fleets, according to most recently available data.[51]

## Exhibit 3: Total Truck and Bus Non-Compliant Trucks Operating in California by Fleet Size, 2019



### Exhibit 4: Truck and Bus Rule Compliance Rates by Fleet Size, 2017




## Barriers to Compliance are Largely Due to Capital Constraints of Contract Truck Drivers

Studies published by the US Environmental Protection Agency, the International Council on Clean Transportation, the US Department of Transportation, and METRANS all confirm that the capital constraints faced by contract truck drivers create a structural barrier to adoption of clean vehicles in the trucking industry.[52] In a survey of the literature on clean vehicle adoption barriers, Klemick et al. summarize that "limited access to capital for owner-operators combined with high upfront costs…and lack of awareness about new technologies [create]…barriers to technology adoption."[53] Giuliano et al. clarify the importance of the trucking company ownership structure to raising capital and investing in clean vehicles:

> The truck ownership model is important to understand when discussing new and potentially costly technologies since owner operators typically work on slim margins and cannot easily raise capital for replacement equipment.[54]

Low incomes in contract trucking, as described above, are the primary reason contract drivers lack capital for clean vehicle investments. Natural gas trucks, diesel particulate filters, and especially electric trucks add significant business costs for contract drivers.[55] CARB estimates that a 2018 Mile Year diesel tractor trailer costs $134,000, and in 2024, when electric truck standards may take effect, an electric tractor trailer will, CARB projects, cost $232,000.[56] Clean-running diesel trucks also cost approximately 70% more to maintain than conventional trucks.[57]

Steep vehicle financing costs for contractors add greater dimension to the capital barrier. Interest rates for private truck loans to large carriers average approximately 5%, according to a recent CARB electric truck cost analysis.[58] For contract drivers, interest rates are much higher. In fact, CARB created a subsidized loan program for contract drivers in California that *reduced* standard interest rates to 13.4%.[59] Industry studies and investigative journalism have also uncovered predatory lending by truck companies to their contract truck drivers.[60]

## CARB's Efforts at Improving Compliance Focus on Low-Income Contract Truck Drivers

CARB regulatory actions to improve compliance from 2008 to 2019 have been focused on the barriers discussed above and have clearly concentrated on the contract truck driver segment. CARB vehicle subsidy assistance has been primarily aimed at fleets of 1 to 3 trucks because of the inability of these fleets to meet vehicle standards and remain in business. For example, CARB has permitted numerous extensions to the compliance deadlines for small fleets and created the $1.2 billion subsidized state-backed loan fund mentioned above, exclusively for small fleets.

Even so, this assistance has not completely solved the non-compliance problem, and CARB plans to enforce compliance by de-registering 50,000 non-compliant California-registered trucks at the end of 2019 as an enforcement backstop, most of which are in the 1 to 3 fleet size category.

## Companies with Likely Misclassified Drivers Control Non-Compliant Trucks

While companies that misclassify are often smaller, under-the-radar operations, even very large companies misclassify their workers. CARB compliance data show examples of non-compliant trucks driven by likely misclassified contract truck drivers for major corporations. As discussed above, contract truck drivers who operate under a larger company's operating authority work exclusively for that company; they, therefore, fit the profile of misclassified workers under various legal tests. CARB compliance data show instances in which many Truck and Bus Rule non-compliant trucks belong to contractors who operate under the federal Motor Carrier number of a large trucking company.[61]

There will be many instances of non-compliant trucks driven by likely misclassified drivers without the combination of indicators described above and presented below. We can safely assume, for instance, that many non-compliant trucks operated by misclassified drivers are prevalent in the short-haul segment. In this segment, federal operating authority may not be required and yet many drivers are still misclassified. The data below should be treated as a snapshot and not indicative of the full extent of misclassification among Truck and Bus Rule non-compliant entities.

Exhibit 5 shows the number of non-compliant trucks operated by contract truck drivers under a number of large companies' authority. The relative size of companies, in revenue terms, is presented to offer a picture of the financial capacity of companies to achieve compliance.[62] Company size is important because large trucking firms are better equipped to absorb the costs of fleet transitions than low-income contract truck drivers. While the companies exhibited below report annual revenue in the hundreds of millions to billions of dollars, drivers face substantially greater capital constraints to vehicle upgrades. A notable point of comparison within this data snapshot is UPS, a high road company operating with employee drivers, which has only 9 trucks that were out-of-compliance with the Truck and Bus Rule as of July 2019.

### Exhibit 5: Large Companies with Truck and Bus Rule Non-Compliant Trucks Operated by Likely Misclassified Contractors

| Company Name | Trucks out of Compliance | Company Annual Revenue 2018 | Rank, US Trucking Companies by Revenue |
|---|---|---|---|
| Landstar Systems, Inc. | 2027 | $4.6B | 7th |
| UniGroup Inc. | 610 | $1.8B | 16th* |
| SIRVA, Inc. | 499 | $1.5B | 23rd |
| FedEx Ground | 462 | $27.2B | 2nd |
| Atlas Van Lines | 416 | $900M | — |
| Mercer Transportation | 403 | $493M | 50th |
| Bennett Motor Express | 275 | $612M | 49th |
| HVH Transportation | 236 | — | — |

While the instances presented above show that even very large companies misclassify their workers, small firms that misclassify proliferate in the highly fragmented trucking market and regulatory landscape, particularly in local and port trucking sub-segments. Ultimately, misclassification is less an episodic problem of misbehavior by large or small companies, and instead a failure of public policy to create labor market conditions that incentivize fair competition towards high road, environmentally accountable economic development.

## Conclusion and Policy Recommendations

This report documents the significant problem of non-compliance with clean vehicle policies in the commercial trucking industry.  It presents evidence of the concentration of non-compliance in the contract trucking sector, and the out-sized share of trucks driven by contract truck drivers that are in violation of California's clean truck regulations. It reviews research that highlights capital constraints as a key barrier to compliance, particularly among contract truck drivers, and shows that CARB's regulatory responses to non-compliance are focused almost exclusively on fleets with 1 to 3 trucks.  The report also links contract trucking, where compliance is lowest, to evidence of high prevalence of misclassification of truck drivers as contractors instead of employees. It concludes that the low incomes of contract drivers, including misclassified truck drivers, are a key obstacle to full compliance with clean truck standards.

California policymakers and regulators should consider the following principles that can reduce the social and environmental externalities associated with the contractor business model in trucking:

- **Principle: Enforce Existing Labor and Employment Law**

The California Labor and Workforce Development Agency should use its authority to enforce all labor and employment laws and regulations that cover the commercial trucking sector and target proactive enforcement activities in the segments of the trucking industry where there is evidence of misclassification. The California Supreme Court's recent *Dynamex* Decision identifies a clear set of criteria for distinguishing between employees and contractors in business arrangements such as trucking. *Bordello*, the previous precedent-setting decision with regard to California trucking establishments, did so as well. Under both legal regimes, but especially under the *Dynamex* ruling, California courts, enforcement agencies, and regulators are well positioned to eliminate illegal independent contracting and reduce the impact of this practice on California's climate regulations. Assembly Bill 5 would codify the *Dynamex* decision as applied to wage orders and expand it to the labor code and the unemployment insurance code.[63]

- **Principle: Subsidize the High Road**

The California Air Resources Board and other California public agencies, as participants in the market via funding for incentives, subsidies and other financial assistance, can allocate financial support that either enables low road employers, and perpetuates unfair competition, or that supports and levels the playing field for high road employers. California agencies should take care to not inadvertently subsidize trucking companies that willfully misclassify workers as contractors and should avoid further enabling this unsustainable business model. In awarding subsidies, agencies should require that companies identify their employment and contracting practices and only award funds to companies that can document legal and responsible employment practices.

- **Principle: Ensure Controlling Corporations are the Regulated Entity**

At present, misclassified contract truck drivers bear the burden of clean vehicle adoption instead of their employers. In designing future engine standards and fleet rules, CARB and the legislature should clarify that the regulated entity for these rules is the company controlling the contractor, if that driver operates for a larger company as a misclassified contractor.

California policies should support jointly meeting workforce, equity, and environmental goals in a rapidly changing trucking industry. Implementation of these policy principles can help to build a high road commercial trucking industry capable of making an equitable transition to zero-emissions vehicles, providing family-supporting jobs for truck drivers, and easing the pollution burden on low-income communities of color.

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## Endnotes

[1] In state economic development policy, a "high road" approach to economic development "emphasize(s) new job growth (as opposed to job poaching) and encourage local or regional competitive advantages based on high-value economic products, not merely lower production costs as in the low road approach."; Hanley and Douglas, "High Road, Low Road, or Off Road? Economic Development Strategies in the American States", 221.

[2] Truck and Bus Regulation, 1.

[3] GVWR represents the maximum weight of a vehicle including engine, body, fuel, accessories, and passengers when the vehicle is fully loaded.

[4] "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles", 25.

[5] Link to compliance table

[6] "2018 Updates to the California State Implementation Plan", 74.

[7] "About—Truck and Bus Regulation."

[8] Truck and Bus Regulation, 8.

[9] Ibid.

[10] California Air Resources Board, "Tying Compliance with CARB's Truck and Bus Regulation to DMV Registration."

[11] California Air Resources Board, "Tying Compliance with CARB's Truck and Bus Regulation to DMV Registration"; "Inequitable Exposure to Air Pollution from Vehicles in California", 3.

[12] "Development of Emission Rates for Heavy-Duty Vehicles in the Motor Vehicle Emissions Simulator MOVES2010", 30.

[13] Viscelli, *The Big Rig: Trucking and the Decline of the American Dream*, 11.

[14] Belzer, *Sweatshops on Wheels: Winners and Losers in Trucking Deregulation*; Bensman, "Port Trucking as a Test Case of Precarious Work in the Grey Zone of Work and Employment."

[15] Viscelli, *The Big Rig: Trucking and the Decline of the American Dream*, 110.

[16] Bensman, "Port Trucking as a Test Case of Precarious Work in the Grey Zone of Work and Employment", 3.

[17] Viscelli, The Big Rig: Trucking and the Decline of the American Dream, 22.

[18] Either corporations or sole proprietorships can possess "operating authority", referred to here as "authority". The Motor Carrier Permit conveys operating authority to a trucking establishment and ensures compliance with vehicle use laws and compliance with "statutory requirements to

commercially operate motor vehicles on California's highways"; "Motor Carrier Permit (MCP)—Frequently Asked Questions."

[19] Burks, Belzer, et al., "Trucking 101—An Industry Primer", 11.

[20] Carré, "(In)Dependent Contractor Misclassification", 3.

[21] Cummings, *Blue and Green: The Drive for Justice at America's Port*, 269.

[22] Viscelli, "Driverless? Autonomous Trucks and the Future of the American Trucker", xi.

[23] Carré, "(In)Dependent Contractor Misclassification", 4.

[24] Carré, "(In)Dependent Contractor Misclassification", 1.

[25] Carré, "(In)Dependent Contractor Misclassification", 8.

[26] "Independent Contractor Misclassification Imposes Huge Costs on Workers and Federal and State Treasuries", 1.

[27] Burks, Belzer, et al., "Trucking 101—An Industry Primer", 18.

[28] Burks, Belzer, et al., "Trucking 101—An Industry Primer", 18–24.

[29] Chen, Sieber, and Lincoln, "NIOSH National Survey of Long-Haul Truck Drivers: Injury and Safety", 5.

[30] Viscelli, "Driverless? Autonomous Trucks and the Future of the American Trucker", ii.

[31] "Local Freight Trucking in California."

[32] Viscelli, "Driverless? Autonomous Trucks and the Future of the American Trucker", 43.

[33] Carré, "(In)Dependent Contractor Misclassification", 12; Viscelli, "Driverless? Autonomous Trucks and the Future of the American Trucker", 16; Cummings, *Blue and Green: The Drive for Justice at America's Port*, 244; Rittman et al v Amazon.com Inc et al.

[34] Johanssen, "FedUp with FedEx: How FedEx Ground Tramples Workers' Rights and Civil Rights", 8.

[35] Bonacich, "Pulling the Plug: Labor and the Global Supply Chain", 46.

[36] Monaco and Grobar, "A Study of Drayage at the Ports of Los Angeles and Long Beach", 7.

[37] "Independent Contractor Misclassification Imposes Huge Costs on Workers and Federal and State Treasuries", 11; Bensman and Bromberg, "Port Truckers Survey at New Jersey Ports"; Smith, Marvy, and Zerolnick, "The Big Rig Overhaul: Restoring Middle-Class Jobs at America's Ports Through Labor Law Enforcement", 29.

[38] "Labor Commissioner Posts List of Port Trucking Companies with Unsatisfied Judgments for Labor Violations."

[39] Viscelli, “Driverless? Autonomous Trucks and the Future of the American Trucker”, 31.

[40] “Glossary—‘Long Haul.’”

[41] Viscelli, “Driverless? Autonomous Trucks and the Future of the American Trucker”, 7.

[42] Chen, et al., “NIOSH National Survey of Long-Haul Truck Drivers: Injury and Safety”, 5.

[43] Burks, Belzer, et al., “Trucking 101—An Industry Primer”, 10; Roeth, et al., “Barriers to the Increased Adoption of Fuel Efficiency Technologies in the North American On-Road Freight Sector”, 16.

[44] Viscelli, “Driverless? Autonomous Trucks and the Future of the American Trucker”, v.

[45] “Updated: New Survey Data Reveals Increases in Driver Compensation.”; Calculated using industry standard figure cited “Contractors earn 16% less than median company driver”; Viscelli, *The Big Rig: Trucking and the Decline of the American Dream*, 145.

[46] “Occupational Employment and Wages, May 2018 53-3033 Light Truck or Delivery Services Drivers”; Soper and Black, “Amazon Thrives on FedEx Delivery Model, but Driver Pay Challenges Persist.”

[47] Johanssen, “Fed Up with FedEx: How FedEx Ground Tramples Workers’ Rights and Civil Rights”, 8.

[48] Monaco, “Incentivizing Truck Retrofitting in Port Drayage: A Study of Drivers at the Ports of Los Angeles and Long Beach”, 18; Viscelli, *The Big Rig: Trucking and the Decline of the American Dream*, 164.

[49] On July 26, 2019 CARB staff for Truck and Bus Rule implementation provided the compliance statistics for the rule in table format via email, as presented, current as of July 2019. These statistics summarize Truck Regulation Upload and Compliance Reporting System (TRUCRS) database compliance data. Data reported in the TRUCRS system reflect vehicles that intend to claim a flexibility option offered within the Truck and Bus Regulation, which delays (on a specified schedule) or removes the requirement to install emissions reduction technology. Any vehicle that already meets Truck and Bus Regulation requirements may or may not be captured in TRUCRS. It is not mandatory for trucks already in compliance with the rule to report in TRUCRS.

[50] See CARB 2017 Enforcement Report Table I-4 on total truck populations operating in California by fleet size; “2017 Annual Enforcement Report”, I-4.

[51] Ibid; the 2017 Enforcement Report is the most recent source for overall compliance data available at time of publication. Here, data from Table I-4 are aggregated across Registration Type and Weight Class to indicate truck compliance rates differentiated by fleet size alone.

[52] “The Motor Carrier Efficiency Study 2007 Annual Report to Congress”, 5.

[53] Klemick et al., “Heavy-Duty Trucking and the Energy Efficiency Paradox”, 6, 19, 21, 27; Roeth, et al., “Barriers to the Increased Adoption of Fuel Efficiency Technologies in the North American On-Road Freight Sector”, 6.

[54] Giuliano, White, and Dexter, "Developing Markets for Zero-Emission Vehicles in Goods Movement", 2.

[55] "Advanced Clean Trucks Total Cost of Ownership Discussion Document", 7.

[56] Ibid.

[57] Patel, "From Clean to Clunker: The Economics of Emissions Control", 5.

[58] "Advanced Clean Trucks Total Cost of Ownership Discussion Document", 7.

[59] On April 17, 2019 the California Pollution Control Financing Authority provided a dataset of loan data for all participants in the California Capital Access Program (CalCAP) On-Road Heavy-Duty Vehicle Air Quality Loan Program. This loan program provides loans to trucking entities with 10 or less trucks. Data included loan recipients number of trucks owned, loan amounts, and loan interest rates. To identify the average interest rate for loans to contract drivers granted through this program, average interest rate was calculated for all loan recipients since the inception of the program with 3 or less trucks in their fleet.

[60] Murphy, "Rigged: Forced into Debt. Worked Past Exhaustion. Left with Nothing"; Viscelli, *The Big Rig: Trucking and the Decline of the American Dream*, 148.

[61] On June 14, 2019 CARB staff for Truck and Bus Rule implementation provided a dataset which included compliance data for all California truck fleets with 1 to 3 vehicles in the Truck and Bus compliance database (TRUCRS). Data for each fleet include compliance status (Yes/No), number of trucks, and motor carrier numbers affiliated with the fleet. To identify contract truck drivers operating under the Motor Carrier authority of a larger company, fleet data were hierarchized first by federal Motor Carrier number, and then by company name and CA MC number. Where multiple trucks under different company names and registered under different CA Motor Carrier numbers were affiliated with the same federal Motor Carrier numbers, these trucks were considered to be operated by contract truck drivers under a larger company's operating authority.

[62] Revenues were compared to data presented in the Journal of Commerce on largest trucking companies by revenue; "Special Report: Top 50 Trucking Companies."

[63] Gonzalez, Assembly Bill No. 5.

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