

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

Petroleum Refinery Sector Risk and )  
Technology Review and New ) **Docket No. EPA-HQ-OAR-2010-0682**  
Source Performance Standards; )  
Proposed Rule, 79 Fed. Reg. 36,880 ) *Via regulations.gov and e-mail*  
(June 30, 2014) ) *October 28, 2014*

**COMMENTS OF ENVIRONMENTAL AND COMMUNITY GROUPS**

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It is time for the U.S. Environmental Protection Agency (“EPA”) to set robust new standards limiting the toxic air pollution coming from petroleum refineries. Communities in the shadow of refineries have waited for over a decade for updated national standards. In response to EPA’s proposed rule, Earthjustice and Environmental Integrity Project submit the following comments on behalf of the above-listed Environmental and Community Group Commenters (“Commenters”).

Commenters have members and constituents who live on or near the fence-line of one or more refineries and have grave concerns about their and their families’ exposure to toxic air pollution and associated cancer and other health impacts. This exposure occurs regularly from routine flaring and other uncontrolled or inadequately controlled pollution. Catastrophic leaks, explosions, and other incidents causing spikes in toxic air pollution have occurred too often during the last two decades at U.S. petrochemical complexes, as the Chemical Safety Board has well-documented. EPA must finalize a rule to provide greatly needed health protection for the most-exposed and most vulnerable people, including children, living in communities near U.S. refineries.

**EXECUTIVE SUMMARY**

Commenters urge EPA to strengthen and finalize important new refinery emission standards as quickly as possible to bring relief to the millions of Americans exposed to excess and unnecessary toxic pollution from refineries.

Commenters agree that it is necessary to set strong, enforceable, emissions standards for petroleum refineries, remove the unlawful startup, shutdown, and malfunction exemptions and require fence-line monitoring. The following provisions of EPA's proposal are essential, and must not be weakened when EPA finalizes the rule. (EPA also must strengthen some of these provisions, as discussed below).

1. Fence-line monitoring requirements;
2. Delayed coker unit work practice standards;
3. Flaring operational and monitoring requirements;
4. Storage vessel emission standard updates;
5. Prohibitions on uncontrolled releases from pressure relief devices, bypasses, and monitoring requirements for such releases; and
6. Rule amendments deleting and removing unlawful startup, shutdown, and malfunction exemptions.

But EPA's proposal does not do nearly enough to control toxic pollution and we need strong leadership from EPA to strengthen the rule. The agency charged with protecting public health and the environment from the toxic air pollution of U.S. refineries is legally required to do more to meet its responsibilities under the Clean Air Act, including under both § 7412(d) and § 7412(f). Current science and developments in pollution control and monitoring are reflected in EPA's own enforcement division's consent decrees and the rules of other expert government agencies. EPA must make, at least, the following essential improvements (described further below) to comply with the Act's requirements.

1. Require fence-line monitoring that measures multiple pollutants in real-time or near-real time, establish a corrective action level that is enforceable, and make the data available to the public promptly.
2. Require reductions in uncontrolled fugitive emissions and strengthen the standards that apply to equipment leaks and wastewater emissions.
3. Limit flaring to prevent unnecessary, routine emissions and reduce toxic air pollution from waste-gas burning and require continuous monitoring of gas flow rate and heat value.
4. Require facilities to retrofit external floating roof tanks into internal floating roof tanks.
5. Set a limit on hydrogen cyanide from fluid catalytic cracking units ("FCCUs") for the first time.
6. Require the use of inherently safer techniques that can prevent toxic air pollution, including the phase-out of hydrogen fluoride, a requirement for an anonymous worker

- reporting system, the use of back-up power, and stronger leak and other emission monitoring.
7. Strengthen the compliance and enforcement provisions applicable to refineries, including by requiring continuous emissions monitoring.
  8. Set health-risk based limits that recognize that the current amount of health risk communities near refineries face is unacceptable; and assure reductions based on the currently available science showing the need to protect children and vulnerable communities, including those over-exposed to multiple refineries' and other toxic air sources' pollution.
  9. Fully assess the emissions impacts of new unconventional crude oils, such as exceptionally volatile crudes (*e.g.*, Bakken) and unusually heavy crude oils (*e.g.*, tar sands) that may be contaminated with excess heavy metals and other toxic constituents that may require additional refining and abatement; and incorporate the resulting analysis into the health risk assessment.

EPA's standards are not protective enough for public health in part because EPA's emission inventory underestimates emissions. As a result, its risk assessment underestimates risk. Add to that the problem that EPA's risk assessment is far behind current science. Although EPA states that its risk assessment is conservative, in fact EPA is not following prevailing, scientific approaches outlined by the National Academy of Sciences and California's Office of Environmental Health Hazard Assessment, or EPA's own policies which were supposed to update as science advanced. Even so, EPA still found a cancer risk of 100-in-1 million from inhalation alone, and found multipathway (non-inhalation), and chronic non-cancer and acute health risks on top of that.

**One additional cancer case is too many.** Congress enacted the 1990 Amendments of the Clean Air Act to prevent cancer from toxic air pollution, and to do so especially in communities overburdened by such pollution. **Yet EPA proposes to allow at least 1 new cancer case every other year, and 5 new, additional cancer cases every decade,** in communities that have refineries. That is plainly unacceptable.

In addition, EPA must do a better job to assess the real-world health risks and impacts that communities face. Just as importantly, Commenters urge that EPA should not find that it is "acceptable" to allow Americans to experience a cancer risk of 100-in-1 million from breathing pollution from refineries, especially when too many of these same people are exposed to many other toxic air sources. Even if EPA continues to use this outdated benchmark – which it should instead recognize is too high – these comments provide a long list of ways in which EPA's risk assessment underestimates the health risks. Following the science and correcting even one of the many serious problems that have led EPA to underestimate health risk would likely lead the agency to recognize that health risk is higher than it has found, and plainly unacceptable.

Finally, Commenters emphasize that taking the action described in these comments will be critical for EPA to fulfill the Administrator's commitment to protect communities' health and provide environmental justice.

As EPA has found, "despite the significant strides in the air toxics program, many areas around the country remain with elevated risks from air toxics compared to areas of the country with very few or no sources of air toxics emissions." EPA estimates that there are at least 13.8 million people – **5% of the total U.S. population** – exposed to air toxics levels that cause their increased cancer risk to be 100-in-1 million or greater.<sup>1</sup> At least 7 million people have elevated cancer risk from refineries alone.

Those who are most exposed and most vulnerable to refinery pollution are people of color, lower income people, and children, creating a serious environmental and social injustice. In particular, half of the people who currently face a cancer threat from refineries' pollution are racial minorities, even though the U.S. population is only 28% minority. Unfortunately, EPA predicts that under its proposed rule, among the at least 4 million people who will still face an increased cancer threat from refineries, more than 50% will be racial minorities, 31% will be African Americans, 24% will be Hispanic or Latino, and 22% will be people living below the poverty level. The disparity increases under EPA's proposed rule.<sup>2</sup> This is entirely unacceptable. In view of the evidence EPA has compiled and all commenters have presented, EPA must take stronger action than it has proposed both to resolve the dire need for robust national air toxics standards and to reduce the socioeconomic disparity in environmental health impacts caused by U.S. refineries.

Commenters appreciate EPA staff's work on this rule and would be glad to provide any additional information that may be useful to EPA as the agency works to finalize this rule. Many of the above-listed Commenters have also joined with other national and local allied groups to submit a short summary of the important components of this Rule, in the form of a letter that is being filed separately in the docket today. For additional information, please contact: Emma Cheuse at Earthjustice, [echeuse@earthjustice.org](mailto:echeuse@earthjustice.org), or Sparsh Khandeshi at Environmental Integrity Project, [skhandeshi@environmentalintegrity.org](mailto:skhandeshi@environmentalintegrity.org).

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<sup>1</sup> EPA, Nat'l Air Toxics Program, Second Integrated Urban Air Toxics Report to Congress, EPA-456/R-14-0001 at xvi, 3-17(Aug. 21, 2014) ("Second Integrated Urban Air Toxics Report"), <http://www2.epa.gov/urban-air-toxics/second-integrated-urban-air-toxics-report-congress>.

<sup>2</sup> Draft Residual Risk Assessment for the Petroleum Refining Source Sector, EPA-HQ-OAR-2010-0682-0225 ("Draft Risk Assessment"); Analysis of Socio-Economic Factors for Populations Living Near Petroleum Refineries, EPA-HQ-OAR-2010-0682-0226; Analysis of Socio-Economic Factors for Populations Living Near Petroleum Refineries Post Control Scenario at 8, EPA-HQ-OAR-2010-0682-0227.

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- NRDC Report on Bakken and Tar Sands Health Risks..... Addendum B
- Phyllis Fox Report..... Addendum C

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## INTRODUCTION AND BACKGROUND

### I. COMMUNITIES NEED STRONGER STANDARDS.

#### A. EPA's Current Standards Are Outdated.

Stronger updated standards are long overdue. EPA first set refinery air toxics emission standards under 42 U.S.C. § 7412(d)(2)-(3) in 1995 (MACT 1) and 2002 (MACT 2).<sup>3</sup> Within 8 years, sections 112(d)(6) and (f)(2) of the Clean Air Act required EPA to perform a technology and community health risk review and set revised standards if necessary.<sup>4</sup> EPA still has not completed the first legally required review, and the proposed rule is part of a rulemaking to do so.

Commenters agree with EPA that under the Clean Air Act, its review shows the need to set stronger standards in myriad ways. In the proposed rule, EPA recognizes that it is necessary to set new national air toxics standards and related requirements.<sup>5</sup> EPA also recognizes the need to remove unlawful and harmful exemptions from the existing standards. For example, EPA appropriately acknowledges that it must remove exemptions for uncontrolled emissions during startup, shutdown, and malfunction periods, from pressure relief devices (not connected to a control device), and from other bypasses of control devices, and require monitoring to prevent violations of the standards.<sup>6</sup>

As further discussed below, EPA also must set stronger standards than it has proposed to address major gaps in its current standards, account for other developments in pollution control and monitoring, and to protect public health.

#### B. The Clean Air Act Requires EPA To Set Stronger Standards To Account for Pollution Control Developments and Protect Public Health.

The purpose of the Clean Air Act is to protect public health by preventing air pollution.<sup>7</sup> The statutory test for the health risk rulemaking under § 7412(f)(2) is two-fold: (1) EPA must prevent all unacceptable health risks; and (2) EPA must assure an “ample margin of safety to protect public health” and “prevent . . . an adverse environmental effect.”<sup>8</sup> As the D.C. Circuit

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<sup>3</sup> Proposed Rule, 79 Fed. Reg. 36,880, 36,886 (June 30, 2014) (citing 60 Fed. Reg. 43,620 (Aug. 18, 1995); 67 Fed. Reg. 17,762 (Apr. 11, 2002)).

<sup>4</sup> 42 U.S.C. § 7412(d)(6), (f)(2).

<sup>5</sup> 79 Fed. Reg. at 36,900 (DCU limit, CRU vents, flares, bypasses), 36,915, 36,940 (storage vessels), 36,920 (fence-line monitoring), 36,930 (FCCU process vents), 36,933 (SRU process vents).

<sup>6</sup> *Id.* at 36,942 (SSM), 36,912 (vent control bypasses).

<sup>7</sup> 42 U.S.C. § 7401(b)(1) (“purposes” include “to protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare and the productive capacity of its population”); *id.* § 7401(c) (“primary goal . . . is . . . pollution prevention”); *see also id.* § 7401(a)(2).

<sup>8</sup> *Id.* § 7412(f)(2)(A).



has recognized, the “aspirational goal” of this provision includes reducing lifetime cancer risk to the most-exposed person to be one-in-one million or lower.<sup>9</sup> As EPA recognizes, this provision directs EPA to “protect[] the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1-in-1 million” and “limit[] to no higher than approximately 1-in-10 thousand [i.e., 100-in-1 million] the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years.”<sup>10</sup>

In addition, and independently, the technology review required by § 7412(d)(6) aims to continue to reduce toxic air pollution, and thus Americans’ exposure to air toxics, as greater emission reductions become achievable.<sup>11</sup> As EPA has recognized, § 7412(d)(6) is “a continuation of the technology-based section 112(d) standard-setting process,” and it thus serves the same goals of § 42 U.S.C. § 7412(d) overall to assure emission reductions.<sup>12</sup>

Under § 7412(d)(6), EPA must review the existing standards and determine whether revision is “necessary,” including by “taking account of developments in practices, processes, and control technologies.” EPA may determine that it is “necessary” to update the standards based on any relevant factors, but when such “developments” exist, it must update the standards, as developments are the “core requirement” of § 7412(d)(6).<sup>13</sup>

When EPA determines under § 7412(d)(6) that revised standards are “necessary,” any standards it promulgates are governed by the plain text and statutory test provided for all § 7412(d) emission standards in 42 U.S.C. § 7412(d)(2)-(3). In setting each set of revised standards EPA proposes to promulgate in this rulemaking, EPA must follow the plain text of § 7412(d)(2)-(3) which govern “emissions standards promulgated under this subsection,” *i.e.*, § 7412(d), to set current floor and beyond-the-floor standards, and assure reductions based on what existing sources have “achieved,” and “maximum achievable degree of emission reduction” as the Act directs.

Although the D.C. Circuit held otherwise in the lead smelting case in 2013, neither EPA nor any court has addressed the plain text of those provisions, which apply to “emission standards promulgated under this subsection,” *i.e.*, § 7412(d). In view of that, and the lack of statutory interpretation or reasoning in EPA’s policy or the court decision itself interpreting the statute, Commenters believe that EPA and the court wrongly decided this issue.

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<sup>9</sup> *NRDC v. EPA*, 529 F.3d 1077, 1082 (D.C. Cir. 2008) (interpreting 42 U.S.C. § 7412(f)(2)).

<sup>10</sup> 79 Fed. Reg. at 36,885 (quoting Benzene Rule, 54 Fed. Reg. 38,044-45 (Sept. 14, 1989)).

<sup>11</sup> 42 U.S.C. § 7412(d)(6) (requiring EPA to review and determine whether it is “necessary” to revise existing standards, including to account for “developments in practices, processes, and control technologies”).

<sup>12</sup> *See, e.g.*, Subpart N: Summary of Public Comments on Chromium Electroplating and Steel Pickling Risk and Technology Review (RTR), EPA-HQ-OAR-2010-0600-0691 at 3; 42 U.S.C. § 7412(d)(2)-(3); S. Rep. No. 101-228 (1990) at 127-33, *reprinted in* 1990 U.S.C.C.A.N. 3385, 3512-18.

<sup>13</sup> *NRDC*, 529 F.3d at 1083.

EPA has a responsibility to follow the clear language of the law and, at least, to provide a statutory interpretation supporting its policy decision that discusses that language. EPA should recognize that and finally engage with what the Act actually says. For that reason and all of the reasons provided in the attached briefs, EPA should decide to follow the clear language of the Clean Air Act, rather than continuing to pursue a policy of inadequately revising emission standards and ignoring the basic stringency test provided by Congress in the 1990 Clean Air Act Amendments.<sup>14</sup>

Refusing to recognize that revised air toxics standards follow the same test as other § 7412(d) standards would conflict with EPA's policy and interpretation in the electric utility MACT standards. As EPA recognized there, § 7412(n)(1)(A) provides the test for whether standards are needed, as § 7412(d)(6) does here.<sup>15</sup> And, then § 7412(d)(2)-(3) provide the test for the actual standards. Just as § 7412(n) provides no exception for utility standards, § 7412(d)(6) similarly does not exempt revised standards from § 7412(d)(2)-(3), as further discussed in the attached briefs.<sup>16</sup>

Moreover, the argument both EPA and the court rejected in *White Stallion v. EPA* is functionally the same as the policy EPA uses here. There, industry petitioners argued that § 7412(n)(1)(A) governed both the decision to set standards for coal-fired power plants and the stringency of those standards, just as EPA attempts to use § 7412(d)(6) as the basis both for its decision to set revised standards and the stringency. Both arguments fail for the same simple reasons: that is not what § 7412 says and they disregard Congress's careful structure in this provision.<sup>17</sup>

Even if, for the sake of argument, the Act were ambiguous, EPA should interpret it to apply the same test to revised air toxics standards as other emission standards. Doing so better serves congressional intent, for it will provide more health benefit, which is the core of the Act's objective, and will assure that EPA continues to serve the Congressional objective of limiting EPA's discretion to assure ongoing emission reductions.<sup>18</sup>

As Commenters have explained in many prior comments and in their briefs (attached from *NASF v. EPA*), if EPA does not follow the plain text and intent of the Clean Air Act,

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<sup>14</sup> See 2014 Final Opening and Reply Briefs of Environmental Petitioners, *NASF v. EPA*, D.C. Cir. No. 12-1459 (attached).

<sup>15</sup> *White Stallion v. EPA*, 748 F.3d 1222, 1244 (D.C. Cir. 2014).

<sup>16</sup> See 2014 Final Opening and Reply Briefs of Environmental Petitioners, *NASF v. EPA*, D.C. Cir. No. 12-1459 (attached).

<sup>17</sup> *White Stallion*, 748 F.3d at 1244.

<sup>18</sup> See, e.g., *South Coast Air Quality Management District v. EPA*, 472 F.3d 882, 895 (D.C. Cir. 2006), *amended in unrelated part* 489 F.3d 1245 (D.C. Cir. 2007) ("We further hold that EPA's interpretation of the Act in a manner to maximize its own discretion is unreasonable because the clear intent of Congress in enacting the 1990 Amendments was to the contrary.").

communities around the nation living in air toxics hot spots will suffer. Communities in those areas, as EPA's own demographic analysis here shows, are more likely to be communities of color and lower income communities. EPA's recently released Second Integrated Urban Air Toxics Report (Aug. 21, 2014) recognized that there continue to be elevated areas with high cancer and other health risks. In that report, EPA stated that it would "continue to address urban air toxics . . . through regulations called for under the CAA."<sup>19</sup> This rulemaking and others like it – where EPA finds developments in pollution control have occurred, and there is significant disparity in risk and health impact distribution – are exactly the context where, if the agency is serious, it will take action to make its policy mirror what federal law actually requires. If it does not do so, it will not be following the commitment it has made to take air toxics hot spots seriously and give communities real relief from cancer-causing pollution.

### **C. Refineries Expose People To Harmful Toxic Air Pollution That Can Cause Severe Health Impacts That EPA Must Prevent And Reduce.**

People living near U.S. refineries are exposed to toxic air pollution that harms their health, welfare, and way of life.

As EPA found, at least 7 million people currently face lifetime cancer risks above 1-in-1 million from breathing the toxic air pollution emitted by refineries alone. And the maximum lifetime cancer risk for the most-exposed person is 100-in-1 million from inhalation exposure to refineries alone.<sup>20</sup>

EPA estimates that this means refineries cause about 0.6 excess cancer cases per year, or at least 1 extra cancer case every other year. **Even one additional cancer case is too many -- EPA is allowing about 5 additional cancer cases every decade. That is plainly unacceptable.** Congress enacted the 1990 Amendments of the Clean Air Act to prevent cancer from toxic air pollution, and to do so especially in communities overburdened by such pollution.<sup>21</sup> Yet EPA proposes to allow at least 1 new cancer case every other year, and 5 new, additional cancer cases every decade, in communities that have refineries. That is plainly unacceptable.

EPA also has found a high non-cancer chronic risk to the thyroid and neurological systems (0.9-1), as well as high acute health risks ( $\geq 5$ ). And the risks EPA found come on top of the exposure the same people face from all other sources and other kinds of air pollution in their neighborhoods.

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<sup>19</sup> See Second Integrated Urban Air Toxics Report, *supra* note 1, at xvi.

<sup>20</sup> Draft Risk Assessment at 38; 79 Fed. Reg. at 36,934 tbl. 10 & n.a (noting EPA's estimates "would also be higher" if it took the more conservative approach of combining the model plant and REM emissions estimates).

<sup>21</sup> S. Rep. No. 101-228, at 128-29, 1990 U.S.C.C.A.N. at 3513-14.

But EPA's numbers themselves underestimate exposure and risk. EPA's assessment based on actual emissions underestimates exposure because the emission inventory used for this review is based on emission factors that assume hypothetical perfect compliance and operation, not actual real-world emissions. EPA's assessment based on allowable emissions is equally underestimated, if not more so, because the agency relied on data that is nearly two decades old and ignores some potential releases. And, EPA underestimated all of the health risks communities face by using these underestimated emission values with outdated and incomplete methodologies. For example, EPA did not account for the threats faced when children are exposed early in life, or account for the greater vulnerability caused by multiple-source category exposure in a community.

EPA's own analysis shows a disparity – the harm is not equal. All of these health threats fall disproportionately on communities of color and lower income communities. African Americans are more than twice as likely as whites to face the extra health threats from refineries.<sup>22</sup>

EPA has presented these numbers in the abstract – making it difficult for communities to understand the risk assessment and for the public to understand what the substantial risks EPA has found actually mean on the ground. That is inconsistent with the public notice-and-comment requirements of the Clean Air Act, the 1994 Environmental Justice Executive Order, and EPA's own commitment in Plan EJ 2014 to greater community transparency and public participation in rulemakings.<sup>23</sup>

What does all of this really look and feel like in communities around the United States? It affects people every day living with extra pollution and health threats that they would not face if EPA adequately regulated the refinery industry. It means that, daily, some parents have to send their kids out to school and to the playground in air full of carcinogens and other air pollution that other parents cannot even imagine. It means that some people in the U.S. are more likely to face early mortality and suffering from cancer than others, just because they live near under-regulated petroleum refineries.

Commenters have submitted a Community Impact Spotlight (Addendum A), attached to these comments, that EPA must consider, showing the grave need for stronger standards in some of the communities with one or more U.S. refineries. The stories from these communities are just some examples of what those Americans currently face in the 32 states that contain over 140 U.S. refineries. EPA must take the experiences of the most-exposed people living in the shadow of U.S. refineries, on the front lines, into account.

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<sup>22</sup> 79 Fed. Reg. at 36,937; Analysis of Socio-Economic Factors for Populations Living Near Petroleum Refineries, EPA-HQ-OAR-2010-0682-0226.

<sup>23</sup> 42 U.S.C. § 7607(d); Federal Actions To Address Environmental Justice, Exec. Order No. 12898, 3 C.F.R. § 859 (1995), *reprinted as amended in* 42 U.S.C. § 4321 (1998); <http://www.epa.gov/environmentaljustice/plan-ej>.

Based on all of the evidence before EPA and presented with these comments, Commenters urge EPA to set strong standards that will finally bring to all corners of the United States the protection that all communities deserve from toxic air pollution.

**1. Hazardous Air Pollutants That Refineries Emit Are Highly Toxic to Human Health.**

The following is a summary of the health impacts of some of the hazardous air pollutant compounds emitted by refineries. Many of these compounds present significant hazards to human health at varying levels of exposure; some are persistent in the environment. Toxic air pollutants emitted by refineries contribute to a wide range of serious health impacts including asthma and other respiratory diseases; developmental impacts including IQ loss; cancer; heart disease; reproductive system impacts including birth defects; damage to a range of organs including the kidneys and liver; and even premature death.

1. **Benzene** is a common component of crude oil and gasoline, and a widespread environmental pollutant resulting from refinery activity.<sup>24</sup> Human exposure to benzene has been associated with a range of acute and long-term adverse health effects and diseases, including cancer and adverse hematological, reproductive and developmental effects.<sup>25</sup> Benzene is a known carcinogen; long term exposure can cause leukemia.<sup>26</sup> Inhalation of high doses of benzene may impact the central nervous system leading to drowsiness, dizziness, irregular heartbeat, nausea, headaches, and depression.<sup>27</sup> Female workers experiencing high exposure levels over the course of many months experienced reproductive impacts, such as a decrease in the size of their ovaries. In animal studies, breathing benzene was associated with developmental effects such as low birth weight, delayed bone formation, and bone marrow damage.<sup>28</sup>
2. **Toluene** is a volatile organic compound (“VOC”) emitted in large quantities by petroleum refineries. California’s list of chemicals known to cause cancer or

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<sup>24</sup> Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Benzene*, U.S. Department of Health and Human Services, August 2007; see Cal. EPA, OEHHA, Air Toxicology and Epidemiology, Notice of Adoption of Reference Exposure Levels for Benzene (June 27, 2014) [http://oehha.ca.gov/air/chronic\\_rels/BenzeneJune2014.html](http://oehha.ca.gov/air/chronic_rels/BenzeneJune2014.html).

<sup>25</sup> CARB, Report to the Scientific Review Panel on Benzene, Prepared by the Staffs of The Air Resources Board and The Department of Health Services, November 27, 1984, <http://www.arb.ca.gov/toxics/id/summary/benzene.pdf>.

<sup>26</sup> Chronic Toxicity Summary: Benzene, [http://www.oehha.org/air/chronic\\_rels/pdf/71432.pdf](http://www.oehha.org/air/chronic_rels/pdf/71432.pdf)

<sup>27</sup> World Health Organization, Exposure to Benzene: A Major Public Health Concern, <http://www.who.int/ipcs/features/benzene.pdf>.

<sup>28</sup> Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Benzene*, U.S. Department of Health and Human Services, August 2007.

reproductive toxicity includes toluene as a developmental toxicant.<sup>29</sup> Similar to many organic solvents, toluene acts as a respiratory tract irritant, particularly at high air concentrations.<sup>30</sup> For this reason, it can be especially harmful to people with asthma. A ubiquitous air pollutant, exposure to toluene constitutes a serious health concern as it has negative impacts on the central nervous system. Exposure to toluene can cause headaches, impaired reasoning, memory loss, nausea, impaired speech, hearing, and vision, amongst other health effects.<sup>31</sup> Long term exposure may damage the liver and kidneys.<sup>32</sup>

3. **Ethylbenzene** is a commonly occurring component of petroleum. Ethylbenzene has been recently classified as a possible human carcinogen by the International Agency for Research on Cancer (“IARC”)<sup>33</sup>, and has been associated with a number of adverse health outcomes. Breathing high levels can cause dizziness as well as throat and eye irritation; chronic, low-level exposure over several months to years can result in kidney damage as well as hearing loss.<sup>34</sup>
4. **Xylene**<sup>35</sup> is a VOC in petroleum. Short term exposure to xylene may result in a number of adverse human health effects including irritation of the skin, eyes, nose and throat; difficulty breathing; damage to the lungs; impaired memory; and possible damage to the liver and kidneys. Long term exposure may affect the nervous system presenting symptoms such as headaches, lack of muscle coordination, dizziness, confusion, and loss of balance.<sup>36</sup> More serious long term health effects include memory impairment, red and white blood cell abnormalities, abnormal heartbeat (in laboratory workers), liver damage,

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<sup>29</sup> California EPA Office of Environmental Health Hazard Assessment, ‘Chemicals Known to the State to Cause Cancer or Reproductive Toxicity’, 2013, [http://oehha.ca.gov/prop65/prop65\\_list/files/P65single052413.pdf](http://oehha.ca.gov/prop65/prop65_list/files/P65single052413.pdf) (accessed June 2013)

<sup>30</sup> Agency for Toxic Substances and Disease Registry, *Toluene Toxicity: Case Studies in Environmental Medicine*, U.S. Department of Health and Human Services, Division of Toxicology and Environmental Medicine, February 2001, <http://www.atsdr.cdc.gov/hec/csem/toluene/docs/toluene.pdf> (accessed June, 2013)

<sup>31</sup> *Id.*

<sup>32</sup> National Institute for Occupational Safety and Health, ‘Toluene’, *NIOSH Pocket Guide to Chemical Hazards*, 2010, <http://www.cdc.gov/niosh/npg/npgd0619.html> (accessed June 2013)

<sup>33</sup> Henderson, Leigh, David Brusick, Flora Ratpan, and Gauke Veenstra, ‘A Review of the Genotoxicity of Ethylbenzene’, *Mutation Research/Reviews in Mutation Research*, 635 (2007), 81-89  
<doi:10.1016/j.mrrev.2007.03.001>

<sup>34</sup> Agency of Toxic Substances and Disease Registry, *Toxicological Profile for Ethylbenzene, ToxFAQs*, 2010, <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=382&tid=66> (accessed June 2013)

<sup>35</sup> Also known as dimethyl benzene

<sup>36</sup> Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Xylene*, U.S. Department of Health and Human Services, August 2007.

mutagenesis (mutations of genes), reproductive system effects, and death due to respiratory failure.<sup>37</sup>

5. **Polycyclic aromatic hydrocarbons (PAHs also described as Polycyclic Organic Matter, or POM)** are a group of over 100 different chemicals that are formed during incomplete combustion.<sup>38,39,40</sup> Infants and children are *especially* susceptible to the hazards of PAHs, a class of known human mutagens, carcinogens, and developmental toxicants found in diesel exhaust.<sup>41</sup> Greater lifetime cancer risks result from exposure to carcinogens at a young age. These substances are known to cross the placenta to harm the unborn fetus, contributing to fetal mortality, increased cancer risk, and birth defects.<sup>42</sup> Prenatal exposure to PAHs may also be a risk factor for the early development of asthma-related symptoms and can adversely affect children's cognitive development, with implications for diminished school performance.<sup>43</sup> Exposure of children to PAHs at levels measured in polluted areas can also adversely affect IQ.<sup>44</sup> Low molecular weight PAHs can form quinones, which exert pulmonary oxidative stress and have a potent negative affect on the immune system.<sup>45</sup>

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<sup>37</sup> Zoveidavianpoor, M., A. Samsuri, and S. R. Shadizadeh, 'The Clean Up of Asphaltene Deposits in Oil Wells', *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 35 (2013), 22–31 <doi:10.1080/15567036.2011.619630>

<sup>38</sup> Salmon A.G. and Meehan T. Potential Impact of Environmental Exposures to Polycyclic Organic Material (POM) on Children's Health, California Office of Environmental Health Hazard Assessment (OEHHA). [http://www.oehha.ca.gov/public\\_info/public/kids/pdf/PAHs%20on%20Children's%20Health.pdf](http://www.oehha.ca.gov/public_info/public/kids/pdf/PAHs%20on%20Children's%20Health.pdf)

<sup>39</sup> Agency for Toxic Substances and Disease Registry, Public Health Statement for Polycyclic Aromatic Hydrocarbons (PAHs). August 1995. <http://www.atsdr.cdc.gov/PHS/PHS.asp?id=120&tid=25>

<sup>40</sup> Perera FP. DNA Damage from Polycyclic Aromatic Hydrocarbons Measured by Benzo[a]pyrene-DNA Adducts in Mothers and Newborns from Northern Manhattan, The World Trade Center Area, Poland, and China *Cancer Epidemiol Biomarkers Prev* 2005;14(3):709–14.

<sup>41</sup> Salmon A.G. and Meehan T. "Potential Impact of Environmental Exposures to Polycyclic Organic Material (POM) on Children's Health," California Office of Environmental Health Hazard Assessment (OEHHA). [http://www.oehha.ca.gov/public\\_info/public/kids/pdf/PAHs%20on%20Children's%20Health.pdf](http://www.oehha.ca.gov/public_info/public/kids/pdf/PAHs%20on%20Children's%20Health.pdf).

<sup>42</sup> Perera FP. "DNA Damage from Polycyclic Aromatic Hydrocarbons Measured by Benzo[a]pyrene-DNA Adducts in Mothers and Newborns from Northern Manhattan, The World Trade Center Area, Poland, and China," *Cancer Epidemiology Biomarkers & Prevention* 14, no. 3 (2005):709–14.

<sup>43</sup> Perera FP, Rauh V, Tsai WY, Kinney P, Camann D, et al. "Effects of transplacental exposure to environmental pollutants on birth outcomes in a multiethnic population," *Environmental Health Perspective* 111 (2003): 201–205. Perera FP et. al. "Effect of Prenatal Exposure to Airborne Polycyclic Aromatic Hydrocarbons on Neurodevelopment in the First 3 Years of Life among Inner-City Children," *Environmental Health Perspective* 114 (2006):1287–1292.

<sup>44</sup> Perera, FP et. al. "Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years," *Pediatrics* 124 (2009):e195–e202.

<sup>45</sup> Bolton, J., Trush, M.A., Penning, T.M., Dryhurst, G., & Monks, T.J. (2000). Role of Quinones in Toxicology. *Chemical Research in Toxicology*, 13(3), 135–160. doi: 10.1021/tx99; Ikeda, A., Vu, K.K.-T., Lim, D., Tyner, T.R., Krishnan, V.V., & Hasson, A.L. (2012). An Investigation of the Use of Urinary Quinones as Environmental Biomarkers for Exposure to Ambient Particle-Borne Pollutants. *Science of the Total Environment* (submitted).

6. **Hydrogen Cyanide** exposure at high levels swiftly harms the brain and heart, beginning with rapid breathing, followed by convulsions, and loss of consciousness, and can even cause coma and death.<sup>46</sup> More commonly, even low level exposure to hydrogen cyanide is associated with breathing difficulties, chest pain, vomiting, headaches, and enlargement of the thyroid gland.<sup>47</sup>
7. **Naphthalene**, a known carcinogen, also has respiratory impacts, ocular effects such as cataracts and retinal damage, and impacts to the hematological systems.<sup>48</sup>
8. **1,3-butadiene** causes inflammation of nasal tissues, changes to lung, heart, and reproductive tissues, neurological effects, and blood changes; it is a known carcinogen associated with cancers of the blood and lymphatic system, and it may also cause birth defects according to animal studies.<sup>49</sup>
9. **Formaldehyde** is a known carcinogen that can cause asthma or asthma-like symptoms, neurological effects, increased risk of allergies, and Eczema and changes in lung function at exposure levels from 0.6 to 1.9 ppm.<sup>50</sup>
10. **Acetaldehyde** is carcinogenic, mutagenic (or genotoxic) and may cause reproductive and developmental harm based on animal studies.<sup>51</sup>
11. **Arsenic** is a known human carcinogen. Chronic (long-term) inhalation exposure to inorganic arsenic in humans is associated with irritation of the skin and mucous membranes. Human data suggest a relationship between inhalation exposure of women working at or living near metal smelters and an increased risk of reproductive effects, such as spontaneous abortions. Inorganic arsenic exposure in humans by the inhalation route has been shown to be strongly associated with lung cancer, while ingestion of inorganic arsenic in humans has been linked to a form of skin cancer and also to bladder, liver, and lung cancer. The adverse effects of inorganic arsenic exposure reported in children include skin lesions, neurodevelopmental effects (IQ and related effects), lung disease expressed in later years, and reproductive effects (decreased birth weight, spontaneous abortion, neonatal death).<sup>52</sup>

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<sup>46</sup> ATSDR, ToxFaqs, <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=71&tid=19>

<sup>47</sup> *Id.*

<sup>48</sup> CalEPA, Air Toxics Hotspots, Adoption of a Unit Risk Value for Naphthalene, 2004. [http://www.oehha.ca.gov/air/hot\\_spots/pdf/naphth080304.pdf](http://www.oehha.ca.gov/air/hot_spots/pdf/naphth080304.pdf)

<sup>49</sup> ATSDR ToxFaqs; <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=458&tid=81>

<sup>50</sup> ATSDR ToxFaqs; <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=219&tid=39>

<sup>51</sup> CalEPA, 1993 Determination of Acetaldehyde as a TAC.

[http://www.oehha.ca.gov/air/toxic\\_contaminants/html/Acetaldehyde.htm](http://www.oehha.ca.gov/air/toxic_contaminants/html/Acetaldehyde.htm)

<sup>52</sup> ATSDR *Toxicological Profile for Arsenic*, U.S. Department of Health and Human Services, August 2007.



12. **Cadmium**<sup>53</sup> can severely damage the lungs and may cause death when breathing air with high levels of this pollutant. Breathing air with lower levels of cadmium over long periods of time results in a build-up of cadmium in the kidney, potentially resulting in kidney disease. Airborne Cadmium can also end up in the food supply, where it can cause problems including death, especially at high concentrations. Ingestion of lower levels of cadmium over a long period of time can lead to kidney damage and can also cause bones to become fragile and break easily. Lung cancer has been found in some studies of workers exposed to cadmium in the air; it is a known human carcinogen according to the U.S. Department of Health and Human Services (DHHS) the International Agency for Research on Cancer (IARC). Animal studies indicate that cadmium may cause birth defects.
13. **Chromium (VI) or hexavalent chromium**<sup>54</sup> is a known human carcinogen, primarily affecting the lungs, but tumors in the stomach and intestinal tract have also been reported. Additional effects associated with exposure to hexavalent chromium compounds in human and animal studies include: respiratory effects (nasal and lung irritation, altered pulmonary function), gastrointestinal effects (irritation, ulceration and nonneoplastic lesions of the stomach and small intestine), hematological effects (microcytic, hypochromic anemia), and reproductive effects (effects on male reproductive organs, including decreased sperm count and histopathological change to the epididymis). The respiratory tract is the major target organ for hexavalent chromium toxicity for inhalation exposures. Bronchitis, decreases in pulmonary function, pneumonia, and other respiratory effects have been noted from chronic high dose exposure of hexavalent chromium in occupational settings. Limited human studies suggest that hexavalent chromium inhalation exposure may be associated with complications during pregnancy and childbirth.<sup>55</sup>
14. **Lead** is a well-known toxic heavy metal with diverse and severe health impacts.<sup>56</sup> In particular, lead is associated with neurological, hematological, and immune effects on children, and hematological, cardiovascular, and renal effects on adults. Children are particularly sensitive to the effects of lead, including sensory, motor, cognitive, and behavioral impacts. Cognitive effects of special concern include decrements in IQ scores and academic achievement, as well as attention deficit problems. Children in poverty and black, non-Hispanic, children face higher exposures to lead and are consequently more susceptible to lead's health impacts. Reproductive effects, such as decreased sperm count

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<sup>53</sup> ATSDR ToxFaqs; <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=47&tid=15>

<sup>54</sup> Chromium health impacts are primarily derived from US DHHS, ATSDR. 2008. Draft Toxicological Profile For Chromium.

<sup>55</sup> ATSDR ToxFaqs; <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=61&tid=17>

<sup>56</sup> See National Ambient Air Quality Standards for Lead, 73 Fed. Reg. 66,964, 66,975-76 (Nov. 12, 2008).

in men and spontaneous abortions in women, have been associated with lead exposure. EPA has classified lead as a probable human carcinogen. No safe blood lead level in children has been identified; even low levels of lead in blood have been shown to affect IQ, ability to pay attention, and academic achievement; and effects of lead exposure cannot be corrected.<sup>57</sup> One recent study found that for every 0.2 µg/dl of lead in the blood, an adolescent's IQ was reduced one point.<sup>58</sup>

15. **Manganese**<sup>59</sup> results primarily in central nervous system effects from chronic inhalation exposure. Visual reaction time, hand steadiness, and hand-eye coordination were affected in chronically-exposed workers. Impotence and loss of libido have been noted in male workers afflicted with manganism attributed to inhalation exposures. In addition, exposures to low levels of manganese have been linked to subtle deficits in cognitive and neurobehavioral functions in both adults and children. Neurodevelopmental deficits have been associated with early life exposure to excessive manganese and include impaired intellectual performance and behavioral disinhibition.<sup>60</sup>
16. **Mercury** is a highly neurotoxic contaminant emitted by refineries, among other sources. Airborne mercury deposits in oceans, lakes, and streams where it accumulates in fish, other wildlife, and ultimately in humans when we eat contaminated foods such as Tuna-fish.<sup>61</sup> Nearly every state – 48 out of 50 – has measured mercury contamination in fish, recording unsafe levels that have prompted health advisories.<sup>62</sup> Health effects of mercury include neurological, developmental, and behavioral problems, such as lower IQ, attention deficit hyperactivity disorder (ADHD), and impaired memory and motor

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<sup>57</sup> Center for Disease Control and Prevention; [http://www.cdc.gov/nceh/lead/acclpp/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm)

<sup>58</sup> Lucchini, RG, S Zoni, S Guazzetti, E Bontempi, S Micheletti, K Broberg, G Parrinello and DR Smith. 2012. Inverse association of intellectual function with very low blood lead but not with manganese exposure in Italian adolescents, <http://www.sciencedirect.com/science/article/pii/S0013935112002344>.

<sup>59</sup> CalEPA, OEHHA.2007 Technical Support Document For the Derivation of Noncancer Reference Exposure Levels (attached).

<sup>60</sup> ATSDR, *Toxicological Profile for Manganese*, U.S. Department of Health and Human Services, September 2012.

<sup>61</sup> U.S. Environmental Protection Agency 2009. Human Exposure to Methylmercury. <http://www.epa.gov/mercury/exposure.htm>.

<sup>62</sup> U.S. Geological Survey. 2009. Recent findings from the National Water-Quality Assessment (NAWQA) and Toxic Substances Hydrology Programs (as presented to the NAWQA National Liaison Committee, August 21, 2009); U.S. Environmental Protection Agency 2007. National Listing of Fish Advisories Technical Fact Sheet: 2005/06 National Listing Fact Sheet; EPA-823-F-07-003; (July 2007). U.S. Department of Health and Human Services and Environmental Protection Agency. 2009. "What You Need to Know About Mercury in Fish and Shellfish." Available at <http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/FoodbornePathogensContaminants/Methylmercury/ucm115662.htm>; U.S. Geological Survey. 2009. Mercury in Fish, Bed Sediment, and Water from Streams Across the United States, 1998-2005.

skills.<sup>63</sup> Cardiovascular effects including increased risks of heart attacks, increased blood pressure, and thickening of arteries are also associated with elevated mercury levels.<sup>64</sup>

17. **Nickel** is associated with chronic dermatitis, respiratory impacts, and potentially also reproductive impacts.<sup>65</sup> The EPA has classified nickel refinery subsulfide as a Group A, human carcinogen and nickel carbonyl as a Group B2, probable human carcinogen. Extensive research also relates exposure in metals, particularly nickel and vanadium in PM<sub>2.5</sub>, to cardiovascular effects.<sup>66</sup> A national epidemiological study recently found that communities with higher fractions of nickel, vanadium, and elemental carbon in their PM<sub>2.5</sub> also had higher risk of cardiovascular and respiratory hospitalization.

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<sup>63</sup> Myers GJ, Davidson PW. "Prenatal mercury exposure and children: Neurologic, developmental, and behavioral research," *Environ Health Perspect* 106 (Suppl 3) (1998): 841-847. Grandjean P, White RF, Weihe P, Jørgensen PJ. "Neurotoxic risk caused by stable and variable exposure to methylmercury from seafood," *Ambulatory Pediatrics* 3, no. 1 (2003):18-23. Debes F, Budtz-Jørgensen E, Weihe P, White RF, Grandjean P. "Impact of prenatal methylmercury exposure on neurobehavioral function at age 14 years," *Neurotoxicology and Teratology* 28, no. 5 (2006):536-47. Oken E, Wright RO, Kleinman KP, Bellinger D, Amarasinghwardena CJ, Hu H, Richardson ED, Gillman MW. "Maternal fish consumption, hair mercury, and infant cognition in a U.S. Cohort," *Environmental Health Perspectives* 113, no.10 (2005):1376-80. Oken E, Radesky JS, Wright RO, Bellinger DC, Amarasinghwardena CJ, Kleinman KP, Hu H, Gillman MW. "Maternal fish intake during pregnancy, blood mercury levels, and child cognition at age 3 years in a US cohort," *American Journal of Epidemiology* 167, no. 10 (2008):1171-81. Myers GJ, Thurston SW, Pearson AT, Davidson PW, Cox C, Shamlaye CF, Cernichiari E, Clarkson TW. "Postnatal exposure to methyl mercury from fish consumption: a review and new data from the Seychelles Child Development Study," *Neurotoxicology and Teratology* 30, no. 3 (2009):338-49. Yoshida M, Shimizu N, Suzuki M, Watanabe C, Satoh M, Mori K, Yasutake A. "Emergence of delayed methylmercury toxicity after perinatal exposure in metallothionein-null and wild-type C57BL mice," *Environmental Health Perspectives* 116, no. 6 (2008):746-51. Yokoo EM, Valente JG, Grattan L, Schmidt SL, Platt I, Silbergeld EK. "Low level methylmercury exposure affects neuropsychological function in adults," *Environmental Health* 2, no. 1(2003):8.

<sup>64</sup> Guallar E, Sanz-Gallardo MI, van't Veer P, Bode P, Aro A, Gomez-Aracena J, et al. "Mercury, fish oils, and the risk of myocardial infarction." *New England Journal of Medicine* 347, no. 22 (2002):1747-54. Salonen JT, Seppanen K, Nyyssonen K, Korpela H, Kahonen J, Kantola M, et al. "Intake of mercury from fish, lipid peroxidation, and the risk of myocardial infarction and coronary, cardiovascular, and any death in eastern Finnish men." *Circulation* 91, no. 3 (1995):645-55. Choi AL, Weihe P, Budtz-Jørgensen E, Jørgensen PJ, Salonen JT, Tuomainen TP, Murata K, Nielsen HP, Petersen MS, Askham J, Grandjean P. "Methylmercury exposure and adverse cardiovascular effects in Faroese whaling men," *Environmental Health Perspectives* 117, no. 3 (2009):367-72. Jacob-Ferreira AL, Passos CJ, Jordão AA, Fillion M, Mergler D, Lemire M, Gerlach RF, Barbosa Jr F, Tanus-Santos JE. "Mercury Exposure Increases Circulating Net Matrix Metalloproteinase (MMP)-2 and MMP-9 Activities," *Basic Clinical Pharmacological Toxicology* (2009): 1-8 [Epub ahead of print] PMID: 19594729.

<sup>65</sup> Agency for Toxic Substances and Disease Registry, Public Health Statements, <http://www.atsdr.cdc.gov/>

<sup>66</sup> Bell, M.L., Ebisu, K., Peng, R.D., Samet, J.M. & Dominici, F. (2009). Hospital Admissions and Chemical Composition of Fine Particle Air Pollution. *American Journal of Respiratory Critical Care*, 179, 1115–1120. Retrieved from <http://ajrcm.atsjournals.org/content/179/12/1115.full.pdf+html>; Lippmann, M., Ito, K., Hwang, J-S., Maciejczyk, P., & Chen, L-C. (2006). Cardiovascular Effects of Nickel in Ambient Air. *Environmental Health Perspectives*, 114(11), 1662–1669. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1665439/>; Chen, L.C., & Lippmann, M. (2009). Effects of Metals within Ambient Air Particulate Matter (PM) on Human Health. *Inhalation Toxicology*, 21(1), 1–31. Retrieved from <http://faculty.unlv.edu/buckb/scanned%20pdf/Chen%20and%20Lippmann%202009.pdf>

## Acids:

18. **Hydrogen chloride (HCl)** is irritating and corrosive to any tissue it contacts. Brief exposure to low levels causes throat irritation. Long-term exposure to low levels can cause respiratory problems, eye and skin irritation, and discoloration of the teeth. Exposure to higher levels can result in rapid breathing, narrowing of the bronchioles, blue coloring of the skin, severe burns of the eyes and skin, accumulation of fluid in the lungs, and even death. Some people may develop reactive airways dysfunction syndrome (RADS), a type of asthma caused by some irritating or corrosive substances. Children may be more vulnerable than adults to corrosive agents, such as HCl, because of their relatively narrower airways, relatively greater exposure due to greater breathing volume per pound of body weight and relatively longer potential exposure durations.<sup>67</sup>
19. **Hydrogen fluoride or Hydrofluoric acid (HF)** is a serious systemic poison that is highly corrosive. Its severe and sometimes delayed health effects are due to deep tissue penetration by the fluoride ion. The colorless, fuming gas with a strong odor can burn skin or lungs on contact though symptoms of exposure can be delayed for days. Acute exposure can cause severe and fatal mineral imbalances. Other systemic impacts include nausea, vomiting, gastric pain, low blood pressure, irregular heartbeat, involuntary muscle contractions, seizures, and death. Inhaled hydrogen fluoride initially affects the nose, throat, and eyes. Impacts range from irritation and inflammation, cough, and narrowing of the bronchi to more severe reactions including immediate narrowing and swelling of the throat, causing upper airway obstruction. Exposure to HF can also cause fluid to accumulate in the lungs, constriction of the bronchi, and partial or complete lung collapse. Acute inhalation injury may lead to chronic lung disease. Other impacts can include slow-healing burns to the skin and potentially permanent damage to the eyes, causing clouding. Children are at greater health risk from HF for the same reasons as stated above.<sup>68</sup>

## **2. Additional Harmful Pollutants Combine With Section 7412 Hazardous Air Pollutants to Threaten Public Health.**

Although EPA's rule targets § 7412-listed HAPs, refineries emit vast quantities of other pollutants, including criteria pollutants that can negatively interact with and exacerbate the impacts of HAP exposure.

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<sup>67</sup> Agency of Toxic Substances and Disease Registry, ToxFAQs, <http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=759&tid=147>

<sup>68</sup> ATSDR, Medical Management Guidelines for Hydrogen Fluoride, <http://www.atsdr.cdc.gov/MMG/MMG.asp?id=1142&tid=250>

Of gravest concern are the numerous studies that have documented a wide range of adverse health impacts from exposure to **fine particulate matter (PM<sub>2.5</sub>)**, including increased rates of cardiovascular disease, such as atherosclerosis, heart attacks, respiratory illness, emergency room visits, and premature death.<sup>69</sup> Exposure to particulate matter has also been linked to birth defects, low birth weights, and premature births.<sup>70</sup>

**Nitrogen oxides** can have a toxic effect on the airways, leading to inflammation, asthmatic reactions, and worsening of allergies and asthma symptoms.<sup>71</sup> In addition, nitrogen oxides react with VOCs in the sunlight to form ozone – also known as smog. This layer of brown haze contributes to decreased lung function, increased respiratory symptoms, asthma, emergency room visits, hospital admissions, and premature deaths.<sup>72</sup> Ozone can also cause irreversible changes in lung structure, eventually leading to chronic respiratory illnesses, such as emphysema and chronic bronchitis.<sup>73</sup>

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<sup>69</sup> Kuenzli N, Jerrett M, Mack WJ, Beckerman B, LaBree L, Gilliland F, Thomas D, Hodis HN. “Ambient Air Pollution and Atherosclerosis in Los Angeles,” *Environmental Health Perspective* 113 (February 2005):201-6.

Miller KA, Siscovick DS, Sheppard L, Shepherd K, Sullivan JH, Anderson GL, Kaufman JD. “Long-term Exposure to Air Pollution and Incidence of Cardiovascular Events in Women,” *New England Journal of Medicine* 1:356 (February 2007):447-58; Hoffman B, Moebus S, Mohlenkamp S, Stang A, Lehman N, Dragano D, Schmermund A, Memmesheimer M, Mann K, Erbel R, Jockel K-H. “Residential Exposure to Traffic Is Associated With Coronary Atherosclerosis.” *Circulation*, published online July 16, 2007, DOI:10.1161 / CIRCULATIONAHA.107693622; Pope CA, Muhlestein JB, May HT, Renlund DG, Anderson JL, Horne BD. “Ischemic Heart Disease Events Triggered by Short-term Exposure to Fine Particulate Air Pollution,” *Circulation* 114 (December 5): 20062443-8; Schwartz J, Slater D, Larson TV, Person WE, Koenig JQ. “Particulate Air Pollution and Hospital Emergency Room Visits for Asthma in Seattle,” *American Review of Respiratory Disease* 147 (April 1993):826-31. Jerrett M, Burnett RT, Ma R, Pope CA, Krewski D, Newbold KB, Thurston G, Shi Y, Finkelstein N, Calle EE, Thun MJ. “Spatial Analysis of Air Pollution and Mortality in Los Angeles,” *Epidemiology* 16 (November 2005):727-36.

<sup>46</sup> Ritz B, Wilhelm M, Zhao Y. “Air Pollution and Infant Death in Southern California, 1989–2000,” *Pediatrics* 118 (August 2000):493-502. Wilhelm M, Ritz B. “Residential Proximity to Traffic and Adverse Birth Outcomes in Los Angeles County, California, 1994–1996,” *Environmental Health Perspective* 111 (February 2003):207-16. Wilhelm M, Ritz B. “Local Variations in CO and Particulate Air Pollution and Adverse Birth outcomes in Los Angeles County, California, USA,” *Environmental Health Perspective* 113 (September 2005):1212-21.

<sup>71</sup> Davies, R.J., Rusznak, C., Calderon, M.A., Wang, J.H., Abdelaziz, M.M., Devalia, J.L.: “Allergen-irritant interaction and the role of corticosteroids,” *Allergy* 52, (Suppl 38) (1997):59–65. Davies, R.J., Rusznak, C., Devalia, J.L.: “Why is allergy increasing?—environmental factors,” *Clinical & Experimental Allergy* 28, (Suppl 6) (1998):8–14.

<sup>72</sup> U.S. EPA. Provisional Assessment of Recent Studies on Health and Ecological Effects of Ozone Exposure. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/101, 2009.

<sup>73</sup> Hodgkin, J.E., Abbey, D.E., Euler, G.L., Magie, A.R. “COPD prevalence in nonsmokers in high and low photochemical air pollution areas,” *Chest* 86 (1984):830-838; Abbey DE, Petersen F, Mills PK, Beeson WL. “Long-term ambient concentrations of total suspended particulates, ozone, and sulfur dioxide and respiratory symptoms in a nonsmoking population,” *Archives of Environmental Health* 48 (1993):33–46.

**Sulfur dioxide (SO<sub>2</sub>)** emissions are another criteria pollutant of concern from refineries. These react in the air to create acids that irritate the airways, often causing severe respiratory symptoms in asthmatics.<sup>74</sup>

In addition, refineries emit hazardous **Hydrogen Sulfide (H<sub>2</sub>S)** which is a flammable and colorless gas that smells like rotten eggs. It is a broad spectrum poison that can be lethal at high concentrations. At low concentrations, hydrogen sulfide can cause irritation to the eyes, nose and throat. Additionally, exposure may result in incoordination, memory loss, hallucinations, personality changes, loss of sense of smell, coughing, and shortness of breath; people with asthma may experience difficulty breathing. In occupational settings, workers have died from exposure to high levels of hydrogen sulfide.<sup>75</sup> As EPA is aware, there is a pending petition to list H<sub>2</sub>S as a HAP, and EPA should grant that petition without further delay and regulate it at refineries.<sup>76</sup> In addition, EPA has recently recognized the need for hydrogen sulfide emissions to be reported as part of the Toxic Release Inventory, under the Emergency Planning and Community Right-to-Know Act, due to EPA's finding that the science "shows that it can reasonably be anticipated to cause chronic health effects in humans" and threatens "significant adverse effects in aquatic organisms."<sup>77</sup> EPA has sufficient toxicity data on this pollutant to list and regulate this HAP for petroleum refineries in this rulemaking.

### **3. Research has shown higher rates of cancer, respiratory, reproductive, and other health impacts for nearby communities.**

In its risk assessment, EPA does not evaluate any of the research performed on health impacts near refineries. That is unlawful, arbitrary and capricious under § 7412(f)(2) and EPA must evaluate the best available scientific research documenting refinery-based harm as part of this rulemaking.

Community health impacts of pollution from petroleum refineries have been analyzed in dozens of studies around the world,<sup>78</sup> finding increased rates of several types of cancer, preterm deliveries, asthma related hospitalizations, and increased mortality in communities around

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<sup>74</sup> Nicolai, T. "Environmental air pollution and lung disease in children," *Monaldi Archives of Chest Disease* 54 (1999):475-478.

<sup>75</sup> Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Hydrogen Sulfide*, U.S. Department of Health and Human Services, July 2006.

<sup>76</sup> Letter from Sierra Club et al. to U.S. EPA Administrator Jackson, Hydrogen Sulfide Needs Hazardous Air Pollutant listing under CAA Title III, (Mar. 25, 2009), available at <http://www.texas.sierraclub.org/press/newsreleases/H2SLetterToEPA.pdf>.

<sup>77</sup> U.S. EPA, *Lifting of Administrative Stay for Hydrogen Sulfide*, 76 Fed. Reg. 64,022, 64,024 (Oct. 17, 2011), see also <http://www.epa.gov/tri/lawsandregs/hydrogensulfide/indexf.html> (last accessed Sept. 23, 2011).

<sup>78</sup> Of the studies evaluated here, four were conducted in the United States, six in Taiwan, one in Sweden, three in the UK, three studies came from Canada, and one from Argentina.



refineries. Community health surveys have long indicated significantly increased illness and health impacts among residents living near refineries and petrochemical complexes.<sup>79</sup>

Many studies have found elevated rates of leukemia in residents living close to petrochemical plants, confirming concerns that known carcinogens associated with leukemia, such as benzene that is emitted in significant quantities from refineries, can greatly harm the health of nearby residents. One study from Taiwan found leukemia rates that were almost two times higher than expected in highly exposed communities surrounding petrochemical plants.<sup>80</sup> Another study in Southeast Texas also found greatly elevated leukemia rates in refinery impacted communities.<sup>81</sup> A Swedish study of small communities of approximately 5000 residents found that leukemia rates were 1.5 times higher in those communities where most of the residents live within 2 to 5 kilometers of a refinery.<sup>82</sup>

In the industrial heartland of Alberta, Canada, a recent major study that measured greatly elevated pollutant levels in the area (which includes several major refineries), reviewed over a decade of cancer incidence data and found that leukemia and non-Hodgkin lymphoma were higher in the most industrial areas compared to neighboring counties.<sup>83</sup> Another study also found greater than expected rates of leukemia and lymphoma in residents within 3 kilometers of a petrochemical plant in Balgfan Bay, Wales.<sup>84</sup>

The U.S. Atlantic coast childhood brain cancer study found increased risk of brain cancer among babies born to mothers who lived within 1 mile of a major source of carcinogenic air pollution including refineries, compared to those mothers living greater than one mile away.<sup>85</sup> The potential for increased rates of brain cancer in refinery impacted areas is confirmed by a

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<sup>79</sup> See for example, health surveys reported by the Louisiana Bucket Brigade; <http://www.labucketbrigade.org/blog/st-bernard-residents-sick-oil-industry-pollution-new-door-door-survey-released-today?page=1>

<sup>80</sup> H Weng, 'Association of childhood leukemia with residential exposure to petrochemical air pollution in Taiwan', *Inhalation Toxicology* (2008). <http://www.ncbi.nlm.nih.gov/pubmed/18236219>. The study found an Odds Ratio of 1.75 for increased leukemias.

<sup>81</sup> K Whitworth, 'Childhood lymphohematopoietic cancer incidence and hazardous air pollutants in southeast Texas, 1995-2004' *Environmental health perspectives* (2008). <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2592281&tool=pmcentrez&rendertype=abstract>. This study found a Rate Ratio of 1.37 for increased leukemia.

<sup>82</sup> L Barregard, 'Leukaemia incidence in people living close to an oil refinery.' *Environmental research* (2009) <http://www.ncbi.nlm.nih.gov/pubmed/19781695>

<sup>83</sup> I Simpson, 'Air quality in the Industrial Heartland of Alberta, Canada and potential impacts on human health' *Atmospheric environment*, (2013) <http://linkinghub.elsevier.com/retrieve/pii/S135223101300705X>.

<sup>84</sup> R Lyons, 'Incidence of leukaemia and lymphoma in young people in the vicinity of the petrochemical plant at Balgfan Bay, South Wales, 1974 to 1991' *Occupational and environmental medicine* (1995) <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1128199&tool=pmcentrez&rendertype=abstract>.

<sup>85</sup> H Choi, 'Potential residential exposure to toxics release inventory chemicals during pregnancy and childhood brain cancer' *Environmental health perspectives* (2006) <http://www.jstor.org/stable/3651785>. The study was based on Toxics Release Inventory (TRI) emitting facilities, the largest emitters of which are refineries; it found an Odds Ratio of up to 1.72 for mothers living near facilities that release carcinogens.

Taiwanese study which evaluated over 200 communities that found a statistically significantly higher risk of developing brain cancer among residents living in the municipalities with greater exposure to petrochemical emissions.<sup>86</sup>

In 2006, the Texas Department of State Health Services found that Corpus Christi (Nueces County), home of “Refinery Row,” had a birth defect rate that was 84 percent higher than the rest of Texas. A follow-up study explored the relationship between the rate of birth defects and several industrial sites in the county. Researchers found that mothers living near refineries and chemical plants had babies with high rates of life-threatening birth defects of the abdominal wall and diaphragm.<sup>87</sup>

Another Taiwanese study reviewed national mortality data, finding elevated rates of lung cancer mortality in women who lived in communities surrounding a petroleum refinery.<sup>88</sup> Increased rates of lung cancer mortality have also been found among residents who lived closer to petrochemical industry sites in Teesside, England, compared to people in a similar English city that does not have industry, Sunderland.<sup>89</sup> Additional studies have found increased incidences or rates of other types of cancers in refinery impacted areas, including increased mortality due to liver cancer,<sup>90</sup> increased bone cancer in girls and bladder cancer in boys,<sup>91</sup> increased buccal cavity, pharyngeal, stomach, and male combined kidney and urinary cancers,<sup>92</sup> and increased larynx cancer and incidence of all cancers.<sup>93</sup>

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<sup>86</sup> C Liu, ‘Association of brain cancer with residential exposure to petrochemical air pollution in Taiwan’ *Journal of toxicology and environmental health, part A* (2008). <http://www.ncbi.nlm.nih.gov/pubmed/18214804>; The odds ratio was 1.65.

<sup>87</sup> Dan Kelley, “Birth Defects 84 Percent Higher in Nueces Co.,” *Corpus Christi Caller Times*, Jan. 25, 2008 <http://www.caller.com/news/2008/jan/25/birth-defects-84-percent-higher-nueces-co>; Langlois, Peter, Texas Department of State Health Services, “A Case-Control Study of the Association Between Birth Defects Elevated in Nueces County and Sites of Concern to Citizens for Environmental Justice”; ATSDR, January 2010 Progress Report on Agency Activities in Corpus Christi, [http://www.atsdr.cdc.gov/sites/corpuschristi/final\\_report.html](http://www.atsdr.cdc.gov/sites/corpuschristi/final_report.html).

<sup>88</sup> C Yang, ‘Female lung cancer mortality and sex ratios at birth near a petroleum refinery plant’ *Environmental research* (2000) <http://www.ncbi.nlm.nih.gov/pubmed/10845779>.

<sup>89</sup> R Bhopal, ‘Does living near a constellation of petrochemical, steel, and other industries impair health?’ *Occupational and environmental medicine* (1998). <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1757538&tool=pmcentrez&rendertype=abstract>

<sup>90</sup> C Yang, ‘Cancer Mortality and Residence Near Petrochemical Industries in Taiwan’ *Journal of toxicology and environmental health* (1997) <http://www.tandfonline.com/doi/abs/10.1080/009841097160474>.

<sup>91</sup> B Pan, ‘Excess cancer mortality among children and adolescents in residential districts polluted by petrochemical manufacturing plants in Taiwan’ *Journal of toxicology and environmental health* (1994) <http://www.ncbi.nlm.nih.gov/pubmed/8078088>.

<sup>92</sup> J Kaldor, ‘Statistical association between cancer incidence and major-cause mortality, and estimated residential exposure to air emissions from petroleum and chemical plants’ *Environmental health perspectives* (1984) <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1568163&tool=pmcentrez&rendertype=abstract>

<sup>93</sup> S Sans, ‘Cancer incidence and mortality near the Baglan Bay petrochemical works, South Wales’ *Occupational and environmental medicine* (1995), <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1128198&tool=pmcentrez&rendertype=abstract>



Several studies show increased asthma prevalence and emergency room visits among children and residents living close to refineries. In Puerto Rico, one study showed that proximity to certain major air pollution sources, including refineries specifically, is associated with increased risk of asthma attacks.<sup>94</sup> A 2009 Canadian study assessed children's hospitalization and Emergency Department visits, and found that asthma related visits were associated with short-term exposure to refinery emissions of SO<sub>2</sub>.<sup>95</sup> A similar study found a correlation between refinery stack emissions of SO<sub>2</sub> and the prevalence of active asthma in children who live and attend school in proximity to refineries.<sup>96</sup> In Argentina, children living near a petrochemical plant were found to have twice the asthma prevalence and respiratory symptoms as well as significantly lower lung function than those living in other regions.<sup>97</sup>

One study in Taiwan collected pregnancy outcome data from a federal registry and found that preterm deliveries were occurring at a significantly higher rate in petroleum refining areas compared to other areas.<sup>98</sup> A recent major study of sector specific air pollution related mortalities in the U.S. found that out of 5,695 cities evaluated, Donaldsonville, Louisiana has the highest mortality rate from fine PM pollution.<sup>99</sup> Nine refineries processing a total of 2.2 million barrels per day in the 70-km radius contribute to the roughly 81 deaths from cardiovascular disease and lung cancer per 100,000 people.<sup>100</sup>

And, in communities that host refineries, not only are the outdoor ambient pollutant levels significantly higher, but the indoor concentrations of pollutants can be elevated as well. For example, PM<sub>2.5</sub> concentrations (which can show the presence of various metallic HAPs) were found to be much higher in the air inside people's homes in one refinery community

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<sup>94</sup> Loyo-Berrios, Nilsa I., Rafael Irizarry, Joseph G. Hennessey, Xuguang Grant Tao and Genevieve Matanoski. Air Pollution Sources and Childhood Asthma Attacks in Cataño, Puerto Rico. *Am. J. Epidemiol.* (2007) 165 (8):927-935. <http://aje.oxfordjournals.org/content/165/8/927.short>

<sup>95</sup> A Smargiassi, 'Risk of asthmatic episodes in children exposed to sulfur dioxide stack emissions from a refinery point source in Montreal, Canada' *Environmental health perspectives* (2009) <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2679612&tool=pmcentrez&rendertype=abstract>

<sup>96</sup> Deger L, Plante C, Jacques L, Goudreau S, Perron S, Hicks J, Kosatsky T, Smargiassi A. Active and uncontrolled asthma among children exposed to air stack emissions of sulphur dioxide from petroleum refineries in Montreal, Quebec: a cross-sectional study. *Can Respir J.* 2012 Mar-Apr;19(2):97-102.

<sup>97</sup> Fernando A. Wichmann, MDa, Andrea Müllerc, Luciano E. Busia, Natalia Ciannib, Laura Massolob, Uwe Schlinkc, Andres Porta, PhDb, Peter David Sly, MBBS, MD, DSc, FRACPd. Increased asthma and respiratory symptoms in children exposed to petrochemical pollution. *Journal of Allergy and Clinical Immunology* Volume 123, Issue 3, March 2009, Pages 632–638. <http://www.sciencedirect.com/science/article/pii/S0091674908018794>

<sup>98</sup> M Lin, 'Increased risk of preterm delivery in areas with air pollution from a petroleum refinery plant in Taiwan' *Journal of toxicology and environmental health, Part A* (2001) <http://www.ncbi.nlm.nih.gov/pubmed/11766170>

<sup>99</sup> F Caiazzo, 'Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005' *Atmospheric Environment* (2013), <http://linkinghub.elsevier.com/retrieve/pii/S1352231013004548>. The study also found that the most impacted region from air pollution is California, with 21,000 early deaths each year, of which 5,000 are attributable to industry, refineries being the major contributor.

<sup>100</sup> *Id.*

compared to a non-refinery community, and even in exceedance of California’s annual ambient air quality standard.<sup>101</sup>

**D. For Decades, Communities Have Faced Substantial Amounts of Uncontrolled “Off-the-Books” Pollution During Periods of Startup, Shutdown, and Malfunction.**

Refineries release millions of pounds of emissions during startup, shutdown, and malfunctions each year. Much of this pollution is undocumented and poses significant health risks to refinery communities. First, much of the pollution is reported using emission factors. As discussed in more detail below, nearly 90% of toxic pollution from refineries in Louisiana report emissions using emission factors.<sup>102</sup> Data from component 1 of the refinery ICR confirms this, showing that 99.57% of the total emissions from refinery incidents (in terms of pounds) were reported using calculations rather than being measured.<sup>103</sup>

Emission factors and calculations drastically underestimate emissions. As discussed in more detail below, there are numerous studies showing that the emission factors underestimate emissions by an order of magnitude or more.<sup>104</sup> Studies have found that emissions are biased low because they were developed by measuring emissions from new, well-maintained, and properly operating equipment. Recently, a study conducted on storage vessels at refineries in Carson, California determined that emissions from storage vessels are 3 to 5 times higher than predicted using emission factors.<sup>105</sup> Further, several differential absorption light detection and ranging (DIAL) studies have shown that emissions from wastewater treatment plants, flares, and cooling towers also release emissions that are several orders of magnitude higher than reported.<sup>106</sup>

Even with the poor reporting, data from Texas shows that startup, shutdown, and malfunction emissions are a severe public health problem. Between 2009 and 2013 Texas refineries alone released nearly 1 million pounds of HAP.<sup>107</sup> EPA also attempted to collect this data as part of the Component 1 of the ICR. While facilities reported more than 100,000 pounds of HAP emissions, 96.77% of the pollution was reported by the 43 Texas and Louisiana

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<sup>101</sup> Brody, J. G.; Morello-Frosch, R. A.; Zota, A. R.; Brown, P.; Perez, C.; Rudel, R. Linking exposure assessment science with policy objectives for environmental justice and breast cancer advocacy: The Northern California Household Exposure Study, *Am. J. Public Health* 2009, 99 (3) S600– 609.

<sup>102</sup> See *infra* Table A: Louisiana Emission Inventory Reporting Methodologies (2008).

<sup>103</sup> See EPA, Comprehensive Data Collected for the Petroleum Refining Sector, ICR Component 1 Data - Questionnaire on Processes Controls, Part III [hereinafter ICR Component 1] available at <http://www.epa.gov/airtoxics/petref/petrefpg.html>, EPA-HQ-OAR-2010-0682-0075.

<sup>104</sup> See *infra* note 135.

<sup>105</sup> See *infra* note 131.

<sup>106</sup> See *infra* note 135.

<sup>107</sup> See Microsoft Excel File containing TCEQ Emission Event Database (2012-2013) available at <http://www11.tceq.texas.gov/oce/ee/index.cfm>.

refineries. It seems unlikely that the other 103 refineries across the country accounted for less than 5% of startup, shutdown, and malfunction pollution.

But, even the data available in the ICR show that startup, shutdown, and malfunction emissions can pose severe health risks. In many instances this pollution is released in minutes or hours. For example, one Texas facility reported releasing more than 1,800 pounds of toxic pollution in less than two minutes because of a piping failure.<sup>108</sup> EPA risk assessment does not properly account for public health risks posed by such high levels of pollution over short periods of time. In other cases, facilities slowly leak large pollution quantities over long periods of time that expose communities to excess, illegal pollution without anyone finding out until it is too late. For example, the BP Texas City Refinery reported a leak lasting nearly 40 days, slowly gassing the community with 5,682 pounds of xylene, 14,519 pounds of toluene, 1,980 pounds of ethylbenzene, and 17,372 pounds of benzene.<sup>109</sup> As discussed above these pollutants are highly hazardous to human health. It is not clear from the record that EPA considered these events in its risk review of whether to require stronger standards, including LDAR requirements, or the total and acute risks that communities near refineries are exposed to.

Additional research shows that refinery emissions released in upsets and malfunctions can, in some cases, be greater than total operational emissions recorded in formal inventories. For example, a recent investigation of 18 Texas oil refineries between 2003 and 2008 found that “upset events” were frequent, with some single upset events producing more toxic air pollution than what was reported to the federal Toxics Release Inventory database for the entire year.<sup>110</sup>

Additional information and state-specific example data, *e.g.*, from Texas and Louisiana, on emissions during malfunctions and upsets are included later in these comments.

**E. Emission Data and Evidence on Developments That Have Occurred in Monitoring and Pollution Control Methods Require Significant Improvements to the Current Rules.**

In recent years, significant developments have occurred showing that sources have achieved better control of toxic emissions from the following sources at refineries:

1. Improvements for fence-line ambient air monitoring. *See* Part VII, *supra*.
2. Controls for storage vessels. *See* Part V.F, *supra*.

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<sup>108</sup> ICR Component 1, *supra* note 103, at Part III (Incident Report from TX3A1290, release ID 167), EPA-HQ-OAR-2010-0682-0016.

<sup>109</sup> *Id.* (Incident Report from TX3B1110, release ID 19).

<sup>110</sup> J. Ozymy and M.L. Jarrell, *Upset over Air Pollution: Analyzing Upset Event Emissions at Petroleum Refineries*, *Review of Policy Research*, v. 28, no. 4, 2011.

3. Wastewater treatment controls. *See* Part V.B.2, *supra*.
4. Developments in equipment leak detection and repair (“LDAR”). *See* Part V.B.1, *supra*.
5. Process vent controls for FCCUs and sulfur recovery units (SRUs). *See* Part V.D, *supra*.<sup>111</sup>

These developments make it “necessary” to set stronger standards under section 7412(d)(6) of the Clean Air Act.<sup>112</sup> However, although EPA acknowledges that each of the above types of developments have occurred, EPA does not recognize the need to ensure the standards reflect all of the above developments. As further described below, that is unlawful and arbitrary and capricious.

In addition, there are several other “developments” that have occurred and that also require EPA to update the limits, controls, and/or work practice emission standards for refineries. Each of the methods to reduce toxic pollution, listed below, falls within the definition of “developments” within § 7412(d)(6), as EPA has interpreted and explained it in the proposed rule preamble.<sup>113</sup> Therefore, EPA must also update the standards to account for each of the following developments.

**1. Flaring:**

- Prohibitions on wake dominated flow and other flare operational and monitoring requirements. Several EPA Consent Decrees include these provisions to ensure maximum flare efficiency.
- Limits on flaring, flare minimization plans, root cause analysis for flaring events, and requirements to install flare gas recovery. The Refinery NSPS, several EPA Consent Decrees, and both the BAAQMD and the SCAQMD include one or more of these requirements to reduce flaring.
- EPA also must require refineries to continuously monitor the flow rate and the composition of the waste gas routed to a flare. *See* Part V.C, *supra*.

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<sup>111</sup> 79 Fed. Reg. at 36,920-22 (finding developments in monitoring); *id.* at 36,914 (finding developments in storage vessel pollution control); *id.* at 36,915-16 (developments in wastewater control); *id.* at 36,929 (FCCU PM), *id.* at 36,933 (SRU process vents).

<sup>112</sup> 42 U.S.C. § 7412(d)(6) (requiring EPA to account for “developments in practices, processes, and control technologies”); *NRDC v. EPA*, 529 F.3d at 1084 (recognizing that Act requires updates where “developments” occur).

<sup>113</sup> 79 Fed. Reg. at 36,900.

## 2. Inherently Safer Technology:

- Several refineries use solid bed catalyst alkylation instead of hydrofluoric acid, as the United Steelworkers has reported.
- Require back-up power to reduce the likelihood of upsets and malfunctions.
- Anonymous worker reporting system, to address maintenance and other problems that can lead to uncontrolled pollution releases and other safety hazards. *See* Part VI, *supra*.

## 3. Pressure Release Devices:

- Require venting of pressure release devices to a vapor recovery or control system. This is required by the SCAQMD, and the BAAQMD has a similar requirement. *See* Part VII.B, *supra*.

Further, the emission information that EPA collected also provides evidence that EPA must strengthen the existing standards. As EPA recognized, the data show high emissions of hydrogen cyanide, which is a listed hazardous air pollutant for which there is currently no existing standard, in violation of the Act, as described below. For many pollutants, many sources have achieved lower levels of toxic air pollution than the standards currently allow.<sup>114</sup>

### F. EPA Must Apply The Expertise And Experience The Agency Has Gained Through Its Refinery Enforcement Initiative In This Rulemaking.

In recent years, EPA's Office of Enforcement and Compliance Assurance ("OECA") has been working to ensure that refineries implement developments in pollution control and monitoring. EPA has done this in part to implement its current enforcement policy, which Assistant Administrator Cynthia Giles has described as "next generation compliance," meaning: "achieve greater compliance and reduce pollution using advanced monitoring and information technologies."<sup>115</sup>

As EPA's policy states:

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<sup>114</sup> *See, e.g.*, 79 Fed. Reg. at 36,934 (showing that EPA found a lower level of "actual" emissions than the "allowable" emissions under the current standards); see also Parts II.A.1-II.A.3, *supra* (explaining that both EPA's inventory and modeling of "allowable" emissions are underestimates).

<sup>115</sup> EPA, Cynthia Giles, Assistant Administrator for the Office of Enforcement and Compliance Assurance, <http://www2.epa.gov/aboutepa/cynthia-giles-assistant-administrator-office-enforcement-and-compliance-assurance>.

Next Generation Compliance consists of five interconnected components, each designed to improve the effectiveness of [the] compliance program:

- Design regulations and permits that are easier to implement, with a goal of improved compliance and environmental outcomes.
- Use and promote advanced emissions/pollutant detection technology so that regulated entities, the government, and the public can more easily see pollutant discharges, environmental conditions, and noncompliance.
- Shift toward electronic reporting to help make environmental reporting more accurate, complete, and efficient while helping EPA and co-regulators better manage information, improve effectiveness and transparency.
- Expand transparency by making information more accessible to the public.
- Develop and use innovative enforcement approaches (e.g., data analytics and targeting) to achieve more widespread compliance.<sup>116</sup>

It would be unlawful and arbitrary and capricious for EPA not to ensure that the rule, at least, reflects and follows the policy and monitoring and compliance-assurance developments that its own enforcement office has recognized have occurred and is working to implement in enforcement cases and regulations.

Specifically, EPA should ensure that the refineries rule is no less stringent on each of the following issues than its own enforcement experts' current policy, as reflected in the strategic plan for 2014-17, and in recent petrochemical enforcement decrees:

1. Flaring – EPA appropriately proposes to update the flaring provisions in this rule to match some of what its enforcement office has achieved, but ignores some of the developments implemented.<sup>117</sup>

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<sup>116</sup> EPA, Next Generation Compliance: Delivering the Benefits of Environmental Laws, <http://www2.epa.gov/compliance/next-generation-compliance-delivering-benefits-environmental-laws>; EPA, Ofc. of Enforcement & Compliance Assurance, Next Generation Strategic Plan 2014-17 (Oct. 2014), <http://www2.epa.gov/sites/production/files/2014-09/documents/next-gen-compliance-strategic-plan-2014-2017.pdf>.

2. Fence-line monitoring – Sources must implement UV-DOAS monitoring or other open-path fence-line monitoring that assures the same degree of data integrity and time resolution.<sup>118</sup>
3. Leak detection and repair – Existing sources must replace leaking valves with leakless valves or low-emission valves.<sup>119</sup>
4. Tanks and/or Wastewater treatment.<sup>120</sup>

<sup>117</sup> United States of America and The State of Indiana, Plaintiffs, and The Sierra Club, Save the Dunes, The Natural Resources Defense Council, The Hoosier Environmental Council, Susan Eleuterio and Tom Tsourlis, Plaintiff-Intervenors, v. BP Products North America Inc., Defendant, Consent Decree, Appendix D, C.27 (May 23, 2012) (Docket Id. EPA-HQ-OAR-2010-0682-0177) [hereinafter **BP Whiting Consent Decree**]; United States of America, Plaintiff, v. Shell Oil Company, Deer Park Refining Limited Partnership, and Shell Chemical LP, Defendants, Consent Decree, V.E.43. (Jul. 10, 2013) [hereinafter **Shell Deer Park Flaring Consent Decree**] available at <http://www2.epa.gov/sites/production/files/2014-07/documents/sdp-cd.pdf>; United States of America, Plaintiff v. Marathon Petroleum Company LP, Catlettsburg Refining, LLC, Consent Decree, V. (Apr. 5, 2010) [hereinafter **Marathon Flaring Consent Decree**] available at <http://www2.epa.gov/sites/production/files/documents/marathonrefining-cd.pdf>; United States of America, Plaintiff v. Flint Hills Resources Port Arthur, LLC, Defendant, 12 (Mar. 20, 2014) [hereinafter **Flint Hills Resources Port Arthur Consent Decree**] available at [http://www2.epa.gov/sites/production/files/2014-03/documents/flinthills-cd\\_0.pdf](http://www2.epa.gov/sites/production/files/2014-03/documents/flinthills-cd_0.pdf); United States Of America, Plaintiff, State of Oklahoma and State of Wyoming, Plaintiff-Intervenors v. Sinclair Tulsa Refining Company, Sinclair Wyoming Refining Company, and Sinclair Casper Refining Company, V.I., (May 8, 2008) [hereinafter **Sinclair Consent Decree**] available at <http://www2.epa.gov/sites/production/files/documents/sinclair-cd.pdf>; United States of America, Plaintiff v. Total Petrochemicals, Defendant, V.I. (May 1, 2007) [hereinafter **Total Consent Decree**] available at <http://www2.epa.gov/sites/production/files/documents/total-cd.pdf>; United States of America and State of Utah, Plaintiff v. Big West Oil, LLC, V.I.66 (Aug. 8, 2013) [hereinafter **Big West Consent Decree**] available at <http://www2.epa.gov/sites/production/files/2013-08/documents/bigwestoil-cd.pdf>; United States of America, Plaintiff, State of Indiana, State of Utah, State of Ohio, Northwest Pollution Authority, Washington, Plaintiff Intervenors, v. BP Exploration and Oil Co., AMOCO Oil Company, and Atlantic Richfield Company, Defendants, V.18.C (Jan. 1, 2001) [hereinafter **BP AMOCO Consent Decree**] available at [http://www2.epa.gov/sites/production/files/documents/bp-amoco-cd\\_0.pdf](http://www2.epa.gov/sites/production/files/documents/bp-amoco-cd_0.pdf); United States of America, Plaintiff, and State of Hawaii, Mississippi Commission on Environmental Quality, State of Utah, Bay Area Air Quality Management District, Plaintiff-Intervenors, v. Chevron U.S.A., V.K., (Jun. 6, 2005) [hereinafter **Chevron Consent Decree**] available at <http://www2.epa.gov/sites/production/files/documents/chevron-cd.pdf>.

<sup>118</sup> BP Whiting Consent Decree, *supra* note 117, at Appendix E; Shell Deer Park Consent Decree, *supra* note 117, at Appendix 2.9; Flint Hills Resources Consent Decree, *supra* note 117, at Appendix 5.1.

<sup>119</sup> BP Whiting Consent Decree, *supra* note 117, at V.K.; Flint Hills Resources Consent Decree, *supra* note 117, at V.; Chevron Consent Decree, *supra* note 117, at V.M.; Sinclair Consent Decree, *supra* note 117, at V.M.; United States of America, Louisiana Department of Environmental Quality, and the State of Wisconsin, Plaintiffs, v. Murphy Oil USA, Inc., Defendant, Consent Decree, V.M., (Sept. 28, 2010) available at <http://www2.epa.gov/sites/production/files/documents/murphyoil-cd.pdf> [hereinafter **Murphy Oil Consent Decree**]; United States of America and the United States Virgin Islands, Plaintiffs v. Hovensa L.L.C., Defendant, Consent Decree, V.R. (Jan. 1, 2011)(Docket ID. EPA-HQ-OAR-2010-0682-0163) [hereinafter **Hovensa Consent Decree**]; United States of America, Plaintiff v. DOW Chemical Company, Consent Decree, V. (Docket ID. EPA-HQ-OAR-2010-0869-0011) [hereinafter **DOW Chemical Consent Decree**].

<sup>120</sup> BP Whiting Consent Decree, *supra* note 117, at V.M.; United States of America, Plaintiff v. CITGO Petroleum Corporation, et. al., Consent Decree, V. (Sept. 19, 2013) available at <http://www2.epa.gov/sites/production/files/2013-09/documents/citgopetroleumcorp-cd.pdf>.



## **II. EPA UNDERESTIMATES HEALTH RISKS FROM REFINERIES AND ITS PROPOSED RISK DETERMINATION IS TOO LOW AND THUS UNLAWFUL, ARBITRARY, AND CAPRICIOUS.**

Although EPA states that it is taking a conservative, health-protective approach, and it has made some progress in recent years, the agency still lags well behind the best available, current science to address the real-world health risk for the individual most exposed to the current source categories. EPA must finally act to apply this science in the refineries rulemaking and all other health risk rulemakings under the Clean Air Act under § 7412(f)(2).

In particular, EPA has no valid excuse not to follow the recommendations of the National Academy of Sciences and its own Science Advisory Board on the below-discussed key issues that affect the most-exposed and most vulnerable populations, especially children and environmental justice communities.

California's Office of Health Hazard Assessment ("OEHHA") has addressed most of the scientific developments described below, particularly the explicit consideration of infants and children; EPA has no reasonable basis not to do the same. In particular, OEHHA is now applying final scientific technical support documents to update its Air Toxics Hot Spots Program Guidance Manual (Sept. 2014).<sup>121</sup> Those scientific documents and the new manual provide a clear roadmap that the U.S. EPA can and should use to close major gaps in its consideration of health risks from air toxics sources.

As further explained below, EPA must consider the science, and update and strengthen its risk assessment in, at least, each of the following ways before finalizing the rule:

- Account for individual-level vulnerability in this risk assessment by better incorporating the vulnerability of children, early-life exposures, and the developing fetus into risk assessment methods:
  - Account for increased susceptibility by using age-dependent adjustment factors for all carcinogens, not just known mutagens.
  - Pre-natal susceptibility: Account for increased susceptibility by using a pre-natal adjustment factor for all carcinogens of at least 10X.
  - For chronic non-cancer risk, consult and apply child-specific reference values (such as those created by California EPA scientists), where available.

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<sup>121</sup> See Air Toxics Hot Spots Program Guidance Manual (SRP Draft) (Sept. 2014), [http://oehha.ca.gov/air/hot\\_spots/riskguidancedraft2014.html](http://oehha.ca.gov/air/hot_spots/riskguidancedraft2014.html). Although this manual is a draft, the scientific determinations it implements are all final, peer-reviewed documents, which all went through public notice and comment. As OEHHA explains, "the draft Guidance Manual combines the critical information from the three [Technical Support Documents, finalized in 2008, 2009, and 2012] into a guidance manual for the preparation of health risk assessments." *Id.* Each of these final Technical Support Documents are attached in the Appendix, although EPA has them before the agency in other rulemaking dockets as well.



- If child-specific reference values are unavailable, consult science on early exposure impacts, and use an additional default factor of at least 10X.
- Account for vulnerability due to residence in a community that is highly exposed, by including factors to account for increased vulnerability based on demographic differences, as part of the risk assessment. EPA also must fully integrate the findings of its environmental justice analyses into this risk assessment and rulemaking, and set stronger pollution limits to provide environmental justice.
- Assess the cumulative burden of exposures to multiple pollutants and sources via multiple pathways:
  - Assess and aggregate exposure from multiple pathways – including by adding inhalation and non-inhalation-based cancer risks.
  - Include the interaction of multiple pollutants.
  - Account for exposure to multiple sources. Until EPA has a specific mechanism for estimating total exposures, a default or uncertainty factor of at least 10X should be used to provide overburdened communities with the protection they need now.
- Account for cumulative impacts of multiple exposures and vulnerabilities by shifting the level of risk which triggers policy action.
  - Reduce EPA’s benchmark of what it considers acceptable lifetime cancer risk instead of relying on the outdated upper limit of 100-in-a-million.
  - Use a Margin of Exposure (“MOE”) framework for non-cancer impacts and adjust the target MOE according to known vulnerability factors.
- In the face of increasing evidence calling into question the assumption of a safe or acceptable level of exposure, EPA should also consider changing its approach to risk assessment to support reducing risks to the lowest possible level, to protect public health, rather than suggesting that there is always a safe or acceptable level. As EPA itself has recognized, there are many uncertainties suggesting its risk assessment is an underestimate and only addresses part of the picture.

EPA has no reasoned explanation for not applying the current science to address each of the above problems with its current risk assessment. And, as shown below, EPA has no valid basis for ignoring the science from experts such as the National Academy of Sciences, Science Advisory Board, and other expert regulators, such as California EPA’s Office of Health Hazard Assessment (OEHHA). EPA must direct its staff to apply the best scientific evidence tools currently available on risk assessment.

It would be both unlawful under § 7412(f)(2) for EPA to ignore the health risks outlined above, and arbitrary and capricious for EPA to avoid applying the best available science here. It also would be unacceptable and unjust for EPA to ignore the current scientific and regulatory

tools available for communities bombarded by toxic air pollution from the current source categories and many others. If EPA wishes to act on its stated commitment to environmental justice, it will finally start using the science available now to address these impacts and risks, while also working to continue to update its risk assessment approaches.

Commenters have attached many of the health impact and risk documents cited in these comments as part of an accompanying Appendix, but not all, because EPA has those not attached already available before the agency in many different specific rulemaking dockets and/or in the EPA Office of Science Advisor docket on the Request for Information on Cumulative Risk Assessment, EPA-HQ-ORD-2013-0292. These Comments incorporate all of the previously submitted scientific documents on these issues by reference.

**A. EPA UNLAWFULLY IGNORES AND UNDERESTIMATES EXPOSURE.**

**1. Emissions Are Underreported and Underestimated.**

After issuing the initial standards for petroleum refineries in 1995 and 2002, 42 U.S.C. § 7412 requires EPA to review the health risks that remain under these standards within eight years.<sup>122</sup> The Act requires EPA to determine if the standards protect public health from unacceptable risks, and assure that the standards provide an “ample margin of safety.”<sup>123</sup>

To create the risk assessment for the refineries rule, EPA evaluated (1) the emissions reported to the agency pursuant to the 2011 Petroleum Refinery ICR as sources “actual” emissions based on some tests and some estimation, and (2) the emissions EPA estimates that the existing standards currently allow sources to emit, which it describes as “allowable” emissions, based on the Refinery Emissions Model (“REM”). Both data sets are incomplete and undercount emissions, as explained below, directly causing EPA to significantly underestimate emissions, and the resulting risk they cause, in its risk analysis.

EPA’s risk analysis underestimates exposure because it relied on inaccurate data and assumptions to calculate and model the total amount of HAP emissions released by petroleum refineries every year, both in terms of the so-called “actual” and “allowable” emissions. For this reason alone, EPA should find the level of current health risk to be “unacceptable,” and set standards under § 7412(f)(2) to assure the requisite “ample margin of safety to protect public health” from additional emission points at refineries (including wastewater treatment, equipment leaks, FCCUs and process vents), to reduce these emissions.

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<sup>122</sup> 42 U.S.C. § 7412(d)

<sup>123</sup> *Id.*

The underestimated emission data EPA used has led the Agency to underestimate health risks for all nearby communities, including the most exposed individual, whom the Act requires EPA to protect.<sup>124</sup>

## **2. EPA’s Risk Assessment Based on Actual Emissions Significantly Undercounts Exposure.**

EPA’s risk analysis based on the ICR emissions inventory significantly underestimates emissions. This so called “actual” analysis of risk is based on an emission inventory that is largely calculated from emission factors and engineering judgment. It is well documented that emission factors underestimate emissions for a variety of reasons including inherent bias in the factors themselves and the inability to account for equipment malfunctions and environmental conditions.<sup>125</sup> Furthermore, there is direct evidence in this rulemaking that facilities did not use the emission factors as directed or applied them incorrectly.<sup>126</sup> EPA has recognized some of these problems in the technology review component of this rulemaking and made some adjustments.<sup>127</sup> The agency must use these same conclusions from the technology review and the large body of scientific evidence showing that emissions factors underestimate emissions to adjust the emission inventory to ensure that it better represents reality and reflects actual emissions.

### **a. Numerous Scientific Studies Demonstrate that “Actual” Emissions Data from Refineries Are Underreported.**

A recent EPA technical memorandum documented numerous studies that demonstrated a low emission reporting bias for refineries and concluded that emissions data for refineries was biased due to the fundamental flaws in emissions estimates methodology.<sup>128</sup> Numerous studies conducted using remote sensing technologies, like DIAL, show that emissions at refineries can be up to *100 times greater* than emission factors predict.<sup>129</sup> An EPA-sponsored workshop reported that “DIAL studies of 100-plus facilities executed under different climatic,

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<sup>124</sup> *Id.* § 7412(f)(2).

<sup>125</sup> *See infra* Part II.A.2.

<sup>126</sup> *See e.g.*, EPA, Petroleum Refinery Sector Rule: Flare Impact Estimates, 5 (Jan. 16, 2014) (-0209) (noting that several facilities reported VOC from flare emissions but 0 HAP emissions. This is likely an error in reporting because the Emission Factor Protocol provides emission factors for several HAP pollutants including benzene, toluene, and xylene) [hereinafter Flare Impact Estimates].

<sup>127</sup> *See e.g., id.* at 5 (Calculating the HAP emissions for refineries that failed to report HAP emissions for flaring); EPA, Technology Review for Industrial Wastewater Collection and Treatment Operations at Petroleum Refineries, 30 (-0211) (Jan. 22, 2014) (finding that several enhanced biological degradation units (EBUs) operate suboptimally) [hereinafter Industrial Wastewater Technology Review]; EPA, Impacts Estimates for Delayed Coking Units, (Sept. 12, 2013) (-0202) [hereinafter DCU Impacts Estimates].

<sup>128</sup> *See infra* note 148 and footnote text.

<sup>129</sup> *Id.*

environmental, and operating conditions *always* show that the facility has higher emissions than are reported” using emission factor estimates.”<sup>130</sup>

A 2013 Solar Occultation Flux (SOF) and mobile Differential Optical Absorption Spectroscopy (DOAS) study conducted at the storage vessels areas of the Tesoro and Phillips 66 refineries in Carson, California found that VOC emissions were 3.5-7 times higher than reported to the South Coast Air Quality Management District.<sup>131</sup> The study goes on to explain that the measurements showing VOC emissions 3.5% higher than reported at Tesoro indicated that it is “well maintained site” because measured emissions are usually 4 to 10 times higher than reported.<sup>132</sup> That emissions are higher than reported at a well maintained site indicates that “the conventional API method of estimating the emissions does not provide reliable values.”<sup>133</sup> The study concludes that “the observed difference in fugitive VOC emissions between measurements and estimates appears to be a general problem of the refining industry” and is at least in part caused by incorrect emission factors.<sup>134</sup>

Three separate DIAL studies at refineries in North America have shown that emission factors for flares, tanks, wastewater treatment systems, and several other processes significantly underestimate emissions. An EPA review of a 2008 DIAL test at the BP Texas City petroleum refinery found that actual emissions from several units exceeded emission factor estimates for emissions from tanks and flares.<sup>135</sup> For flares, EPA found that actual average emissions were six times higher than the average hourly emissions in the emissions inventory report.<sup>136</sup> For storage tanks, EPA found that actual emissions were, in some cases, at least three to seven times higher than emission factor estimates.<sup>137</sup> A 2006 DIAL test at a refinery in Alberta Canada found that actual emissions from storage tanks exceeded emission factor estimates for benzene and VOCs.<sup>138</sup> A 2011 DIAL test at Shell Deer Park measured emission concentrations of benzene and VOCs that far exceeded emission factor estimates.<sup>139</sup> The DIAL test results found actual

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<sup>130</sup> Office of Air Quality Planning & Standards, U.S. Env'tl. Prot. Agency, VOC Fugitive Losses: New Monitors, Emission Losses, and Potential Policy Gaps 38 [hereinafter EPA, VOC Fugitive Losses] (emphasis added).

<sup>131</sup> FluxSense, Pilot Study to Quantify Industrial Emissions of VOCs, NO<sub>2</sub>, and SO<sub>2</sub> by SOF and Mobile DOAS in the Carson Area, 4 tbl. E1. (Mar. 27, 2014) [Carson Area SOF Study].

<sup>132</sup> *Id.* at 36.

<sup>133</sup> *Id.* at 37.

<sup>134</sup> *Id.* at 37-38.

<sup>135</sup> EPA, Critical Review of DIAL Emission Test Data for BP Petroleum Refinery in Texas City, Texas, ES-2 & tbl. 1. (2010) [hereinafter BP Texas City DIAL Study], EPA-HQ-OAR-2010-0682-0070.

<sup>136</sup> *Id.* at ES-5.

<sup>137</sup> *Id.* at ES-1, ES-4 (“On average, the DIAL results for external floating roof tanks storing crude oil were at least 3 to 7 times higher than estimates that used conditions at the time of the DIAL testing.”).

<sup>138</sup> Alan Chambers & Mel Strosher, Refinery Demonstration of Optical Technologies for Measurement of Fugitive Emissions and for Leak Detection, 27 (2006) [hereinafter Alberta DIAL Study].

<sup>139</sup> Dan Hoyt et. al., City of Houston Bureau of Pollution Control and Prevention, Measurement and Analysis of Benzene and VOC Emissions in the Houston Ship Channel Area and Select Major Stationary Sources Using

VOC emissions from tanks were underestimated by a factor of 132; actual benzene emissions from tanks were underestimated by a factor of 93; actual VOC emissions from wastewater treatment systems were underestimated by a factor of 108; and actual benzene emissions from wastewater treatment systems were underestimated by a factor of 67.<sup>140</sup>

**b. The ICR Emissions Inventory Is Largely Based on Estimates Created With “Emission Factors.”**

While EPA did not require facilities to identify the methodology used to report emissions to the ICR emissions inventory, it is clear that most of the reported pollution is based on emission factors and engineering judgment. EPA instructed the industry to report emissions using the Refinery Estimation Protocol.<sup>141</sup> The protocol directs facilities on the preferred methods for reporting emissions to the ICR.<sup>142</sup> Generally, direct measurement is identified as the top ranked methodology for reporting emissions.<sup>143</sup> Next are source specific emission factors and engineering judgment.<sup>144</sup> Finally, the EPA directs facilities to use default emissions factors, generally derived from AP-42 as a last resort.<sup>145</sup>

Evidence shows that most emissions reported by refineries are based on engineering judgment or emission factors. For example, 90% of emissions reported to the Louisiana Department of Environmental Quality (LDEQ) for the 2008 emissions inventory were based on engineering judgment, emissions models, or EPA AP-42 emission factors. See Table A, below. About 4.5% were based on direct monitoring, stack test, or site specific emission factors.<sup>146</sup>

**Table A: Louisiana Emission Inventory Reporting Methodologies (2008)**

Calculation Method	Percent of time used to estimate benzene, toluene, xylene, and total VOC emissions	Total estimated emissions of benzene, toluene, xylene, and total VOCs (lb/yr)
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DIAL (Differential Absorption Light Detection and Ranging) Technology to Support Ambient HAP Concentrations Reductions in the Community (DIAL Project) 1, 92 (2011) [hereinafter Shell Deer Park DIAL Study].

<sup>140</sup> *Id.*

<sup>141</sup> 79 Fed Reg. at 36,887.

<sup>142</sup> *Id.* EPA, Emission Estimation Protocol for Petroleum Refineries v. 2.1.1, 1-1 (May 2011) [hereinafter Emission Estimation Protocol], EPA-HQ-OAR-2010-0682-0060.

<sup>143</sup> Emission Estimation Protocol, *supra* note 142.

<sup>144</sup> *Id.*

<sup>145</sup> *Id.*

<sup>146</sup> *Id.*

Emissions model	59%	6,380,941.68
EPA emission factors (e.g., AP-42)	19%	1,102,412.04
Engineering judgment	12%	3,097,075.91
Material balance	5%	4,861,291.69
Facility specific emission factor	2%	46,460.07
Direct measurement	1%	2,072,533.67
Stack test	1%	122,030.93
EPA published criteria	1%	259,580.65
Continuous emission monitors	0.3%	2,669.58
Manufacturer emission factor	0.3%	360.00
EPA speciation profile	0.2%	3,771.60
Vendor emission factor	0%	0
<b>Total</b>	<b>1197</b>	<b>17,949,127.80</b>

The evidence from Louisiana is likely to be representative of how the emissions were reported to the ICR emissions inventory because EPA did not require facilities to install additional monitors or conduct additional testing for the purpose of reporting to the ICR emission inventory.<sup>147</sup>

**c. Emission Factors Underestimate “Actual” Emissions.**

There is widespread consensus among EPA, scientists, and industry that the emission factors pertaining to refineries are inaccurate, unreliable, and biased. EPA candidly acknowledges that the use of emission factors, generally, results in inaccurate and unreliable emissions data.<sup>148</sup> This emissions data is used to create regional and national emissions inventories, and EPA’s Office of the Inspector General (“OIG”) states that “[t]he heavy use of emission factors in the [national emissions inventory] makes the *reliability of the data highly uncertain*. Emission factors can result in emissions data of *questionable reliability . . .*”<sup>149</sup>

The emission factors pertaining to refineries are of particularly poor quality. EPA’s OIG specifically noted that VOC emissions from fugitives and flares at “petroleum refineries were

<sup>147</sup> See 79 Fed. Reg. at 36,887.

<sup>148</sup> Office of Inspector Gen., U.S. Env’tl. Prot. Agency, EPA Can Improve Emissions Factors Development and Management (No. 2006-P-00017) (Mar. 22, 2006) [hereinafter EPA Can Improve] and Memorandum from Brenda Shine, U.S. Env’tl. Prot. Agency, on Potential Low Bias of Reported VOC Emissions from the Petroleum Refining Industry to EPA Docket No. EPA-HQ-OAR-2003-0146 (July 27, 2007) [hereinafter EPA, Potential Low Bias].

<sup>149</sup> EPA Can Improve, *supra* note 148, at 18 (emphasis added).

significantly under reported in the emissions inventory.”<sup>150</sup> The OIG report concluded that the under-reporting was caused by the “poor quality” of the emission factors used to generate emissions data.<sup>151</sup> In the preamble to the proposed NESHAP, EPA readily admits “the accuracy of the emissions [inventory] will vary depending on the degree to . . . which assumptions made to complete the datasets are accurate, errors in emission estimates and other factors.”<sup>152</sup> EPA’s prior NESHAP proposal for petroleum refineries stated that there is “*inherent uncertainty* in the development and use of emission factors.”<sup>153</sup>

**d. Emissions Factors Underestimate Emissions Because They Do Not Account for Aging Equipment, Malfunctions, or Wind.**

The emission factors pertaining to refineries underestimate emissions in part because; (1) the emission factors incorporate the erroneous assumption that equipment is operating as designed under normal conditions and (2) the emission factors do not account for environmental variables that significantly impact emissions.

***(i) The emission factors pertaining to refineries incorporate the erroneous assumption that equipment is new and operating under normal conditions.***

The emission factors pertaining to refineries were developed based on the assumption that all equipment is new and functioning as designed under normal, operating conditions. The tests used to develop emission factors are intentionally conducted on new equipment operating under normal conditions because emission factors are formulas that attempt to estimate long-term average emissions.<sup>154</sup> EPA itself notes that “[p]arameters that can cause short-term fluctuations in emissions are generally avoided in testing and not taken into account in test evaluation.”<sup>155</sup> Further, “[s]ources often are tested more frequently when they are new and when they are believed to be operating properly, and *either situation may bias the results.*”<sup>156</sup> The incorporation of this erroneous assumption in the development of the emission factors significantly distorts emissions data in two significant ways – emissions generated during upset, SSM events, and increased emissions that result from poor maintenance of equipment are not accounted for in a facility’s reported emissions and emissions inventories.

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<sup>150</sup> *Id.* at 11.

<sup>151</sup> *Id.* at 11–12.

<sup>152</sup> 79 Fed. Reg. at 36,895.

<sup>153</sup> 72 Fed. Reg. 50,716, 50,725–26.

<sup>154</sup> EPA, Compilation of Air Pollutant Emission Factors, Vol. 1: Stationary Point and Area Sources, 4-5, *available at* <http://www.epa.gov/ttn/chief/ap42/index.html> [hereinafter EPA, AP-42 Series].

<sup>155</sup> *Id.*

<sup>156</sup> *Id.* at 2–3. (emphasis added).

Because emission factors incorporate the assumption that equipment is functioning as designed under normal conditions, emissions produced during SSM events are not accurately represented in reported emissions. The emissions from SSM events can be significant, and industry-filed reports show that for some facilities, releases from SSM events were actually higher than the total annual emissions reported to EPA's Toxics Release Inventory ("TRI") or state emission inventories for the entire facility for the entire year.<sup>157</sup> In 2004, for example, half of the 37 facilities studied had SSM emissions of at least one pollutant that were 25% or more of their reported annual emissions of that pollutant.<sup>158</sup> For 10 of the facilities, SSM emissions of at least one pollutant actually exceeded the annual emissions that each facility reported to the state for that pollutant.<sup>159</sup> A single SSM event at a refinery can release substantial amounts of HAPs.

Similarly, basing emission factors on this faulty assumption fails to accurately account for increased emissions that result from poor maintenance of equipment. EPA itself notes the dramatic impact poor maintenance has on emissions from facilities in a recent technical memorandum discussing the low bias of VOC emissions from refineries.<sup>160</sup> An inspection of one California facility by state officials "revealed that *more than 80%* of the tanks had numerous leaks, gaps, torn seals, and other defects that caused excess emissions."<sup>161</sup> Failing to account for the significant emissions produced during SSM upset events or increased emissions that result from poor equipment maintenance results in grossly inaccurate, unreliable, and biased emissions data for refineries and chemical plants.

***(ii) The emission factors pertaining to refineries do not account for environmental variables that significantly impact emissions.***

The emission factors do not account for environmental variables that significantly impact emissions from refineries. Wind speed, for example, can have a substantial impact on emissions from storage tanks and flares. One study using remote sensing technology of a refinery in Canada found that emissions of VOCs from storage tanks increase when wind speed increases.<sup>162</sup> Emissions from storage tanks increased by a factor of four times when winds increased from 10 km/hour to 30 km/hour.<sup>163</sup> The group of 11 tanks studied emitted 0.3 kg/h of benzene in low wind speed (10 km/h), and 1.3 kg/h of benzene when winds reached 30 km/h.<sup>164</sup> The study showed that the annual emissions of VOCs from tankage at the refinery calculated using

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<sup>157</sup> Env'tl. Integrity Project, *Gaming the System: How Off-the-Books Industrial Upset Emissions Cheat the Public Out of Clean Air* (Aug. 2004).

<sup>158</sup> *Id.*

<sup>159</sup> *Id.*

<sup>160</sup> EPA, *Low Bias*, *supra* note 148, at 6.

<sup>161</sup> *Id.* (emphasis added).

<sup>162</sup> *Id.* at 14.

<sup>163</sup> Chambers et al., *supra* note 138, at 15.

<sup>164</sup> *Id.*



estimates based on direct measurement were approximately 5,000 tons, as opposed to the 153 tons based on calculations using AP-42 emission factors for tanks.

This is particularly significant in the context of storage tanks because the tanks at oil refineries and chemical plants are a major source of VOC emissions.<sup>165</sup> The Canadian study, for example, found that “[t]ankage was the source of 64% of the benzene emissions from the site.”<sup>166</sup>

Wind speed also has a significant impact on flare emissions from refineries.<sup>167</sup> The emission factors for industrial flares were developed based on the assumption that 98 to 99 percent of VOCs sent to the flare are destroyed.<sup>168</sup> However, flares become less efficient, and destroy less VOCs, as wind speeds increase.<sup>169</sup> The ability of flares to destroy VOCs (*i.e.*, the destruction efficiency) decreases rapidly as wind speed increases from one to six meters per second.<sup>170</sup> A study published in the Journal of the Air and Waste Management Association (“JAWMA”) found that “[a]s wind speeds increased beyond six meters per second, combustion efficiencies tended to level off at values between 10 and 15%.”<sup>171</sup> The study further noted that “[t]heoretical considerations and observational evidence suggest that flare combustion efficiency typically may be at ~ 70% at low wind speeds ( $U \leq 3.5$  m/sec). They should be even less at higher wind speeds.”<sup>172</sup>

**e. In This Rulemaking Inventory, Many Emissions Were Not Reported or Not Reported Using the Proper Emission Factors.**

Emissions for several sources, including flares, delayed cokers, wastewater treatment plants, and storage vessels plants were reported using faulty emission factors, improperly reported, or not reported at all. EPA’s own estimates, conducted for its technology review, determined that emissions from these sources are at least 8,000 tons higher than reported. Including the underestimate emissions from storage tanks shows that the ICR emission inventory is missing nearly 13,000 tons of HAPs.<sup>173</sup> EPA must make adjustments to emission inventory, used for this risk analysis, to ensure that its risk model is rational. EPA correctly recognized the

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<sup>165</sup> *Id.* at 13.

<sup>166</sup> *Id.*

<sup>167</sup> Robert E. Levy et al., *Indus. Prof. for Clean Air, Reducing Emissions from Plant Flares* (No. 61) 1 (Apr. 24, 2006).

<sup>168</sup> Douglas M. Leahey et al., *Theoretical and Observational Assessment of Flare Efficiency*, 51 *J. Air & Waste Mgmt.* 1610, 1611 (2001).

<sup>169</sup> EPA, *VOC Fugitive Losses*, at viii (noting that “the emission factor for flare estimation is based on a flare operating in still air conditions”).

<sup>170</sup> Leahey et al., *supra* note 168, at 1611.

<sup>171</sup> *Id.*

<sup>172</sup> *Id.* at 1615.

<sup>173</sup> *See* Table B.

importance of making such adjustments for newly discovered hydrogen cyanide (HCN) emissions from FCCUs, and must do so for these other sources of underestimated emissions.<sup>174</sup>

**Table B: Emissions Reported to ICR vs. EPA’s Baseline Assumptions for the Technology Review**

Unit	ICR Reported Emissions <sup>175</sup> (tons)	Revised Estimate Based on Technology Review (tons)	Difference (tons)
Flares	1,085	3,695	2,610
Delayed Cokers	249	4,760	4,511
Wastewater Treatment	2,757	3,697	940
Storage Vessels	1,615	6,459	4,844
Total	5,706	18,611	12,905

Further, this is a lower bound estimate based on the calculations EPA made for the technology review for flares, delayed cokers, and wastewater treatment systems. As discussed in more detail in Section V, the technology review significantly underestimates baseline actual emissions from these sources. The revised estimate for storage vessels is based on a conservative assumption that emissions are three times higher than what is reported. “Measured fugitive VOC emissions are often a factor of 4 to 10 times higher than reported emissions.<sup>176</sup> Failing to account for these unreported emissions to assess actual risk is unlawful and arbitrary and capricious.

*(i) Flares*

The ICR emissions inventory for flares is underestimated for several reasons. First, EPA concluded that the industry average destruction efficiency for flares is 93.9%, meaning that emissions from flares are likely 3 times higher than reported.<sup>177</sup> For the ICR emissions inventory, EPA instructed facilities to assume that flares achieve 98% destruction efficiency as a primary method to calculate emissions from flares.<sup>178</sup> Based on these instructions, facilities reported 1,085 tons of HAP emissions from flares to the ICR emission inventory.<sup>179</sup> Using the actual destruction efficiency calculated by EPA, flares should have reported 3,695 tons of HAPs.

<sup>174</sup> 79 Fed. Reg. at 36888.

<sup>175</sup> EPA, Comprehensive Data Collected for the Petroleum Refining Sector; ICR Component 2 Data - Emission Inventory available at <http://www.epa.gov/ttn/atw/petref/petrefpg.html> [hereinafter ICR Component 2].

<sup>176</sup> Carson Area SOF Study, *supra* note 131, at 36 (citing J. Mellqvist, et. al., Emission Measurements of Volatile Organic Compounds with SOF method in the Rotterdam Harbor (2008) available at [www.fluxsense.se](http://www.fluxsense.se); J. Johansson, et. al., Emission Measurements of Alkenes, Alkanes, SO<sub>2</sub> and NO<sub>2</sub> from Stationary Sources in Southeast Texas over a 5-year-period Using SOF and Mobile DOAS, Vol. 119 Issue. 4 (Feb. 2014), <http://onlinelibrary.wiley.com/doi/10.1002/2013JD020485/abstract>.

<sup>177</sup> Flare Impact Estimate, *supra* note 126 at 9.

<sup>178</sup> Emission Estimation Protocol, *supra* note 5, at 6-3.

<sup>179</sup> ICR Component 2, *supra* note 175.

Furthermore, there is additional evidence in the record showing that flare destruction efficiency can be as low as 50%.<sup>180</sup>

Second, many facilities did not report any HAP emissions from flares but reported VOCs.<sup>181</sup> As part of the technology review, EPA correctly concluded that these flares likely released HAPs.<sup>182</sup> Using the data reported by facilities that did report HAP, EPA extrapolated that 11.5% of the VOCs were HAP emissions at the flares that did not report any HAP emissions.<sup>183</sup> EPA must use this methodology to adjust the total HAP emissions reported to the ICR emission inventory as well.

Before making this second adjustment, EPA should also recalculate the VOCs reported using the newly proposed emission factor for VOCs.<sup>184</sup> Facilities were directed to use default emission factors to report VOC emissions if they did not have monitoring for fuel gas composition.<sup>185</sup> The original emission factor was 0.14 lbs. of total hydrocarbon per mmBTU, and total hydrocarbon was intended to be used as a surrogate for VOC emissions.<sup>186</sup> More recent testing has shown that 0.55 lbs. of VOC per mmBtu is a more accurate emission factor for flare releases.<sup>187</sup> Using this emission factor, facilities would have reported nearly four times as much VOC pollution. EPA should revise the total VOC emissions reported by facilities only reporting VOCs and then apply the 11.5% factor to determine the amount of HAP emissions that refineries failed to report to the ICR emission inventory.

### *(ii) Delayed Cokers*

EPA calculated that delayed coking units release 4,760 tons of HAP each year using the emission estimation methodologies provided in the Emission Estimation Protocol.<sup>188</sup> Delayed cokers are batch process units that crack hydrocarbon feedstock under high pressure and temperature conditions.<sup>189</sup> At the end of the cycle, the coker releases steam, entrained with hydrocarbon material including HAPs, to the atmosphere.<sup>190</sup>

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<sup>180</sup> Flare Impact Estimates, *supra* note 126, at 5

<sup>181</sup> *Id.*

<sup>182</sup> *Id.*

<sup>183</sup> *Id.*

<sup>184</sup> EPA, DRAFT Review of Emissions Test Reports for Emissions Factors Development for Flares and Certain Refinery Operations, 41-44 (Aug. 2014) [hereinafter Refinery Emission Factor Proposal].

<sup>185</sup> Emission Estimation Protocol, *supra* note 142, at 6-4.

<sup>186</sup> *Id.*

<sup>187</sup> Refinery Emission Factor Proposal, *supra* note 184.

<sup>188</sup> DCU Impacts Estimates, *supra* note 127, at 2-7.

<sup>189</sup> *Id.* at 1-2.

<sup>190</sup> *Id.*

EPA estimated the total HAP emissions for each facility using the ICR Component 1 data provided by refineries that included information on the physical characteristics of each delayed coker and the number of coking cycles the refinery runs each year.<sup>191</sup> Using this data, EPA was able to apply the emission factors from the Emission Estimation Protocol to determine that the total emissions from delayed cokers totaled 4,760 tons, as opposed to the 249 tons reported by industry.<sup>192</sup>

### *(iii) Wastewater Treatment Plants*

Refinery reported HAP emissions from wastewater treatment plants to the ICR emission inventory drastically underestimate emissions. First, the DIAL study at Shell Deer Park found that actual VOC emissions from wastewater treatment systems were underestimated by a factor of 108; and actual benzene emissions from wastewater treatment systems were underestimated by a factor of 67.<sup>193</sup> Second, EPA itself determined that 20% of wastewater treatment plants operate sub-optimally and only achieve 82% control efficiency rather than 90.7%, as estimated in the Wastewater Technology review document, or 92% as estimated by EPA for its analysis of allowable emissions.<sup>194</sup> Based on EPA's Impacts Analysis for Wastewater Treatment Systems, the average control efficiency, weighted for refinery size, hovers around 88.9%.<sup>195</sup> Applying this emission estimate to EPA's model, the agency estimated that wastewater treatment plants release about 3,697 tons annually, 964 tons more than what facilities reported to the ICR inventory.<sup>196</sup> Third, EPA collected data on the control efficiency and other operating characteristics for three refinery wastewater treatment systems.<sup>197</sup> The record does not show that EPA reviewed or analyzed this data. EPA must do so to determine if the ICR emission inventory data for wastewater treatment needs to be revised to be more reflective of actual emissions.

### *(iv) Storage Vessels*

Refinery storage vessels are another likely source of underestimated emissions in the ICR emission inventory. Multiple remote sensing studies have consistently found that fugitive emissions from these sources are consistently 4-10 times higher than reported.<sup>198</sup> And in some

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<sup>191</sup> *Id.* at 5-6.

<sup>192</sup> Compare *id.* with ICR Component 2, *supra* note 175.

<sup>193</sup> Shell Deer Park Dial Study, *supra* note 139.

<sup>194</sup> See Table D: Emission Impacts for EPA Control Options 3 and 4. See also EPA, Technology Review for Industrial Wastewater Collection and Treatment Operations at Petroleum Refineries, 28, 30 (Jan. 22, 2014) [hereinafter Wastewater Collection Technology Review]; EPA, Refinery Emissions and Risk Estimates for Modeled "Allowable" Emissions, 13 (Nov. 15, 2013) [Refinery Allowable Emissions].

<sup>195</sup> See Table D: Emission Impacts for EPA Control Options 3 and 4.

<sup>196</sup> Industrial Wastewater Collection Technology Review, *supra* note 194, at 30; ICR Component 2, *supra* note 175.

<sup>197</sup> EPA, Summary of Wastewater Emissions Test Reports (May 29, 2012) (Only three facilities of the five that EPA requested test information submitted data).

<sup>198</sup> Carson Area SOF Study, *supra* note 131.

cases, the detected emissions are 100 times higher than reported.<sup>199</sup> Further, EPA has received data from source specific emission testing from at least two storage vessels in Maine.<sup>200</sup> The record does not show that EPA reviewed or analyzed this data. EPA must do so to determine if the ICR emission inventory data for storage vessels needs to be revised to more accurately reflect actual emissions.

### **3. EPA’s Estimate of Allowable Emissions Significantly Underestimates Emissions and Thus Undercounts Exposure.**

Commenters agree with EPA that it needs to consider allowable emissions, because it provides an essential piece of information regarding the potential health risks under the existing standards. However, EPA must not underestimate the amount of allowable emissions, as it does here, by relying on an outdated model that is not based on the best available data. The agency’s model must have a rational basis to the emissions it attempts to estimate, which EPA fails to demonstrate here.<sup>201</sup> Furthermore, EPA “retains a duty to explain key assumptions as part of its affirmative burden of promulgating and explaining a non-arbitrary, noncapricious rule.”<sup>202</sup>

EPA’s modelling approach in this rulemaking is based on the REM EPA developed in 2002, with adjustments based on source test data EPA collected in response to the ICR and to account for “allowable” emissions limits in the MACT standards.<sup>203</sup> It must be improved to ensure it reflects allowable emissions and serves the goal for which EPA has defined it. First, many of the underlying assumptions of the REM, and thus the proposed rule, are factually incorrect, causing EPA to underestimate emissions from flares. Second, the REM is based on outdated information. EPA must address these problems, remodel the allowable emissions from petroleum refineries, and then recalculate the risk posed by refineries.

More detail regarding these problems and the steps EPA must take to assess “allowable” emissions is below.

#### **a. EPA’s Underlying Assumptions for Flares are Factually Incorrect.**

EPA’s proposal estimated maximum “allowable” HAP releases from flares that appear to have been based on AP-42 emission factors still in effect at that time as discussed below. Given

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<sup>199</sup> See *supra* note 148 and footnote text.

<sup>200</sup> EPA, DRAFT EPA Review of Available Documents for Developing Proposed Emissions Factors for Flares, Tanks, and Wastewater Treatment Systems, 28-30 (Aug. 2014) [hereinafter Draft Emission Factor Proposal for Flares].

<sup>201</sup> See *e.g.* Columbia Falls Aluminum Co. v. E.P.A., 139 F.3d 914, 923 (D.C. Cir. 1998) (*quoting* Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 534 (D.C.Cir.1983)).

<sup>202</sup> *Id.*

<sup>203</sup> Refinery Allowable Emissions, *supra* note 194, at 2.

the variability in flare emission rates, these estimates were then adjusted by a factor of three in an effort to arrive at a conservative projection of total emissions.<sup>204</sup> EPA's analysis shows that maximum allowable emissions from flares, after this adjustment, were the most significant source of cancer risk among the units that EPA evaluated, contributing to about 0.12 excess cancers per year.<sup>205</sup>

EPA's estimate of allowable HAP emissions from flares significantly underestimates exposure because the REM is based on incorrect factually incorrect premises. As background, the original REM estimate for flaring emissions is based on general emission factors that were developed from Title V permit applications by seven Louisiana refineries.<sup>206</sup> While EPA did adjust these factors to account for outliers, the factors are still fundamentally flawed.<sup>207</sup> First, EPA's assumption that facilities reported flaring emissions based on 98% combustion efficiency is misplaced. Second, some facilities calculated emissions based on the combustion of natural gas, not refinery flare gas. Finally, the REM emission factor purports to account for all flaring emissions, but the underlying permits make clear that the facilities did not include malfunction emissions in their estimates. EPA's attempt to account for the uncertainty in the data by applying a multiplier of three to the modeled emissions cannot correct for the structural errors in EPA's model.

Also, EPA's risk assessment must account for the recently proposed changes to the VOC emission factor for flares. As discussed above, the REM developed an emission factor using data where at least some facilities used an AP-42 emission factor of 0.14 pounds per mmBTU of VOCs.<sup>208</sup> But in August, after an extensive review of test data based upon passive FITR measurements at the combustion zone, EPA proposed increasing the AP-42 emission factor to 0.55 lb/mmBTU, a nearly four-fold increase.<sup>209</sup> The Agency has not yet proposed revising the emission factor for benzene and other organic HAPs in vent gases sent to flares, but absent evidence to the contrary, EPA must assume that HAP emissions increase in proportion to VOC emissions. As explained in the August Emission Factor proposal, EPA's proposed revision is based on test results from 9 flares, and appears to be supported by other data.<sup>210</sup>

The risk estimates based on allowable emissions from flares reflected in EPA's June 30 RTR proposal must be revised, as they are based on emission factors that EPA has since determined understate actual VOC releases from flares by a factor of four. EPA must assume

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<sup>204</sup> Refinery Allowable Emissions, *supra* note 194, at 12-13.

<sup>205</sup> *Id.* at 16, Fig. 1.

<sup>206</sup> RTI (Research Triangle Institute), Petroleum Refinery Source Characterization and Emissions Model for Residual Risk Assessment, 4-13 (Jul. 1 2002).

<sup>207</sup> Refinery Allowable Emissions, *supra* note 194; Emission Estimation Protocol, *supra* note 142.

<sup>208</sup> *Id.* at 12-13.

<sup>209</sup> Draft Emission Factor Proposal for Flares, *supra* note 200, at 44-45.

<sup>210</sup> *Id.* at 45. *See also* Environmental Integrity Project, Analysis of Bay Area Flaring Data 2011-2013.

that benzene and organic HAP releases were also under-estimated by the same amount. EPA's earlier risk estimate must be increased by a factor of four to reflect the more accurate, and much higher, emission factor that EPA has proposed to adopt.

**b. Many Flares Do Not Achieve 98% Destruction Efficiency.**

EPA's assumption that the Louisiana Title V permits applications calculated flaring emissions based on 98% destruction efficiency is not supported by the record. A detailed review of the Title V permits show that one facility assumed 99.7% destruction efficiency and a second assumed 99.9%.<sup>211</sup> If these facilities had calculated emissions assuming 98% combustion efficiency the reported emissions and EPA's resulting emission factors would have been significantly higher.

Furthermore, modelling "allowable" flaring emissions assuming 98% destruction efficiency when recent tests and EPA's own rule recognizes that flares do not always achieve this level of control is arbitrary and capricious. EPA's estimate of allowable emissions is based on compliance with the Refinery MACT 1 and 2 regulations.<sup>212</sup> The current proposal recognizes that compliance with these limits does not guarantee 98% destruction efficiency and includes additional operating and monitoring requirements to help all refinery flares achieve this standard.<sup>213</sup> EPA reached this conclusion based on a series of PFTIR and extractive tests conducted at refineries, chemical plants, and flare test sites.<sup>214</sup> These tests show that the median destruction efficiency over a series of 351 PFTIR and extractive flare tests, where the flares were operated in compliance with the minimum heat value and vent gas exit velocity requirements, was about 92%.<sup>215</sup> Further, EPA's analysis of data provided by petroleum refiners concluded that the average flare has not been operating properly and thus often only assures approximately 93.9% destruction efficiency.<sup>216</sup> This flaw in EPA's model ensures that flaring emissions are underestimated by about 500%, significantly surpassing the uncertainty multiplier applied by EPA. While EPA asserts that these tests were conducted under non-standard operating

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<sup>211</sup> Cit-Con Oil Corporation, Initial Part 70 Operating Permit Application, 3-16 (Sept. 2006) *available* on Louisiana Department of Environmental Quality's (LDEQ) Electronic Document Management Server (EDMS) (Document ID 5476534); Marathon Ashland Petroleum LLC, Title V (Part 70) Operating Permit Application Part 3 of 3 Miscellaneous Emission Points, Appendix A, 137 (Sept. 2000) *available* on LDEQ's EDMS (Document ID 6652819).

<sup>212</sup> 79 Fed. Reg. at 36,889. *See also* Memo on Allowable Emissions, *supra* note 194, at 2.

<sup>213</sup> 79 Fed. Reg. at 36,905.

<sup>214</sup> *Id.*

<sup>215</sup> EPA, Parameters for Properly Designed and Operated Flares, Appendix B, EPA-HQ-OAR-2010-0682-0191 (July 2012) (The average measured combustion efficiency was 90.5%, this corresponds to approximately 92% destruction efficiency applying EPA's adjustment factor from the Flare Impact Estimate, *supra* note 126) [hereinafter Parameters for Properly Operated Flare Data]; see T-5, Table D for a list of the subset of test runs that complied with existing standards and were not flagged by EPA for data quality concerns).

<sup>216</sup> Flare Impact Estimate, *supra* note 126.

scenarios, these 351 test runs complied with law and are by definition “allowable.”<sup>217</sup> Therefore it is arbitrary and capricious to use a model that purports to estimate “allowable” emissions based on flares achieving 98% destruction efficiency, when the proposed rule itself recognizes that compliance with existing requirements does not guarantee that level of control.

**(i) Refinery Flare Gas has Significantly Higher HAP Concentrations than Natural Gas**

Refinery flare gas has much higher concentrations of HAP than natural gas. The REM and proposed rule emission factors are flawed because they are based on emission calculations for flares that are based on the combustion of natural gas. For example, the Murphy Oil permit used EPA speciation data for natural gas to estimate the hazardous components of the flare gas.<sup>218</sup> The data EPA collected from the PFTIR test show the actual concentration of benzene in refinery flare gas is significantly higher than natural gas.<sup>219</sup> EPA must revise the REM and the proposed rule to account for this flaw resulting in an underestimate of allowable emissions from flares.

**(ii) Unplanned Startup, Shutdown, and Malfunction Emissions**

EPA’s estimate of allowable emissions underestimate emissions because the default emission factors EPA derived from Title V permit applications do not account for unplanned startup, shutdown, and malfunction (“SSM”) emissions. Facility reported emissions, in several of the subject Title V permits, are based on AP-42 emission factors.<sup>220</sup> EPA’s Emission Estimation Protocol for Petroleum Refineries makes clear that “it is likely that these factors would not include emissions released during SSM events.”<sup>221</sup> It is important for EPA to account for these emissions because data from Texas, California, and EPA consent decree negotiations show that unplanned SSM events account for a significant source of toxic emissions.<sup>222</sup> Finally, these emissions must be included in EPA’s estimate of allowable emissions because the existing

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<sup>217</sup> See Refinery Emission Factor Proposal, *supra* note 217, 39, Parameters for Properly Operated Flare Data, *supra* note 215.

<sup>218</sup> Murphy Oil USA, Revised Part 70 Application, 197 (May 2000) available on LDEQ’s EDMS (Document ID: 2147926).

<sup>219</sup> See Parameters for Properly Operated Flare Data, *supra* note 215.

<sup>220</sup> REM for Residual Risk Assessment, *supra* note 206, at 4-14

<sup>221</sup> Emission Estimation Protocol, *supra* note 142, at 6-8.

<sup>222</sup> See Table C.; Environmental Integrity Project, Accident Prone: Malfunctions and “Abnormal” Emissions Events at Refineries, Chemical Plants, and Natural Gas Facilities, 2009-2011 (Jul. 18, 2012) available at [http://www.environmentalintegrity.org/news\\_reports/documents/20120718AccidentProneFinal.pdf](http://www.environmentalintegrity.org/news_reports/documents/20120718AccidentProneFinal.pdf). [hereinafter Accident Prone].



MACT 1 and 2 standards and EPA's present proposal do not limit flaring emissions from unplanned SSM events.<sup>223</sup>

**Table C: Startup, Shutdown, Maintenance and Malfunction Data from the Texas Emission Event Database 2009-2013.**

<b>RN</b>	<b>Refinery Name</b>	<b>HAP Emissions from Flares (lbs.)</b>
RN102535077	Blanchard Refining Company Galveston Bay Refinery	45,106.09
RN102450756	Exxon Mobil Beaumont Refinery	43,826.94
RN100235266	Flint Hills Resources Corpus Christi West Plant	35,953.09
RN101619179	Sweeny Refinery	21,705.52
RN100211879	Shell Oil Deer Park	15,319.16
RN100209451	Port Arthur Refinery	9,935.03
RN100214386	Valero Corpus Christi Refinery West Plant	8,270.26
RN102495884	Borger Refinery	5,425.37
RN100716661	Pasadena Refining System	4,780.92
RN102584026	Valero Port Arthur Refinery	2,915.53
RN100210517	Valero McKee Refinery	2,549.53
RN102534138	Flint Hills Resources East Refinery	2,205.88
RN102555166	Citgo Corpus Christi Refinery East Plant	618.57
RN102579307	Exxon Mobil Baytown Facility	521.94
RN100210608	Marathon Petroleum - Texas City Refinery	341.48
RN100542802	Valero Three Rivers Refinery	284.89
RN100211663	Valero Corpus Christi Refinery East Plant	274.69
RN100218130	Houston Refining	205.73
RN100238799	Citgo Corpus Christi Refinery - West Plant	101.10
RN102457520	Total Petro Chemicals & Refining USA Port Arthur Refinery	73.54
RN100219310	Valero Refining Houston Refinery	22.40
RN100238385	Valero Refining Texas City Refinery	21.24
RN101485183	Age Refining	20.41
RN100250869	Alon USA Big Spring Refinery	4.02
RN100222512	Delek Tyler Refinery	

<sup>223</sup> See Refinery Allowable Emissions, *supra* note 194, at 12 (“There is not currently a limit on how much gas can be combusted in a flare.”).

RN	Refinery Name	HAP Emissions from Flares (lbs.)
RN100213016	Western Refining El Paso All Sites	
	<b>Total</b>	<b>200,483.33</b>

**(iii) Flaring Emissions are Proportional to Refinery Complexity**

EPA’s recent consent decrees recognize that flaring emissions are proportional to the refinery’s Nelson Complexity Index (“NCI”).<sup>224</sup> The NCI is a measure of a refinery’s secondary conversion capacity in terms of the complexity and costs of major refinery equipment in relationship to atmospheric distillation.<sup>225</sup> In 2002, the complexity of the U.S. Refineries was 9.8.<sup>226</sup> In 2010, the year that EPA is basing its allowable emissions calculations on, refinery complexity rose to 11.0.<sup>227</sup> This is nearly a 12% increase in complexity. According to EPA’s methodology for calculating flaring limits in several refinery consent decrees, this would warrant increasing the limit by about 12% as well.<sup>228</sup> EPA should use this analysis to adjust the REM’s and proposed rule’s estimate of flaring emissions accordingly.

**c. EPA’s Underlying Assumptions About Wastewater Treatment Systems Are Factually Incorrect.**

EPA has severely underestimated the allowable emissions from petroleum refinery wastewater systems. First, EPA’s 2011 ICR for the Petroleum Refining industry shows that the average benzene concentration and wastewater production rates are much higher than the assumptions used to estimate allowable emissions. Second, EPA uses two contradicting models to estimate the control efficiency for wastewater treatment system pollution controls. To estimate allowable emissions, EPA assumed 92% control efficiency, significantly higher than the average 86.5% control efficiency assumed in the Technology Review for Industrial Wastewater Collections and Treatment Operations at Petroleum Refineries (Wastewater Technology

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<sup>224</sup> BP Whiting Consent Decree, *supra* note 117, at Appendix D; Shell Deer Park Consent Decree, *supra* note 117, at V.E.43.

<sup>225</sup> Petroleum Refineries Vary by Level of Complexity, U.S. Energy Information Administration (Oct. 11, 2012) available at <http://www.eia.gov/todayinenergy/detail.cfm?id=8330#>.

<sup>226</sup> Worldwide Refinery Survey and Complexity Analysis – Historical, Penn Energy Research, available at <http://ogjresearch.stores.yahoo.net/worldwide-refinery-survey-and-complexity-analysis-historical.html>.

<sup>227</sup> *Id.*

<sup>228</sup> BP Whiting Consent Decree, *supra* note 117; Shell Deer Park Flaring Consent Decree, *supra* note 117.

Review).<sup>229</sup> EPA must address these flaws before finalizing its residual risk determination for the petroleum refining source categories.

**(i) EPA's Assumptions for Benzene Concentrations and Wastewater Treatment Loading Rates are Incorrect.**

EPA's estimate of allowable emissions from wastewater treatment systems must utilize the 2011 data it collected on wastewater loadings and VOC, benzene, and HAP concentrations. Failure to incorporate this data into its decision making process is arbitrary and capricious.<sup>230</sup> EPA's estimate of allowable emissions from refinery wastewater systems is based on the REM it developed in 2002.<sup>231</sup> This model utilizes data EPA collected for the original refinery MACT rules and it is nearly two decades old now.<sup>232</sup> Specifically the benzene loading rates were derived from a 1998 document, *Locating and Estimating Air Emissions Sources of Benzene*, which uses data from EPA's Information Collection Request for the original MACT 1 regulations for petroleum refineries issued in 1994.<sup>233</sup> The REM uses this data to model benzene emissions and HAP emissions using "adjustment factors based on the relative concentration of the HAP in wastewater streams."<sup>234</sup>

While it may be justifiable to rely on this data in the absence of better, more reliable information, that is not the case here. EPA collected detailed information on the VOC, benzene, and other HAP concentrations from petroleum refineries as part of the 2011 ICR.<sup>235</sup> An analysis of this data shows that several refinery process units produce significantly more wastewater and that the benzene concentration in the wastewater is significantly higher than EPA assumed to estimate the allowable emissions.<sup>236</sup> For example, EPA's ICR data show that crude distillation units produce more than 50% more wastewater and that the benzene concentration is nearly 30 times as high.<sup>237</sup> As a result, the allowable benzene emissions from wastewater treatment plants are likely significantly higher than EPA estimated. Also, it is unclear which adjustment factors

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<sup>229</sup> Compare Refinery Allowable Emissions, *supra* note 194, at 13, with *infra* Table B.

<sup>230</sup> See e.g. *Columbia Falls Aluminum Co. v. E.P.A.*, 139 F.3d 914, 923 (D.C. Cir. 1998) (*quoting* Small Refiner Lead Phase-Down Task Force v. EPA, 705 F.2d 506, 534 (D.C.Cir.1983)).

<sup>231</sup> See Refinery Allowable Emissions, *supra* note 194, at 13 (explaining that the only revision to the 2002 REM was to account for compliance with BWON control requirements).

<sup>232</sup> *Id.* (the only revisions EPA made to the model were to account for BWON control requirements that became applicable since the original model was developed.”).

<sup>233</sup> *Id.* (The Memorandum *Locating and Estimating Air Emissions from Sources of Benzene* derives the benzene loading rates from the Information Collection Request issued by the agency prior to issuing the very MACT rules EPA is attempting to review here).

<sup>234</sup> *Id.*

<sup>235</sup> ICR 2011 Component 1, 64, Table 15-2 Wastewater Generation Information.

<sup>236</sup> See Table B, (Derived from the *Locating and Estimating Air Emissions from Sources of Benzene* and the ICR Component 1, *supra* note 103, at 64, Table 15-2.

<sup>237</sup> *Id.*

EPA used to estimate other HAP concentrations in wastewater and the resulting emissions. If EPA did not use the data from the 2011 ICR data, it must revise its estimate of allowable emissions for benzene and other HAPs.

***(ii) EPA’s Estimate of the Control Efficiency of the Benzene Waste Operations NESHAP (BWON) Requirements Does Not Use the Best Scientific Data.***

EPA required five facilities to conduct emissions testing to determine the control efficiency of their biological treatment units. EPA must use this data to inform its analysis of the allowable emissions from wastewater treatment facilities. Ignoring this data, EPA relied on the unsubstantiated assumption that facilities that comply with the BWON standards control 92% of the total benzene load in the wastewater system and that uncontrolled facilities release 85% of benzene load to the atmosphere.<sup>238</sup> This assumption is directly contradicted by EPA’s Wastewater Technology Review which uses a more conservative model, assuming that facilities subject to the BWON control emissions by about 86.5% and that uncontrolled facilities release about 91% of the total VOC loadings as air pollution.<sup>239</sup> In this case, EPA’s estimate of BWON emissions is based on the agency’s finding that 20% of facilities subject to the BWON achieve reductions similar to Control Option 3 and 80% of facilities achieve reductions similar to Control Option 4.<sup>240</sup>

EPA explained that it was appropriate to use these models to account for the fact that the BWON lacks “specific operating or performance limits,” and “some units are not properly designed or well operated.”<sup>241</sup> The record is unclear if EPA made this determination based on the Refinery ICR testing of biological treatment units. To the extent that it did, EPA must clarify the record. If EPA did not utilize ICR test data, EPA must revise its analysis to develop a model of allowable emissions based on the results of the testing.

**Table D: Emission Impacts for EPA Control Options 3 and 4<sup>242</sup>**

Model Plant	VOC Wastewater Generated (Tons/Yr)	Baseline VOC Emissions (Tons/Yr)	Baseline Emissions as Percent of VOC Load	Control Option 3 VOC Emissions (Tons/Yr)	Control Option 3 Emission Reduction Efficiency (%)	Control Option 4 VOC Emissions (Tons/Yr)	Control Option 4 Emission Reduction Efficiency (Tons/Yr)

<sup>238</sup> See Refinery Allowable Emissions, *supra* note 194, at 13.

<sup>239</sup> See Table D: Emission Impacts for EPA Control Options 3 and 4.

<sup>240</sup> Industrial Wastewater Technology Review, *supra* note 127, 6-28, tbl. 15. Impacts for Control Options for Each Model Facility

<sup>241</sup> *Id.* at 15, 30.

<sup>242</sup> This table is derived from Table 15 of EPA’s Wastewater Technology Review, *supra* note 240.

1	18.30	16.4	90%	4.9	70%	3.2	80%
2	56.44	50.8	90%	14.6	71%	9.7	81%
3	171.96	156	91%	21.2	86%	11.9	92%
4a	434.31	395	91%	56.5	86%	31.4	92%
4b	756.19	687	91%	130.8	81%	66.6	90%
5	1021.84	927	91%	171.9	81%	87.1	91%
6	3401.73	3089	91%	565.2	82%	287.8	91%
Average Emissions Reduction Efficiency			91%		80%		88%

#### 4. EPA’s Inventory of Hydrogen Cyanide Emissions Underestimates These Emissions from FCCUs.

EPA used the same factor to estimate so-called “actual” and “allowable” emissions of hydrogen cyanide. As the report of Dr. Phyllis Fox explains (see *Fox Report*, Addendum C), EPA underestimated both types of HCN emissions for two main reasons:

First, the underlying FCCU stack test show that HCN emissions are highly variable between process units. Based on only 9 stack tests, EPA found an HCN emission rate that ranged from 114 to 22,100 lb/MMbbl. With such a small sample size and such a high level of variability, EPA must use a conservative uncertainty factor to characterize “actual” emissions from all 203 FCCUs in use at refineries.

Second, the existing MACT standards do not regulate HCN emissions from the FCCUs, and the existing CO standard actually leads to higher HCN emissions as CO is reduced.

As a result of these problems, HCN emissions at many FCCUs could be greater than the highest measured HCN emissions, from Hovensa, of 22,000 lb/MMbbl, achieved at a CO concentration of only 33 ppm, well below the proposed 500 ppm threshold (based on an improper use of CO as a surrogate, discussed in the *Fox Report*, and later in these comments). The resulting TOSHI from inhalation exposure to “MACT-allowable” HCN emissions from FCCU’s could be much greater than the TOSHI significance threshold of 1.

To fulfill the agency’s duty to assess health risks from all emitted pollutants, prevent all unacceptable risk, and assure an “ample margin of safety to protect public health,” as 42 U.S.C. § 7412(f)(2) requires, EPA must evaluate the HCN data and evidence provided in the *Fox Report* and set standards that will assure limits on HCN for the first time. EPA must also do so, as described below, to satisfy its legal duty under § 7412(d)(2)-(3), and (d)(6) to address “developments” and ensure it is limiting all emitted HAPs as *National Lime Association* makes clear that the Clean Air Act requires.

**5. EPA must account for the acute, cancer, and chronic non-cancer health risks from emissions during upsets and malfunctions, instead of ignoring these risks.**

In the proposed rule, EPA is proposing the elimination of exemptions from emission limits during periods of startup, shutdown and malfunction. EPA acknowledges that “emissions during a malfunction event can be significantly higher than emissions at any other time of source operation.”<sup>243</sup> However, through the risk assessment process, EPA is not evaluating any health risks during these periods.

EPA’s analysis of all risks plainly ignores the additional risk from short-term emission spikes associated with upsets and malfunctions. For acute risk, EPA has used a factor of 10 for some emissions, and lower factors for other emissions.<sup>244</sup> This is one component of EPA’s analysis that the Science Advisory Board has questioned – as EPA recognized, its own scientists stated that EPA may be underestimating actual maximum short-term emissions, and thus also underestimating maximum health risk for the most-exposed person.<sup>245</sup>

EPA attempts to defend its use of these low, short-term emission factors through an analysis of Texas data on emission events above 100 pounds.<sup>246</sup> But its own analysis shows that it continues to ignore all emissions that occur through upsets and malfunctions, and thus it continues to underestimate maximum short-term emissions and risk.

In particular, as the Palma-Smith analysis states, EPA engaged in “data filtering,” such that: “Accidental releases were dropped.”<sup>247</sup> The dropping of all so-called “[a]ccidental releases” removes most of the maximum short-term emissions numbers that EPA must consider if it indeed wishes to fulfill the Act’s requirement and its own interpretation of its responsibility. Considering startup, shutdown, and maintenance emissions does not come close to the emission spikes that occur during extreme flaring events, or malfunctions.<sup>248</sup>

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<sup>243</sup> 79 Fed. Reg. at 36,945.

<sup>244</sup> Risk Assessment App. 3, Attached Factors Memo.

<sup>245</sup> Risk Assessment App. 3, Ted Palma & Roy Smith, Analysis of data on short-term emission rates relative to long-term emission rates, at 3.

<sup>246</sup> *Id.*

<sup>247</sup> *Id.*

<sup>248</sup> In addition, EPA dropped data from some facilities which probably also led to an underestimation. “Only facilities whose long-term VOC releases exceeded 0.068 tons per day (25 tons per year) were retained, to approximate the population of facilities likely to be subject to residual risk standards (i.e., major facilities).” *Id.* The HAP threshold is 10 tons per year of one HAP or 25 tons per year of more than 1 HAP, and emissions are underestimated, as discussed elsewhere in these comments. So ignoring facilities below 25 tpy for one year is likely to miss some facilities.

EPA gives no explanation for ignoring “[a]ccidental releases.” Although EPA has stated in the past that it need not evaluate emissions above the level of the standards because they are a violation of the standards, it does not say that it removed only emissions that were accidental releases that exceeded the allowable level of the emission standards. Besides, even if that were the case, EPA may not ignore such releases because its existing standards currently allow accidental releases, due to malfunctions, above the level of the standards. According to the existing standards, malfunctions – even when they exceed the standards – are not a regulatory violation. That is precisely why EPA is proposing to remove these exemptions and ensure that standards apply at all times, as the D.C. Circuit has held is required. Because under the existing standards, malfunction-caused exceedances of the standards as well as high emissions during startup and shutdown periods, are still lawful, even under EPA’s own theory that it need only evaluate the emissions allowed by existing standards, EPA must evaluate the risks such emissions cause.

High emissions due to malfunctions – including those that go above the level of the emission standards – are occurring under the existing standards, and EPA must evaluate them under its own interpretation of § 7412(f)(2). EPA must assess and “reduc[e] any remaining (*i.e.*, ‘residual’) risk according to CAA § 112(f).”<sup>249</sup> Further, as EPA has recognized: it is necessary to assess “allowable” emissions because “these risks reflect the maximum level facilities could emit and still comply with national emission standards.”<sup>250</sup> Malfunction emissions “remain” under EPA’s existing standards, and are part of the “allowable” emissions because sources may have them without violating the standards.

Malfunction, upset, or so-called “accidental” events increase emissions and thereby pose increased health risks which EPA must consider. Although EPA has used the term “accidental,” many such emission spikes occur as a result of events that can be prevented, and thus Commenters disagree that they are actually “accidental.” Where control equipment fails for any reason, emissions could be at least 100 times greater (*e.g.*, in the circumstance where a control device has 99% efficiency, such that an uncontrolled release would cause 100 times the usual amount of emissions). Ignoring such emissions is an unlawful and arbitrary example of the problem of ignoring health risk in its assessment. The higher emissions caused by malfunction or upset emissions can accumulate and combine to increase public health impacts and risk much higher than the otherwise daily risks. Further, “[u]psets are a significant problem for many areas, including rural ones, but they are a particular problem for the predominantly lower income communities of color surrounding many refinery and chemical complexes.”<sup>251</sup>

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<sup>249</sup> 79 Fed. Reg. at 36,883.

<sup>250</sup> 79 Fed. Reg. at 36,888.

<sup>251</sup> Env’tl. Integrity Project, *Gaming the System: How Off-the-Books Industrial Upset Emissions Cheat the Public Out of Clean Air* at 1-2 (Aug. 2004) (finding significant likelihood of an upset at refineries, chemical plants, gas

Failing to look at the true potential for spikes in emissions over a person's lifetime may underestimate acute risk, cancer risk and the amount of chronic non-cancer risk based on pollutants that persist in the environment, such as PCBs, POM, mercury, lead, and cadmium. Ignoring these emission spikes is equivalent to treating additional health risk caused by exceedances as zero. The Science Advisory Board has criticized EPA's underestimation of maximum short-term emissions, and this rulemaking continues to suffer from the same flaws it identified. EPA knows that there is additional risk from malfunctions and violations, and it has no lawful or scientific basis to ignore this additional risk.

EPA calls its method of calculating acute risk a "worst-case" scenario approach, and it does attempt to account for some variability under the existing standards.<sup>252</sup> But it does not come close to modeling the actual "worst case" scenario because it is ignoring all malfunctions which exceed the standards. Still, EPA's recognition that it is appropriate to use factors to assess higher emissions shows that the agency could simply use a more accurate factor to account for malfunctions for acute and other types of health risk, to close the gap and respond appropriately to the Science Advisory Board's criticism of its current method. EPA regularly uses statistical methods and probability factors, which are readily available tools that EPA can also use to assess health risk due to malfunctions, to set clean air standards.

To create representative factors to assess the health risk from malfunctions, EPA has information available or can collect information on major sources' malfunction and violation histories.<sup>253</sup> In the record here, EPA has already collected significant information on upset incidences.<sup>254</sup> And as EPA's own memo shows, it has already collected approximately two years' worth of this type of information from the Texas Commission on Environmental Quality.<sup>255</sup> EPA should consider more of these data from TCEQ and other states that have

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plants and a carbon black plant, and finding that the resulting emissions release is many times higher than the amount of otherwise-reported annual emissions),

[http://www.environmentalintegrity.org/news\\_reports/Report\\_Gaming\\_System.php](http://www.environmentalintegrity.org/news_reports/Report_Gaming_System.php).

<sup>252</sup> Draft Risk Assessment (-0225) at 9, 39.

<sup>253</sup> See, e.g., EPA, Enforcement and Compliance History Online (ECHO), [www.epa.gov/echo](http://www.epa.gov/echo); Kelly Haragan, Env'tl. Integrity Project, "Gaming the System: How Off-the-Books Industrial Upset Emissions Cheat the Public Out of Clean Air" (Aug. 2004), 1-2, 5,

[http://www.environmentalintegrity.org/news\\_reports/Report\\_Gaming\\_System.php](http://www.environmentalintegrity.org/news_reports/Report_Gaming_System.php) (finding significant likelihood of an upset at refineries, chemical plants, gas plants and a carbon black plant, and finding that the resulting emissions release is many times higher than the amount of otherwise-reported annual emissions and that "releases from upsets actually dwarf a facility's routine emissions.").

<sup>254</sup> See ICR Component 1, *supra* note 103, at Part III.

<sup>255</sup> Palma & Smith memo at 2-3 ("The Texas Commission on Environmental Quality (TCEQ) collects emissions data using online reporting required of any facility releasing 100 pounds or more of a listed chemical (primarily ozone-forming VOCs) during a non-routine event. . . . The database we utilized in our analysis was a subset of the TCEQ data covering emission events that occurred in an eight-county area in eastern Texas during a 756-day period between January 31, 2003 and February 25, 2005."); see Tex. Comm'n on Env'tl. Quality, Search the Air Emission Event Report Database, <http://www11.tceq.texas.gov/occe/eeer/index.cfm>.



delegated air programs, as facilities are required to report malfunction releases to the states under EPA's existing regulations.<sup>256</sup> Commenters offer more such data with these comments, including: (1) EIP has created two major reports on upset or malfunction incident data that refineries reported to Texas and more recent follow-up letters summarizing data since 2012,<sup>257</sup> (2) Louisiana Bucket Brigade has compiled similar data from Louisiana reports by refineries to the state.<sup>258</sup>

As noted above, EPA itself collected data on emissions during upset incidents as part of the Information Collection Request for this rulemaking.<sup>259</sup> Those data are in the record, and the agency must evaluate and use them to address emission spikes at least to the extent reported by these existing sources. If EPA needs more refined data regarding these emissions, EPA may request additional data from sources.

#### **6. EPA unlawfully understates health risks for the most-exposed individual by assessing exposure only at the census block centroid.**

EPA's modeling understates cancer and other chronic health risk by assuming that chronic exposure to hazardous air pollutants from this source occurs at the census block centroid and *not* at the facility fence or property line. According to the risk assessment document, "We used the estimated annual average ambient air concentration of each HAP, at each census block centroid, as a surrogate for the lifetime inhalation exposure concentration of all the people who reside in the census block."<sup>260</sup> To assess cancer risk from this source, EPA then based "the assessment on the assumption that each person's predicted exposure is constant over the course of their lifetime which is assumed to be 70 years."<sup>261</sup> For these risks from HAP emissions (except lead), no effort was made to move receptor points closer to the facility to assess chronic or cancer risk, even in those instances where local residents live nearer to a facility than the geographic centroid of the census block. This conflicts with the recommendation of the SAB, which has urged EPA to consider "specific locations of residences."<sup>262</sup>

Taking geographic variation out of the equation fails to properly account for exposure to

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<sup>256</sup> See, e.g., 40 CFR § 63.10(b) & (d); 40 C.F.R. § 63.655(g)(6)(i)-(ii) (pre-proposed rule) (requiring reporting of periods of "excess emission"); see also 40 C.F.R. part 60 subpart J and Ja, 40 C.F.R. Part 63 subparts CC, UUU (other similar requirements).

<sup>257</sup> Accident Prone, *supra* note 222; Letter from Eric Schaeffer, Environmental Integrity Project, Executive Director, to Inspector General Arthur Elkins, Environmental Protection Agency, Clean Air Act Enforcement of Excess Emissions and the Affirmative Defense (Apr. 23, 2012) [hereinafter EIP SSM Enforcement Letter] available at [http://www.environmentalintegrity.org/news\\_reports/documents/EmissionEventLetter2009-2012FINAL\\_001.pdf](http://www.environmentalintegrity.org/news_reports/documents/EmissionEventLetter2009-2012FINAL_001.pdf);

<sup>258</sup> Louisiana Bucket Brigade, Common Ground Reports I-IV.

<sup>259</sup> See ICR Component 1, *supra* note 103, Part at III.

<sup>260</sup> Draft Risk Assessment (-0225) at 8.

<sup>261</sup> *Id.*

<sup>262</sup> SAB May 2010, *supra* note 274.

the “individual most exposed to emissions” as required by section 7412(f)(2)(A), and fails to provide an accurate estimate of risk. Estimating the annual average concentrations at the area-weighted centers of census blocks blatantly and artificially underestimates the risk estimated for people at the fence-line, since the center of a census block is almost always further away from the facility than the fence-line. Census blocks vary greatly in size, especially outside of large urban areas, yet EPA provides no evidence that it reviewed census block size or configuration to consider how concentrations of pollutants might vary within these blocks. Therefore, area-weighted centers of census blocks may be significantly underestimating exposure in some cases.

EPA’s failure to adjust receptor points for residents living on the fence-line is particularly inexcusable given that the HEM-AERMOD system allows for such an adjustment, and that such an adjustment was appropriately made for the estimation of acute health risks.<sup>263</sup> Having recognized that the maximum exposed individual for acute risks is likely present at the fence-line, EPA cannot justify failing to analyze cancer and other chronic health effects in a similar manner.

**B. EPA underestimates health risks by not using the best available information on pollutants.**

EPA must stop treating various types of risk as zero when the science shows risk is present. Just because EPA has not yet developed a risk function for a pollutant, type of exposure, or type of risk, does not mean risk does not exist and can be ignored.<sup>264</sup> As the NAS explained, EPA should develop “explicitly stated defaults to take the place of implicit or missing defaults,” and “[k]ey priorities should be development of default approaches to support risk estimation for chemicals lacking chemical-specific information to characterize individual susceptibility to cancer . . . and to develop a dose-response relationship.”<sup>265</sup> For example, EPA failed to evaluate cancer risks from chloroform and lead despite cancer potency factors that are available from California EPA.<sup>266</sup>

If EPA cannot or does not wish to follow the NAS recommendation to use defaults then, at minimum, it must engage in the interim in a qualitative assessment of the additional, missing risks, and account for them in its analysis. It can have no valid or reasonable basis for failing to

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<sup>263</sup> 79 Fed. Reg. at 36,890 (stating that EPA evaluated acute exposures and risks “at the point of highest off-site exposure for each facility (i.e., not just the census block centroids”).

<sup>264</sup> See, e.g., National Research Council, National Academy of Sciences, “Science and Decisions: Advancing Risk Assessment” at 203-04, 207 (2009) (“NAS 2009”), [http://www.nap.edu/catalog.php?record\\_id=12209](http://www.nap.edu/catalog.php?record_id=12209).

<sup>265</sup> *Id.* at 207.

<sup>266</sup> See CalEPA Cancer Potencies, Guidelines for conducting health risk assessments under the Air Toxics Hot Spots Program, Appendix A: Hot Spots Unit Risk and Cancer Potency Values, May 2014, [http://www.oehha.ca.gov/air/hot\\_spots/pdf/CPFs042909.pdf](http://www.oehha.ca.gov/air/hot_spots/pdf/CPFs042909.pdf); EPA Cancer Potency Values, as reported in the Draft Risk Assessment for the Petroleum Refining Source Sector (Doc. ID -0225), Table 2.6-1.

attempt to account in any way for all risks known to be present in some amount, due to the existence of HAP emissions.

**1. EPA failed to use the best available reference values for a number of key HAPs including benzene, and thus underestimated risk from these pollutants.**

EPA is using outdated reference values for benzene and other key HAPs, which it considers to be a major risk driver. A comparison of cancer potency values utilized by EPA and the cancer potency values recommended by California EPA based on the latest science is summarized in **Table E** below. Although cancer potency values used by EPA are higher in some instances, an emissions weighted analysis of the different potency values used by EPA versus recommended by CalEPA shows that cancer risk may have been two times higher had EPA utilized up to date factors. EPA must use the latest reference values, as summarized by California EPA in updated guidance in 2014.

**Table E: Comparison of Cancer Potency Factors Utilized by EPA vs. California EPA<sup>267</sup>**

HAPs:	CalEPA Cancer Potency Unit Risk (1/ µg/m3)	EPA Cancer Potency Unit Risk (1/µg/m3)	Percent Lower Potency of EPA value
<b>1,3-butadiene</b>	0.00017	0.00003	<b>82%</b>
<b>Benzene</b>	0.000029	7.8E-06	<b>73%</b>
<b>Cadmium Compounds</b>	0.0042	0.0018	<b>57%</b>
<b>Chromium (vi) Compounds</b>	0.15	0.012	<b>92%</b>

Similarly, EPA has used some out of date and less health protective reference inhalation factors for chronic exposure to benzene and several other important high-exposure HAPs. A comparison of RfC values utilized by EPA and the RfC values recommended by California EPA to assess chronic exposure based on the latest science is summarized in Table F below. Although certain RfC values used by EPA are slightly lower (e.g. more health protective) in some instances, the higher, less protective RfC values remain in use for select HAPs that have a high exposure impact based on emissions and toxicity. EPA must use the latest reference values, as summarized by California EPA in updated guidance in June 2014.

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<sup>267</sup> CalEPA Cancer Potencies, Guidelines for conducting health risk assessments under the Air Toxics Hot Spots Program, Appendix A: Hot Spots Unit Risk and Cancer Potency Values, May 2014, [http://www.oehha.ca.gov/air/hot\\_spots/pdf/CPFs042909.pdf](http://www.oehha.ca.gov/air/hot_spots/pdf/CPFs042909.pdf); EPA Cancer Potency Values, as reported in the Draft Risk Assessment for the Petroleum Refining Source Sector (Doc. ID -0225), Table 2.6-1.

**Table F: Comparison of Chronic Inhalation Reference Concentrations (RfC)  
Utilized by EPA vs. California EPA<sup>268</sup>**

HAPs:	Cal EPA RfC (µg/m3)	EPA RfC (µg/m3)	EPA RfC, Factor less protective
<b>Benzene</b>	3	30	<b>10</b>
<b>Toluene</b>	300	5,000	<b>17</b>
<b>Manganese</b>	0.09	0.3	<b>3</b>
<b>Mercury (elemental)</b>	0.03	0.3	<b>10</b>
<b>Nickel</b>	0.014	0.09	<b>6</b>

Finally, we note that the acute reference value used to evaluate benzene exposure *is two orders of magnitude too high*, leading to a very significant underestimate of the acute non-cancer health hazards of benzene emissions from refineries. EPA used an acute reference exposure value of 1.3 mg/m<sup>3</sup>, while California EPA uses a value of 0.027 mg/m<sup>3</sup> based on the latest science.<sup>269</sup>

**2. EPA unlawfully and arbitrarily treats risk as zero for a pollutant for which it has no reference value, even though it is aware such pollutants do create some health risks.**

EPA acknowledges that “some HAP have no peer-reviewed cancer potency values or reference values for chronic non-cancer or acute effects,” and that as a result EPA has not assessed the risks from those pollutants.<sup>270</sup> Lack of knowledge cannot possibly be equated with a lack of harmful effects, or with safety; it can only be equated with lack of knowledge. For example, EPA ignores the multipathway risk from PCBs because it states that it has no reference value on multipathway risk.<sup>271</sup> EPA’s table summarizing emissions and dose-response values suggests that it also did not evaluate the health risks at all from PCB, 2,2,4-trimethylpentane, phosphorus, dibutylphthalate, 3,3’-dimethylbenzidine, 3,3’-dimethoxybenzidine, N,N-dimethylaniline, p-Phenylenediamine.<sup>272</sup> In addition, EPA recognizes that many pollutants

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<sup>268</sup> CalEPA Table of Reference Exposure Levels, Guidelines for conducting health risk assessments under the Air Toxics Hot Spots Program, May 2014, <http://www.oehha.ca.gov/air/allrels.html>; EPA Dose-Response Values for Chronic Inhalation Exposure, as reported in the Draft Risk Assessment for the Petroleum Refining Source Sector (Doc. ID -0225), Table 2.6-2.

<sup>269</sup> CalEPA Table of Reference Exposure Levels, Guidelines for conducting health risk assessments under the Air Toxics Hot Spots Program, May 2014, <http://www.oehha.ca.gov/air/allrels.html>; EPA Dose-Response Values for Chronic Inhalation Exposure, as reported in the Draft Risk Assessment for the Petroleum Refining Source Sector (Doc. ID -0225), Table 2.6-2.

<sup>270</sup> Draft Risk Assessment (-0225) at 50.

<sup>271</sup> *Id.* at 42; 79 Fed. Reg. at 36,936.

<sup>272</sup> Draft Risk Assessment (-0225) tbl. 3.1-1 at 33-37.

creating acute risks are pollutants for which it has no reference value.<sup>273</sup> For that reason, EPA looks at inappropriate values (*i.e.*, the AEGLs and ERPGs) – designed only for emergency exposure response – which should not be considered health-protective.<sup>274</sup>

EPA did not provide public notice of all HAPs for which it is aware of cancer, chronic non-cancer, acute, or multipathway risk, for which it did not evaluate such risk. This is a violation of notice and comment because it prevents Commenters from having a meaningful opportunity to present data to EPA that may be useful in EPA’s evaluation of the risk from pollutants for which EPA is currently treating a risk as zero.

It is unlawful under § 7412(f)(2), arbitrary, and capricious for EPA not to assess risk at all from any HAP, because it ignores risks EPA knows exist and which led Congress to list that pollutant under § 7412(b)(1), and conflicts with scientific evidence before the agency. Just as *National Lime Association*, 233 F.3d at 642, requires EPA to set emission limits for all HAPs, EPA must assess the health risk for all listed HAPs. EPA may not, as it stated here, just write off the amount of a highly dangerous pollutant even if EPA believes it is “not emitted in appreciable quantities (0.001 tpy),” (notwithstanding its underestimation of emissions).<sup>275</sup> Pollutants like PCBs are highly toxic and persistent in the environment, creating reservoirs of future exposure by contaminating soil and dust and fish that people will eventually eat. EPA cannot write-off the long-term and multi-pathway impacts that such toxic chemicals can have when they are emitted pollutants that the Act requires EPA to regulate.

As the NAS explained, it is a problem that “agents that have not been examined

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<sup>273</sup> *Id.* tbl. 2.6-3 at 27-28.

<sup>274</sup> The AEGL values (and Emergency Response Planning Guidelines (“ERPG”) values, which EPA also should not use) were created for emergency exposure scenarios. Levels defined for “once-in-a-lifetime, short-term exposures” and “emergency” chemical releases or accidents, 76 Fed. Reg. at 52,772, are not appropriate tools to measure long-term, lifetime acute exposure risk. As the Science Advisory Board has explained:

The incorporation of the available California Reference Exposure Levels (RELs) for the assessment of acute effects is a conservative and acceptable approach to characterize acute risks. . . . The Panel has some concern with the use of the Acute Exposure Guidelines Limits (AEGLs) and Emergency Response Planning Guidelines (ERPGs) . . . . AEGL-2 and ERPG-2 values should never be used in residual risk assessments because they represent levels that if exceeded could cause serious or irreversible health effects.

Sci. Adv. Bd., Review of EPA’s draft entitled, “Risk and Technology Review (RTR) Risk Assessment Methodologies: For Review by the EPA’s Science Advisory Board with Case Studies – MACT I Petroleum Refining Sources and Portland Cement Manufacturing,” EPA-SAB-10-007 at 6 (May 07, 2010) (“SAB May 2010”), EPA-HQ-OAR-2010-0682-0103 (emphasis added). The AEGL and ERPG numbers would be expected to underestimate risk. Using these numbers is likely to discount or cloak the level of risk to the maximum exposed individual. These values are therefore not appropriate for rely on as health-protective in a section 7412(f)(2) residual risk analysis. They simply do not provide sufficient protection for health.

<sup>275</sup> 79 Fed. Reg. at 36,936.

sufficiently in epidemiologic or toxicologic studies are insufficiently included in or even excluded from risk assessments” by EPA.<sup>276</sup> Many chemicals have no cancer slope factor, RfD, or RfC.<sup>277</sup> It is not appropriate to treat such compounds “as though they pose no risk that should be subject to regulation.”<sup>278</sup> The NAS has recommended that EPA develop “explicit defaults to use in place of missing defaults,” including for its “untested-chemical assumption,” *i.e.*, that a chemical with no reference value poses no risk.<sup>279</sup>

Where there is no reference value for a pollutant, EPA may not simply *ignore* health risks associated with these pollutants completely in its analysis by hiding behind uncertainty. Section 7412 requires EPA to address and regulate all emitted HAPs. EPA states that “an understatement of risk for these pollutants at environmental exposure levels is *possible*,” in this rulemaking due to the lack of reference values.<sup>280</sup> In fact, an understatement of risk for pollutants that are excluded from the analysis is *certain* because EPA has performed no quantitative assessment of health risk for those pollutants *at all*. The absence of a reference value means that EPA does not know by how much it is *underestimating* risk to human health, but it does know that its assessment is an underestimation.

In the absence of an available reference dose, EPA must, at minimum, add an uncertainty factor to account for the additional risk that a HAP likely causes, until such time as EPA does have a reference value to use. Using a protective uncertainty factor – developed based on the best available science – would allow EPA to satisfy its legal duty under section 7412(f)(2) to prevent unacceptable health risk, and ensure an “ample margin of safety to protect public health.”<sup>281</sup> The NAS has described an approach EPA can use to account for this risk, and explained that this approach “is based on the notion that for virtually all chemicals it is possible to say *something* about the uncertainty distribution regarding dose-response relationships.”<sup>282</sup> For example, EPA can use information on chemical structure, available toxicologic tests and model or experimental data, and data on similar chemicals that have been well-studied.<sup>283</sup>

Section 7412(f)(2) of the CAA creates a critical duty and opportunity for EPA to conduct a comprehensive and protective analysis of risk to public health and the environment. In view of this, it is a serious problem for EPA’s analysis that some pollutants continue to have no reference values.<sup>284</sup> Over twenty years after the Clean Air Act was amended, sufficient studies for some

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<sup>276</sup> NAS 2009, *supra* note 264, at 193.

<sup>277</sup> *Id.* at 203.

<sup>278</sup> *Id.* at 193.

<sup>279</sup> *Id.* at 203.

<sup>280</sup> Draft Risk Assessment (-0225) at 50.

<sup>281</sup> 42 U.S.C. § 7412(f)(2).

<sup>282</sup> NAS 2009, *supra* note 264, at 203 (emphasis added).

<sup>283</sup> *Id.* at 204.

<sup>284</sup> *See, e.g.*, 79 Fed. Reg. at 36,936, 36,897.

pollutants have not been conducted to calculate reference doses, reference concentrations, or potency values. Moreover, the Integrated Risk Information System (“IRIS”) review process has been bogged down for many pollutants as the Government Accountability Office recently documented.<sup>285</sup> As the Center for Progressive Reform (“CPR”) has recognized, EPA should prevent the delay in this process from undermining its residual risk analysis for source categories under review.<sup>286</sup>

For pollutants currently under IRIS assessment, EPA must use the best available scientific information from the IRIS review during current rulemakings.<sup>287</sup> At minimum, EPA must account for the lack of reference values or the lack of an up-to-date final IRIS assessment rather than just allowing another important rulemaking, this one on refineries, to go by without any consideration of health risk due to such pollutants.

### **3. EPA MUST RECOGNIZE THAT CHRONIC (NON-CANCER) RISK-CAUSING POLLUTANTS HAVE NO SAFE LEVEL OF EXPOSURE.**

NAS recommends that cancer and chronic non-cancer risk assessment use the same approach in order to address the fact that very low levels of non-carcinogen exposures can pose health risks.<sup>288</sup>

The use of reference doses (“RfDs”) for dose-response risk assessment of chronic non-cancer health effects may significantly underestimate risk according to NAS:

For these health effects, risk assessments focus on defining the reference dose

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<sup>285</sup> U.S. Gov’t Accountability Office, GAO-12-42, Chemical Assessments: Challenges Remain with EPA’s Integrated Risk Information System Program 17-18 (2011).

<sup>286</sup> See Rena Steinzor *et al.*, *Setting Priorities for IRIS: 47 Chemicals that Should Move to the Head of the Risk-Assessment Line*, Ctr. For Progressive Reform (Dec. 2010), ([http://www.progressivereform.org/articles/IRIS\\_Priorities\\_1010.pdf](http://www.progressivereform.org/articles/IRIS_Priorities_1010.pdf)). CPR’s analysis of IRIS offers a critical expose of these problems. *EPA’s IRIS: A Database With Blind Spots*, Ctr. For Progressive Reform, <http://www.progressivereform.org/iris.cfm> (last visited June 27, 2013). See also Gov’t Accountability Office, GAO-11-278, “High Risk Series: An Update” (2011); Gov’t Accountability Office, GAO-09-774T, <http://www.gao.gov/new.items/d11278.pdf>; Gov’t Accountability Office, “EPA Chemical Assessments: Process Reforms Offer the Potential to Address Key Problems” (2009); Gov’t Accountability Office, GAO-08-743T, <http://www.gao.gov/new.items/d09774t.pdf>; Gov’t Accountability Office, “Toxic Chemicals: EPA’s New Assessment Process Will Increase Challenges EPA Faces in Evaluating and Regulating Chemicals” (2008); Gov’t Accountability Office, GAO-08-440, 29, (2008), <http://www.gao.gov/new.items/d08743t.pdf>; Gov’t Accountability Office, “Chemical Assessments: Low Productivity and New Interagency Review Process Limit the Usefulness and Credibility of EPA’s Integrated Risk Information System” (2008), <http://www.gao.gov/new.items/d08440.pdf>.

<sup>287</sup> Integrated Risk Information System (IRIS); Announcement of 2012 Program, 77 Fed. Reg. 26,751 (May 7, 2012).

<sup>288</sup> NAS 2009, *supra* note 264, at 265-266.

(RfD) or reference concentration (RfC), which is defined as a dose “likely to be without an appreciable risk of deleterious effects” over a lifetime of exposure. In actual fact, these levels may pose appreciable risks.<sup>289</sup>

For this reason, EPA should follow the NAS recommendation to use similar approaches for chronic non-cancer as for cancer risk assessment, which assumes deleterious health effects for any amount of exposure.

Traditional toxicology risk assessment is a method developed for engineering but is very poor for assessing the biological complexities of human health. Most government and industry scientists that study environmental contaminants are not physicians, but rather toxicologists. In recent years the medical community has increasingly parted ways with toxicologists regarding the health consequences of environmental and chemical toxins. For 400 years the foundation of toxicology has been the concept of “the dose makes the poison,” which is a presumption that health effects are related to dose, and that a dose can be found for virtually all chemicals where no effect is found. As reassuring as that thought may be, it no longer holds up to scientific scrutiny.

Medical scientists are now pointing out two important contradictions to this pillar of toxicology. The greatest public health threat of chemicals is for fetal exposure and the dose may be less important than the timing, *i.e.*, does the exposure occur during a critical window of embryonic development? The second contradiction is the idea that the smaller the dose, the less effect. Medicine is now discovering that for some toxic chemicals, the clinical effect can actually increase as the chemical concentration decreases and that there is no safe level of exposure.

Prominent medical societies are now publicly disputing the assumption of safe levels of exposure for toxic agents like endocrine disruptors. PAHs, prominent in refinery emissions, are now known to act as endocrine disruptors. A 2009 statement by the Endocrine Society, the largest organization of internal medicine physicians that specialize in endocrine and hormonal diseases, made this statement regarding endocrine disruptors and their potential harm to fetal development:

Even infinitesimally low levels of exposure indeed, any level of exposure at all, may cause endocrine or reproductive abnormalities, particularly if exposure occurs during a critical

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<sup>289</sup> NRDC Issue Paper, Strengthening Toxic Chemical Risk Assessments to Protect Human Health at 10 (Feb. 2012), <http://www.nrdc.org/health/files/strengthening-toxic-chemical-risk-assessments-report.pdf>.



developmental window. Surprisingly, low doses may even exert more potent effects than higher doses.<sup>290</sup>

The extraordinary vulnerability of in utero development makes reducing refinery emissions a public health an urgent matter. This risk was specifically addressed by a recent joint public statement by the American College of Obstetricians and Gynecologists and the American Society for Reproductive Medicine. The position statement included this:

Reducing exposure to toxic environmental agents is a critical area of intervention for obstetricians, gynecologists, and other reproductive health care professionals. Patient exposure to toxic environmental chemicals and other stressors is ubiquitous, and preconception and prenatal exposure to toxic environmental agents can have a profound and lasting effect on reproductive health across the life course. Prenatal exposure to certain chemicals has been documented to increase the risk of cancer in childhood...[we] join leading scientists and other clinical practitioners in calling for timely action to identify and reduce exposure to toxic environmental agents while addressing the consequences of such exposure.<sup>291</sup>

A recent panel of twelve national endocrine disruptor specialists recently wrote a review of the medical literature and made this comment: “[for] every chemical that we looked at that we could find a low-dose cutoff, if it had been studied at low doses it had an effect at low doses.”<sup>292</sup>

Finally, a report published in *The New England Journal of Medicine*, regarding the toxicity of volatilized compounds from oil made these important statements illustrating the risk from small exposure to toxic agents.

- “Mutagenic effects theoretically can result from a single molecular DNA alteration. Regulatory prudence has led to the use of “one-hit models” for mutagenic end points, particularly cancer, in which every molecule of a carcinogen is presumed to pose a risk.”

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<sup>290</sup> Endocrine Society, Scientific Statements, <https://www.endocrine.org/endocrine-press/scientific-statements>.

<sup>291</sup> American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women, American Society for Reproductive Medicine Practice Committee, Committee Opinion No. 575, Exposure to Toxic Environmental Agents (Oct. 2013), <http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/Exposure-to-Toxic-Environmental-Agents>.

<sup>292</sup> Vandenberg L, et al. Hormones and endocrine-disrupting chemicals: low-dose effects and nonmonotonic dose responses. *Endocrine Rev*; doi:10.1210/er.2011-1050 [online 14 Mar 2012].

- “Pregnant women should particularly avoid dermal contact with oil and should avoid areas with visible oil contamination or odors.”<sup>293</sup>

The medical community’s growing recognition of this science illustrates the exquisite sensitivity that the developing fetus has to toxic agents at extremely small doses, and the fact that EPA needs to evaluate non-cancer chronic risk similarly to cancer risk: in recognizing that there is no safe level of human exposure.

**4. EPA may not lawfully ignore and must account for evidence showing that refining Bakken or Tar Sands, heavy crude creates additional health risks.**

EPA must fully evaluate the increased health risks created by the use of heavy crude at some existing refineries, and additional refineries in the future. As discussed below and in the attached report by Natural Resources Defense Council (Addendum B), these are impacts EPA may not ignore in the risk assessment or its assessment will be unlawfully incomplete, and arbitrary and capricious.<sup>294</sup>

Unconventional crude oils including tar sands, oil shale, and tight oil require new technology to access and often have properties that make them more difficult to refine.<sup>295</sup> Many unconventional or “extreme” crudes are associated with increased global warming pollution and other substantial environmental impacts. They can also create increased safety risks at refineries due to more corrosive properties and other parameters that vary widely from conventional crude oil.

Tar sands (also referred to as oil sands) are a combination of clay, sand, water, and bitumen, a heavy black viscous oil.<sup>296</sup> Tar sands crude oil is fundamentally different from conventional crude in several important ways. It is a solid mud- or coal-like consistency that needs to be treated with chemical solvents to flow like oil. Compared to conventional crude oil,

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<sup>293</sup> Goldstein B, Osofsky H, Lichtveld M. The Gulf Oil Spill N Engl J Med 2011; 364:1334-1348 April 7, 2011.

<sup>294</sup> See NRDC Report on Bakken and Tar Sands Health Risks, in Addendum B.

<sup>295</sup> National Petroleum Council (NPC), Unconventional Oil Paper #1-6, Sep. 2011.  
[http://www.npc.org/prudent\\_development-topic\\_papers/1-6\\_unconventional\\_oil\\_paper.pdf](http://www.npc.org/prudent_development-topic_papers/1-6_unconventional_oil_paper.pdf)

<sup>296</sup> U.S. Department of the Interior, Bureau of Land Management (BLM), Programmatic Environmental Impact Statement (PEIS) for Oil Shale and Tar Sands resources on lands administered by the BLM in Colorado, Utah, and Wyoming, <http://ostseis.anl.gov/guide/tarsands/>

The largest deposits in the world are found in Canada (Alberta) and Venezuela, and much of the rest is found in various countries in the Middle East. In the U.S., there are some tar sands deposits, mainly in Utah, which is a much smaller reserve than in Canada.

The in-place tar sands oil resources in Utah are estimated at **12 to 19 billion barrels**.

tar sands-derived oils contain 11 times more sulfur, 5 times more lead, 11 times more nickel, 21 times more vanadium, and 102 times more copper.<sup>297</sup>

Given these unique properties, tar sands crude oil poses a number of additional environmental, health and safety risks relative to standard conventional crude oil:

- **Higher Risk of Refinery Accidents:** Tar sands are more corrosive than conventional crude oil, because of higher sulfur levels and higher total acid content. The metallurgy in most refineries is not suited to handle more corrosive tar sands crude oil unless it has recently been upgraded. More corrosive crude oil increases the risk of refinery accidents, which not only pose safety threats to workers and communities, but also raise potential for significant additional air emissions during upsets and accidents.
- **Increases in Air Pollution & Associated Health Impacts:** The chemicals used to dilute and blend tar sands contain highly volatile organic chemicals, including extremely toxic volatiles such as benzene, at much higher concentrations than conventional crude oil. Tar sands also contain many toxic constituents including heavy metals, such as lead, at much higher concentrations than in conventional crude oil.<sup>298</sup> These heavy metals are released as fine soot pollution during refining. The much heavier, denser tar sands crude requires greater use of heaters, boilers, hydro-treating, coking, cracking, and greater hydrogen use, all of which creates greater emissions of smog- and soot-forming pollutants and toxic chemicals.<sup>299</sup>
- **Irreversible Climate Damage:** Carbon pollution from extracting and upgrading tar sands can be 3 to 5 times greater than for conventional crude oil. Over the course of

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<sup>297</sup> R.F. Meyer, E.D. Attanasi, and P.A. Freeman, Heavy Oil and Natural Bitumen Resources in Geological Basins of the World, U.S. Geological Survey Open-File Report 2007-1084, 2007, p. 14, Table 1, Available at <http://pubs.usgs.gov/of/2007/1084/OF2007-1084v1.pdf>.

<sup>298</sup> R.F. Meyer, E.D. Attanasi, and P.A. Freeman, Heavy Oil and Natural Bitumen Resources in Geological Basins of the World, U.S. Geological Survey Open-File Report 2007-1084, 2007, p. 14, Table 1; <http://pubs.usgs.gov/of/2007/1084/OF2007-1084v1.pdf>.

<sup>299</sup> Excerpt from Phyllis Fox Report to NRDC, July 1, 2013. Canadian tar sands bitumen is distinguished from conventional petroleum by the small concentration of low molecular weight hydrocarbons and the abundance of high molecular weight polymeric material, such as asphaltenes, some with molecular weights above 15,000. They generally have higher amounts of coke-forming precursors; larger amounts of contaminants (sulfur, nitrogen nickel, vanadium) that require more intense processing to remove; and are deficient in hydrogen, compared to other heavy crudes. Thus, to convert them into the same refined products requires more utilities -- electricity, water, heat, and hydrogen. This requires that more fuel be burned in most every fired source at the refinery and that more water be circulated in heat exchangers and cooling towers. Further, this requires more fuel to be burned in any supporting off-site facilities, such as power plants that may supply electricity or Steam-Methane Reforming Plants that may supply hydrogen. The increases in fuel consumption also releases increased amounts of NO<sub>x</sub>, SO<sub>2</sub>, VOCs, CO, PM10, PM2.5, and HAPs as well as greenhouse gas emissions (GHG).

production (well-to-tank), tar sands release 80% more global warming pollution than the U.S. average refined crude.<sup>300, 301</sup>

- **Other environmental & Community Impacts:** Tar sands processing releases strong odors due to the higher levels of sulfur compounds, particularly noxious mercaptans.<sup>302</sup> Mercaptans are a large class of toxic compounds that generally have a strong and unpleasant odor even at very low concentrations. They are added in small amounts to natural gas to help detect gas leaks. Because they are extremely flammable, mercaptans present fire and explosion hazards in industrial processes. Exposure to mercaptans may cause irritation of the skin, eyes, and upper respiratory tract. All mercaptans negatively affect the central nervous system. Workers accidentally exposed to high levels of mercaptans experienced muscular weakness, nausea, dizziness, stupor, and unconsciousness (narcosis).<sup>303</sup> Refining tar sands also leads to roughly 50% more petroleum coke,<sup>304</sup> which is a hazardous by-product that in some cases is stored in open piles creating a serious health hazard.

Tight Oil is produced from low-permeability rock formations, like sandstone, typically requiring horizontal drilling and hydraulic fracturing (“fracking”) technology to access.<sup>305</sup> The largest tight oil “play” (similar to “oil field” in conventional terms) is the Bakken, which yields light (high API), sweet (low sulfur) oil.<sup>306</sup> While fracked Bakken crude is not heavy or high in sulfur like other unconventional crude oils, it has some negative properties that impact refinery emissions, such as:

- Significant use of acids and drilling chemicals increasing corrosiveness of produced crude oil;
- Unusually high flashpoint and Reid Vapor Pressure leading to potentially double the emissions of many light organic HAPs such as benzene from storage and handling; and

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<sup>300</sup> Richard K. Lattanzio, Congressional Research Service report: *Canadian Oil Sands: Life-Cycle Assessments of Greenhouse Gas Emissions*, March 10, 2014. This source also reports a 17% increase in GHGs from tar sands v. conventional crude over the lifecycle, including the use of the fuel in vehicles.

<sup>301</sup> Jessica P. Abella and Joule A. Bergerson, Model to Investigate Energy and Greenhouse Gas Emissions Implications of Refining Petroleum: Impacts of Crude Quality and Refinery Configuration *Environ. Sci. Technol.*, 2012, 46 (24), pp 13037–13047 DOI: 10.1021/es3018682

<sup>302</sup> Mercaptans are also commonly known as thiols, thioalcohols, or sulphhydrates.

<sup>303</sup> Stellman, Jeanne Mager, *Encyclopaedia of Occupational Health and Safety*, vol. 4, Geneva: International Labor Office, 1998.

<sup>304</sup> Lattanzio CRS Report, 2014.

<sup>305</sup> NPC, 2011.

<sup>306</sup> NPC, 2011. Note that the Bakken play spans North Dakota, Montana and parts of Canada. The Eagle Ford play in Texas is also under heavy production.

- Reports of potentially high hydrogen sulfide (H<sub>2</sub>S) and benzene emissions during handling, potentially related to high volatility.

EPA completely neglects to consider the many serious impacts to refinery emissions from unconventional crude oil including tar sands and Bakken crude, both relatively new types of crude oil yet already in significant and increasing use at U.S. refineries. Unconventional crude oil refining is likely to significantly increase volatile HAPs as well as heavy metals, PAHs, and other HAPs, resulting in significant health impacts to refinery fence-line communities.<sup>307</sup>

**C. TO ASSESS THE RISK TO THE MOST EXPOSED PERSON, EPA MUST ACCOUNT FOR INDIVIDUAL-LEVEL VULNERABILITY AND VARIABILITY.**

EPA is legally required under § 7412(f)(2) to assess the health risks to the “individual most exposed” to refinery emissions. 42 U.S.C. § 7412(f)(2). EPA’s failure to account for vulnerability and variability based on the current science, particularly the science addressing early-life and socioeconomic factors in the risk related to exposure, has led EPA to underestimate the health risks from refineries to the most-exposed individuals.

First, the National Academy of Sciences (“NAS”) reports and other new scientific and policy developments direct that EPA must better account for vulnerability and variability.<sup>308</sup> In particular, the science is now clear that “children are not ‘little adults’” when it comes to toxic chemicals.<sup>309</sup> They are both susceptible to greater harm from exposure to toxic chemicals, because they are still growing and developing, *and* they are exposed to such chemicals at a greater rate than adults because of age-specific behaviors and physiological characteristics.

Second, EPA must also better account for other types of human variability because some people exposed to the same amount of a pollutant experience greater health risk due to other factors, such as genetics and baseline health status. Socioeconomic status has been shown to act as a proxy for other types of human variability to chemical risk that EPA has not adequately addressed in its draft risk assessment for the refineries rule.<sup>310</sup>

This section discusses key ways in which EPA must better address both the greater risk to children (including from early-in-life exposure to toxic chemicals), and other important types of human variability. Summarized at the end of this document are the currently available scientific

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<sup>307</sup> See NRDC Report (attached in Addendum B).

<sup>308</sup> NAS 2009, *supra* note 264.

<sup>309</sup> National Research Council, “Pesticides in the Diets of Infants and Children” at 3 (1993).

<sup>310</sup> Draft Risk Assessment, EPA-HQ-OAR-2010-0682-0225.

and policy developments on children’s health and environmental justice that illustrate the need for updates to EPA’s risk assessment approach.

## **1. Children’s Risk and Early-Life Exposures**

### **a. Cancer: Account for increased early life susceptibility by using age-dependent adjustment factors for all carcinogens.**

EPA’s cancer risk assessment for refineries does not adequately account for early-life exposure or the greater risk to and susceptibility of children. EPA must follow the science and account for increased early-life susceptibility by applying age-dependent adjustment factors for *all carcinogens* emitted by a source category.

EPA has restricted its application of age-dependent adjustment factors, as discussed in the 2005 *Guidelines* and *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*, to those HAPs included in EPA’s list of carcinogens that act by a mutagenic mode of action.<sup>311</sup> EPA therefore has not applied age-dependent adjustment factors to assess cancer risk from all of the carcinogens emitted by refineries. The NAS recognized this as a “missing” default in EPA’s approach that it should address and account for.<sup>312</sup>

EPA must follow the science showing the need to use age-dependent adjustment factors for all carcinogens.<sup>313</sup> Because OEHHA has provided robust scientific support for this approach, using these factors to assess cancer risk for all carcinogens would be consistent with the NAS recommendations. As the NAS explained in 2009: “EPA needs methods for explicitly considering in cancer risk assessment . . . chemicals that do not meet the threshold of evidence that the agency is considering for judging whether a chemical has a mutagenic mode of action . . . . Special attention should be given to hormonally active compounds and genotoxic chemicals that do not meet the threshold of evidence requirements.”<sup>314</sup>

The 2005 Guidelines recognized that updates would be needed if more data become

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<sup>311</sup> *Id.* at 29-30; See EPA, “Guidelines for Carcinogen Risk Assessment,” EPA/630/P-03/001F, at 1-19 to 1-20 (Mar. 2005), [http://www.epa.gov/raf/publications/pdfs/CANCER\\_GUIDELINES\\_FINAL\\_3-25-05.PDF](http://www.epa.gov/raf/publications/pdfs/CANCER_GUIDELINES_FINAL_3-25-05.PDF); EPA, “Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens,” EPA/630/R-03/003F (2005), [http://www.epa.gov/raf/publications/pdfs/childrens\\_supplement\\_final.pdf](http://www.epa.gov/raf/publications/pdfs/childrens_supplement_final.pdf).

<sup>312</sup> NAS 2009, *supra* note 264, at 196 (Tbl. 6-3 - Examples of “Missing” Defaults in EPA “Default” Dose-Response Assessments).

<sup>313</sup> Cal. EPA, OEHHA, “Technical Support Document for Cancer Potency Factors: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Stage Exposures” 3-4, 50-51 (May 2009), [http://www.oehha.ca.gov/air/hot\\_spots/2009/TSDCancerPotency.pdf](http://www.oehha.ca.gov/air/hot_spots/2009/TSDCancerPotency.pdf), and [http://oehha.ca.gov/air/hot\\_spots/tsd052909.html](http://oehha.ca.gov/air/hot_spots/tsd052909.html).

<sup>314</sup> NAS 2009, *supra* note 264, at 112 (ch. 4) (describing the fact that “*in utero* periods and nonmutagenic chemicals were not covered” by EPA’s 2005 guidelines, as significant omissions).

available.<sup>315</sup> Now that such data are available, including from the NAS and OEHHA, to follow even EPA's own guidelines, the agency must update its approach and implement age-dependent adjustment factors for all carcinogens.<sup>316</sup>

**b. Cancer: Pre-natal susceptibility: Account for increased susceptibility to pre-natal exposures by using pre-natal adjustment factors for all carcinogens.**

EPA's risk assessment also does not take into account increased susceptibility to carcinogens due to pre-natal exposures, even for known-to-be mutagenic carcinogens.<sup>317</sup>

The 2005 Supplemental Guidance recognized the scientific findings of increased susceptibility to carcinogens resulting from pre-natal exposure, but did not develop adjustment factors to account for increased cancer risk resulting from pre-natal exposures.<sup>318</sup> For example, EPA recognized that "[e]xposures that are of concern extend from conception through adolescence and also include pre-conception exposures of both parents."<sup>319</sup> The NAS identified the lack of accounting for "*in utero* periods" of exposure as a major omission in EPA's 2005 cancer guidelines.<sup>320</sup>

OEHHA conducted its own review of the scientific literature to account for pre-natal susceptibility and exposures, which EPA should also consult and use.<sup>321</sup> It has also developed methods and adjustment factors to account for pre-natal susceptibility and exposures that EPA should use.<sup>322</sup> In its risk assessment guidelines and risk assessment manual, OEHHA includes procedures for exposure assessment during fetal development, which EPA should evaluate.<sup>323</sup>

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<sup>315</sup> See EPA, 2005 Supp. Guidance at 21, 31 ("EPA expects to expand this Supplemental Guidance to specifically address modes of action other than mutagenicity when sufficient data are available and analyzed.")

<sup>316</sup> Cal. EPA, OEHHA, TSD for Cancer Potency Factors, *supra* note 313. EPA should also update the 2005 Guidelines to fully reflect current science as described in OEHHA's 2009 review of the scientific literature on increased susceptibility to carcinogens from early life exposures

<sup>317</sup> Draft Risk Assessment (-0225) at 29 (noting that EPA applied factors only to known mutagens to account for "children aged 0-1" but not younger than that).

<sup>318</sup> EPA, 2005 Supp. Guidance at 4-5, 14 & tbl. 1a (A-1) (discussing research on human and animal cancer risks from prenatal exposure).

<sup>319</sup> EPA 2005 Guidelines for Carcinogen Risk Assessment, EPA/630/P-03/001F, at 1-16.

<sup>320</sup> NAS 2009, *supra* note 264, at 112-13; *see also id.* at 112, 196 (noting that it is a "missing" default that EPA recognizes *in utero* carcinogenic activity, but fails to take account of it or calculate any risk for it as "EPA treats the prenatal period as devoid of sensitivity to carcinogenicity").

<sup>321</sup> See Cal. EPA, OEHHA, "Technical Support," *supra* note 313, App. J: "In Utero and Early Life Susceptibility to Carcinogens: The Derivation of Age-at-Exposure Sensitivity Measures" – conducted by OEHHA's Reproductive and Cancer Hazard Assessment Branch," [http://oehha.ca.gov/air/hot\\_spots/2009/AppendixJEarly.pdf](http://oehha.ca.gov/air/hot_spots/2009/AppendixJEarly.pdf).

<sup>322</sup> *Id.* App. J at 7-8 & tbl. 1.

<sup>323</sup> See Cal. EPA, *Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis* at 1-6 to 1-7 (Aug. 27, 2012) ("OEHHA 2012 Guidelines"), [http://www.oehha.ca.gov/air/hot\\_spots/tsd082712.html](http://www.oehha.ca.gov/air/hot_spots/tsd082712.html).

OEHHA specifically discusses the use of a 10X adjustment factor for cancer risk to account for pre-natal (third trimester) to age 2 exposures, and EPA should consider using this same factor.<sup>324</sup>

EPA should consult the science OEHHA has used to develop this well-supported factor, and should then use at least a 10X adjustment factor for all carcinogens to assess health risk due to pre-natal exposure.

As EPA's rules are insufficient to protect humans at the critical stage of embryonic development, they simply are failing to protect public health. Exposure to toxic agents in the intrauterine stage of life has one of the most important impacts on life long health, and can be irreversible.

**c. Chronic non-cancer risk: EPA must consult and apply child-specific reference values, where available.**

Most of EPA's IRIS toxicity threshold values (reference concentrations and reference doses) used for chronic non-cancer risk assessment do not incorporate the latest science on increased susceptibility of children.<sup>325</sup> EPA needs to account for early exposure and the greater risk to and susceptibility of children in its risk assessment, including for nickel, cadmium, manganese and lead. EPA has recognized these are emitted by refineries and are driving the health risk EPA found.<sup>326</sup>

OEHHA child-specific health values include reference doses for cadmium, chlordane, heptachlor, manganese, methoxychlor, nickel, and pentachlorophenol, and a benchmark for lead.<sup>327</sup> OEHHA has generated these child-specific reference values based on the latest science to take into account children's greater exposure and greater vulnerability.

Until the IRIS values fully account for the increased risk caused by early-life exposure to an emitted pollutant, EPA should use the OEHHA child-specific reference doses or benchmarks available to assess chronic non-cancer health risk from ingestion for certain pollutants. EPA should also assess such risk from inhalation by using standard methods to translate these values

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<sup>324</sup> See *id.*; 2014 Air Toxics Hot Spots Program Guidance Manual, *supra* note 121, at 2.

<sup>325</sup> OEHHA has explained why child-specific reference doses or values are needed and provided a list of chemicals. See, e.g., Cal. EPA, OEHHA, "Prioritization of Toxic Air Contaminants - Children's Environmental Health Protection Act" (Oct. 2001), [http://oehha.ca.gov/air/toxic\\_contaminants/pdf\\_zip/SB25%20TAC%20prioritization.pdf](http://oehha.ca.gov/air/toxic_contaminants/pdf_zip/SB25%20TAC%20prioritization.pdf); Cal. EPA, OEHHA, "Development of Health Criteria for School Site Risk Assessment Pursuant to Health and Safety Code 901(g): Identification of Potential Chemical Contaminants of Concern at California School Sites, Final Report" (June 2002), [http://oehha.ca.gov/public\\_info/public/kids/pdf/ChildHealthreport60702.pdf](http://oehha.ca.gov/public_info/public/kids/pdf/ChildHealthreport60702.pdf).

<sup>326</sup> Draft Risk Assessment at 35, 40-43

<sup>327</sup> A full list, with links to each scientific determination document, is available here: OEHHA, Table of all child-chRDs Finalized to Date (last updated 06/22/09), [http://oehha.ca.gov/public\\_info/public/kids/chrtable.html](http://oehha.ca.gov/public_info/public/kids/chrtable.html).



into child-specific reference concentrations to assess inhalation-based risk.

**d. Chronic non-cancer risk: Where child-specific reference values are unavailable, EPA must consult science on early exposure impacts and use an additional default or uncertainty factor.**

The increased susceptibility of children, while known to exist, has not been quantified for many toxic chemicals. Until EPA has child-specific or child-based reference values available for a given pollutant, EPA should apply a default or uncertainty factor of at least 10 to account for increased risk from early-life exposures for non-cancer risk in this rulemaking and other risk assessments.

This would be consistent with the NAS recommendation on the need for EPA to use default factors to account for greater risk,<sup>328</sup> with the science developed and considered by OEHHA, and with the 10X factor enacted by Congress in the Food Quality Protection Act. Specifically, as the SAB report explained:

California EPA/OEHHA has determined that inhalation dosimetry for children is sufficiently different from adults to warrant a full 10-fold intra-individual pharmacokinetic uncertainty factor (i.e., an extra 3-fold PK uncertainty for children relative to the IRIS method) as a default approach. In setting non-cancer reference exposure levels (RELs), Cal EPA/OEHHA also considers that children may be outliers in terms of chemical susceptibility and on a case-specific basis adds a children's pharmacodynamic factor of 3-fold, making the inhalation risk for children as much as 10 times greater than adults.<sup>329</sup>

In addition, Congress has recognized this science in its unanimous vote on toxics legislation passed in 1996 – the Food Quality Protection Act (“FQPA”) – in which Congress found the need to use, and enacted, a Ten-fold Margin of Safety, or “10X factor.” Specifically, the Act provides that “an additional tenfold margin of safety for the pesticide chemical residue and other sources of exposure shall be applied for infants and children to take into account potential pre- and post-natal toxicity and completeness of the data with respect to exposure and

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<sup>328</sup> NAS 2009, *supra* note 264, at 190-93, 203.

<sup>329</sup> Cal. EPA, OEHHA, “Technical Support Document for Cancer Potency Factors: Methodologies for Derivation, Listing of Available Values, and Adjustments to Allow for Early Life Stage Exposures” 3-4, 50-51 (May 2009), [http://www.oehha.ca.gov/air/hot\\_spots/2009/TSDCancerPotency.pdf](http://www.oehha.ca.gov/air/hot_spots/2009/TSDCancerPotency.pdf), and [http://oehha.ca.gov/air/hot\\_spots/tsd052909.html](http://oehha.ca.gov/air/hot_spots/tsd052909.html).

toxicity to infants and children.”<sup>330</sup> Congress’s recognition of the need to use this default factor provides a model that EPA should consider and incorporate into its residual risk assessment.

It would be appropriate and within EPA’s authority under Clean Air Act section 7412(f)(2) to determine that EPA must similarly use a children’s ten-fold margin of safety factor here, to fulfill the Clean Air Act’s “margin of safety” requirement.<sup>331</sup> In doing so, EPA may rely directly on the science itself, and also on the unanimous guidance from Congress, provided in the FQPA, that the existing evidence of increased harm requires significant action to protect children from toxic exposure.

Further, the child-specific reference doses that OEHHA has created for some pollutants provide support for the use of an additional ten-fold Margin of Safety Factor. EPA’s current reference values are generally one order of magnitude less protective (*i.e.*, larger) than the values that California has recognized as needed to protect children, based on the currently available science and a specific assessment of research relevant to early life exposures, as shown in the chart attached as Appendix D.

As further discussed in Part II.B.3, EPA can have no valid basis for ignoring science showing that pollutants other than carcinogens also can cause substantial harm even at low doses if exposure occurs *in utero* and during the early windows of vulnerability.

**e. Utilize the best science on assessing children’s health risk of exposure to lead, rather than consider only the 2008 Lead NAAQS.**

Concerning the health risks caused by lead, EPA considered only the 2008 Lead National Ambient Air Quality Standards (“NAAQS”). As EPA states in the Risk Assessment:

In evaluating the potential multipathway risks from emissions of lead compounds, rather than developing a screening emission rate for them, we compared maximum estimated chronic atmospheric concentrations with the current National Ambient Air Quality Standard (NAAQS) for lead. Values below the NAAQS were considered to have a low potential for multipathway risks of any significance.<sup>332</sup>

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<sup>330</sup> 21 U.S.C. § 346a(b)(2)(C) (requiring that, in establishing, modifying, leaving in effect, or revoking a tolerance or exemption for a pesticide chemical residue, “for purposes of clause (ii)(I) an additional tenfold margin of safety for the pesticide chemical residue and other sources of exposure shall be applied” to protect infants and children).

<sup>331</sup> 42 U.S.C. § 7412(f)(2).

<sup>332</sup> Draft Risk Assessment (-0225) at sec 2.5, p.11.

In regard to lead emissions, EPA may not merely rely on the lead NAAQS to protect children under § 7412(f)(2). EPA must address and incorporate the best currently available information on children’s exposure, including the CHPAC recommendation of lowering the lead standards to  $0.02\mu\text{g}/\text{m}^3$ <sup>333</sup> from the current EPA NAAQS level of  $0.15\mu\text{g}/\text{m}^3$ . The CDC has now recognized that there is no safe level of exposure, and has replaced the now-outdated  $10\mu\text{g}/\text{dL}$  standard with a recognition that action is required at the reference level of  $5\mu\text{g}/\text{dL}$ .<sup>334</sup> California’s health benchmark for lead shows EPA should look at a blood-lead level change of  $1.0\mu\text{g}/\text{dL}$  as the level at which measurable neurological harm, illustrated by a correlating loss of 1 IQ point, can occur.<sup>335</sup>

Because EPA simply replicates the lead NAAQS in its proposed residual risk rule, EPA has not met the legal standard of section 7412(f)(2). The Clean Air Act sets different tests for these rules to meet and EPA cannot substitute one for the other. The residual risk standards are designed to do more than just replicate other statutory protections, such as those provided by the NAAQS. If Congress had intended EPA simply to replicate the NAAQS, or some other different Clean Air Act requirement, in its section 7412(f)(2) residual risk rulemaking, the section 7412(f)(2) requirement would become redundant for any hazardous air pollutant that also has any relationship to any other regulated pollutant. If there were any ambiguity on this question, statutory construction requires a reading of section 7412(f)(2) that preserves its independent value and meaning.

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<sup>333</sup> Letter from Dr. Melanie A. Marty, Chair, Children’s Health Protection Advisory Comm., to Administrator Stephen L. Johnson, (June 16, 2008), <http://www2.epa.gov/sites/production/files/2014-05/documents/61608.pdf>

<sup>334</sup> CDC, What Do Parents Need to Know to Protect Their Children?, [http://www.cdc.gov/nceh/lead/acclpp/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm) (last updated June 19, 2014).

<sup>335</sup> See California Office of Environmental Health Hazard Assessment, J. Carlisle et al., Development of Health Criteria for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(g): Child-Specific Benchmark Change in Blood Lead Concentration for School Site Risk Assessment, Final Report at 1 (Apr. 2007) (explaining that this blood-lead level increase may occur from a daily intake of  $6\mu\text{g}$  of ingested soluble lead or  $5\mu\text{g}$  of inhaled lead). *available at* [http://www.oehha.ca.gov/public\\_info/public/kids/pdf/PbHGV041307.pdf](http://www.oehha.ca.gov/public_info/public/kids/pdf/PbHGV041307.pdf); *see also* California Environmental Protection Agency, Prioritization of Toxic Air Contaminants Under the Children’s Environmental Health Protection Act 25–26 (Oct. 2001) (“Lead is in Tier 1 because it is a developmental neurotoxin. The increased susceptibility of infants and children is well established and the neurological effects are extremely prolonged. In addition, lead is a carcinogen. Although airborne lead exposures have dropped due to removal of lead from gasoline, airborne lead exposures still occur as a result of stationary source emissions and reentrainment of soil contaminated with lead. In addition, deposition of airborne lead onto soil, vegetation, and other surfaces results in exposure via ingestion.”).

## 2. Account for increased vulnerability based on demographic differences, as part of the risk assessment.

The NAS report also identified significant flaws in EPA’s assessment of individual variability in risk assessments, like the refineries rule, that could result in significant underestimation of risk, including in regard to socioeconomic differences. In particular, EPA must fully account for the fact that people can be more vulnerable to toxic pollution due to various physiological, societal, demographic, and exposure history differences, and can therefore experience greater health risk from the same amount of a toxic chemical exposure.<sup>336</sup> As the NAS has observed, performing risk assessment that is meaningful for communities that already face a significant amount of pollution and for communities concerned about environmental justice “requires an ability to evaluate multiple agents or stressors simultaneously—to consider exposures not in isolation but in the context of other community exposures and risk factors.”<sup>337</sup> Addressing this issue is particularly important for EPA because of the need to consider and address environmental justice as mandated by Executive Order 12898.

EPA found disparity in the risks refineries create, with disproportionate exposure and thus risks, falling on African-American, Latino and lower income communities.<sup>338</sup>

Communities that have minority and lower income populations and communities with higher than average levels of cancer, respiratory, and other health problems, as well as a lack of access to health care, are likely to be more vulnerable to the impact of toxic air pollution.<sup>339</sup> Because refineries, and thus the refineries rule, affect communities that are disproportionately minority or lower income, EPA cannot ignore this greater risk in its assessment.

As a key starting point, EPA must assess the greater health risk based on socioeconomic

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<sup>336</sup> See, e.g., NAS 2009, *supra* note 264, at 135-39, 145-51 (explaining that “[h]ow the population responds to chemical insults depends on individual responses, which vary among individuals”; and “[i]f the sensitive people constitute a distinct group either because of their numbers or because of identifiable characteristics—such as ethnicity, genetic polymorphism, functional or health status, or disease—they should be considered for separate treatment in the overall risk assessment”); *id.* at 112 (noting that EPA’s guidelines do not address variability due to factors “such as age, ethnic group, socioeconomic status, or other attributes,” and explaining that “there is a need for a nonzero default to address the variation in the population expected in the absence of chemical-specific data”); see also *id.* at 134 (discussing various factors and recommending that “much more emphasis needs to be placed on describing the ranges of susceptibility and risk”); see also *id.* at 177-82, 196.

<sup>337</sup> *Id.* at 214-15.

<sup>338</sup> Socioeconomic Impacts Memo (-0226) at 7-8 & tbl.2.

<sup>339</sup> See, e.g., Chari *et al.*, *Integrating Susceptibility*, at 1078 & nn.5-10 (citing research); see also Cal. EPA, OEHHA, “Cumulative Impacts,” *supra*, at 6, 10, 12-17.

status found in epidemiological research studies.<sup>340</sup> As the NAS recognized, “there is growing epidemiologic evidence of interactions between environmental stressors and place-based and individual-based psychosocial stressors, driven in part by the spatial and demographic concordance between physical and chemical environmental exposures and socioeconomic stressors,” and there is also a growing field of information on social epidemiology, which addresses the relationship between social factors and disease in human populations.<sup>341</sup> Data describing these factors are available from the Center for Disease Control’s Environmental Public Health Tracking (“EPHT”) Program, the U.S. Agency for Toxic Substances and Disease Registry, state and local health agencies, and academic researchers,<sup>342</sup> and EPA must consider and use such information in its risk assessment.

Further, EPA must recognize and evaluate the need to consider socioeconomic factors not only as part of an environmental justice analysis, but also as part of EPA’s consideration of both vulnerability and variability, as core elements of the risk assessment itself. EPA has been assessing the demographics of affected communities, pursuant to CAA § 7412(f) and the Environmental Justice Executive Order 12898.<sup>343</sup> This is necessary and important to continue. However, in addition to looking at the demographic census data on race, ethnicity, poverty level, and similar factors, EPA must also assess the starting point or baseline overall health status of the affected individuals and communities using the best available data at a local and national level, including the baseline cancer levels, respiratory problems, and health problems associated with the toxic chemicals emitted by a source category. Doing so would be consistent with the 1999 Residual Risk Report.<sup>344</sup> It would also follow EPA’s own statements in the 2014 Second Integrated Urban Air Toxics Report that more work is needed to reduce excess cancer risks in urban areas that continue to face elevated risks.<sup>345</sup>

Further, EPA has significant research available on which it must draw to incorporate “overall health” into its risk assessment. For example, the American Lung Association has published research showing that African Americans are at a much higher risk of lung cancer than

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<sup>340</sup> NAS 2009, *supra* note 264, at 109-10 & tbl. 4-1 (describing the need to consider increased susceptibility due to prior and concurrent exposures; and to “social and economic factors”); *id.* at 220-21 (describing ways to assess cumulative risk including by consideration of “epidemiologic concepts” and information, and by considering “what the burden of disease is in the context of simultaneous exposure to a number of stressors”); *id.* at 230 (discussing the role of epidemiology and surveillance data).

<sup>341</sup> *Id.* at 230-33.

<sup>342</sup> *Id.* at 232 (describing data available on health status, and patterns of diseases and exposures).

<sup>343</sup> Exec. Order 12898, “Federal Actions To Address Environmental Justice,” *supra*.

<sup>344</sup> U.S. EPA, “Residual Risk Report to Congress” at 42, 67 (Mar. 1999), EPA-453/R-99-00 (discussing factor of “overall health” and recognizing the need to consider sensitive subpopulations that “consist of a specific set of individuals who are particularly susceptible to adverse health effects because of physiological (e.g., age, gender, pre-existing conditions), socioeconomic (e.g., nutrition), or demographic variables, or significantly greater levels of exposure,” based on various demographic factors).

<sup>345</sup> Second Integrated Urban Air Toxics Report, *supra* note 1, at xiv.

white Americans, and that African-American men have a 37 percent higher risk of lung cancer than white men.<sup>346</sup> EPA must consider this type of health information as part of the refineries risk assessment.

Thus far, EPA has failed to adequately assess human variability, particularly the increased vulnerability of different socioeconomic groups, or to incorporate the information gained from the environmental justice analysis into its risk assessment. In this rulemaking, EPA has recognized that there are disproportionate impacts, *e.g.*, on African Americans, Latinos, and low income people (living below the poverty level). But EPA also has not considered the existing health burden at all in local refinery communities, or the greater vulnerability to toxic air pollution of the particular demographic groups EPA acknowledges are exposed. This is unlawful because it means EPA has not fully evaluated the risks as required by § 7412(f)(2). And it is arbitrary because EPA can have no rational basis for ignoring this information, or the fact that it shows additional risk beyond that estimated by EPA here.

As the NAS discussed, “EPA should compile relevant data related to socioeconomic status (SES), which may serve as a proxy for numerous individual risk factors . . . and may be a more direct measure of vulnerability than could reasonably be assembled by looking at all relevant individual risk factors.”<sup>347</sup> EPA should follow the NAS recommendations and science to review and address these risk factors in the refineries risk assessment.

In addition, or in the alternative, EPA should simply use a default factor to account for socioeconomic and other community-based stressors, just as it does to account for intrinsic biological factors.<sup>348</sup> For example, it traditionally uses a factor of 100 to account for the use of animal studies, when translating such studies to assess human impacts. The Food Quality Protection Act directed EPA to use a factor of at least 10 to account for *in utero* exposure. California’s Office of Environmental Health Hazard Assessment uses a similar factor to account for in utero exposure. EPA also uses age-dependent adjustment factors in other contexts. EPA should do the same to account for increased vulnerability based on socioeconomic factors or the presence of multiple sources to which a community is exposed.

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<sup>346</sup> Am. Lung Ass’n, “Too Many Cases, Too Many Deaths: Lung Cancer in African Americans” at 1 (2010), <http://www.lungusa.org/assets/documents/publications/lung-disease-data/ala-lung-cancer-in-african.pdf> (explaining higher risk to African Americans even though primary factor for lung cancer, *i.e.*, cigarette smoke exposure, is lower than for whites); *see also* State of Lung Disease in Diverse Communities: 2010, available at [www.LungUSA.org](http://www.LungUSA.org).

<sup>347</sup> NAS 2009, *supra* note 264, at 226 (citing O’Neill *et al.* (2003)).

<sup>348</sup> Rachel Morello-Frosch, Zuk, Jerrett, Shamasunder & Kyle, *Understanding The Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy*, 30(5) Health Affairs 879, 881 nn.24-26 (2011) (citing sources).

**D. TO ASSESS THE RISK TO THE MOST-EXPOSED PERSON, EPA MUST ASSESS THE CUMULATIVE BURDEN OF EXPOSURES TO MULTIPLE POLLUTANTS AND SOURCES VIA MULTIPLE PATHWAYS.**

We agree that EPA must perform a multipathway (*i.e.*, non-inhalation-based) risk assessment as part of this rulemaking, in addition to assessing inhalation risks. However, its analysis is deficient in many ways detailed below. The net result is a significant underestimate of health risks from refineries and therefore, flawed decision-making in EPA's proposed decision not to set residual risk standards for any part of this source category other than storage vessels.

**1. EPA's Multipathway Risk Assessment Is Incomplete and Underestimates Risk.**

EPA performed a multipathway (or non-inhalation) risk assessment for only what it calls "actual" emissions, not allowable emissions. It assessed only the following 5 persistent/bioaccumulative hazardous air pollutants ("PB-HAP"): cadmium (emitted by 97 facilities), chlorinated dibenzodioxins and furans or "dioxins and furans" (78 facilities), polychlorinated biphenyls or "PCBs" (58 facilities), mercury compounds (106 facilities), and polycyclic organic matter or "POM" (113 facilities).<sup>349</sup> EPA states that PCB multipathway risk was actually "not evaluated," however, because PCBs do "not currently have a multipathway screening value."<sup>350</sup>

Rather than perform this assessment for lead, EPA compared emissions to the National Ambient Air Quality Standards for lead (0.15  $\mu\text{g}/\text{m}^3$ ).<sup>351</sup> For lead, EPA found that one facility exceeds the NAAQS by 1.5 times "on-site," and did not find exceedances off-site.<sup>352</sup>

To do a multipathway risk assessment, first, EPA used a Tier I screening analysis, initially finding that there were 114 exceedances at facilities of the screening thresholds it used for cadmium, dioxins and furans, mercury, and/or POM.<sup>353</sup>

Second, EPA then performed what it called a "refined analysis" using "some additional site-specific information to develop an 'intermediate' or Tier II screen."<sup>354</sup> At this stage, EPA found 1 facility remained above the screening threshold for cadmium, 23 remained above the

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<sup>349</sup> Draft Risk Assessment at 42.

<sup>350</sup> *Id.*

<sup>351</sup> *Id.* at 43.

<sup>352</sup> *Id.*

<sup>353</sup> *Id.* at 42.

<sup>354</sup> *Id.*

threshold for dioxins and furans, as high as 40 times the threshold, and 44 facilities exceeded the Tier II threshold for POM, as high as a factor of 30.

According to EPA's method, this means that at least one facility may have cancer risk from dioxins and furans as high as 39 times the threshold, or 39-in-1 million; and at least one facility may have cancer risk from POM at as high as 29 times the threshold, or 29-in-1 million.<sup>355</sup>

Third, EPA performed "a more refined multipathway case study" for one refinery: Marathon Petroleum, near Garyville in St. John the Baptist Parish, Louisiana.<sup>356</sup> In this analysis, EPA found that the non-inhalation cancer risk at this example facility was an additional 4-in-1 million, and that the chronic non-cancer risk at this facility was 0.04 from mercury, and 0.02 from cadmium. EPA then stated that "the results of this analysis lead us to the conclusion that if refined analyses were performed for other sites, the risk estimates would consistently be lower than those estimated by the Tier 1 and 2 analyses."<sup>357</sup>

EPA's analysis shows that the highest level of multipathway risk to which the most-exposed individual is exposed may well be above these numbers. As EPA recognized, its refined multipathway risk study for only one refinery is "not necessarily representative of the highest potential exposures for human receptors from the petroleum refineries sector," although it is likely to be "among the highest."<sup>358</sup>

**a. EPA must follow the best available current science to assess multipathway risk.**

***(i) EPA must assess the non-inhalation-based risk created by refineries' emissions of all persistent and all bioaccumulative pollutants.***

In the refineries risk assessment, EPA has restricted its multipathway risk screening assessment to only those contaminants identified in the out-dated 2004 Risk Assessment Guidance as persistent and bioaccumulative in the environment (*i.e.*, PB-HAPs).<sup>359</sup> EPA's 2004 list of 14 PB-HAPs is incomplete, however, because it ignores other HAPs which present a

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<sup>355</sup> *Id.* (explaining that "an exceedance of 30 for a carcinogen [at the Tier II stage] means that we have high confidence that the risk is lower than 30-in-1 million").

<sup>356</sup> *Id.* at 44.

<sup>357</sup> *Id.* at 45.

<sup>358</sup> *Id.* at 44.

<sup>359</sup> *Id.* at 10-11. Those 14 PB-HAPs include: Cadmium Compounds, Chlordane, Chlorinated dibenzodioxins and furans, DDE, Heptachlor, Hexachlorobenzene, Hexachlorocyclohexane (all isomers), Lead compounds, Mercury compounds, Methoxychlor, Polychlorinated biphenyls, Polycyclic organic matter, Toxaphene, and Trifluralin.



multipathway risk.<sup>360</sup> And, in this risk assessment, there is no change in the list from the previous HAPs evaluated for multipathway risk, despite our well-documented recommendations in previous comments to include these compounds: Arsenic, Hexavalent Chromium, Nickel, Diethylhexylphthalate, Beryllium, Selenium, and Naphthalene.

EPA's choice to continue assessing only certain contaminants that bioaccumulate is not supported by the 2004 Guidance which states that "multipathway risk assessment may be appropriate generally when air toxics that persist and which also *may* bioaccumulate and/or biomagnify are present in releases."<sup>361</sup> This guidance does not direct that the multipathway assessment be limited to only those contaminants listed as PB-HAPs, but that is how EPA has applied it. The choice to exclude those contaminants which persist and accumulate in soils underestimates risks from HAPs. The 2004 guidance document recognized deposition of *persistent* HAPs as a source of soil contamination presenting a potentially significant route of exposure, particularly for children.<sup>362</sup>

The pollutants listed above have been shown to have a significant potential for deposition and retention within the environment. Air emissions of these compounds therefore present a risk to nearby communities via dermal, ingestion, and other non-inhalation pathways that are currently not being considered in the residual risk assessment. For extensive documentation on the rationale for multipathway analysis for these compounds and multipathway exposure parameters, please review the OEHHA 2012 Guidelines for Exposure Assessment.<sup>363</sup>

In addition to the six metals listed by OEHHA, manganese is a pollutant to which children have particular exposure and vulnerability, and there is evidence that it can pose a multipathway risk due to elevated levels in soils around major emission sources.<sup>364</sup> Naphthalene is a PAH and as such must be considered in the POM category which is listed as a PB HAP.

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<sup>360</sup> EPA, "PB-HAP Compounds, Risk Assessment and Modeling – Air Toxics Risk Assessment Reference Library, Vol. I Tech. Resource Manual, Ch. 4 Air Toxics: Chemicals, Sources, and Emissions Inventories," at 4-10, Exhibit 4-2 (2004), [http://www2.epa.gov/sites/production/files/2013-08/documents/volume\\_1\\_reflibrary.pdf](http://www2.epa.gov/sites/production/files/2013-08/documents/volume_1_reflibrary.pdf).

<sup>361</sup> *Id.*, Part III, Ch. 14 "Human Health Risk Assessment: Multipathway," at 14-1(emphasis added).

<sup>362</sup> *Id.* ch. 20.

<sup>363</sup> *Id.* App. E.

<sup>364</sup> *See, e.g.*, ATSDR, "Draft Toxicological Profile for Manganese" at 12 (Sept. 2012) ("Manganese concentrations in soil may be elevated when the soil is in close proximity to a mining source or industry using manganese and may therefore pose a risk of excess exposure to children who ingest contaminated soil.") <http://www.atsdr.cdc.gov/ToxProfiles/tp151.pdf>; *see also* Cal. EPA, OEHHA, "Development of Health Criteria for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(g): Child-Specific Reference Doses (chRDs) for School Site Risk Assessment: Manganese and Pentachlorophenol," at 10 (June 2006) (discussing science showing that manganese can accumulate in the brain and showing that ingestion of high levels of manganese is associated with harm).

Naphthalene has been demonstrated to be persistent and to bioaccumulate in biota, particularly shellfish.<sup>365</sup>

Therefore, in this risk assessment, EPA must assess multipathway (*i.e.*, non-inhalation) risk for *all* metals and *all* other pollutants with a persistent or bioaccumulative impact, as OEHHA has recognized is appropriate based on the science. California OEHHA has recommended a multipathway assessment for metals based on scientific research.<sup>366</sup> EPA should consider and apply this science in its risk assessment. EPA simply may not assume that the ingestion and other multipathway risks are zero for persistent pollutants when science shows otherwise. The failure to assess multipathway risk from exposure to all PB-HAPs, both individually and cumulatively, results in an underestimate of the health risks of HAP emissions.

***(ii) EPA must perform multipathway assessment for all pathways of exposure, including those that particularly affect children.***

EPA should recognize that the science shows *additional pathways* that it has not addressed for certain pollutants, for which it does recognize the need for a multipathway assessment. For example, OEHHA has recognized that soil ingestion, dermal exposure to contaminated soil, and breast milk consumption are all “mandatory exposure pathways” that must be evaluated for residential receptors.<sup>367</sup> EPA should evaluate the research on various pathways of toxic exposure discussed by OEHHA.

In particular, science shows that EPA has been relying on outdated estimates of incidental soil ingestion exposures and EPA must update these values to ensure that it considers the urban child scenario in its multipathway risk assessment.<sup>368</sup> Risk assessment of exposure to soil contaminants should evaluate both direct exposure, hand-to-mouth, and indirect, object-to-mouth exposure. Indirect hand-to-mouth activity is the exposure from young children who touch an object or food with soil contaminated hands and then put that object or food into their mouths.

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<sup>365</sup> R. Yender *et al.*, NOAA, “Managing Seafood Safety after an Oil Spill,” (Nov. 2002).

<sup>366</sup> OEHAA 2012 Guidelines, Appendix E, at E-5, E-10 to E-12, [http://oehha.ca.gov/air/hot\\_spots/SRP/index.html](http://oehha.ca.gov/air/hot_spots/SRP/index.html).

<sup>367</sup> OEHHA Risk Assessment Manual, *supra* note 121, at 8-10; OEHHA 2012 Guidelines, *supra* note 323, App. E, at E-12, tbl. E3.

<sup>368</sup> As an additional problem, California’s lead in soil standard is more stringent than EPA’s due to more recent science on the harm of lead exposure. EPA has recognized that its standard is based on out-dated information about lead, that previously assumed children’s blood-lead levels below 10.0 ug/dL was safe. EPA now admits that number is not protective, but has not updated its soil standard. *See, e.g.*, “EPA fails to revise key lead-poisoning hazard standards,” USA Today (Mar. 10, 2013), <http://www.usatoday.com/story/news/nation/2013/03/10/epa-has-not-revised-lead-hazard-standards-for-dust-and-soil/1971209> (“The EPA has not revised key hazard standards that protect children from lead poisoning since 2001, despite science showing harms at far lower levels of exposure than previously believed.”); Children’s Health Advisory Protection Comm., Letter to Administrator Jackson Regarding Childhood Lead Poisoning (Mar. 29, 2012), [http://yosemite.epa.gov/oehp/ochpweb.nsf/content/chpac\\_childhood\\_lead\\_poison\\_letter.htm](http://yosemite.epa.gov/oehp/ochpweb.nsf/content/chpac_childhood_lead_poison_letter.htm).

Published studies show that there is noticeable indirect hand-to-mouth activity in infants and children. In fact, one study found that, on average, a toddler will touch an object and then put that object into his or her mouth 15 times in one hour. At the high end of the study's distribution (90th percentile), that rate rises to 66 times per hour.<sup>369</sup> This same study found a statistically significant positive correlation between the frequency of object or food in mouth activity and blood lead levels. The 2011 update to EPA's Exposure Factors Handbook includes more recent studies and estimates of hand-to-mouth behavior, which must be used to assess risks from exposures to contaminated soils.<sup>370</sup>

***(iii) EPA must perform multipathway assessment for all pathways of exposure, including those that particularly affect children.***

EPA must assess multipathway risk based on “allowable” emissions, not just the so-called “actual” emissions, which are likely underestimated. EPA assessed the “allowable” emissions number for inhalation, and has given no reasonable basis not to do the same for multipathway risk. Doing so would likely find that multipathway risk from allowable emissions is at least as much higher as EPA found for inhalation (*i.e.*, 100-in-1 million v. 60-in-1 million).

EPA has recognized greater amounts of inhalation-risk pollutants, but has not recognized or assessed the full potential for persistent and bioaccumulative emissions by failing to assess the potential for greater amounts of other PB-HAP emissions. Intermittent or short spikes of PB-HAPs can represent a significant health risk because the contaminants stay in the environment and small amounts can accumulate into larger amounts over time. For this reason, EPA's analysis likely underestimates the health risks from multipathway routes of exposure.

***(iv) EPA must account for the aggregate impact of inhalation and multipathway cancer and chronic non-cancer risk by adding each type of similar risk together for all pollutants.***

The purpose of the multipathway assessment is to allow EPA to look overall at a person's exposure – not just inhalation, and not just other exposure pathways, in isolation. To do so, EPA must add inhalation and multipathway risk. Failing to add up each type of risk in order to come up with a *total* cancer risk number and a *total* non-cancer number, and then (as further discussed below), a *cumulative* burden metric makes EPA's overall risk assessment incomplete.

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<sup>369</sup> Ko, S., Schaefer *et al.*, *Relationships of Video Assessments of Touching and Mouthing Behaviors During Outdoor Play in Urban Residential Yards to Parental Perceptions of Child Behaviors and Blood Lead Levels*, 17 J. of Exposure Science and Environ. Epidemiology 47 (2007).

<sup>370</sup> EPA, Exposure Factors Handbook, 2011 Edition (<http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252>).

In performing a cumulative risk assessment, the NAS suggests the consideration of chemical and non-chemical stressors and how these stressors work in concert to promote adverse health outcomes.<sup>371</sup>

**2. EPA Must Assess the Combined Impact of Multiple Pollutants.**

**a. Assess the combined total of each type of risk for multiple pollutants, not just some risks.**

In the refineries risk assessment, EPA only assesses the combined impact of cancer risk and chronic non-cancer risk that operates on the same target organ.<sup>372</sup> These are important and consistent with existing science. In addition, however, EPA should apply the same scientific principles to recognize that it also must combine and look at the whole picture of all other kinds of risk from multiple pollutants.

In particular, EPA must assess the total and synergistic cancer risk and total chronic non-cancer risk for different pollutants. For example, as OEHHA found, “[t]he potential neurotoxicity of arsenic in children, possibly in combination with other environmental agents, is also a concern. Studies in mice<sup>373</sup> indicate combined effects of lead and arsenic on the central nervous system that were not observed with either metal alone.”<sup>374</sup>

In addition, EPA should apply these same principles to create a mechanism for assessing the total acute risk to chemical mixtures, such as the TOSHI for chronic risk, that aggregates the acute impacts on the same organ systems for all pollutants.

**b. Assess the total cumulative risk burden from all pollutants.**

EPA must create a metric to assess the total and cumulative risk burden, rather than only looking at each type of risk in a discrete, separate way.<sup>375</sup> EPA should be integrating its assessments and performing a “comprehensive risk assessment” as the NAS has emphasized.<sup>376</sup> After first assessing the total cancer, chronic non-cancer, and acute risks, for both inhalation and

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<sup>371</sup> NAS 2009, *supra* note 264, at 9-10, 219-223.

<sup>372</sup> Draft Risk Assessment (-0225).

<sup>373</sup> Meija *et al.*, (1997)

<sup>374</sup> Cal. EPA, OEHHA, “Prioritization of Toxic Air Contaminants - Children’s Environmental Health Protection Act, Arsenic and Arsenic Compounds” at Arsenic-2 (Part II) (Oct. 2001).

<sup>375</sup> *See, e.g.*, NAS 2009, *supra* note 264, at 177 (“The underlying scientific and risk-management considerations point to the need for unification of cancer and noncancer approaches in which chemicals are put into a common analytic framework regardless of type of outcome.”).

<sup>376</sup> *Id.* at 131; *see also id.* at 132-33 (discussing related issues).

multipathway exposure, EPA also must create a metric to assess the total bundle of risks.<sup>377</sup> EPA must aggregate health risk for each pollutant, and each type of health risk, to create a cumulative risk determination for the individual “most exposed” to emissions as the Act requires.<sup>378</sup>

Unless and until EPA creates a combined health risk metric, it is unclear how it can make an ample margin of safety determination that is based on the full picture of health risk for a source category and that can be compared to other source categories. EPA must assess the full cumulative burden for public health. By failing to perform a full, cumulative risk assessment, EPA fails to gather the information needed to assess whether the risk to public health is acceptable under CAA § 7412(f)(2).

### **3. EPA Must Account for Multiple Sources.**

EPA must assess and account for the cumulative impact and risk caused by exposure to multiple source categories’ toxic air emissions. In many communities containing refineries, there are many other nearby sources of toxic air emissions within the 3, 5, 10, and the full 50 km radius of EPA’s residual risk assessment. For example, EPA should look at the situation in Wilmington, California, Port Arthur, Texas, and Delaware City, Delaware, and other U.S. communities.<sup>379</sup>

Such exposures increase the vulnerability of a community to new and additional toxic air emissions, as discussed in Part I.E, above.<sup>380</sup> Further, EPA’s own analysis recognizes that refineries create disproportionate health risk for minority and lower income communities. This problem is exacerbated even more by the fact that multiple refineries and other toxic air sources are concentrated in minority and lower income communities, creating a serious environmental justice problem.<sup>381</sup>

Therefore, in addition to performing a cumulative assessment from refineries alone, EPA also must perform a cumulative analysis that considers source categories’ individual impact and risk with that of other sources to which people are exposed.<sup>382</sup> EPA has acknowledged the

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<sup>377</sup> Cal. EPA, OEHHA, “Cumulative Impacts,” *supra* at 19-21, 25 (describing total “pollution burden” as sum of exposures, public health effects, and environmental effects); EPA, “Concepts, Methods and Data Sources,” *supra*, at 4-42 to 4-46.

<sup>378</sup> 42 U.S.C. § 7412(f)(2).

<sup>379</sup> See Community Impact Report (attached), Addendum A.

<sup>380</sup> See, e.g., NAS 2009, *supra* note 264, at 214.

<sup>381</sup> See, e.g., Cal. EPA, OEHHA, “Cumulative Impacts,” *supra*.

<sup>382</sup> We support EPA’s recognition of the need to assess whether the maximum exposed individual is exposed to emissions from more than one source *within* each source category. We also appreciate that EPA has considered facility-wide risk in some way in this rulemaking. However, those assessments offer only part of the picture. And, even on both of these issues, EPA has provided very little information about what it included in such assessments,

importance of addressing multiple source exposures, by stating that it “understands the potential importance of considering an individual’s total exposure to HAP in addition to considering exposure to HAP emissions from the source category and facility,” and that it is “interested in placing source category and facility-wide HAP risks in the context of total HAP risks from all sources combined in the vicinity of each source.”<sup>383</sup> And, EPA has also recognized this need in its recent risk report.<sup>384</sup> Yet, so far EPA has failed to follow through on this.

Although EPA has looked at all existing sources within the refineries source category, it has not proposed any changes to the emission standards based on the combined exposure with any other sources. EPA also has calculated what it calls “facility-wide” risk for different sources collocated at the same address, but it has not used that number to set standards, and it has ignored different sources across the street or in close proximity.<sup>385</sup> In particular, in this risk assessment, EPA recognizes that refineries are contributing more than 50% of significant amounts of the cancer risk, but does not use that information in any way in this rulemaking. Instead, it should acknowledge that the multiple-source exposure risk from refineries, and the increased combined risk it creates through exposing people to multiple sources, require action.

In addition, EPA has provided no information at all on how it reached the “facility-wide” risk number.<sup>386</sup> For example, EPA does not state what other sources it considered as collocated. It just provides the numbers in the record, without any way for the public to evaluate or comment meaningfully. This is a violation of the Clean Air Act’s notice and comment requirements. 42 U.S.C. § 7607(d).

EPA’s failure to assess the combined, cumulative impact on health risk from multiple pollution source categories conflicts with the recommendation from the Scientific Advisory Board that in May 2010 urged EPA to incorporate cumulative risk into its residual risk analysis. The SAB stated that “RTR assessments will be most useful to decision makers and communities if results are presented in the broader context of aggregate and cumulative risks, including background concentrations and contributions from other sources in the area.”<sup>387</sup>

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as discussed elsewhere in these comments. EPA just states numbers found for facility-wide risk, without explaining where those numbers came from, how they were calculated, or what emission sources they cover.

<sup>383</sup> 79 Fed. Reg. at 36,900.

<sup>384</sup> U.S. EPA, “Concepts, Methods and Data Sources,” *supra*, at xxxii (defining a cumulative risk assessment as including “aggregate exposures by multiple pathways, media and routes over time, plus combined exposures to multiple contaminants from multiple sources”).

<sup>385</sup> See Draft Risk Assessment (-0225), at 47-48.

<sup>386</sup> *Id.* at 47.

<sup>387</sup> SAB May 2010, *supra* note 274, at ii, 10.

To perform a cumulative risk or impact analysis, EPA should combine current baseline emissions, exposures, and health impacts in addition to those of the specific source category EPA is reviewing. The NAS explained the need for “[i]ncorporation of background additivity to account for . . . [a]dditional sources of exposure to the same chemical or to similarly acting chemicals (including endogenous sources). . . .”<sup>388</sup> As part of this analysis, EPA should aggregate or add the emissions for the most-exposed communities coming from: (1) the source category (including all individual sources within it); (2) facility-wide risk from collocated sources outside of this category; and (3) all other sources of toxic air pollution in the area. Virtually all of the existing federal air toxics standards (under section 7412(d)) require periodic testing and monitoring, and this is something EPA must ensure is included in all rules as it updates them. Using these data, EPA can aggregate the community’s exposure and assess the full health threats faced by the affected community, including from the source under review.

Moreover, toxicology assessments typically ignore the impact of toxic exposures to genetics and epigenetics and the evidence that many adverse health impacts from environmental exposures, like chemicals in air pollution, can in fact be passed on to subsequent generations. This scientific evidence illustrates an additional dimension of the long-term harm that can occur in communities that have been and continue to be exposed to toxic air pollution over time.<sup>389</sup>

At minimum, EPA can and should use the risk assessment results available for those source categories for which it has already performed a risk assessment review – such as those covered by the hazardous organic NESHAP and other chemical plant sources that are frequently located near refineries. For example, EPA has recognized Port Arthur, Texas as an “environmental justice showcase” community in part because: (1) “More than 50 percent of its residents are African American and Hispanic” and (2) “The city has many facilities including chemical plants, refineries and a hazardous waste incinerator.”<sup>390</sup> EPA has also recognized Salt Lake City, Utah as an environmental justice showcase community, and it has both refineries and other sources like chrome platers, oil and gas production, and mineral wool plants, for which

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<sup>388</sup> NAS 2009, *supra* note 264, at 180 (explaining that this may require the use of default factors).

<sup>389</sup> See, e.g., Bruner-Tran, KL and KG Osteen. 2010. Developmental exposure to TCDD reduces fertility and negatively affects pregnancy outcomes across multiple generations. *Reproductive Toxicology* <http://dx.doi.org/10.1016/j.reprotox.2010.10.003>; Baccarelli A. Breathe deeply into your genes!: genetic variants and air pollution effects, *Am J Respir Crit Care Med.* 2009 Mar 15;179(6):431-2; Rubesa J, Rybara R, Prinosilovaa P, Veznika Z, et al. Genetic polymorphisms influence the susceptibility of men to sperm DNA damage associated with exposure to air pollution. *Mutation Research* 683 (2010) 9–15; Rubes J, Selevan S, Evenson D, Zudova D, Vozdova M, Zudova Z, Robbins W, Perreault S. Episodic air pollution is associated with increased DNA fragmentation in human sperm without other changes in semen quality. *Human Reproduction* Vol.20, No.10 pp. 2776–2783, 2005 doi:10.1093/humrep/dei122. Advance Access publication June 24, 2005; Sánchez-Guerra M, Pelallo-Martínez N, Díaz-Barriga F, Rothenberg SJ, Hernández-Cadena L, Faugeron S, Oropeza-Hernández LF, Guaderrama-Díaz M, Quintanilla-Vega B. Environmental polycyclic aromatic hydrocarbon (PAH) exposure and DNA damage in Mexican children. *Mutat Res.* 2011 Dec 17. [Epub ahead of print]

<sup>390</sup> <http://www.epa.gov/environmentaljustice/grants/ej-showcase-r06.html>.

EPA has done or is doing residual risk assessments.<sup>391</sup> Many other communities – from Cancer Alley, Louisiana, to Delaware City, Delaware – also have both refineries and chemical plants, as well as other sources for which EPA may have completed a risk assessment in the past.<sup>392</sup> Commenters recognize that the HON and other past risk assessments were also flawed and incomplete, but using them is better than ignoring the combined-source risks. If EPA were to look at the combined risk results for these sources near one another (not just collocated) it would likely have to recognize that the overall risk is much higher than it has estimated for the most-exposed person near a refinery, such that stronger standards are needed under § 7412(f)(2) for multiple emission points at refineries (not just storage vessels).

EPA must also consider the research that has already occurred to assess health risk from toxic air pollution in urban communities nationwide.<sup>393</sup> EPA should also draw on the OEHHA cumulative assessment approach.<sup>394</sup> EPA should consult with OEHHA and investigate the scientific approach it is using to address cumulative impacts, and consider and apply a similar science-based approach in this residual risk assessment.

Further, the NAS has recommended that EPA evaluate “background exposures and vulnerability factors,” as well as use “epidemiologic and toxicologic evidence” in its risk assessments.<sup>395</sup> Rather than separating an environmental justice analysis and considerations of inequality from the risk assessment, considering these factors as part of the cumulative risk assessment – because of the increased vulnerability created (as also discussed in Part I.E above) – would be a more effective, meaningful, and scientific approach.

In assessing a source category’s emission contributions in affected communities and considering whether these contributions cause the most-exposed people to experience an unacceptable level of public health risk when combined with the existing baseline from past emissions, other HAP emissions, and the community’s health status, EPA can describe and

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<sup>391</sup> <http://epamap14.epa.gov/ejmap/ejmap.aspx?wherestr=salt%20lake%20city%2C%20ut>.

<sup>392</sup> See Community Impact Report, accompanying these comments, for further examples (Addendum A).

<sup>393</sup> See, e.g., Rachel Morello-Frosch & Bill M. Jesdale, *Envtl. Health Perspectives*, *Separate and Unequal: Residential Segregation and Estimated Cancer Risks Associated with Ambient Air Toxics in U.S. Metropolitan Areas*, 114(3) *Envtl. Health Perspectives* 386 (2006) (assessing toxic air pollution cancer risk for 309 metropolitan areas encompassing 45,710 tracts); “National Air Toxics Program: The Integrated Urban Strategy,” 64 *Fed. Reg.* 38,706, 38,738 (July 19, 1999).

<sup>394</sup> See, e.g., Cal. EPA, “Cumulative Impacts,” *supra*.

<sup>395</sup> NAS 2009, *supra* note 264, at 221-23 (discussing Menzie et al. 2007 model); *id.* at 230 (discussing the role of epidemiology and surveillance data).



manage uncertainties, as it does and other federal agencies do for many other analyses.<sup>396</sup> Uncertainties do not justify failing to assess and address the severe cumulative harm and risk to local communities from air toxics sources. Rather, there is no excuse for treating an unknown amount of additional risk as a missing default, to use the NAS term.

As a scientific and policy matter, where there is exposure to air toxic emissions beyond the individual source category, the level of total risk that is occurring, including the baseline health risk and the risk from other sources, is greater. Thus, the total risk that is unacceptable for the most-exposed person must in fact be lower for each source category that person is exposed to, because it combines with other risks to create a *total* risk from all regulated source categories which must be minimized. Looking at a source category's contribution of risk in isolation is equivalent to ignoring the facts and pretending other health risks are not occurring. EPA may not decide that it is okay for a person to be exposed at a higher level simply because they live in a community where they are exposed to multiple sources of air pollution. That is the opposite of what EPA is required to do – protect the people in local communities who are most exposed and most vulnerable to air pollution. It also conflicts with EPA's own commitment to consider and provide environmental justice to overburdened communities.

At minimum, until EPA develops a data-driven approach to comprehensively model cumulative risk or impacts from multiple sources, EPA must not treat multiple source exposure as a missing default, or ignored amount of health risk. EPA must incorporate an explicit default or uncertainty factor to adjust the degree to which each individual source category is contributing to the total risk experienced by the most-exposed individuals. For example, wherever there is evidence that the source category is contributing pollutants on top of a history of other exposures or is contributing pollutants in addition to other source categories, the “unacceptable” level of cancer, non-cancer chronic, and acute risk from the source category must be adjusted downward based on the number of other facilities contributing HAP exposure risks (such that no single source category could consume all of it, when the most-exposed person is exposed to many other source categories). ***For a source category in an area with up to 10 other HAP-emitting***

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<sup>396</sup> See, e.g., 42 U.S.C. §§ 7475(a)(3), 7503(a)(1) (requiring a localized, cumulative assessment of whether or not a new or modified source's additional emissions will cause an attainment area to deteriorate, or will make it difficult for a nonattainment area to make progress toward achieving the national ambient air quality standards); *New York v. EPA*, 443 F.3d 880, 883 n.1 (D.C. Cir. 2006) (citing *New York v. EPA*, 413 F.3d 3, 11-14 (D.C. Cir. 2005)); see also 40 C.F.R. § 1508.27(b)(7) (requiring a consideration of “[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts”); see also 40 C.F.R. § 1508.7; *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 930 (9th Cir. 2008) (applying 16 U.S.C. § 1536(a)(2) to enforce the Endangered Species Act duty to ensure against jeopardy which includes the requirement to assess a newly proposed action in the context of all other impacts, and determine whether or not the specific action will “tip a species from a state of precarious survival into a state of likely extinction,” or, where baseline conditions already jeopardize a species, whether it will “deepen[] the jeopardy by causing additional harm”).

*facilities, this default or uncertainty factor should equal at least 10, consistent with the common scientific use of this factor for other kinds of vulnerability.*<sup>397</sup>

### **III. EPA MUST RECOGNIZE THAT THE HEALTH RISKS REFINERIES CREATE ARE UNACCEPTABLE.**

#### **A. EPA Should Recognize That Risk Is Unacceptable Even Where the MIR Is 100-in-1 Million Or Below.**

EPA has a longstanding policy of assuming that it is possible to find a safe or acceptable level of cancer and other kinds of health risks. Currently available science debunks this assumption because there is so much uncertainty built into EPA's risk assessment, and because EPA lacks information on so many pollutants. For communities overburdened by pollution, this policy is especially problematic.

As a major example, EPA should recognize that cancer risk from a major industrial source category of toxic air pollution (listed under CAA § 7412) that is 100-in-1 million or less cannot be presumed safe or "acceptable." Since 1990, however, EPA has made this assumption. EPA based this assumption not on scientific information about cancer risk, but on an unusual study of people's perceptions of their own risk from 1988, known as the Survey of Societal Risk (July 1988), to consider various types of health risks at that time.<sup>398</sup> Using a comparison of cancer risk to other kinds of hazards Americans then faced in their daily lives, EPA effectively chose a number out of a hat that it would consider acceptable. EPA looked at an odd collection of risks, such as dangers from driving a car, and found that "the presumptive level established for MIR [maximum individual risk of cancer] of approximately 1 in 10 thousand is within the range for individual risk in the survey, and provides health protection at a level lower than many other risks common 'in the world in which we live.'"<sup>399</sup>

EPA has failed to revisit or update this number for the decades since, even though scientists have made breakthroughs on early-life exposure and children's vulnerability; biomonitoring and other data on adult body burdens of chemicals; the vulnerability of overburdened communities, including socioeconomic disparities; and on ways to analyze and control the impacts of pollutants on human health.

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<sup>397</sup> For areas with more facilities, which cause an even greater level of health risk combined, the UF should be adjusted accordingly, *i.e.*, 11-20 facilities would result in an UF of 20, and more than 20 would result in an UF of 100, so the source category's contribution is no higher than 1/100 of the threshold.

<sup>398</sup> Benzene Rule Docket No. OAQPS 79-3, Part I, Docket Item X-B-1, EPA Air Docket (cited at Nat'l Emission Standards for Hazardous Air Pollutants; Benzene Emissions from Maleic Anhydride Plants, Ethylbenzene/Styrene Plants, Benzene Storage Vessels, Benzene Equipment Leaks, and Coke By-Product Recovery Plants, 53 Fed. Reg. 28,496, at 28,512-13 (July 28, 1988)).

<sup>399</sup> 54 Fed. Reg. 38,044, 38,046 (Sept. 14, 1989) (emphasis added) (quotation omitted).

## LANDMARKS SINCE 1990

In 1990, the Clean Air Act Amendments required new basic stringency requirements for technology-based control for hazardous air pollutants and added an additional review of residual health risk to ensure protection of communities.<sup>400</sup>

In 1993, the National Research Council published *Pesticides in the Diets of Infants and Children*, finding that children are not little adults, and have greater exposures and susceptibility.<sup>401</sup>

In 1994, President Clinton signed Executive Order 12898 on Environmental Justice.<sup>402</sup>

In 1996, Congress enacted the Food Quality Protection Act and the Safe Drinking Water Act amendments, which explicitly require consideration of the susceptibility of children and due to early exposure.<sup>403</sup> This same year, EPA announced a new National Agenda to Protect Children's Health.

In 1997, the President issued the Children's Environmental Health Executive Order (No. 13045) on the need to address risks to children.<sup>404</sup>

In 2000, EPA first published *America's Children and the Environment*, which it has since updated.<sup>405</sup>

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<sup>400</sup> 42 U.S.C. § 7412, 1990 Amendments.

<sup>401</sup> Nat'l Research Council, "Pesticides in the Diets of Infants and Children" (1993); *see also* Hugh A. Barton *et al.*, *Assessing Susceptibility from Early-Life Exposure to Carcinogens*, 113(9) *Env'tl. Health Perspectives* 1125 (2005); Dale Hattis *et al.*, *Age-Related Differences in Susceptibility to Carcinogenesis: a Quantitative Analysis of Empirical Animal Bioassay Data*, 112(11) *Env'tl. Health Perspectives* 1152 (2004).

<sup>402</sup> Exec. Order No. 12898, 3 C.F.R. 859 (1995), *reprinted as amended* in 42 U.S.C. § 4321 (1998).

<sup>403</sup> 21 U.S.C. § 346a(b)(2)(C) (requiring that, in taking certain actions on pesticides "an additional tenfold margin of safety for the pesticide chemical residue and other sources of exposure *shall be applied for infants and children to take into account potential pre- and post-natal toxicity and completeness of the data with respect to exposure and toxicity to infants and children*") (emphasis added); 42 U.S.C. § 300g-1(b)(1)(C) (requiring that, in selecting unregulated contaminants for consideration, EPA "shall take into consideration, among other factors of public health concern, the effect of such contaminants upon subgroups that comprise a meaningful portion of the general population (such as *infants, children, pregnant women*, the elderly, individuals with a history of serious illness, or other subpopulations) that are identifiable as being at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population") (emphasis added); *id.* § 300j-18(a)(1) (requiring EPA to "identify groups within the general population that may be at greater risk than the general population of adverse health effects from exposure to contaminants in drinking water. The study shall examine whether and to what degree *infants, children, pregnant women*, the elderly, individuals with a history of serious illness, or other subpopulations that can be identified and characterized are likely to experience elevated health risks, including risks of cancer, from contaminants in drinking water. . . .") (emphasis added).

<sup>404</sup> Exec. Order 13045, 62 Fed. Reg. 19,885 (Apr. 21, 1997).

In 2006, EPA issued new guidance on protecting children from environmental health risks as part of the rulemaking process.<sup>406</sup> Among other things, this Guide<sup>407</sup> recognized the problem of disproportionate risk to children because they may be more sensitive to pollution and exposed at a higher rate than adults because of their developmental stage. This Guide also recognized the need “to think in terms of the broad range of early life, pre-natal and post-natal, environmental exposures that may affect the incidence of disease or alter development.”<sup>408</sup>

In 2008, EPA updated the Child-Specific Exposure Factors Handbook.<sup>409</sup>

In 2008 and 2009, the major National Academy of Sciences reports – *Science and Decisions: Advancing Risk Assessment* (“NAS 2009”), and *Phthalates and Cumulative Risk Assessment: The Tasks Ahead* (2008) – were released, re-emphasizing the importance of addressing real-world risk to children and cumulative health risk.

In 2009, EPA Administrator Jackson declared environmental justice and children’s health priorities.<sup>410</sup>

In 2010, EPA Administrator Jackson issued *EPA’s Action Development Process: Interim Guidance on Considering Environmental Justice During the Development of an Action*.<sup>411</sup>

In 2011, EPA Administrator Jackson announced Plan EJ 2014 including rulemaking and science goals to finally achieve the goals of the 1994 Environmental Justice Executive Order.<sup>412</sup> EPA continues to work to issue guidance that will advance these goals.

In addition, in recent years, EPA’s Children’s Health Protection Advisory Committee has recommended addressing the developmental origins of adult disease that come from childhood exposure to air pollution and other environmental contaminants.<sup>413</sup> Similarly, the Committee has

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<sup>405</sup> U.S. EPA, “American’s Children and the Env’t” (3d ed. 2013), <http://www.epa.gov/opeedweb/children/publications/index.html>.

<sup>406</sup> U.S. EPA, “Guide to Considering Children’s Health When Developing EPA Actions: Implementing Executive Order 13045 and EPA’s Policy on Evaluating Health Risks to Children” (2006), [http://yosemite.epa.gov/ochp/ochpweb.nsf/content/ADPguide.htm/\\$File/EPA\\_ADG\\_Guide\\_508.pdf](http://yosemite.epa.gov/ochp/ochpweb.nsf/content/ADPguide.htm/$File/EPA_ADG_Guide_508.pdf).

<sup>407</sup> *Id.* at 8.

<sup>408</sup> *Id.*

<sup>409</sup> U.S. EPA, Child-Specific Exposure Factors Handbook (2008).

<sup>410</sup> <http://www.epa.gov/compliance/ej/plan-ej/index.html>.

<sup>411</sup> U.S. EPA, “EPA’s Action Development Process: Interim Guidance on Considering Environmental Justice During the Development of an Action” (2010). <http://www.epa.gov/compliance/ej/resources/policy/ejrulmaking.html>.

<sup>412</sup> Plan EJ 2014, U.S. EPA, <http://www.epa.gov/compliance/ej/plan-ej/index.html>.

<sup>413</sup> U.S. EPA, *Report of the Task Group of the Children’s Health Protection Advisory Comm. on America’s Children & the Env’t*, 3d Ed. (2010), [http://yosemite.epa.gov/ochp/ochpweb.nsf/content/ACETask.htm/\\$file/ACE%20Task%20Group%20Report.pdf](http://yosemite.epa.gov/ochp/ochpweb.nsf/content/ACETask.htm/$file/ACE%20Task%20Group%20Report.pdf).

recommended that EPA incorporate a more robust analysis of childhood and pre-natal exposure to environmental contaminants into its risk assessment method.<sup>414</sup>

The Science Advisory Board has also urged EPA to address the greater risk to children from hazardous air pollution.<sup>415</sup> As the SAB further explained: “California’s Office of Environmental Health Hazard Assessment (OEHHA) has very recently updated its methodology in ways that could affect the development of RfC and URE (unit risk estimate) values. EPA should examine these developments to make sure that the RTR process adequately covers children’s risks.”<sup>416</sup>

Finally, during the last decade, OEHHA has also released a number of groundbreaking scientific determinations and protocols to consider and address children’s health, early life exposure, and cumulative impacts, which are cited in this document, above, and are all available at <http://oehha.ca.gov/>. Most recently, these include three final Technical Support Documents on risk assessment and a proposed Risk Assessment Manual (2014).<sup>417</sup>

It is time for EPA scientists and science policymakers to revisit the outdated assumption EPA makes regarding what level of cancer risk triggers policy interventions. EPA’s own policy regarding carcinogens recognizes that they have no safe threshold of exposure. EPA has appropriately recognized that cancer risks add up to increase lifetime risk. EPA cannot reconcile what it knows – and does not know – about carcinogens with its outdated presumption that a cancer risk of 100-in-1 million is acceptable.

Importantly, EPA’s presumption regarding cancer risk ignores the experience of communities exposed to multiple sources and types of sources of pollution. Even if some level of risk might otherwise be acceptable, that cannot be assumed to be true for communities exposed to more than one source that is causing that level of health risk. EPA has a

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<sup>414</sup> Letter from Pamela Shubat, Chair, Children’s Health Protection Advocacy Council, CHPAC to Lisa Jackson, Administrator, U.S. EPA, (Oct. 21, 2010) (“CHPAC recommends that EPA staff scientists participating in the upcoming discussions bring the concern of early life stage exposure and sensitivity to the conversations that will take place concerning optimizing risk assessment practice.”), [http://yosemite.epa.gov/ochp/ochpweb.nsf/content/CHPAC\\_NRC\\_Report.htm](http://yosemite.epa.gov/ochp/ochpweb.nsf/content/CHPAC_NRC_Report.htm).

<sup>415</sup> U.S. EPA, Sci. Advisory Bd., Review of EPA’s draft entitled, “Risk and Technology Review (RTR) Risk Assessment Methodologies: For Review by the EPA’s Science Advisory Board with Case Studies – MACT I Petroleum Refining Sources and Portland Cement Manufacturing,” EPA-SAB-10-007 (May 2010), at 7 (stating that “an overarching concern with the Agency’s chronic inhalation exposure estimates is that children’s exposures do not appear to have been adequately addressed”); *see also id.* at 34 n.13 (“In particular is the question of whether the interindividual variability factor for non-carcinogens and the standard cancer unit risk derivation adequately covers children. If it does not, it is a potentially significant uncertainty given the greater intake rate of children via inhalation and sensitivity to carcinogens and other toxicants.”).

<sup>416</sup> *Id.* at 6

<sup>417</sup> *See* OEHHA 2014 Manual and final Technical Support Documents, cited *supra* note 121.

responsibility to address the science on cumulative impacts and risk and update its assumptions accordingly, to acknowledge that cancer risks below 100-in-1 million cannot be presumed safe.

EPA should also reform how it evaluates chronic and acute hazard indices, in which a risk number below 1 does not result in policy changes or standards. EPA should instead factor in uncertainties and vulnerability factors that adjust the “acceptable level of risk.” This is currently done under the FQPA when EPA uses factors to determine a Target Margin of Exposure and risks below this level warrant increased scrutiny and changes to allowable exposures.<sup>418</sup>

In the face of increasing evidence which challenges the assumption of a safe or acceptable level of exposure, EPA should also consider reforming risk assessments to support reducing risks to the lowest possible level, to protect public health, rather than suggesting that there is a safe or acceptable level.

**B. EPA Should Decide That The Health Risks Under the Existing Refineries Standards Are Unacceptable.**

EPA proposes that the health risks it has found are acceptable, but is taking comment on whether it should actually find them to be unacceptable.<sup>419</sup> EPA appears to base its proposed acceptability determination mainly on the fact that the cancer risks (MIR) from inhalation “are no greater than approximately 100-in-1 million, which is [EPA’s] presumptive limit of acceptability.”<sup>420</sup> This overly narrow view (see below) fails on its own terms.

Further, as EPA acknowledges, based on inhalation of refineries’ toxic air pollution alone, EPA anticipates approximately 1 additional cancer case every 3 years based on “actual” emissions, or one extra case every 1.5 years based on “allowable” emissions.<sup>421</sup> That should be clearly unacceptable. U.S. residents should not have to face significant amounts of extra cancer just because they live near a refinery. When EPA recognizes that at least 7 million people are exposed to extra cancer risk from refineries, it should plainly find this inhalation-based cancer risk, alone, to be unacceptable under § 7412(f)(2).

EPA recognizes in this proposed rule that there are many additional reasons why risk could be considered unacceptable – all of those reasons merit an unacceptability determination here.<sup>422</sup>

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<sup>418</sup> See, e.g., EPA, Sulfuryl Fluoride; Proposed Order Granting Objections to Tolerances and Denying Request for a Stay, Proposed Rule, 76 Fed. Reg. 3422, 3427 (Jan. 19, 2011) (explaining use of MOE).

<sup>419</sup> 79 Fed. Reg. at 36,939-40.

<sup>420</sup> *Id.* at 36,939.

<sup>421</sup> *Id.* at 36,934.

<sup>422</sup> *Id.* at 36,940.

EPA should also find the current health risks to be unacceptable for all, or any one, of the following reasons:

1. EPA has significantly underestimated the cancer risk from inhalation. If EPA addressed any of the above science outlined on this point, including the fact that it is underestimating the risk from early exposure, it would likely find the inhalation-based cancer risk exceeds even EPA's presumptive limit.
2. EPA has also underestimated the cancer risk from multipathway exposure. If EPA fully assesses multipathway cancer risk and adds that to the inhalation risk, that is also likely to exceed EPA's presumptive limit.
3. EPA should recognize that the combination of cancer, and high chronic non-cancer and acute risks, together, create unacceptable risk, particularly where EPA has underestimated all other kinds of risk as well, as described above.
4. EPA should recognize that the cumulative impacts and multiple source exposure from various sources, including refineries, mean that allowing refineries to cause 100-in-1 million cancer risk, plus the additional risks, is unacceptable. It is unacceptable for EPA to allow its entire presumptive benchmark of acceptable risk to be consumed by one or more refineries – when EPA is well aware that many people are exposed to many other kinds of toxic air pollution at the same time, leading them to have much higher than 100-in-1 million risk exposure, in total.
5. EPA has found high facility-wide cancer and chronic non-cancer risk based on so-called “actual” emissions, and that refineries contribute at least 50% to that risk. EPA did not evaluate facility-wide risk based on “allowable” emissions, and if it did, would likely find its presumptive acceptability benchmark for cancer is exceeded. And, the chronic non-cancer risk EPA found is 4 (4 times EPA's TOSHI threshold of 1).<sup>423</sup>
6. The high population exposed to refineries' risk (at least 7 million), and resulting incidence of cancer risk (at least one case every 1.5 years), should lead EPA to find the risk unacceptable. There are 83 million people living within 50 km (approx. 31 miles) of refineries, with an additional risk of catastrophic exposure.

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<sup>423</sup> *Id.* at 36,937.

7. EPA also should decide that it is unjust and inconsistent with the Act's health-protection purpose to allow the high health risks caused by refineries to fall disproportionately on communities of color and lower income communities who are least equipped to deal with the resulting health effects. Because of that disparity, EPA should recognize that the risks found are unacceptable and set stronger national standards for all exposed Americans.
8. EPA has recognized that the rule likely does not address all emissions, particularly fugitive emissions, and this provides an additional reason to find the current level of health risk unacceptable.

Commenters note that in other rules, EPA has found or is proposing to find similar or lower levels of risk to be unacceptable. For example, in Secondary Lead Smelting, EPA found that health risks were “unacceptable,” based partly on high chronic non-cancer risk (due to fugitive lead emissions) and partly on: “[t]he fact that maximum individual cancer risks due to actual emissions are above 1 in a million also contributes to our determination of unacceptability.”<sup>424</sup> Here, the maximum individual cancer risk due to actual emissions is well above 1 in 1 million, is underestimated, as explained in these comments, and the risk number based on allowable emissions is 100-in-1 million – right at EPA’s (too low, outdated) presumptive benchmark of acceptability. Thus, it would be inconsistent with its risk acceptability determination in Secondary Lead Smelting not to find risk in this case similarly unacceptable.

EPA has long recognized that a combination of cancer and non-cancer risks can show unacceptable health risks, as it states as its policy in the current rulemaking.<sup>425</sup> For example, in its proposed rule for Ferroalloys, EPA finds that allowable cancer risk is 100-in-1 million and that cancer risk based on reported “actual” emissions is lower; EPA also finds significant chronic non-cancer risks from manganese and mercury. EPA states that the fact that “risks from allowable emissions are at the upper end of the range of acceptability . . . combined with” high non-cancer risk, lead EPA to conclude that the current risk from Ferroalloys sources is “unacceptable.”<sup>426</sup> EPA similarly found significant non-cancer risks here, as well as cancer risk at the “upper end” of the range EPA considers acceptable – and thus should similarly find the health risks from refineries to be “unacceptable.” (Specifically, EPA has found a high acute risk

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<sup>424</sup> Secondary Lead Smelting, Final Rule, 77 Fed. Reg. 556, 563 (Jan. 5, 2012) (EPA has since granted the reconsideration petition of environmental petitioners on the issue of how EPA underestimated health risks in the secondary lead smelting risk assessment, and reconsideration remains pending).

<sup>425</sup> 79 Fed. Reg. at 36,899 (“the level of the MIR [maximum individual lifetime cancer risk] is only one factor to be weighed in determining acceptability of risks. . . . the Agency may find, in a particular case, that a risk that includes MIR less than the presumptively acceptable level is unacceptable in the light of other health risk factors.”) (quoting Benzene Rule).

<sup>426</sup> Ferroalloys, Supplemental Proposed Rule, 79 Fed. Reg. 60,238, 60,269-70 (Oct. 6, 2014).



(HQ of 5 based on “actual” emissions) and high chronic non-cancer risk (TOSHI of 1), as well as multipathway risks that did not screen out, in a refined analysis for a single facility that EPA recognizes is not representative of the highest multipathway risk for any exposed individual.<sup>427</sup>).

As another example, EPA finds in regard to the Wool Fiberglass source category that, although EPA’s assessment of so-called “actual” emissions did not create risk above 100-in-1-million (as is true here), under the potential cancer risk EPA evaluated: “8,100 people would be exposed to risks greater than 100-in-1-million, 460,000 people would be exposed to risks of greater than 10-in-1-million, and over 7 million people would be exposed to cancer risks of greater than 1-in-1-million.”<sup>428</sup> Here, there are millions of people exposed to cancer risks above 1-in-1 million, about 100,000 exposed above 10-in-1 million, and EPA has found that based on allowable emissions, there is exposure at 100-in-1 million – and that is from inhalation risk alone. By contrast with Wool Fiberglass, where EPA finds no other relevant health risks above its threshold, here there are significant acute, chronic non-cancer, and multipathway risks that EPA has found, and there are many more people exposed to refinery risks, on top of the cancer risks, which all provide additional reasons for EPA to find risk here “unacceptable.”

It would be out of step with EPA’s interpretation of § 7412(f)(2), and with the policy reflected in other EPA risk determinations, and thus arbitrary and capricious, for EPA not to find that the refineries risk is similarly unacceptable. EPA must provide equal protection for people near air toxics sources. Because people living near refineries are disproportionately people of color and lower income people, disparate treatment by EPA would be especially problematic and raise discrimination concerns under all applicable requirements for equal treatment and equal protection.

EPA should not ignore the reality communities near refineries face daily, and instead should find that their health risks are currently “unacceptable,” and set residual risk standards for to reduce those risks.

#### **IV. EPA HAS UNDERESTIMATED ECOLOGICAL RISK.**

EPA has correctly recognized that it is legally required to perform an environmental or ecological risk assessment in this rulemaking, under § 7412(f)(2), in order to “prevent ... an adverse environmental effect.”<sup>429</sup> As the SAB has stated: “The assumption that ecological receptors will be protected if human health is protected is incorrect.”<sup>430</sup> In addition to inhalation risk for wildlife and air impacts to plants, chemicals that are persistent in the environment or bioaccumulative in living tissue will remain or increase over time, particularly in areas of high

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<sup>427</sup> 79 Fed. Reg. at 36,934-38. Risk Assessment (-0225).

<sup>428</sup> Wool Fiberglass, Proposed Rule, 76 Fed. Reg. 72,770, 72,801 (Nov. 25, 2011).

<sup>429</sup> 42 U.S.C. § 7412(f)(2).

<sup>430</sup> SAB May 2010, *supra* note 274, at 48.

emissions. Accordingly, any additional exposure from current activities would thus be added to a background that is likely unsafe already for wildlife and other environmental resources. EPA must perform an appropriate ecological assessment, however, and Commenters are concerned that EPA has not adequately examined environmental, wildlife, and other ecological risks, including region-specific impacts to wildlife, including federally listed species under the Endangered Species Act, and aquatic resources in rivers and estuaries from refinery emissions as EPA's materials appear to apply a "one size fits all" assessment without regard to region-specific science.

In this risk assessment, EPA is legally required to assess impacts to endangered and threatened species, and yet EPA's assessment includes no discussion of potentially affected species located near refineries, much less any evaluation of the risks they face. EPA also says nothing at all about ESA consultation, which provides further evidence that it has not considered or addressed its duty to prevent adverse environmental effects, as recognized by the D.C. Circuit.<sup>431</sup> EPA must assess potential endangered and threatened species near the existing sources in this source category.

For example, the State of Washington is home to five refineries, all of them on the shores of Puget Sound, four of them (all large refineries) are in the area of Anacortes, Washington and Cherry Point. This area of Washington is where the Nooksack and Skagit River deltas provide fertile salmon habitat, particularly estuaries where juvenile salmon shelter and forage while their bodies change for the marine stage of their lives.<sup>432</sup> The Skagit estuary where the Washington refineries are located is particularly significant. Shellfish are also of particular concern with world-class beds located just north of the Anacortes area refineries. The Anacortes area is also where Puget Sound orcas spend significant amounts of time (in the San Juan Islands) and is near important migration routes for salmon species that spawn in Puget Sound rivers.

It is also important to consider that air emissions from the Anacortes area refineries (and from the aluminum smelter that is also located there) significantly affect Olympic National Park, across Puget Sound from the refineries. This has been amply demonstrated by studies and modeling done relative to the Washington Regional Haze Implementation Plan—in particular work by the National Park Service, EPA Region 10, and the State Department of Ecology.<sup>433</sup> Emissions from the Anacortes sources (the Park Service was concentrated on the Tesoro Refinery) are the most significant source of haze impairment in the Olympics. Presumably, air toxics travel with those emissions and are deposited in Olympic lakes, rivers, and estuaries as well. It is unclear whether EPA has done any assessment of those impacts.

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<sup>431</sup> See *Sierra Club v. EPA*, 353 F.3d at 992 (ESA consultation part of the section 7412(f)(2) rulemaking).

<sup>432</sup> [http://www.ecy.wa.gov/programs/sea/pugetsound/species/salmon\\_est.html](http://www.ecy.wa.gov/programs/sea/pugetsound/species/salmon_est.html).

<sup>433</sup> See e.g., Comments by National Park Service to EPA, Region 10 (Feb. 15, 2013).

Aquatic species in Washington are already under multiple threats, and it does not appear EPA paid particular heed in its assessment here. Orcas already carry an extremely heavy body burden of toxins (PCBs, lead, mercury), likely coming from their primary food sources (primarily salmon for the resident pods, mammals like seals for the transients), and possibly from sediment/ambient levels.<sup>434</sup> Orcas are listed as endangered under the Endangered Species Act. Puget Sound Chinook salmon, the primary food for resident orcas, are themselves listed as threatened.<sup>435</sup> In addition to Chinook, many other salmon species inhabit the Sound and its tributaries.

Recent research suggests that PAHs in streams are creating big problems for salmon. Coho salmon are dying within hours of entering streams in the Puget Sound region to spawn. The same research is showing that salmon eggs and fry are deformed and do not hatch when exposed to water in these streams. Current research by the National Oceanic and Atmospheric Administration (“NOAA”) concerns stormwater runoff and PAHs.<sup>436</sup> While stormwater is plainly an issue, the research is relevant and important here in that it points out regional species’ sensitivity to PAH emissions from any source and it highlights a mistaken assumption EPA made in its risk assessment. In EPA’s assessment, it appears to look only at lakes (and the extent to which EPA focused on any Washington waters is not clear). Plainly for at least some of the pollutants, stream species might also be affected. Concentrating only on mountain lakes is not giving EPA the full picture for impacts to salmon and orcas.

An even with regard to lakes, EPA’s risk assessment documents do not make plain how, when, or in what regard EPA analyzed particular existing problems and sensitivity to airborne emissions over time. The research regarding Western National Parks lakes that has been going on for years shows Olympic and Mt. Rainier National Park lakes particularly affected. While there is some sense that Mt. Rainier’s problems might be the after-effects of a copper smelter that operated for years in Tacoma, the Olympic problems are likely contributed to by the Anacortes refineries based upon what is known from the regional haze work, in particular on the Tesoro refinery. Given the understanding of air emissions from that area impacting Olympic National Park (and obviously the surrounding National Forest), rivers and streams on the

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<sup>434</sup> NOAA Fisheries, Killer Whale (*Orcinus orca*), <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/killerwhale.htm> (updated June 25, 2014).

<sup>435</sup> NOAA, Endangered and Threatened Species; Threatened Status for Three Chinook Salmon Evolutionarily Significant Units (ESUs) in Washington and Oregon, and Endangered Status for One Chinook Salmon ESU in Washington, 64 Fed. Reg. 14,308 (Mar. 24, 1999).

<sup>436</sup> See NOAA Northwest Fisheries Science Center, Polycyclic aromatic hydrocarbons, <http://www.nwfsc.noaa.gov/research/divisions/efs/ecotox/pah.cfm> and NOAA Northwest Fisheries Science Center, Stormwater science: ecological impacts, <http://www.nwfsc.noaa.gov/research/divisions/efs/ecotox/ecoimpacts.cfm> and publications cited there.

Olympic peninsula should have been included in any analysis if one was done for Washington (and, again, it is difficult to tell from the materials what lakes, etc. actually were modeled.) The latest studies about mercury in Olympic National Park are here and EPA must consider these and other similar scientific research in this rulemaking in order to fulfill its legal duty to evaluate the adverse environmental effect of refineries' pollution under § 7412(f)(2):

- <http://pubs.usgs.gov/of/2014/1051/pdf/ofr2014-1051.pdf>
- <http://www.kitsapsun.com/news/local-news/environment/study-reveals-mercury-laced-fish-in-olympic>
- The WACAP study features lakes in Olympic and Mt. Rainer national parks and clearly shows mercury deposition to be a problem:
  - [http://www.nature.nps.gov/air/studies/air\\_toxics/wacap.cfm](http://www.nature.nps.gov/air/studies/air_toxics/wacap.cfm)
  - [http://www.nature.nps.gov/air/studies/air\\_toxics/docs/2008FinalReport/WACAP\\_Report\\_Vol\\_I\\_Main\\_Chapters/5\\_Chapter\\_2\\_WACAP\\_Rpt\\_Vol\\_I.pdf](http://www.nature.nps.gov/air/studies/air_toxics/docs/2008FinalReport/WACAP_Report_Vol_I_Main_Chapters/5_Chapter_2_WACAP_Rpt_Vol_I.pdf)
- *See also*, [http://www.sfnps.org/download\\_product/1834/0](http://www.sfnps.org/download_product/1834/0)

## **V. EPA MUST REQUIRE ADDITIONAL REDUCTIONS IN REFINERIES' EMISSIONS UNDER SECTION 7412(D) AND 7412(F) OF THE ACT.**

### **A. EPA Must Require Reductions In Uncontrolled Fugitive Emissions.**

EPA recognizes the need to address fugitive emissions, but its proposed rule carves out an exemption for such emissions. This exemption is unlawful, arbitrary, and capricious.

In particular, EPA appropriately states that the agency is “concerned regarding the potential for high emissions from . . . fugitive sources.”<sup>437</sup> EPA points out problems with monitoring and inspection requirements for tanks and wastewater that are leading to fugitive emissions. EPA is proposing to update requirements for tanks or storage vessels, but is not doing so for wastewater due to its cost analysis.<sup>438</sup> EPA also recognizes that there are ways to strengthen leak detection and repair requirement for other refinery equipment, but proposes not to update LDAR requirements at all in this rule.<sup>439</sup>

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<sup>437</sup> 79 Fed. Reg. at 36,920.

<sup>438</sup> *Id.* at 36,918-19.

<sup>439</sup> *Id.* at 36,919, 36,915-18.

The only action EPA proposes to address the remaining problems with fugitive emissions is the fence-line monitoring requirement.<sup>440</sup> If a facility's fugitive emissions exceed the level EPA anticipates under existing standards, then a facility will have to take corrective action.

But, EPA concludes that “if the facility's estimate of fugitive emissions is consistent with the level of fugitive emissions actually emitted,” then no source would need to take corrective action.<sup>441</sup> As discussed above, corrective action is only required if a fence-line concentration exceeds 9 µg/m<sup>3</sup> on a 12-month rolling average. EPA has designed the action level to be a number that it expects no facility will ever exceed. Even so, there is no specific action even required, much less any specific penalty if the concentration action level is exceeded.

The standards thus include no limit on the amount of fugitive emissions a facility may have. As EPA has recognized, the agency “has authority under CAA section 7412(d)(2) and (d)(3) to set MACT standards for previously unregulated emission points.”<sup>442</sup> EPA also has authority to revise a standard pursuant to these provisions at any time. Indeed, they apply, as stated, to “emission standards promulgated under this subsection,” *i.e.* § 7412(d).<sup>443</sup> EPA has proposed precisely such action on delayed coker units, catalytic reforming units (“CRU”), refinery flares, and vent control bypasses.<sup>444</sup>

EPA must set a limit on all hazardous air pollutants emitted – not just those that come from a stack or vent. Section 7412(d)(2) requires measures which “collect, capture or treat such pollutants when released from a process, stack, storage or fugitive emissions point.” Although EPA has set standards for fugitive emissions from storage vessels and leaks, its proposed rule recognizes those are not enough.<sup>445</sup> Under § 7412(d), EPA must set limits on all fugitives. It is unlawful under § 7412(d)(2), (3), and (6), and arbitrary and capricious for EPA not to set limits on fugitive emissions that require the “maximum achievable” degree of emission reduction. EPA must, at least, set a floor for existing source standards under § 7412(d)(3) to limit fugitive emissions according to the average emission limitation “achieved” by the top 12 % of existing sources, and must match the best source, for the new source standards.

Finally, EPA must address fugitive emissions that remain under the existing standards because they pose a health threat to nearby communities. In this rulemaking, it has recognized a concern about some fugitive sources, which the agency recognizes are one lead cause of the

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<sup>440</sup> *Id.* at 36,920 (explaining that this provision is “appropriate under CAA section 112(d)(6) to require refiners to monitor, and if necessary, take corrective action to minimize fugitive emissions, to ensure that facilities appropriately manage emissions of HAP from fugitive sources”).

<sup>441</sup> 79 Fed. Reg. at 36,920.

<sup>442</sup> 79 Fed. Reg. at 36,900 n.25.

<sup>443</sup> 42 U.S.C. § 7412(d)(2)-(3).

<sup>444</sup> 79 Fed. Reg. at 36,900-12.

<sup>445</sup> 79 Fed. Reg. at 36,920.

cancer risk it has found.<sup>446</sup> Because even a small amount of additional cancer risk from the unaccounted-for and underestimated fugitive emissions would push the overall health risk number above 100-in-1 million, which is EPA’s presumptive acceptability benchmark, EPA must set standards to reduce fugitive emissions under § 7412(f)(2). EPA is legally required to prevent all unacceptable risk, and thus it has no valid excuse for not setting fugitive emission standards to ensure they do not cause risk to reach levels EPA considers unacceptable. Moreover, even if fugitive emissions did not cause risk to reach levels EPA considers unacceptable, EPA still must provide an “ample margin of safety to protect public health” under § 7412(f)(2). EPA is taking comment on whether to find risk unacceptable, in view of all of the factors it outlines in the proposed rule preamble.<sup>447</sup> Its concerns about inadequately controlled fugitive emissions provide an additional reason to find that risk unacceptable.

**B. EPA must require reductions in emissions from equipment leaks and wastewater.**

For both equipment leaks and wastewater, EPA has found that “developments” have occurred in practices, processes, and control technologies within the meaning of § 7412(d)(6).<sup>448</sup> Yet in both instances, EPA has proposed not to strengthen the existing standards for these emission points at all. It would be unlawful, arbitrary, and capricious for EPA not to set stronger standards for these emissions. As described above, when developments occur, § 7412(d)(6) requires EPA to set revised standards. And, as also explained above, when EPA promulgates such standards, it must follow § 7412(d)(2)-(3) which apply to “emissions standards promulgated under this subsection,” *i.e.*, § 7412(d). *See* Part I.B, *supra*.

In addition, EPA has recognized that these sources drive the health risk EPA found under § 7412(f)(2).<sup>449</sup> Therefore, under § 7412(f)(2), EPA must reduce all unacceptable risk – which it has underestimated and should find to be unacceptable here – and set stronger standards to assure an “ample margin of safety to protect public health” from these sources. EPA’s purely cost-based reasons for not updating the equipment leak and wastewater standards are both inconsistent with the text and purpose of the Act, as cited above, and are irrational based on the record showing that methods to reduce emissions from these sources are available, are in use, and are not cost-prohibitive. Further, EPA should not use a cost-per-ton test to assess the value of HAP reductions. As the reference exposure values show the pollutants emitted by these sources are harmful at levels well below 1 ton, and even 1 pound – at the level of micrograms –

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<sup>446</sup> 79 Fed. Reg. at 36,934 (stating that the lifetime cancer risk is “driven by emissions of benzene and naphthalene from refinery fugitives”).

<sup>447</sup> 79 Fed. Reg. at 36,940.

<sup>448</sup> 79 Fed. Reg. at 36,915 (leaks), 36,919 (wastewater), 36,920 (wastewater and leaks).

<sup>449</sup> 79 Fed. Reg. at 36,934.

EPA has no valid basis not to acknowledge that it is indeed valuable to public health to reduce less than 1 ton of benzene and the other air toxics emitted by these sources.

## 1. Leak detection and repair.

### Developments

EPA estimates that there are 778 tons per year of hazardous air pollutant emissions coming from equipment leaks alone.<sup>450</sup> EPA also recognizes that there are now well-established processes and methods in use to reduce equipment leaks.<sup>451</sup> For example: “repair methods have improved and owners and operators have become more proficient at implementing those programs.”<sup>452</sup>

As the Office of Inspector General summarized, EPA consent decrees since 2010 have required low-leak valves that “virtually eliminate pollutant leaks.”<sup>453</sup> EPA has made it a policy to require low-emission valves in decrees, and should do so also in this rule. Some examples include the following refineries, as well as numerous chemical plants.

- Hovensa.<sup>454</sup>
- BP Whiting.<sup>455</sup>
- Murphy Oil.<sup>456</sup>
- Shell Chemical.<sup>457</sup>
- Dow Chemical CD, EPA-HQ-OAR-2010-0869-0011.<sup>458</sup>

As EPA summarized in its memo on the uniform standards and certain chemical plant sources, additional developments have occurred that EPA has not acknowledged in this rulemaking – including: the use of low-leak technologies; lowering the leak definition for valves, connectors, and other equipment to 100 ppm; lowering the leak definition for pumps,

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<sup>450</sup> EPA Memo, Impacts for Equipment Leaks at Petroleum Refineries at 4, EPA-HQ-OAR-2010-0682-0207.

<sup>451</sup> EPA Region 5 Presentation, Low Leak Valve and Valve Packing Technology (Low-E Valve) 8/16/2011, EPA-HQ-OAR-2010-0869-0009.

<sup>452</sup> 79 Fed. Reg. at 36,915; Impacts for Equipment Leaks at Petroleum Refineries, EPA-HQ-OAR-2010-0682-0207.

<sup>453</sup> OIG Report (2014) at 7.

<sup>454</sup> Hovensa Consent Decree, *supra* note 119.

<sup>455</sup> BP Whiting Consent Decree, *supra* note 117, at V.K.

<sup>456</sup> Murphy Oil Consent Decree, *supra* note 119.

<sup>457</sup> Shell Deer Park Consent Decree, *supra* note 117, at V.M.

<sup>458</sup> DOW Chemical Consent Decree, *supra* note 119.

compressors, and pressure relief devices to 500 ppm; and requiring tighter timelines for minimization of leaks to within 24 hours of identification and repairs within seven days.<sup>459</sup>

Stronger LDAR requirements are in use in air districts in California.<sup>460</sup> Their use show sources can achieve much greater emission reductions from leaks than EPA is proposing to require here, and can do so while operating, without problematic costs.

In addition to these developments, in recent decades EPA discovered flagrant, industry-wide violations of several CAA requirements at the nation's refineries.<sup>461</sup> Among the most significant violations were LDAR rule violations where refiners, and independent contractors hired by refiners, routinely underreported by up to 10 times the number of leaking valves, which resulted in significant excess emissions. The ensuing enforcement actions led to 29 settlements with operators, comprising over 90 percent of the refining capacity in the country. These settlements required improved LDAR practices, including lower leak detection limits, \$82 million in fines and \$75 million in Supplemental Environmental Projects. This experience demonstrates a need for detailed independent oversight of LDAR activities.<sup>462</sup>

### **EPA's Duties**

In view of these facts, EPA must strengthen the leak detection and repair standards as follows. Contrary to the evidence showing leaks can be prevented and minimized, and contrary to the legal requirements, the existing standards allow leaks up to 10,000 ppm. This allows an unlimited amount of toxic air pollution to go into the atmosphere without any controls.

As a legal matter, the bottom line is that a leak is a type of malfunction. Leaks include emissions that are generally preventable and should not happen. EPA may not lawfully allow any leaks in any amount. As EPA recognizes, uncontrolled emissions are unlawful, as are exemptions in the standards for any kind of emissions such that the standards do not apply continuously.<sup>463</sup> Thus EPA's proposal not to change the leak definition to recognize leaks of all sizes as a problem that must be corrected violates the Act. It is an exemption for malfunction emissions: Leaks are uncontrolled emissions of hazardous air pollutants that do not represent proper operation. Authorizing facilities to leak below a given threshold, and to do so without repairing or ending the leak, means that EPA's standards do not apply continuously, as the Act

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<sup>459</sup> Analysis of Emissions Reduction Techniques for Equipment Leaks, EPA-HQ-OAR-2010-0869-0029 (uniform standards docket); Supplemental Technology Review for Equipment Leaks in Group IV Polymers and Resins, Pesticide Active Ingredient Production, and Polyether Polyols Production Source Categories (Jan. 31, 2014), EPA-HQ-OAR-2011-0435-0082.

<sup>460</sup> See, e.g., BAAQMD and SCAQMD Rules, provided in Appendix; See Buckheit Report (Nov. 2011), *infra*

<sup>461</sup> <http://www.epa.gov/compliance/resources/cases/civil/caa/oil/index.html>;  
<http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/emissions.pdf> (attached in Appendix).

<sup>462</sup> As does the recent Pelican refinery criminal prosecution in Louisiana.

<sup>463</sup> 79 Fed. Reg. at 36,900 n.25; Nat'l Lime Ass'n; Sierra Club v. EPA, 551 F.3d at 1028; 42 U.S.C. § 7602(k).



requires. EPA must finalize a rule that sets a leak prohibition and establishes up-to-date, stronger leak detection and repair requirements.<sup>464</sup>

On each of the below issues, it also would be arbitrary and capricious for EPA not to finalize LDAR requirements that are at least as stringent as the BAAQMD rules that currently cover 5 refineries with over 200,000 components.

**a. EPA must reduce the leak definition, and aim to achieve zero leaks.**

EPA proposes to retain the very high leak definition of 10,000 ppm for valves and pumps at existing sources and 1,000 ppm for valves at new sources.<sup>465</sup> But as EPA describes, sources have implemented and can implement a lower leak definition, to prevent harmful emissions from occurring from such leaks. EPA and other governmental entities have also set a lower leak definition by regulation, and EPA must review and should decide to set similar requirements here. For example, in the oil and gas rules, EPA finalized a leak definition of 500 ppm for valves at both new and existing sources at natural gas processing plants and equipment leaks.<sup>466</sup> Air districts have even stronger, lower leak definitions.<sup>467</sup>

**b. EPA must set a leak limit based on the use of leakless valves.**

EPA must review the data it has collected for this rulemaking and compliance reports filed by the industry, within the possession of its enforcement division, and determine the best performers on the basis of the sources that consistently have the lowest leak detection levels, the fewest leaks, and the smallest percentage of unrepairable leaks, which in many instances should be zero. EPA must then set standards to follow the Act's requirements to limit leak emissions, under 42 U.S.C. § 7412(d)(2)-(3).

Sources must be required to follow leak standards based on currently available "zero emissions technologies," and practices, at a minimum, as demonstrated by the best performing sources. Leak-free pumps are available technologies and reflect developments within the meaning of § 7412(d)(6) that EPA is required to consider and that require updates to the existing equipment leak standards. EPA must review these technologies, including but not limited to

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<sup>464</sup> In addition to the documents cited herein, we have also attached and incorporate by reference the discussion of developments and leak detection and repair methods discussed by the Bruce Buckheit Report on oil and gas, as all or many of the same problems are issues that EPA must address in this rule for Refineries. *See* Buckheit Report (Nov. 2011).

<sup>465</sup> 79 Fed. Reg. at 36,915.

<sup>466</sup> 77 Fed. Reg. at 49,502, 49,545.

<sup>467</sup> *See* Bay Area Air Quality Management District and South Coast Air Quality Management District Rules, attached in Appendix, <http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx>; <http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book>.

leakless valves and improvements in practices that reduce the number of leaks by using a greater percentage of other kinds of leakless devices.

At minimum, EPA must require that when leaks are detected and must be repaired, existing refineries should be required to install leak-less or “low-emission valves,” just as EPA’s enforcement division requires in various consent decrees.<sup>468</sup>

EnCana – a natural gas firm – promotes a product for its pilot valves that it claims eliminates all leaks from those valves. The leak rate on a conventional pilot valve is 7.9 liters per minute, which calculates to 147 mcf (or 147,000 cubic feet) per year. According to EnCana, a WellMark Mizer Low Bleed Level Control has a leak rate of 0 liters per minute.<sup>469</sup>

**c. EPA Must Set a Definite Leak Repair Deadline and May Not Allow Indefinite Leaks.**

The current rules allow sources to delay and defer leak repair indefinitely, which is an unlawful malfunction exemption.

In particular EPA proposes to continue to rely on 40 C.F.R. Part 60, Subpart VV, and Part 63, Subpart HH, which contain a number of deferred monitoring and repair provisions that are unlawful exemptions that EPA must remove. For example:

1. Although the standards generally set deadlines to repair leaks, EPA allows the “delay of repair” through until “the end of the next process unit shutdown,” if repair within 15 days “is technically infeasible without a process unit shutdown,” and even beyond the next shutdown.<sup>470</sup> That is equivalent to an indefinite delay – which can go on for years, and allow a large, unlimited amount of HAPs to leak in the meantime.
2. The rules do not actually require repair of and an end to the leak. They state only that: “[i]f action is taken to repair the leaks within the specified time, failure of that action to successfully repair the leak is not a violation of this subpart.”<sup>471</sup> That is an unlawful exemption for a malfunction, *i.e.*, an unrepaired leak.
3. EPA exempts from monitoring all valves that an existing source designates as “difficult to monitor,” and all valves at a new source that are so designated as long as at a new source, these are less than 3 percent of the total number of valves.<sup>472</sup> There

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<sup>468</sup> See BP Whiting Consent Decree, *supra* note 117, at V.K.; Flint Hills Resources Consent Decree, *supra* note 117, at V.; Chevron Consent Decree, *supra* note 117, at V.M.; Sinclair Consent Decree, *supra* note 117, at V.N.;

<sup>469</sup> EPA Gas Star, Encana Presentation, <http://www.epa.gov/gasstar/documents/workshops/2008-tech-transfer/rocksprings3.pdf> (last accessed Nov. 13, 2011).

<sup>470</sup> 40 C.F.R. § 63.171 (Standards: Delay of repair).

<sup>471</sup> 40 C.F.R. § 63.162(h).

<sup>472</sup> 40 C.F.R. § 63.168(i).

is no limit on the valves an existing source can exempt from monitoring – which is equivalent to exempting them from the emission standards, because if they are not monitored, they are not likely to be found to be leaking.

4. EPA also completely exempts all valves a source designates as “unsafe-to-monitor,” again with no limits.<sup>473</sup>
5. EPA also provides an option for sources to reduce performance monitoring in exchange for keeping equipment leaks below 2 percent, 1 percent, or lower, or keeping pump leaks below 10 percent or 3 pumps.<sup>474</sup> EPA even allows sources to ignore 1 percent of leaks as part of calculating their leaks.<sup>475</sup> This is an unlawful exemption that does not contain any cap on the amount of HAP emissions which may result, and appears to have been done as a matter of routine, without any consideration of the public health impacts or any determination of how 2 percent compares to the leak rates achieved by the best performing facilities.
6. Many of the same exemptions are part of the Subpart CC alternative provisions – such as 40 C.F.R. § 63.649(e), and allow sources to continue leaks indefinitely “if repair is not technically feasible by normal repair techniques without a process unit shutdown.”

Each of these provisions, and all others throughout the rules applicable to refineries, are unlawful exemptions for leaks, which are a kind of malfunction. These provisions violate the Act’s requirement in 42 U.S.C. § 7602(k) that the standards apply at all times.<sup>476</sup> EPA must remove all leak deferral exemptions from the LDAR provisions, just as it is proposing to remove all other unlawful exemptions. EPA must set a firm, enforceable deadline for the repair of all leaks found.<sup>477</sup> EPA must not exempt any valves, connectors, or other equipment from the leak detection and repair standards and requirements.

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<sup>473</sup> See, e.g., 40 C.F.R. § 63.168(h).

<sup>474</sup> 40 CFR § 63.175 (Quality Improvement Program for valves); 63.168(d) (providing less monitoring for sources with lower percents of leaking valves); 40 CFR § 63.176 (“The owner or operator shall comply with the requirements of this section until the number of leaking pumps is less than the greater of either 10 percent of the pumps or three pumps, calculated as a 6-month rolling average, in the process unit (or plant site)”).

<sup>475</sup> *Id.* § 63.168(e) (equation).

<sup>476</sup> *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008).

<sup>477</sup> For example, “as soon as practicable, but no later than 15 calendar days after the leak is detected,” and where “[a] first attempt at repair shall be made no later than 5 calendar days after the leak is detected.” 40 C.F.R. § 63.649(c)(3).

**d. Optical gas imaging.**

EPA proposes to allow use of optical imaging as an alternative, once EPA sets a protocol for using such technologies (to become Appendix K to 40 C.F.R. Part 60).<sup>478</sup> EPA should take this action now. It has no valid grounds to delay. It is creating a protocol for fence-line monitoring, and should also finalize this protocol.

Ultrasound and optical scanning or imaging programs can and should be a part of an overall improved LDAR program.<sup>479</sup> These devices can provide an extremely low cost means of filling LDAR program gaps. Daily or weekly scans can identify plant areas containing significant emissions for targeted LDAR inspections. Such inspections could save operators money by detecting leaks early, while improving the environmental performance of the facility. In addition, even well-designed LDAR programs do not require monitoring of all devices at a facility (*e.g.*, leakless valves). Remote scanning devices can serve to identify problem areas that may require more frequent monitoring and areas which, though not currently monitored, are significant sources of HAP emissions. When optical gas imaging is used, EPA should require reporting of results of such scans, to ensure that there is oversight if this LDAR method is used.

**e. EPA has no valid basis not to update the LDAR standards.**

Specifically, EPA states that the annualized cost and “cost effectiveness,” or dollar per ton of HAPs reduced, under available methods to reduce emissions from these sources was not “necessary.”<sup>480</sup>

But CAA § 7412(d)(6) does not authorize EPA to refuse to update standards based on cost. Where “developments” have occurred, EPA must “account” for those. The D.C. Circuit has held that, when setting revised air toxics standards, EPA may consider cost, but it has not held that EPA may not update a standard, at all, as it proposes to do for leaks and wastewater, based on cost. That Court has recognized that “developments” are the core requirement of this provision.<sup>481</sup> Thus, if they are present, EPA must set revised standards. Further, in Commenters’ view, the D.C. Circuit’s holding on cost in *Association of Battery Recyclers v. EPA* was wrongly decided.<sup>482</sup> Notwithstanding that decision, EPA should decide to follow the plain text of § 7412(d)(2)-(3) of the Clean Air Act and applicable precedent requiring explicit authorization to consider cost. Commenters continue to advocate for the agency to follow both the letter and spirit of the law in setting revised standards.

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<sup>478</sup> 79 Fed. Reg. at 36,917.

<sup>479</sup> 79 Fed. Reg. at 36,916.

<sup>480</sup> 79 Fed. Reg. at 36,916, 36,919.

<sup>481</sup> *NRDC v. EPA*, 529 F.3d 1077, 1084 (D.C. Cir. 2008).

<sup>482</sup> *ABR v. EPA*, 716 F.3d 673 (D.C. Cir. 20132003); *NASF v. EPA* Opening and Reply Briefs of Environmental Petitioners.

In addition, EPA's cost-focused analysis ignores the statutory objective of assuring the "maximum" achievable degree of emission reduction provided in 42 U.S.C. § 7412(d)(2) and implemented through the review required by § 7412(d)(6). It also ignores the statutory goal of protecting public health, which is the core purpose behind this provision and the stated purpose of 42 U.S.C. § 7412(f)(2). Thus, EPA's proposed inaction is unlawful, arbitrary, and capricious because it ignores key statutory purposes that are required factors to consider.

EPA does not acknowledge that the fact that many sources have already complied with stronger LDAR provisions in the CA air districts and under EPA consent decrees. This shows that such requirements are technologically and economically feasible. EPA's cost analysis ignores this whole part of the picture of sources that have already complied in an economically successful way, and it is thus arbitrary and incomplete.

Moreover, EPA's analysis ignores the positive economic impact that rule improvements can have. For example, in regard to the power plants air toxics rule, the Economic Policy Institute found a significant increase in job creation.<sup>483</sup>

As another problem, EPA's decision to make cost-per-ton the standard-setting criterion and to choose a number it deems unreasonable, without a rational explanation, is arbitrary and capricious. The cost-per-ton of reduction says nothing about whether a stronger standard is feasible. This analysis does not consider at all whether the industry could easily bear the costs of additional controls that would strengthen emission reduction and health protection. The analysis of economic impacts of the rule EPA decided to promulgate shows that most of the firms with regulated facilities are well-prepared to take on some additional cost in order to reduce leaks. Even the 35 refineries owned by companies EPA considers to be "small businesses," "earned an average \$1.36 billion of revenue per year."<sup>484</sup> EPA does not claim, and could not plausibly claim, that this industry cannot afford to prevent, detect, or repair leaks to reduce the toxic air pollution nearby communities must breathe.

Cost-per-ton, alone, says nothing about health risk. A ton of hazardous air pollution is a very large amount. EPA's own risk assessment shows that the pollutants emitted by these source categories are known to be hazardous at an exposure level of micrograms or less.<sup>485</sup> The carcinogens emitted – *e.g.*, benzene, formaldehyde, naphthalene – have no safe level of exposure.

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<sup>483</sup> Josh Bivens, Economic Policy Inst. Briefing Paper, A lifesaver, not a job killer; EPA's proposed "air toxics rule" is no threat to job growth (June 24, 2011), [http://www.epi.org/publication/a\\_life\\_saver\\_not\\_a\\_job\\_killer](http://www.epi.org/publication/a_life_saver_not_a_job_killer).

<sup>484</sup> Memo, Economic Impact Analysis, Petroleum Refineries (Feb. 2014) (-0228), at 4-21.

<sup>485</sup> See Draft Risk Assessment (-0225) (providing EPA's dose response values for pollutants); see also Cal. OEHHA Consol. Table of OEHHA-ARB Approved Risk Assessment Health Values (last updated July 3, 2014).

Further, no two hazardous air pollutants create the same health risks, and reducing tons of one pollutant does not produce the same benefit as reducing tons of another.<sup>486</sup> Treating a ton of one hazardous air pollutant or combination of pollutants like a ton of any other hazardous air pollutant is not supported by the data showing how toxic the emitted pollutants at issue here are at low levels of exposure. The value of removing the HAPs emitted by these sources from the air cannot be expressed in dollars per ton, or dollars per pound for that matter. EPA should not base its final standards on cost-effectiveness at all; the agency's job is simply to determine the "maximum" degree of reduction that can be achieved considering cost, under 42 U.S.C. § 7412(d)(2), and to assure an "ample margin of safety to protect public health" under 42 U.S.C. § 7412(f)(2). But if EPA wishes to consider cost-effectiveness in any meaningful sense, it cannot rely on dollars per ton figures, which say virtually nothing about the true effectiveness of reducing emissions of highly toxic pollutants emitted here, in terms of public health – which is a key factor missing from EPA's analysis.

Thus it was arbitrary and capricious for EPA to decide that it was not necessary to update the standards to account for developments in LDAR based on cost.

Moreover, the cost EPA found here is lower than other rules where EPA has determined the cost-per-ton to be appropriate. EPA found a cost-effectiveness of \$14,100/ton of HAP (overall, with VOC recovery credit), which is only \$7.05 per pound of HAP reduction from the leak definition reductions it considered (a reduction to 500 ppm for valves, 2,000 ppm for pumps).<sup>487</sup> EPA found the annualized cost with recovery credits would be \$340,000/year. EPA proposes that this is too costly.

But even in this rule, EPA found higher annualized costs were appropriate. For example, for storage vessels, EPA recognizes that an annualized cost of \$36.3 million/year is appropriate for the flare provisions, and Commenters agree. That is orders of magnitude higher than the annualized costs of the leak reduction provisions EPA proposes to reject.

And, EPA has recognized as appropriate or cost-effective much higher cost-per-ton ratios. For example, in the secondary lead smelting rule, EPA determined that the following cost-per-ton measures were appropriate: \$0.33M/T (\$170/lb) (for stack lead emission limit); \$1M/T (\$500/lb) (for enclosure requirements); \$1.5M/T (\$550/lb) (for fugitive control work practices).<sup>488</sup> As EPA stated in the preamble to that final rule:

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<sup>486</sup> See, e.g., Cal. OEHHA Consol. Table of OEHHA-ARB Approved Risk Assessment Health Values (last updated July 3, 2014) (showing various values, and cancer potency factors for various pollutants).

<sup>487</sup> 79 Fed. Reg. at 36,916 tbl.6.

<sup>488</sup> National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting, 77 Fed. Reg. 556, 576 (Jan. 5, 2012).

The EPA notes that the cost effectiveness of the controls for stack emissions of metal HAP are within the range of values the agency has determined to be reasonable in other section 112 rules. Indeed, EPA determined that a value of \$175 per pound of metal HAP removed was reasonable when determining standards for the iron and steel foundry source category, an area source standard . . . . See 73 FR at 249. Thus, EPA regards the cost effectiveness of the standards for metal HAP here as reasonable, for purposes of the standards adopted pursuant to sections 112(f)(2) (ample margin of safety determination) and 112(d)(6). The measures required to control fugitive emissions are also cost effective, based largely on the fact that much of the industry has implemented some or all of the measures required in this final rule.<sup>489</sup>

EPA has failed to show why the cost-HAP reduction ratios it has found here are inappropriate, and failed to show why further reductions are not required to satisfy § 7412(d)(6) and 7412(f)(2). In view of the fact that EPA has found higher cost-reduction ratios appropriate, it is especially arbitrary and capricious for EPA not to require greater reductions here, when they are clearly achievable and would provide more protection for public health, as statutorily provided.

## **2. Wastewater treatment.**

EPA has acknowledged developments have occurred in controlling emissions from wastewater treatment.<sup>490</sup> EPA has no valid basis for rejecting requirements for drain and tank controls, specific performance parameters for enhanced biological units, and requiring wastewater streams to be treated with stream-stripping.

As discussed above in regard to leaks, § 7412(d)(6) does not allow EPA to ignore “developments.” It must “take account of” them and update the existing standards accordingly, as § 7412(d) requires.

EPA also has no lawful basis to refuse to update these standards at all based on cost. As described above, even assuming that EPA may consider cost (which Commenters dispute, as discussed above), the statute contains no authorization to place cost above the statutory objectives of § 7412(d).

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<sup>489</sup> *Id.*

<sup>490</sup> 79 Fed. Reg. at 36,918-19.

As a further problem, EPA proposes to use benzene as a surrogate for all other pollutants emitted by wastewater treatment.<sup>491</sup> The proposed rule includes only a conclusory statement to this effect, based on an outdated consideration of surrogacy from 1994.

The D.C. Circuit requires EPA to justify the use of a surrogate based on facts in the record. EPA has neither attempted to meet nor has it met the test to use a single pollutant to control other emitted hazardous air pollutants. A surrogate is reasonable only if it meets three conditions: (1) the target pollutant(s) must invariably be present in the surrogate; (2) the control technology used to control the surrogate must indiscriminately capture both the surrogate and the target pollutant(s); and (3) control of the surrogate must be “the only means by which facilities achieve reductions in the target pollutant.”<sup>492</sup>

In addition, EPA’s cost-based decision on wastewater is also arbitrary and capricious because EPA’s cost-effectiveness analysis for the various options it considered all produced cost per ton numbers that are well within the range it has found reasonable in other rules.<sup>493</sup> EPA found the options would range from: \$26,600/ton HAP (or \$13.30/pound) to \$54,500 /ton HAP (or \$27.25/pound). As summarized above, these numbers are well below numbers EPA has found cost-effective and appropriate in the secondary lead smelting rule.<sup>494</sup>

Even if EPA is legally justified in using a cost analysis, it must be based on sound data. In this case, EPA should have developed its analysis using the data from the 2011 ICR, instead, the agency relied on data that is incorrect and more than two decades old. Wastewater treatment system emissions are related to the total wastewater produced at the facility, the pollutant concentration in the wastewater, and the effectiveness of any controls applied. EPA developed model facilities to estimate these emissions.<sup>495</sup> EPA derived the HAP and benzene concentrations for its models from the 1998 *Locating and Estimating Air Emissions from Sources of Benzene*.<sup>496</sup> This document provides estimates for the benzene and HAP concentration of refinery wastewater treatment systems that is based the ICR EPA originally performed for the MACT 1 rule.<sup>497</sup> EPA’s more recent ICR data shows that refinery wastewater treatment systems have much higher benzene and HAP concentrations.<sup>498</sup>

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<sup>491</sup> 79 Fed. Reg. at 36,918.

<sup>492</sup> *Sierra Club v. EPA*, 353 F.3d 976, 984 (D.C. Cir. 2004) (quoting *Nat’l Lime Ass’n*, 233 F.3d at 639).

<sup>493</sup> 79 Fed. Reg. at 36,919.

<sup>494</sup> National Emissions Standards for Hazardous Air Pollutants From Secondary Lead Smelting, 77 Fed. Reg. 556, 576 (Jan. 5, 2012).

<sup>495</sup> See *supra* note 206,

<sup>496</sup> EPA, *Locating and Estimating Air Emissions from Sources of Benzene*, EPA-454/R-98-011 (Jun. 1998) available at <http://www.epa.gov/ttnchie1/le/>.

<sup>497</sup> *Id.* at 6-25 tbl. 6-10 .

<sup>498</sup> ICR Component 1, *supra* note 103, at 64 tbl. 15-2.



Furthermore, the *Locating and Estimating Air Emissions from Sources of Benzene* document omits several refinery processes that produce significant sources of wastewater and include benzene.<sup>499</sup> Also, EPA’s estimate of the control effectiveness of biological treatment process systems is inconsistent between EPA’s Technology Review for Industrial Wastewater Collection and Treatment Operations at Petroleum Refineries and EPA’s estimate of allowable emissions. In the Technology Review, EPA estimated that a properly operated EBU achieves about 88% control efficiency, but assumed that EBUs achieve 92% control efficiency in the allowable analysis.<sup>500</sup>

Use of these inconsistent numbers is arbitrary and capricious and either underestimates the benefits of better controls or underestimates exposure. EPA must revise its analysis to correct this error. Furthermore, EPA collected data on the control efficiency of EBUs as part of the 2011 ICR. EPA must review this information to determine the actual control efficiency of a properly operated EBU to determine the pollution control potential.

Finally, because EPA has recognized that wastewater is driving a significant amount of health risk, EPA must set standards to reduce these emissions under § 7412(f)(2) to provide the requisite “ample margin of safety.” As discussed above, EPA should find risk from these emission points unacceptable, and EPA also should reject its cost-based determination not to require more control from these sources, to assure the “ample margin of safety” requirement is met, for the reasons described above.

**C. EPA Must Require Flares To Achieve 98% Control Efficiency, Limit Routine Flaring, And Assure Continuous Compliance With All Applicable Limits.**

A flare is a combustion device often used to reduce benzene and other organic HAP emissions by combusting organic material and converting it into carbon dioxide.<sup>501</sup> EPA’s original rule required that miscellaneous process vents at refineries route organic HAP material to a flare prior to releasing it to the atmosphere.<sup>502</sup> EPA assumed that the combustion process

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<sup>499</sup> See T-4 Table C.

<sup>500</sup> See *infra* EPA’s Underlying Assumptions About Wastewater Treatment Systems Are Factually Incorrect. II.A.3.c

<sup>501</sup> EPA defines “destruction efficiency” as the percent of organic HAP material that is converted into Carbon Dioxide, Carbon Monoxide, or other non-HAP carbon compound through combustion. This is equivalent to a flare’s “control efficiency.” EPA defines combustion efficiency as the percent of organic HAP material that is completely combusted into Carbon Dioxide. Pursuant to EPA’s technical analysis, the destruction efficiency is approximately 0.015 times higher than the combustion efficiency if the combustion efficiency is equal to or less than 97.98%. The destruction efficiency of a flare that achieves 96.5% combustion efficiency assumed to be 98%. See Flare Impact Estimate, *supra* note 126, at 7-8.

<sup>502</sup> 79 Fed. Reg. at 36904.

would reduce emissions of HAP's and volatile organic compounds would reduce emissions at least 98% and set this as the control requirement.<sup>503</sup>

After a lengthy and intensive review of emissions test data, EPA has determined that when not operated and monitored properly, some refinery flares do not achieve anything close to this level of performance, leaving communities downwind exposed to much higher emissions of toxins and smog forming VOCs than allowed under the Refinery MACT 1 rule adopted in 1994. Accordingly, EPA is proposing new monitoring and operational requirements to assure that heat value in the combustion zone are high enough to destroy at least 98% of all hazardous air pollutants in vent gas that reaches the flare tip.

Commenters support the components of EPA's proposal on flares that would strengthen the operational and monitoring requirements, but believe that additional improvements are required under Sections 7412(d) and (f) of the Clean Air Act. Our comments are summarized below, and explained in greater detail in the discussion that follows.

1. EPA's finding that many flares do not consistently achieve 98% destruction efficiency is supported by numerous studies and extensive test data. The data show that current rules do not assure heat values in the combustion zone high enough to achieve the MACT 1 standard;
2. EPA's proposal reflects best practices already in place at many refineries and must be required pursuant to Sections 7412(d)(2),(3), and (6) of the Clean Air Act. For example, at least 7% of refinery flares are already required to determine the heat value in the combustion zone and comply with a minimum limit on the heat value, while, at least, nearly 20% monitor the composition of vent gas sent to flares;
3. EPA has understated the impact that its proposal will have in reducing allowable HAP and VOC emissions from flares by at least a factor of four;
4. The Agency must require the continuous monitoring of either the heat value or composition of flare gas, as infrequent monitoring will not assure compliance with the DRE standard and take other necessary measures to assure 98% destruction efficiency at all times;
5. EPA must also revise the standards to account for "developments" that improve emissions controls by eliminating or drastically reduce routine flaring.
6. Process gases are frequently routed to flares from heaters and boilers catalytic crackers, cokers and other production units during malfunctions. The HAP emission

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<sup>503</sup> *Id.*

rates from flares during such incidents may not be less stringent than the emission limits that apply to such units during normal operations.

7. EPA must set a limit on routine flaring that complies with Section 7412(d)(2)-(3) and 7412(f).

- 1. Flares Often Do Not Achieve 98% Destruction Efficiency Under Current Rules, Due to Low Heating Values in the Combustion Zone.**

EPA set the existing standard for miscellaneous process vents at 98% destruction efficiency, and determined that facilities could achieve this standard by utilizing a properly operated flare.<sup>504</sup> As discussed above, flares control emissions by burning the material routed to it. The existing operating requirements for steam-assisted flares sets a minimum heat value of 300 Btu/scf for vent gas routed to flares, and a minimum exit velocity when the gas exits the flare tip.<sup>505</sup> The heat value limit attempts to assure that gas routed to the flare is combustible. The exit velocity limit attempts to assure that the gas does not move past the combustion zone too quickly to burn properly.

Over the past twenty years, the petroleum refining industry has never questioned the ability of a flare to achieve 98% destruction efficiency. Certain facilities even report emissions assuming that the flare achieves 99% destruction efficiency or higher.<sup>506</sup>

EPA can rely on an extensive record to support its conclusion that some refinery flares do not destroy at least 98% of HAPs under current regulations. For example:

- 1) EPA evaluated test data for 38 steam-assisted flares submitted by the American Petroleum Institute, National Petrochemical and Refiners Association, and the American Chemical Society, and determined their average destruction efficiency was 93.9%.<sup>507</sup> That means HAP emissions were approximately three times higher than allowed under the MACT 1 performance standard in effect since 1994. An estimated 80% of the estimated 510 flares currently in operation are steam-assisted.<sup>508</sup>

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<sup>504</sup> *Id.*

<sup>505</sup> 40 C.F.R. § 60.18.

<sup>506</sup> See Cit-Con Oil Corporation, Initial Part 70 Operating Permit Application, 3-16 (Sept. 2006) available on Louisiana Department of Environmental Quality's (LDEQ) Electronic Document Management Server (EDMS) (Document ID 5476534); Marathon Ashland Petroleum LLC, Title V (Part 70) Operating Permit Application Part 3 of 3 Miscellaneous Emission Points, Appendix A, 137 (Sept. 2000) available on LDEQ's EDMS (Document ID 6652819).

<sup>507</sup> Flare Impact Estimate, *supra* note 126, at 5.

<sup>508</sup> *Id.*

- 2) Actual emissions can be measured at the flare tip through Passive Fourier Transformation Infrared Spectroscopy (PFTIR) and extractive measurements, and the results compared to the composition or heat value of flare vent gas to determine destruction efficiencies. EPA's record for this rulemaking includes 351 of these test runs during which the flare met existing requirements for vent gas heat value and exit gas velocity, and which were not flagged by EPA for having other data quality problems.<sup>509</sup> 201 of the test runs were performed at refineries. In both cases, the average destruction efficiency measured during these test runs was close to 92%, which means that flares released about four times the HAP and VOC emissions allowed under the 1994 standard. The 351 test runs identified by facility, test condition, and run number are attached.<sup>510</sup>
- 3) Evaluation of flare emissions at specific refineries shows that destruction efficiencies can be even lower. For example, at BP Whiting, EPA enforcement official Pat Foley calculated that the flares released 25 times more pollution than originally reported based on historical operating data.<sup>511</sup> At Marathon, the facility determined that its historical flare combustion efficiency ranged from 65-96% and that emissions were 11 times higher than originally reported across all of its refining operations (EPA's enforcement division determined that emissions were actually 12 times higher).<sup>512</sup>
- 4) Differential Absorption LIDAR studies in at facilities in Houston, Texas and Texas City, Texas both show that emissions flare control efficiency is often lower than previously thought and that actual emissions can be several orders of magnitude higher.<sup>513</sup>

**2. EPA's Proposed Work practice and Monitoring Standards are 112(d) "Developments" Required by Law and Supported by the Evidence, and Reflect Best practices at many Refineries today.**

Based on a comprehensive evaluation of PFTIR tests and other data, EPA has determined that heat value in the combustion zone is frequently too low to achieve the 98% destruction efficiency required under MACT 1. While the current rule sets a limit on the minimum heat value of the flare gas routed to the flare, PFTIR testing has revealed that it is even more

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<sup>509</sup> Parameters for Properly Operated Flares Appendix B, *supra* note 215, (EPA reviewed test data from refineries, petrochemical plants, and flare test sites. Appendix B shows all test runs that satisfied EPA's data quality requirements and complied with existing standards).

<sup>510</sup> *See* Table D, at T-5.

<sup>511</sup> Flare Impact Estimate, *supra* note 126, at 5.

<sup>512</sup> *Id.* at 5, & Attachment 5.

<sup>513</sup> BP Texas City DIAL, *supra* note 135; Shell Deer Park DIAL Study, *supra* note 139.

important to maintain a minimum heat value at the flare tip.<sup>514</sup> Current rules do not assure this minimum heat value because they do not take into account the air or steam added to vent gas before the combustion zone, which can dramatically reduce heat values at the point where gases are actually burned.

EPA has proposed closing this gap by requiring facilities to monitor either the composition or the heat value of vent gas that is routed to the flare.<sup>515</sup> But EPA's proposal would require refineries to maintain a minimum heat value in the combustion zone, and to determine those values after taking into account the cooling effect of steam or air added to vent gas before it is burned.<sup>516</sup> The last step is critical, as 90% of refinery flares are "assisted" by addition of steam or air.<sup>517</sup>

EPA's proposal to set limits on the combustion zone heat value for flares is supported by the data and required by law. Section 7412(d)(6) of the Clean Air Act requires EPA to revise National Emission Standards for Hazardous Air Pollutants to reflect "developments in practices, processes and control technologies," that can better control the release of HAP.<sup>518</sup> As discussed above, EPA determined that measuring the heat value of the flare gas, as it enters the flares, is insufficient to determine combustibility because facilities add steam and other gases not accounted for. Further, EPA's review of the flare performance data shows that the heat value of vent gas in the combustion zone must reach at least 270 Btu/scf, with a minimum of 380 Btu/scf for flares that vent hydrogen and olefin above certain level or in certain ratios.<sup>519</sup> The data shows that below this level of heat value, the control efficiency of the flares drops off significantly. For example, the Marathon tests showed DRE can drop to below 90 percent where combustion zone heat values reach 200 Btu/scf and lower.<sup>520</sup> As EPA has found, there are techniques and practices available and in use now that can assure proper combustion zone heat value, and these must be taken into account when revising standards under 7412(d). EPA's proposed operational limits on heat value in the flare gas in the combustion zone reflect these developments, as required under Section 7412(d)(6) of the Clean Air Act.

Some refineries already monitor vent gas flow rate and heat value. At least 86 refinery flares, pursuant to consent decrees, local air quality rules, or otherwise, continuously monitor the

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<sup>514</sup> 79 Fed. Reg. at 36907.

<sup>515</sup> *Id.* at 36982.

<sup>516</sup> *Id.* at 36907.

<sup>517</sup> Flare Impact Estimate, *supra* note 126, at 6.

<sup>518</sup> 42 U.S.C. § 74216(d).

<sup>519</sup> 79 Fed. Reg. at 36908, tbl. 3.

<sup>520</sup> Parameters for Properly Operated Flares Appendix B, *supra* note 215.

flare flow rate and heat value of the gas, using a calorimeter or gas chromatograph.<sup>521</sup> This is a necessary first step for determining if the heat value in the combustion zone of the flare is sufficient to assure 98% destruction efficiency. Pursuant to EPA consent decrees, 39 of these flares are also required to measure the steam or air input into the flare header to account for their effect when determining heat value.<sup>522</sup>

### **3. EPA Underestimates the Benefits of the Requiring Flares to Achieve 98% Destruction Efficiency.**

In this case, EPA has significantly underestimated the benefits of the proposed rule because the agency assumed that flares already achieve 93.9% destruction efficiency.<sup>523</sup> The agency derived this number from flare flow and operational data supplied by the industry.<sup>524</sup> The data provided by industry does not disclose if it is based on actual measurements or engineering estimates.<sup>525</sup> As discussed above, EPA has more accurate PFTIR showing that the destruction efficiency of flares is significantly lower.<sup>526</sup> Just taking the data EPA collected from the PFTIR tests shows that flares only reduce emissions by 92 percent. This would mean that the baseline emissions are actually 150% higher than EPA assumed based on 93.9% DRE.<sup>527</sup>

Evidence from specific refineries shows that destruction efficiency and assumed flare gas content is much lower than operators believe. Materials submitted by Marathon show that historical flare emissions were actually 12 times higher than reported because the facility assumed much higher heat value for the flare gas than reality.<sup>528</sup> This was based on Marathon's analysis of its historical data.<sup>529</sup> At BP Whiting EPA estimated that actual flaring emissions were 25 times higher than reported, meaning that the flare destruction efficiency was 50% on average (assuming BP originally reported emissions using 98% destruction efficiency).<sup>530</sup> Therefore it is arbitrary and capricious for EPA to rely on the industry's data when evidence

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<sup>521</sup> See BP Whiting Consent Decree, *supra* note 117; Marathon Consent Decree, *supra* note 117; Shell Deer Park Consent Decree; *supra* note 117; SCAQMD § 1118; SCAQMD, Control of Emissions from Refinery Flares (“Seven petroleum refining facilities (at eight locations), three hydrogen plants and one sulfur recovery plant within the South Bay region of Los Angeles County operate a total of 30 flares subject to the requirements of Rule 1118.”) available at <http://www.aqmd.gov/home/regulations/compliance/r1118>; Table E, T-14 (Identifying Texas flares that use gas chromatography to report emissions).

<sup>522</sup> See BP Whiting Consent Decree, *supra* note 117; Marathon Consent Decree, *supra* note 117; Shell Deer Park Consent Decree.

<sup>523</sup> Flare Impact Estimate, *supra* note 126, at 9.

<sup>524</sup> *Id.* at 6-8, Attachment 2.

<sup>525</sup> *Id.*

<sup>526</sup> Parameters for Properly Operated Flares, *supra* note 215; Table D, T-5, *supra* note 215.

<sup>527</sup> See *supra* note **Error! Bookmark not defined.** (showing that flare destruction efficiency is approximately 92%).

<sup>528</sup> *Id.* at Attachment 5.

<sup>529</sup> Flare Impact Estimate, *supra* note 128, at Attachment 5.

<sup>530</sup> *Id.* at 9.

suggests that it is inaccurate, especially when EPA has more accurate data and substantial enforcement-related experience and evidence on characterizing flare gas flow and composition.

Also, as discussed in Section II.A.3.a above, EPA has determined that refineries operating at 98% destruction efficiency emit approximately four times the quantity of VOCs per unit of heat input than reflected in the AP-42 factors that have been used to estimate flare emissions for decades. Presuming the same higher ratios apply to flares operating at lower DRE, then improving performance reduce VOC and organic HAP emissions by significantly higher amounts than EPA's analysis assumes.

#### **4. EPA Must Require Refineries to Continuously Monitor Flare Gas Flow and Heat Value.**

EPA correctly recognized that refinery flare operators must install and/or adopt better monitoring to assure flares are operated with the minimum heat rate needed to guarantee 98% destruction efficiency. But the current proposal would allow refiners the option to take a grab sample once every eight hours during a flaring episode,<sup>531</sup> and to use engineering calculations to determine flow rate.<sup>532</sup> EPA should eliminate this option and require continuous monitoring of either heat rate or vent gas composition. Already, more than 13% of refinery flares are subject to continuous monitoring requirements for flow rate and gas composition.<sup>533</sup>

Also, sampling the flare gas once every eight hours is insufficient to assure 98% destruction efficiency and compliance with the proposed requirements on heat value. EPA cannot authorize monitoring that is not sufficient to assure compliance.<sup>534</sup>

As EPA recognizes, the gas composition of refinery flare gas varies greatly over short periods of time.<sup>535</sup> Specifically, EPA states that:

“[Since] flare vent gas flow rates and composition can change significantly over short periods of time, a short averaging time was considered to be the most appropriate for assessing proper flare performance. Furthermore, since flare destruction efficiencies can fall precipitously fast below the proposed operating limits, short time periods where the operating limits are not met could seriously impact the overall performance of the flare. With longer averaging times, there

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<sup>531</sup> 79 Fed. Reg. at 36,982.

<sup>532</sup> *Id.*

<sup>533</sup> See *supra* note 521.

<sup>534</sup> *Sierra Club v. EPA*, 536 F.3d 673 (D.C. Cir. 2008) (While this decision applies to Clean Air Act Operating permits, it would be arbitrary and capricious for EPA to adopt a rule that does not require monitoring sufficient to assure compliance)

<sup>535</sup> Flare Impacts Estimate, *supra* note 126, at 3.

may be too much opportunity to mask these short periods of poor performance.”<sup>536</sup>

EIP’s analysis of flare emissions reporting from the Bay Area shows that emission rates and heat value of flare gas can change dramatically from one day to the next. For example, the adjusted VOC emission rate at Tesoro’s Main Flare was 0.15 lb/mmbtu on April 28, 2014, and 1.44 lb/mmbtu the following day.<sup>537</sup> Short term variations, *e.g.*, based on 15 minute averages, are likely to be even greater. The differences in daily emission rates reflect variations in the composition/heat value of vent gas, which will not be captured through infrequent grab sampling or emission factors that assume that the heat value of vent gas is static.

The EIP analysis of Bay Area refinery flare data accompanies this document as part of the appendix. The analysis is based on refinery reporting of total daily flow rates and emissions of non-methane hydrocarbons.<sup>538</sup> BAAQMD rules require facilities to report this data based on continuous monitoring or samples taken every 15 minutes to determine heat value.<sup>539</sup> To determine the VOC emission rate, EIP subtracted 12% of total reported NMHC to account for ethane, which is reported but not a VOC. EIP used 12% for ethane to match EPA’s modelling of the ethane content for evaluating the impacts of its proposed requirements.<sup>540</sup> Based on this EIP assumed that VOC emissions are 88% of the NMHC reported, after adjusting for ethane, and that daily heat rates average 1016 mmbtu/scf.<sup>541</sup>

Finally, EPA must demonstrate that monitoring requirements are sufficient to assure compliance.<sup>542</sup> The proposal option to allow grab sampling once every eight hours in lieu of continuous monitoring does not meet this standard because, in the Agency’s words, infrequent monitoring would “mask changes in flare performance” and fail to detect violations of the 98% DRE requirement established 20 years ago. The agency argues that the threat of enforcement will motivate most refiners to adopt controls that proactively assure 98% destruction efficiency.<sup>543</sup> This is not sufficient to assure compliance at all times.<sup>544</sup> It is important for EPA

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<sup>536</sup> 79 Fed. Reg. at 36909.

<sup>537</sup> Environmental Integrity Project, Analysis of Bay Area Flaring Data 2011-2013.

<sup>538</sup> BAAQMD, Emissions and Volume Trends, available at <http://www.baaqmd.gov/Divisions/Compliance-and-Enforcement/Refinery-Flare-Monitoring/Emissions.aspx>.

<sup>539</sup> BAAQMD, Regulation 12, Rule 11.

<sup>540</sup> Flare Impact Estimate, *supra* note 126, at 4, tbl. 2.

<sup>541</sup> EIP estimated the heat value of the flare gas based on the average amount measured during the test runs identified in Appendix B of Parameters for Properly Operated Flare Data.

<sup>542</sup> *Sierra Club v. EPA*, 536 F.3d 673 (D.C. Cir. 2008) (While this decision applies to Clean Air Act Operating permits, it would be arbitrary and capricious for EPA to adopt a rule that does not require monitoring sufficient to assure compliance); 42 U.S.C 7414(a)(3).

<sup>543</sup> See also 79 Fed. Reg. at 36909 (“The disadvantage . . . is that if a grab sample indicates non-compliance with operational limits, the permitting authority could presume non-compliance from the time of the previous grab sample indicating compliance.”).

<sup>544</sup> *Sierra Club v. EPA*, *supra* note 544.



to incorporate adequate monitoring in this rule to avoid having to review this issue case-by-case in the Title V context. EPA is already overburdened and has trouble responding to Title V petitions, raising concerns about monitoring, in a timely manner.<sup>545</sup>

In addition to the enhanced monitoring discussed above, EPA also must require the following measures. Each would help assure compliance with 98% destruction efficiency of flaring emissions using methods that are available and implemented at many refinery flares.

- Prohibit wake dominated flow flaring conditions.<sup>546</sup> Studies have shown that high winds can decrease flare destruction efficiency.<sup>547</sup> Several cities with significant refining capacity experience winds that exceed 20 mph on a frequent basis, especially in the California Bay Area. Wake dominated flow is already prohibited by several EPA refinery consent decrees.<sup>548</sup>

**Table G: Wind Data From Cities That Have Substantial Refining Capacity Within 100 Mile Radius.**<sup>549</sup>

City	State	2009-2013 No. of All Wind Measures (in mph)			2009-2013 Percent (%) of All Wind Measures (in mph)		
		≥ 20	≥ 22	≥ 25	% ≥ 20	% ≥ 22	% ≥ 25
Memphis	Tennessee	1,448	702	235	3%	1%	0.44%
Philadelphia	Pennsylvania	3,055	1,728	747	5%	3%	1%
San Francisco	California	6,184	3,687	1525	13%	7%	3%
Los Angeles	California	751	439	191	1%	1%	0.37%
New Orleans	Louisiana	1,826	894	349	3%	2%	0.65%
Houston	Texas	1,416	633	173	3%	1%	0.33%

- Video monitoring of flare tip for flame presence, smoking, and wake dominated flow.<sup>550</sup> Not following these reasonable, common-sense measures that have been

<sup>545</sup> See Environmental Integrity Project, EPA Response to Title V Petitions 1998 – 2014.

<sup>546</sup> See e.g., BP Whiting Consent Decree, *supra* note 117; Marathon Consent Decree, *supra* note 117.

<sup>547</sup> Reducing Emissions from Plant Flares, *supra* note 167 **Error! Bookmark not defined.**, at 1.

<sup>548</sup> See e.g., BP Whiting Consent Decree, *supra* note 117; Marathon Consent Decree, *supra* note 117.

<sup>549</sup> NOAA Quality Controlled Local Climatological Data (final), Hourly Observations at International Airports, <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

implemented without high costs by refineries through EPA Consent Decrees and in these local jurisdictions would be arbitrary and capricious.

- Monitoring of pilot gas. The Bay Area and South Coast Air Quality Management Districts (AQMDs) require this, and EPA has given no valid basis not to do so here.<sup>551</sup>

#### **5. EPA must also set standards that eliminate or drastically reduce routine flaring.**

Routine flaring can be eliminated and or using the utilization of readily available technology and better process management. EPA has acknowledged that some refineries have decreased their use of flares and are unnecessary to control routine flows from miscellaneous process vents.<sup>552</sup> As EPA stated: “Over the last decade, flare minimization efforts at petroleum refineries have led to an increasing number of flares operating at well below their design capacity.”<sup>553</sup> EPA’s analysis of the ICR data confirms that nearly 15% of ‘routine use’ flares utilize flare gas recovery to eliminate flaring during normal operations.<sup>554</sup>

As EPA has recognized, when considering whether or how to propose revisions to HAP floor standards, EPA must take into account “developments” that include, at least “[a]ny improvements in add-on control technology or other equipment . . . that could result in additional emissions reduction,” as well as any new controls, work practices, operational procedures, process changes or pollution prevention alternatives.<sup>555</sup> Generally in its § 7412(d)(6) rulemakings, EPA has recognized the need to consider factors listed in § 7412(d)(2), even though it has often refused to set an updated MACT floor or perform the statutory beyond-the-floor analysis as required by § 7412(d)(2)-(3).<sup>556</sup>

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<sup>550</sup> See BAAQMD § 12-11-507: requiring continuous video monitoring and recording for flares equipped with video monitoring and flares with vent gas more than 1million scf/day; SCAQMD Rule 1118(g)(7): requiring continuous video monitoring and recording; Marathon Consent Decree; BP Whiting Consent Decree; Shell Deer Park Consent Decree; Flint Hills Port Arthur Consent Decree.

<sup>551</sup> See BAAQMD § 12-11-504 (requiring monitoring of pilot gas); SCAQMD 1118(g)(8)(C) (requiring monitoring of pilot gas using flow meter or equivalent device).

<sup>552</sup> EPA Ofc. of Inspector General, Bryant, K., K. Butler, A. Creath, J. Harris, and J. Hart. (2004), EPA Needs to Improve Tracking of National Petroleum Refinery Compliance Program Progress and Impacts, Report No. 2004-P-0021, at 6 See, e.g., EPA, Ofc. of Reg. Enforcement 1:11, Frequent, Routine Flaring May Cause Excessive, Uncontrolled Sulfur Dioxide (2000)..

<sup>553</sup> 79 Fed. Reg. at 36,905.

<sup>554</sup> Flare Impact Estimate, *supra* note 126, at 16 tbl. 9.

<sup>555</sup> 79 Fed. Reg. at 36,900.

<sup>556</sup> See, e.g., Secondary Lead Smelting Rule, 77 Fed. Reg. 556 (citing § 7412(d)(2)); see *NASF v. EPA* briefs (attached).

In addition to what EPA has noted in the record, there is also other evidence of significant developments, within the meaning of § 7412(d)(6) on ways to reduce and prevent the use of flares. In particular:

- Flare Minimization Plans

EPA Consent Decrees, Subpart Ja and the Bay Area and South Coast AQMDs require facilities to submit flare minimization plans.<sup>557</sup> Based on publicly available data on the BAAQMD website, the BAAQMD rules have significantly reduced total flaring emissions.<sup>558</sup> As discussed below, the South Coast also requires the submission of plan if the annual flaring from a refinery exceeds a performance target.<sup>559</sup> EPA has started to collect these plans submitted under the NSPS and it must review and consider requiring flare prevention steps in this rulemaking.<sup>560</sup> As the NSPS applies only to new sources, and does not restrict HAPs, EPA cannot rely solely on those standards and must independently satisfy the requirements of § 7412(d) and (f) in this rulemaking. EPA must review this development and the available data to implement a similar requirement in this rulemaking.

- Prohibitions on Routine Flaring

EPA Consent Decrees and the Bay Area and South Coast AQMDs have some form of prohibition on routine flaring. The Bay Area prohibits flaring not identified in the flare minimization plan.<sup>561</sup> The South Coast AQMD has set flare performance targets to minimize routine flaring and requires facilities to submit a minimization plan if emissions exceed the target.<sup>562</sup> EPA's consent decree with BP Whiting required the facility to install flare gas

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<sup>557</sup> Marathon V.B; BP Whiting, Appendix D; BP Amoco, V.18.C; Shell Deer Park, V.C.35; Flint Hills Resources, IV.B.14, IV.D.; 40 CFR § 60.103a; BAAQMD § 12-12-208.

<sup>558</sup> See BAAQMD, Emissions and Volume Trends, Flare Emissions and Flaring Frequency and Magnitude Trends at Bay Area Refineries, <http://www.baaqmd.gov/Divisions/Compliance-and-Enforcement/Refinery-Flare-Monitoring/Emissions.aspx>.

<sup>559</sup> SCAQMD §1118(d).

<sup>560</sup> Shell Oil, Flare Minimization Plan for the Shell Oil Products US Martinez Refinery, Martinez, CA. (Docket ID. EPA-HQ-OAR-2007-0011-0406); ConocoPhillips, Flare Minimization Plan for the ConocoPhillips San Francisco Refinery, Rodeo, CA (Docket ID. EPA-HQ-OAR-2007-0011-0413); Petro Star Valdez, Flare Management Plan for the Petro Star Valdez Refinery, Valdez, AK (Docket ID. EPA-HQ-OAR-2007-0011-0414); Suncor, Flare Management Plan for the GBR Flare at the Suncor Commerce City Refinery, Commerce City, CO (Docket ID. EPA-HQ-OAR-2007-0011-0407); Hunt Refining, Flare Management Plan for the Hydrocracker Area Flare, Coker Area Flare, and Hydrobon Area Flare at Hunt Refining Company, Tuscaloosa, AL (EPA-HQ-OAR-2007-0011-0408); Valero Refining, Flare Minimization Plan for the Valero Refining Co, Benicia Refinery, Benicia, CA (EPA-HQ-OAR-2007-0011-0412); Continental Refining Co., Flare Management Plan for the Continental Refining Company Refinery, Somerset, KY (Docket ID. EPA-HQ-OAR-2007-0011-0411); BP Cherry Point, Flare Management Plan for the New #2 Hydrogen Flare at BP Cherry Point Refinery, Blaine, WA (Docket ID. EPA-HQ-OAR-2007-0011-0410); ConocoPhillips, Flare Minimization Plan for the ConocoPhillips Company, Wood River Refinery, Roxana, IL (Docket ID. EPA-HQ-OAR-2007-0011-0409).

<sup>561</sup> BAAQMD § 12-12-301.

<sup>562</sup> SCAQMD §1118(d).

recovery based on a design capacity that was sufficient to eliminate routine flaring.<sup>563</sup> Furthermore, the BP Whiting and Shell Deer Park consent decrees set hard caps on the total amount of gas each facility is allowed to release.<sup>564</sup> EPA must review these developments and techniques employed to reduce flaring and mandate similar requirements in this rule.

- Root Cause Analysis

EPA Consent Decrees, Subpart Ja and the BAAQMD require refineries to submit a root cause analysis for flaring events.<sup>565</sup> This is a method to reduce total flaring emissions. EPA must review this development to implement it in this rulemaking. The review must include all submissions it has received pursuant to consent decrees or the NSPS and also obtain any documentation available from the BAAQMD.

Flare prevention and minimization methods, including flare gas recovery systems, as described above in the “developments” summary, are well-proven as a way of reducing the use of flaring and preventing its routine use. EPA has data it has collected in the ICR to assess what sources have achieved, and assure the maximum achievable degree of emission reduction as § 7412(d)(2)-(3) require. Thus, sources have many available methods they can use to achieve a flare emission standard.

It is not sufficient for EPA to rely on the NSPS Subpart Ja requirements for new and modified flares to submit flare minimization plans and root cause analysis reports. First, section 7412(d)(2)-(3), (6) and (f)(2) are independent statutory requirements that apply to all existing refinery HAP sources, and EPA must comply with this statutory obligation. At a practical level, it is not clear from the record that EPA’s assumption that nearly all flares will already have to comply with the NSPS Subpart Ja requirements because of the “quick trigger” modification definition.<sup>566</sup> Also, if it is true that nearly all flares will already have to comply with these requirements, the costs of requiring it in this rule would be minimal. Therefore, EPA should apply a belt-and-suspenders approach and apply similar requirements here.

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<sup>563</sup> BP Whiting Consent Decree, *supra* note 117, Appendix D.D. EIP has additional information on file that can be provided on request.

<sup>564</sup> BP Whiting Consent Decree, *supra* note 117, Appendix D; Shell Deer Park Consent Decree, *supra* note 117, V.E.

<sup>565</sup> Marathon V.B; BP Whiting, Appendix D; Shell Deer Park, V.C.35; Flint Hills Resources, V.A.13.pp, Koch Petroleum Industries, VII.99; 40 CFR § 60.103a; BAAQMD § 12-12-208.

<sup>566</sup> Flare Impact Estimates, *supra* note 126, at 14.

**6. Commenters strongly support EPA’s proposed elimination of current loopholes that allow refinery gases to be vented directly to the atmosphere during malfunctions.**

As EPA recognizes, limits established under 112(d) of the Clean Air Act apply at all times. As *National Lime Ass’n v. EPA* recognizes, EPA must set limits on all HAP sources.<sup>567</sup> EPA’s proposal will close a regulatory gap that currently allows certain pressure release devices to vent emissions directly to the atmosphere during malfunctions.<sup>568</sup> Instead, EPA’s proposal will require refineries to monitor these emission sources and route their emissions to a flare.<sup>569</sup>

**7. EPA Must Prohibit the Use of Flares as a Backdoor Malfunction Exemption.**

The Clean Air Act requires that emissions standards apply at all times and prohibits exemptions for malfunction.<sup>570</sup> EPA’s proposal to allow facilities to route refinery fuel gas and miscellaneous process vent gas to flares caused by malfunctions would violate these requirements. As EPA recognizes, refinery fuel gas systems and refinery process units send gas to flares during process malfunctions, and other situations that cause overpressure in the fuel gas system.<sup>571</sup> EPA’s proposal to allow facilities to flare this gas is an unlawful malfunction exemption that cannot stand under the Act and D.C. Circuit precedent, as EPA’s own proposed rule recognizes in a general manner.<sup>572</sup> If flares are used during malfunctions, refineries bypass the optimal manner of control – near complete combustion in a heater or boiler or capture of the gas as saleable product. That is during normal operation, this gas is utilized for a productive purpose and not released into the atmosphere.

For example, some gas routed to flares comes from process upsets at FCCUs. Some of this gas would never have been released as pollution, but instead recovered as saleable product. The other portion that is combusted in the FCCU is subject to an independent limit on organic HAP emissions. Allowing these units to route emissions during malfunctions to flares, which when working properly achieve 98% destruction efficiency, illegally circumvents applicable requirements and creates a backdoor malfunction exemption.

Similarly, the refinery fuel gas system, during normal operations routes gas to heaters and boilers. EPA never set a HAP standard for the refinery fuel gas system because combustion in a heater and boiler achieve maximum control —properly tuned heaters and boilers combust 99.9%

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<sup>567</sup> 233 F.3d at 642.

<sup>568</sup> 79 Fed. Reg. at 36,912-13, 36,942.

<sup>569</sup> *Id.*

<sup>570</sup> 42 U.S.C. § 7602(k); *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008); *e.g.*, 79 Fed. Reg. at 36,942.

<sup>571</sup> *See, e.g.*, 79 Fed. Reg. at 36,913.

<sup>572</sup> 42 U.S.C. § 7602(k); *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008); *e.g.*, 79 Fed. Reg. at 36,942.

of all fuel carbon.<sup>573</sup> The performance target for flares is 98% combustion efficiency; meaning 2% of organic HAP is released. The 1.9% difference in combustion efficiency means that flares used to combust gas during a malfunction release nearly 2000% more HAP emissions than would have been released at a heater or boiler. Further, if the gas were recovered and processed into a saleable product, no emissions would be released at the refinery. Taking into account EPA's finding that refinery flares often achieve 93.9% destruction efficiency or lower, the difference between normal operations and malfunction emissions is even starker.

Not prohibiting the use of flares for process malfunctions would dwarf the important benefits of EPA's required removal of the general SSM exemption. Just as EPA recognizes the need to prohibit releases from pressure relief devices and bypass lines, EPA must recognize the need to prohibit flaring caused by malfunctions or set a limit on their emissions, to follow the Act and avoid taking arbitrary and capricious, inconsistent action in this rulemaking.

#### **8. EPA Must Prohibit or Limit Routine Flaring Pursuant to the Requirement to set a Technology Based Standard on Miscellaneous Process Vents**

To fully address problems with flaring that EPA has recognized and to fulfill its legal duties under the Clean Air Act, EPA must limit the routine use of flares to vent excess gas. Standards based solely on a single type of control technology, such as percent-reduction standards, rather than the emission reductions actually achieved by the best-performing sources, do not satisfy § 7412(d).<sup>574</sup> EPA's proposal to allow refiners to route unlimited gas streams to a flare does not comply with EPA's obligations under 42 U.S.C. § 7412(d)(2)-(3) to set standards based on the average emission limitation "achieved" by the best-performing sources and to assure the "maximum degree of reduction . . . that is . . . achievable." A standard based on flare efficiency is a specific technology limit, not an emission limit as the Act requires.<sup>575</sup> The requirement is based on the best operation that a flare can achieve -- not based on what the best-performing sources have actually achieved, including through flare reduction and prevention measures (such as reducing the flow of waste gas to flares). Pursuant to *National Lime Ass'n v. EPA*, the agency is required to limit the flow of gas routed to a flare.<sup>576</sup> Just as EPA has

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<sup>573</sup> EPA, Compilation of Air Pollution Emission Factors, Vol. I. Stationary Point and Area Sources, 1.4.3, tbl. 1.4-2 n. b.

<sup>574</sup> See, e.g., *Northeast Maryland Waste Disposal Authority v. E.P.A.*, 358 F.3d 936, 954-55 (D.C. Cir. 2004); *Sierra Club v. Environmental Protection Agency*, 479 F.3d 875 (D.C. Cir. 2007).

<sup>575</sup> *Id.*

<sup>576</sup> 233 F.3d 625, 634 (D.C. Cir. 2000).

recognized the need to set limits for other currently uncontrolled emissions, it must do the same for flared emissions.<sup>577</sup>

EPA has set a limit on flaring in the past, and this has held up in court even when an industry member claimed that this was inappropriate when flaring was the result of a malfunction.<sup>578</sup> Thus, setting such a limit in this rulemaking would also be consistent with EPA's own past policy and practice.

For all of these reasons, EPA must set a § 7412(d) standard for existing units that is at least as strong as the average emission limitation "achieved" by the top performing 12% of existing sources.<sup>579</sup> For new sources, the limit must be no less stringent than the flare reductions achieved by the best single existing source.<sup>580</sup> In considering this floor for the standard, EPA must review the available data from the ICR, EPA enforcement consent decrees, and flare minimization techniques required by the Bay Area and South Coast AQMDs. Specifically, the ICR data shows that nearly 15% of 'routine flares' have flare gas recovery systems to capture all routine waste gas flows.<sup>581</sup> This evidence shows flaring can be prevented in many instances, and at least dramatically reduced in others. This would assure meaningful reductions in toxic air pollution occur, by preventing routine, unnecessary flaring. As the best-performing sources are only flaring when and if this is necessary, following the § 7412(d) test will ensure that EPA brings all communities to, at least, the same "floor" level of protection that communities around those sources have already achieved.

## **9. EPA Must Limit Flaring Pursuant to Section 7412(f).**

In addition to, and independently from, its duties under § 7412(d), EPA must set a limit on flared emissions to meet its health-based obligations under § 7412(f)(2) of the Act, while maintaining the critical requirement that flares achieve 98% destruction efficiency. Flares are creating health risks, which are contributing to the level of risk EPA should find to be "unacceptable," as described above. This is particularly because under the existing standards they can be and are used routinely, in an unlimited way, to emit HAPs into communities already overburdened by refineries' and other sources' toxic air pollution. As EPA recognizes, flares often do not combust efficiently, and its consideration of risk from flares is substantially

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<sup>577</sup> See, e.g., 79 Fed. Reg. at 36,900 n.25; *id.* at 36,902 (proposing limit on delayed coker unit emissions that "are currently unregulated emissions"); *id.* at 36,904 (proposing to remove exemption for active purging depressurization from catalytic reforming unit vents).

<sup>578</sup> *Montana Sulphur & Chemical Co. v. U.S. E.P.A.*, 666 F.3d 1174, 1193 (9th Cir. 2012) (holding that "the EPA reasonably interpreted the Clean Air Act to require continuous limits on emissions and that the actual numerical limits imposed by the FIP [Federal Implementation Plan] are neither arbitrary nor capricious").

<sup>579</sup> 42 U.S.C. § 7412(d)(2)-(3).

<sup>580</sup> *Id.* § 7412(d)(3).

<sup>581</sup> Flare Impact Estimate, *supra* note 126, at 15 tbl. 8.

underestimated, as described above and in these comments. Also, as explained below, actual releases of VOC's and HAPs are likely at least four times higher than EPA has assumed in its proposal (based on the revisions EPA proposed in September for flare emission factors).

Even if EPA deems flares not to be contributing to unacceptable risk, the data EPA has compiled on flare over-use, and flares' inefficiency is reason, alone, to require all of the above operational and monitoring requirements and set a limit on flares. These requirements are already in use, demonstrated methods to achieve greater health protection. Many refineries have agreed to them in consent decrees, showing that they are not cost-prohibitive (even assuming cost could be required, which Commenters dispute). Thus, all of the flare requirements described above, including a limit on flared emissions, are needed to assure the requisite "ample margin of safety to protect public health" as the Act requires.<sup>582</sup> Allowing flares to emit an unlimited amount of toxic air pollution into the air directly contradicts and violates the Act's plain requirement to assure an "ample margin of safety to protect public health." EPA can have no valid justification for claiming that it has met this requirement when it has set no limit, much less a margin of safety-based limit, on the amount of toxic air pollution that flares can emit.

#### **D. Fluid Catalytic Cracking Units (FCCUs)**

##### **1. EPA Must Set Standards to Limit Hydrogen Cyanide.**

EPA must set stronger standards on FCCU emissions. In particular, based on the information collected for this rulemaking, EPA found that FCCUs release high amounts of hydrogen cyanide: with reported "actual" HCN emissions of 3,682 tons per year, which is 7,364,000 pounds per year.<sup>583</sup> EPA's 2011 ICR makes apparent that FCCUs release high levels of HCN and that the chronic non-cancer risk EPA found is "driven by emissions of hydrogen cyanide from catalytic cracking unit vents."<sup>584</sup> EPA has never set standards on HCN emissions from FCCUs and must do so to satisfy its legal duties, pursuant to 42 U.S.C. § 7412(d)(2), (3), and (6) and § 7412(f)(2).

The attached report (Fox Report, attached as Addendum C) from expert Dr. Phyllis Fox, P.E., shows that:

a. EPA must set an emission limit specifically controlling and reducing hydrogen cyanide (HCN) from fluid catalytic cracking unit (FCCU) vents to satisfy its legal duties in this rulemaking under both 42 U.S.C. § 7412(d) and § 7412(f).

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<sup>582</sup> 42 U.S.C. § 7412(f)(2).

<sup>583</sup> Draft Risk Assessment (-0225) at 33.

<sup>584</sup> *Id.* at 38.



EPA must set a limit on hydrogen cyanide because it is unlawful for EPA to have no limit for a § 7412-listed pollutant, or to set a standard that allows for no control.<sup>585</sup> EPA's existing standards set no such limit. Thus, under § 7412(d)(2)-(3), EPA is required to set a standard that is based on the average emission limitation achieved by the best-performing sources (floor), and assure the maximum achievable degree of emission reductions for HCN releases from FCCUs (beyond-the-floor).<sup>586</sup> Section 7412(d)(2) and (3) require EPA to set an emission standard for HCN emissions for existing units that is at least as stringent as what is achieved by the best performing 12% of FCCUs nationwide. Also, EPA must set a standard for new FCCUs that is based on the single best performing unit. EPA's proposed action is unlawful because it does not meet these statutory requirements.

In addition and independently, EPA's risk assessment showed that the existing standards allow a high level of chronic non-cancer risk driven by HCN emissions. These risk data provide reason for EPA to find current health risk levels unacceptable, as discussed above. This information also provides reason for EPA to find that health-based standards are required to provide the statutorily-mandated "ample margin of safety to protect public health" under 42 U.S.C. § 7412(f)(2). It would be both unlawful and arbitrary and capricious for EPA to do as it proposes: ignore the health risks caused by HCN and refuse to reduce them, solely based on cost. As explained in the attached Fox Report, EPA's cost analysis is fundamentally flawed and overestimates cost. EPA may not make its ample margin determination based on cost as the primary factor, as it proposes to do here. And it may not use a cost-per-ton metric for a HAP like hydrogen cyanide which is harmful at low levels of exposure.

b. EPA has no rational or lawful grounds to use carbon monoxide (CO) as a surrogate to control HCN.

EPA may not rely on the CO standards to limit HCN. A surrogate might be reasonable or lawful only if it meets three conditions: (1) the target pollutant(s) must invariably be present in the surrogate; (2) the control technology used to control the surrogate must indiscriminately capture both the surrogate and the target pollutant(s); and (3) control of the surrogate must be "the only means by which facilities achieve reductions in the target pollutant."<sup>587</sup> As shown in the attached Fox Report, none of these conditions is met in regard to CO and HCN, which is an inorganic nonmetallic hazardous air pollutant. EPA has not shown surrogacy is reasonable or lawful.

c. Selective catalytic reduction (SCR) is a reasonable and cost-effective method for controlling HCN.

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<sup>585</sup> *Nat'l Lime Ass'n*, 253 F.3d at 634.

<sup>586</sup> 42 U.S.C. § 7412(d)(2)-(3).

<sup>587</sup> *Sierra Club v. EPA*, 353 F.3d 976, 984 (D.C. Cir. 2004) (quoting *Nat'l Lime Ass'n*, 233 F.3d at 639).

Thus, as discussed in the Fox Report, even under EPA's flawed view of cost consideration and recognizing that cost may be considered only at the beyond-the-floor stage, EPA must set HCN standards under § 7412(d)(2)-(3) based on the HCN reductions sources have achieved and can achieve using SCR as well as other viable methods of HCN control.

d. EPA failed to review and consider other viable methods to control HCN and must do so to satisfy its legal obligations in this rulemaking.

Although as described below and further explained in the Fox Report, EPA may not rely on a CO standard to limit HCN, even if it could do so, EPA would be required to review and update that standard to consider developments in various HCN controls that are viable and available.<sup>588</sup> As discussed in the Fox Report, EPA has either failed to evaluate the effectiveness of those controls properly, or has ignored them completely.<sup>589</sup>

## **2. EPA Must Set Standards to Reduce HAP Emissions EPA Regulates Via the PM Standards for FCCUs.**

EPA failed to consider developments in pollution controls for other important HAPs from FCCUs and must review and consider additional control options. FCCUs are likely the greatest source of heavy metal and particulate emissions regulated by the refinery source category, including HAPs. EPA regulates metallic HAP from FCCUs using PM as a surrogate. In 2008 EPA adopted requirements to limit PM<sub>2.5</sub> to 0.5 pounds per 1,000 pounds of coke burned for new units, as a New Source Performance Standard (NSPS).

EPA reviewed the NSPS standard in this rulemaking but determined that requiring existing units to comply with this standard is not cost effective. EPA's analysis is inadequate for two reasons. First, cost is not a valid consideration to evaluate if a "development" in pollution control is necessary pursuant to § 7412(d)(2),(3),(6), unless EPA is setting a "beyond-the-floor" requirement. Second, EPA's review of developments is nearly 10 years old and misses some important pollution control improvements in the industry.<sup>590</sup> For example, Valero Benicia installed a combination of controls in 2012 including a scrubber, SCR and CO Boiler that combine exhaust streams from the FCCU and coking and reportedly eliminate emissions entirely from these sources.<sup>591</sup> EPA consent decrees also impose lower effective limits on PM. At BP Whiting, the facility is subject to 0.7 pounds of PM10 at one FCCU and 0.9 pounds of PM10 at

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<sup>588</sup> See Fox Report, attached in Addendum C.

<sup>589</sup> *Id.*

<sup>590</sup> 79 Fed. Reg. at 36929 (citing to the *Summary of Data Gathering Efforts: Emission Control and Emission Reduction Activities* (Aug. 2005) and *Review of PM Emission Sources at Refineries* (Dec. 2005)).

<sup>591</sup> Valero, Improvement Project: Addendum to VIP EIR, 2-18 (Jun. 2008), available at <http://www.ci.benicia.ca.us/vertical/sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/%7B5A35F17D-5E23-404C-8032-6597BE84B5F9%7D.PDF>.

another.<sup>592</sup> These limits are significantly lower than the 1.0 pound per 1000 pounds of coke burn limit currently mandated by 63 Subpart UUU because the PM<sub>10</sub> at BP Whiting is inclusive of PM<sub>2.5</sub>.<sup>593</sup>

### **E. Delayed Coking Units**

Commenters support EPA's determination to set a limit on delayed coking vents. These units are a very large source of toxic emissions from refineries and drive a significant part of the cancer risk from refineries.<sup>594</sup> EPA estimates that delayed coking units ("DCUs") release 4,760 tons of HAP pollution each year.<sup>595</sup> There is no emission limit for these units, as required by Section 7412(d)(2)-(3) of the Clean Air Act.<sup>596</sup> EPA's proposal will close this regulatory gap by prohibiting the depressurization of a delayed coking unit to the atmosphere until the internal pressure of the coke drum is 2.0 psig or lower.<sup>597</sup> As EPA's ICR analysis shows, more than 12% of existing coking units already achieve this limit.<sup>598</sup> Therefore, EPA has correctly determined that such a limit is required.

If, however, EPA were to decide for some (unlawful and arbitrary) reason not to set emission standards for DCUs under § 7412(d), however, it would still be required to do so to meet the health-based requirements of § 7412(f)(2). As EPA acknowledges, these emission points cause significant cancer risk and the reason EPA is proposing not to set additional § 7412(f)(2) standards to restrict these emissions is because of the § 7412(d) proposal. Thus, Commenters urge that EPA should also set § 7412(f)(2) standards for these emission points. The risk that EPA has assessed from them helps to show current health risks from refineries are unacceptable, as described above. And the fact that many sources have achieved much lower levels of toxic air emissions from DCUs shows that EPA must set standards for DCUs under § 7412(f)(2) in order to assure the requisite "ample margin of safety to protect public health."<sup>599</sup>

Evidence shows, however, that EPA must supplement this limit with an additional long-term standard on the annual average maximum pressure of the coking unit prior to release to the atmosphere. EPA's proposal is a short-term, never to be exceeded limit which is important. But available data show that the top performing 12% of coking units actually achieve much higher

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<sup>592</sup> BP Whiting Consent Decree, *supra* note 117, at V.C.

<sup>593</sup> EPA, Summary of Fluid Catalytic Cracking Unit Emission Source Test Reports (Docket Id. EPA-HQ-OAR-2010-0682-0086).

<sup>594</sup> 79 Fed. Reg. at 36,942 ("DCU are an important emission source with respect to risk from refineries.") (stating that proposed rule would reduce cancer incidence by 0.05 cases per year, or approximately 15 percent).

<sup>595</sup> DCU Impacts Estimates, *supra* note 127, at 11 tbl. 5 (Sept. 12, 2013).

<sup>596</sup> 79 Fed. Reg. 36,902; *Nat'l Lime Ass'n*, 253 F.3d at 634.

<sup>597</sup> 79 Fed. Reg. 36,880, 36,977.

<sup>598</sup> EPA, MACT Analysis for Delayed Coking Unit Operations, 4-6 (Sept. 20, 2013) (Docket ID. EPA-HQ-OAR-2010-0682-0203).

<sup>599</sup> 42 U.S.C. § 7412(f)(2).

levels of control on average. For new units, the law requires EPA to set a standard that is “not less stringent than the emission control that is achieved in practice by the best controlled similar source.”<sup>600</sup> At existing units, EPA must set a standard based on “the average emissions limitation achieved by the best performing 12 percent of the existing sources.”<sup>601</sup> EIP’s analysis of the ICR data (limited to the submissions not claimed as confidential business information), shows that the typical pressure of the coke drum prior to release to the atmosphere for the best performing facility and the best performing 12 percent of facilities is 1 psig.<sup>602</sup> While this analysis is necessarily limited to the publicly available information, EPA has the full data set and should set a lower, more stringent limit on the maximum average internal coke drum pressure prior to release to the atmosphere for new and existing units.

In addition, EPA should incorporate the new Refinery MACT 1 DCU standards into NSPS Subpart Ja. The proposed rule notes that the DCU work practice standard in Refinery NSPS Ja is less stringent than the proposed requirements for Refinery MACT 1.<sup>603</sup> Because DCUs will therefore have to comply with the stricter NESHAP limit in any event, there is no additional cost to the source to implement measures needed to meet a NSPS that is equivalent to the NESHAP requirements. In such circumstances, EPA has recognized that the controls needed to achieve NESHAP limits may also reflect the “Best System of Emission Reduction” on which the NSPS are based.<sup>604</sup> Moreover, the D.C. Circuit endorsed this approach in *Portland Cement Association v. EPA*, 665 F.3d 177, 191 (D.C. Cir. 2011), explaining that NSPS and NESHAP limits can be equivalent, so long as EPA fulfills the requirements of each section of the Act.

In contrast, the agency’s alternative proposal to delete the DCU work practice standard within NSPS Subpart Ja and rely solely on the DCU standards in Refinery MACT 1 ignores that the NSPS requirements address different pollutants, and is unlawful and arbitrary. EPA established the Subpart Ja requirements in part to reduce SO<sub>2</sub> emissions from DCUs, while the MACT I DCU standards seek to control HAPs.<sup>605</sup> Therefore, when a coke drum is vented without first reaching the prescribed depressurization limit, a DCU emits both SO<sub>2</sub> in excess of the NSPS and HAPs in excess of the NESHAP. In sum, the NSPS and NESHAP requirements are complementary, not redundant, and EPA may not allow either to substitute for or attempt to replace the other.

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<sup>600</sup> 42 U.S.C. § 7412(d)(3)(A).

<sup>601</sup> *Id.*

<sup>602</sup> Our analysis of the ICR data was limited to twelve facilities as the remaining sources claimed this information as confidential business information. Of these twelve facilities, two reported that the typical pressure of the coke drum prior to releasing it to the atmosphere is 1 psig.

<sup>603</sup> 79 Fed. Reg. at 36,949.

<sup>604</sup> See 75 Fed. Reg. 54,970, 54,995 (Sept. 9, 2010).

<sup>605</sup> See 73 Fed. Reg. 35,838, 35,842 (June 24, 2008).

## F. Storage Vessels

It is important that EPA proposes to update and strengthen the storage vessel standards under both its § 7412(d)(6) and § 7412(f)(2) authority, due to pollution control developments that have occurred and to assure an ample margin of safety to protect public health.

However, EPA's proposal for storage vessels at petroleum refineries must be strengthened to require more stringent controls and monitoring to prevent fugitive emissions to take into account developments in control strategies and assure the requisite ample margin of safety. As discussed above, EPA must take into account developments that have occurred and revise the standards based on such developments. EPA correctly determined, based on data, that emissions from storage vessels at refineries are higher than those at other types of facilities. And we support EPA's decision to require better controls for external and internal floating roof tanks and expand the applicability of the standards to smaller storage vessels and/or those with lower vapor pressure.

EPA also reviewed other developments in tank control technology including:

- Degassing controls;
- Retrofit external floating roof tanks;
- Additional monitoring of tanks using EPA Method 21 or optical gas imaging; and
- Warning monitors for liquid overflow and roof landings.<sup>606</sup>

EPA also has no lawful basis not to require these improvements based on costs. As described above, even assuming that EPA may consider cost (which Commenters dispute, as discussed above), the statute contains no authorization to place cost above the statutory objectives of § 7412(d) or § 7412(f).

Several of these developments are already widely in use. For nearly a decade, the SCAQMD required all external floating roof storage vessels at refineries to perform this retrofit if the material has a vapor pressure greater than 3.0 psi and has a capacity larger than 75 cubic meters.<sup>607</sup> Further, EPA's review found that both Texas and the SCAQMD require refiners to control emissions from tanks when they must be emptied and degassed for any reason.<sup>608</sup>

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<sup>606</sup> 79 Fed. Reg. at 36,914-15; Impact for Control Options of Storage Vessels at Petroleum Refineries, at 6-7 (Nov. 14, 2012) (Docket ID. EPA-HQ-OAR-2010-0682-0199) [hereinafter Storage Vessel Impact Memo].

<sup>607</sup> SCAQMD Rule 1178(d)(2).

<sup>608</sup> Storage Vessel Impact Memo, *supra* note 606, at 6-7.

Even if EPA is permitted to consider costs in evaluating these controls, EPA’s analysis must be rational and based on scientifically sound models. EPA must revise its cost analysis of the rejected control options listed above based on the most recent data from the petroleum ICR. EPA’s analysis of augmented monitoring and warning control is flawed because the agency has failed to provide any reasoned analysis for how it estimated the resulting VOC and HAP reductions. The only mention of potential emission reduction is the conclusory estimate of VOC and HAP reductions possible for implementing these controls.<sup>609</sup> It is not clear on what basis EPA derived these numbers. Furthermore, there is significant evidence that leaking storage vessels are significant sources of fugitive HAP Emissions. Direct measurement of tank emissions using Differential Adsorption LIDAR technology has shown that emissions from tanks are significantly underestimated.<sup>610</sup> EPA has recognized that these excess emissions are caused by fittings and other controls on tanks that are leaking or otherwise not properly working. EPA must include these potential emissions reduction in its analysis of requiring augmented monitoring requirements.

Second, in evaluating degassing controls and requiring the conversion of external floating roof tanks into internal floating roof tanks, EPA relied on an earlier analysis of control options from 2012.<sup>611</sup> The underlying data assumed that the vapor pressure of the material stored by external floating roof tanks is significantly lower than what was actually reported to the ICR.<sup>612</sup>

**Table H: EPA Modeled Vapor Pressure for Analysis of Converting External Floating Roof Tanks and ICR Reported Vapor Pressure for Similar Materials.<sup>613</sup>**

<b>EPA Model</b>	<b>Material</b>	<b>EPA Model Vapor Pressure</b>	<b>ICR Reported Vapor Pressure</b>
D & E	Crude Oil	3.97	4.87
F & G	Gasoline	5.85	8.43
H & I	Jet Naphtha	1.81	3.09

EPA should reevaluate the benefits of requiring these controls based on the actual vapor pressures of the stored material as reported in the ICR.

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<sup>609</sup> *Id.* at 21, Table 11.

<sup>610</sup> EPA, Critical Review of DIAL Emission Test Data for BP Petroleum Refinery in Texas City, Texas, EPA 453/R-10-002, 6 (Nov. 2010) (EPA-HQ-OAR-2010-0682-0070)).

<sup>611</sup> *Id.* at 6-7.

<sup>612</sup> *See supra*, Table H.

<sup>613</sup> Table H is derived from Storage Vessel Impact Memo Table 5 and data from the 2011 Petroleum ICR database. The ICR reported vapor pressure is the average vapor pressure reported for each tank that was identified as handling a similar stored material.

**VI. EPA MUST REQUIRE THE USE OF TECHNOLOGIES THAT ARE INHERENTLY SAFER, AND THUS LIKELY TO PREVENT EMISSION SPIKES.**

**A. Safety from Catastrophic Incidents and Resulting Air Pollution Releases Is A Serious Problem That EPA's Rules Must Address.**

In recent decades, refineries and chemical plants have had too many serious incidents that have killed people and caused harm to nearby communities' health and safety. Such incidents, in addition to immediately endangering community members' and workers' lives, can lead to significant excess air pollution that threatens public health.

One in three U.S. schoolchildren goes to school within the vulnerability zone of a hazardous chemical facility, such as a refinery.<sup>614</sup> The people most exposed to toxic air pollution and to health and safety threats from refinery and chemical plants, living in the most vulnerable zones around these facilities, are disproportionately communities of color and lower income communities, as shown by EPA's own demographic analysis in this rule and outlined in a May 2014 report.<sup>615</sup>

As a result of recent catastrophes, the President, U.S. Chemical Safety Board, and California Refinery Taskforce have issued important new recommendations. EPA must consider those recommendations in this rulemaking and exercise its existing regulatory authority to strengthen refinery facility safety and prevent accidents and the resulting toxic air releases they can cause.

The public supports the use of inherently safer, effective alternatives.<sup>616</sup> Some refineries for example, do not use the highly dangerous chemical hydrogen fluoride.<sup>617</sup> A majority of refineries already use safer alternatives, but as of 2010, as many as 50 still used the most

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<sup>614</sup> Ctr. for Effective Gov't, Kids In Danger Zones (Sept. 2014), <http://www.foreffectivegov.org/files/kids-in-danger-zones-report.pdf>.

<sup>615</sup> See Paul Orum et al., Env'tl. Justice & Health Alliance for Chemical Policy Reform, Who's In Danger? Race, Poverty, and Chemical Disasters, A Demographic Analysis of Chemical Disaster Vulnerability Zones (May 2014), <http://comingcleaninc.org/whats-new/whos-in-danger-report>; EPA Socioeconomic Analysis, -0226.

<sup>616</sup> A national poll by Lake Research showed that a strong majority of likely voters from both parties support new requirements to use of safer cost-effective alternatives. <http://preventchemicaldisasters.org/113-2>.

<sup>617</sup> See, e.g., United Steelworkers, A Risk Too Great: Hydrofluoric Acid in U.S. Refineries, at vi (Apr. 2013) ("USW Report"), <http://www.usw.org/workplaces/oil/A-Risk-Too-Great.pdf>.

hazardous form of hydrofluoric acid.<sup>618</sup> Requiring transitions to safer techniques and methods strengthens productivity and job security.<sup>619</sup>

### President's Commitment and Executive Order

Since he was in the Senate, President Obama has championed requirements for safer alternatives. In 2006 he said, “[e]ach one of these methods reduces the danger that chemical plants pose to our communities and makes them less appealing targets for terrorists...” Facing special interest resistance in the Senate, Obama said, “We cannot allow chemical industry lobbyists to dictate the terms of this debate... We cannot allow our security to be hijacked by corporate interests.”<sup>620</sup>

In the Senate, he promised regulations requiring safer technologies, and called for requirements to convert chemical plants and refineries to inherently safer technologies or chemical processes (“IST”).<sup>621</sup>

On August 1, 2013, President Obama signed an Executive Order recognizing that “additional measures can be taken by executive departments and agencies (agencies) with regulatory authority to further improve chemical facility safety and security in coordination with owners and operators.”<sup>622</sup> The Executive Order created an interagency working group, co-chaired by EPA, to advance this objective that is charged with creating “comprehensive and integrated standard operating procedures for a unified Federal approach for identifying and responding to risks in chemical facilities.”<sup>623</sup> The President directed EPA, along with other agencies, to use their existing regulatory authority to advance these goals. A large coalition of petitioner groups has also petitioned EPA to exercise its authority under § 7412(r) of the Clean Air Act to require the use of inherently safer technologies.<sup>624</sup> That is important to do, but EPA should not delay action in order to use that provision alone when it has authority and should apply IST requirements in this refineries rule now in progress, and due to be finalized by 2015. EPA should use its CAA authority in 42 U.S.C. § 7412(d) and § 7412(f), as well as § 7412(r), to fulfill these objectives in the refineries rule.

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<sup>618</sup> *Id.*

<sup>619</sup> Economic and Employment Benefits of the Chemical and Water Security Act of 2009 (H.R. 2868), Report Prepared for Greenpeace by Management Information Services, Inc. at 18 (July 2010), <http://www.misi-net.com/publications/GreenpeaceFactSheet-0710.pdf>.

<sup>620</sup> <https://www.documentcloud.org/documents/563364-obama-amp-his-administrations-policy-on-chem.html>.

<sup>621</sup> *Id.*

<sup>622</sup> Exec. Order 13650, Improving Chemical Facility Safety and Security, 78 Fed. Reg. 48,029 (Aug. 1, 2013), <http://www.whitehouse.gov/the-press-office/2013/08/01/executive-order-improving-chemical-facility-safety-and-security>.

<sup>623</sup> <http://www.whitehouse.gov/the-press-office/2013/08/01/executive-order-improving-chemical-facility-safety-and-security>.

<sup>624</sup> See Petition of United Steelworkers et al. to EPA to Exercise Its Authority (July 25, 2012).



## U.S. Chemical Safety Board Reports and Recommendations:

Investigations of several recent disasters by the Chemical Safety Board (CSB) concluded that tragedies from refinery and other chemical plant disasters are preventable. An analysis of the U.S. Chemical Safety Board's recent reports shows that there have been at least 8 catastrophic incidents investigated at refineries since 1999.<sup>625</sup> In all or most of these incidents, the Board found that the incidents could have been prevented. For example, the CSB found that:

Both the Chevron and Tesoro incidents could have been prevented if inherently safer equipment construction materials had been used. Although inherently safer technology (IST) is the most effective major accident prevention approach in the hierarchy of controls it is not enforced by the EPA through the General Duty Clause or other provisions of the Clean Air Act. . . . Furthermore, the Clean Air Act provides the authority for the EPA to develop and implement new regulations requiring the use of inherently safer systems analysis and the hierarchy of controls to establish more effective safeguards for identified process hazards to prevent major accidents.<sup>626</sup>

Rafael Moure-Eraso, Chairman of the U.S. Chemical Safety Board, has emphasized that it is essential to implement safer technologies at refineries, due to their history of preventable problems.<sup>627</sup>

The Board's recommendations on how to prevent such incidents would also prevent the release of toxic air pollutants like benzene and hydrogen fluoride that can result from such incidents. The Board has advised EPA to use its Clean Air Act authority to achieve this – and that authority includes the authority under which EPA has proposed the current new Refineries standards

- February 23, 1999 – Tosco Avon Refinery Petroleum Naphtha Fire, Martinez, CA<sup>628</sup>
- March 23, 2005 – BP America Refinery Explosion, Texas City, TX<sup>629</sup>

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<sup>625</sup> U.S. Chem. Safety Board, List of Investigations, <http://www.csb.gov/investigations/>.

<sup>626</sup> U.S. Chem. Safety & Hazard Investigation Board, Investigation Report, Tesoro Anacortes Refinery, Catastrophic Rupture of Heat Exchanger, Apr. 2, 2010 at 12 (No. 2010-08-I-WA) (May 2014), [http://www.csb.gov/assets/1/7/Tesoro\\_Anacortes\\_2014-May-01.pdf](http://www.csb.gov/assets/1/7/Tesoro_Anacortes_2014-May-01.pdf).

<sup>627</sup> Rafael Moure-Eraso, CSB Chair, Viewpoints: California is leading the way on oil refinery safety, Sacramento Bee (Oct. 9, 2014), <http://www.sacbee.com/opinion/op-ed/article2665041.html>.

<sup>628</sup> <http://www.csb.gov/tosco-avon-refinery-petroleum-naphtha-fire>;  
[http://www.csb.gov/assets/1/19/Tosco\\_Digest.pdf](http://www.csb.gov/assets/1/19/Tosco_Digest.pdf).

- November 5, 2005 – Valero Refinery Asphyxiation Incident, Delaware City, DE<sup>630</sup>
- February 16, 2007 – Valero Refinery Propane Fire, Sunray, TX<sup>631</sup>
- January 12, 2009 – Silver Eagle Refinery Flash Fire And Explosion and Catastrophic Pipe Explosion, Woods Cross, UT<sup>632</sup>
- October 23, 2009 – Caribbean Petroleum Refining Tank Explosion and Fire, Bayamon, PR<sup>633</sup>
- April 2, 2010 – Tesoro Refinery Fatal Explosion and Fire, Anacortes, WA<sup>634</sup>
- August 6, 2012 – Chevron Refinery Fire, Richmond, CA<sup>635</sup>

As one example, after the April 2, 2010 fire at the Tesoro refinery in Anacortes, Washington that killed seven workers, the investigation revealed the exchanger that blew apart was put into service in 1972 and that inspections had not occurred that could have prevented the disaster. Judy Schurke, director of the Washington state agency that oversees workplace safety and health stated, “This explosion and the deaths of these men and women would never have occurred had Tesoro tested their equipment in a manner consistent with standard industry practices, their own policies and state regulations.”<sup>636</sup>

#### U.S. Steelworkers Report on Incidents Involving Toxic Hydrofluoric Acid:

An analysis by the United Steelworkers found at least six major incidents at U.S. refineries in recent years resulted in harmful releases of the hazardous air pollutant hydrogen fluoride:<sup>637</sup>

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<sup>629</sup> <http://www.csb.gov/bp-america-refinery-explosion>; [http://www.csb.gov/assets/1/19/BP\\_Recs.pdf](http://www.csb.gov/assets/1/19/BP_Recs.pdf).

<sup>630</sup> <http://www.csb.gov/valero-refinery-asphyxiation-incident/>.

<sup>631</sup> CSB, Valero Refinery Fire, <http://www.csb.gov/assets/1/19/CSBFinalReportValeroSunray.pdf>.

<sup>632</sup> CSB, <http://www.csb.gov/silver-eagle-refinery-flash-fire-and-explosion-and-catastrophic-pipe-explosion>.

<sup>633</sup> <http://www.csb.gov/csb-conducting-full-investigation-of-massive-tank-fire-at-caribbean-petroleum-refining-investigative-team-plans-to-thoroughly-examine-facility-safety-practices/>.

<sup>634</sup> CSB, Tesoro Anacortes Final Investigation Report, [http://www.csb.gov/assets/1/7/Tesoro\\_Anacortes\\_2014-May-01.pdf](http://www.csb.gov/assets/1/7/Tesoro_Anacortes_2014-May-01.pdf).

<sup>635</sup> U.S. Chem. Safety and Hazard Investigation Board, Regulatory Report, Chevron Richmond Refinery Pipe Rupture and Fire, (May 2014), available at [http://www.csb.gov/assets/1/19/Chevron\\_Regulatory\\_Report\\_06272014.pdf](http://www.csb.gov/assets/1/19/Chevron_Regulatory_Report_06272014.pdf); <http://www.csb.gov/chevron-refinery-fire/>.

<sup>636</sup> <http://www.washingtonpost.com/wp-dyn/content/article/2010/10/04/AR2010100403708.html>.

<sup>637</sup> USW Report, *supra* note 617, at vi, A-2, A-3.

- March 5, 2012 – CITGO Corpus Christi, Texas
- February 28, 2011 – Marathon Canton, Ohio
- July 19, 2009 – CITGO Corpus Christi, Texas
- March 11, 2009 – Sunoco (Delta) Philadelphia, Pennsylvania
- April 8, 2004 – Fire at Giant Industries Refinery, New Mexico
- October 30, 1987 – Marathon Texas City, Texas.

### California Refinery Taskforce Report and Recommendations

After the Chevron Refinery fire in Richmond, California in 2012, the State of California convened an interagency taskforce to study this incident and provide recommendations.<sup>638</sup> Community advocates made recommendations and called for stronger protection from refinery disasters, with all of the resulting harm they cause to community members and workers.<sup>639</sup>

And, as the data show: “the Chevron, Richmond fire was not an extreme . . . . In the five months following the Chevron fire (August 6, 2012 to January 14, 2013) the California refinery industry reported 30 to 35 upset events to the U.S. Department of Energy, including fires, hydrogen sulfide releases, unexpected flare events, mechanical breakdowns and others.”<sup>640</sup>

The resulting recommendations – released in a 2014 report – show that there are clear steps refineries can take to prevent this kind of incident, and resulting toxic air pollution.<sup>641</sup> Since then, in September 2014, the California Department of Industrial Relations Division of Occupational Safety and Health has released a draft regulation on process safety management at

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<sup>638</sup> Cal. EPA, Interagency Refinery Task Force, <http://www.calepa.ca.gov/Refinery/>.

<sup>639</sup> See, e.g., Refinery Action Collaborative, San Francisco Bay Area, Memo, Initial Response of the Collaborative to the Findings & Recommendations of The July 2013 Draft Report of the Interagency Working Group on Refinery Safety, Governor Jerry Brown: Improving Public and Worker Safety at Oil Refineries (Oct. 10, 2013) (“RAC Memo”). The Refinery Action Collaborative includes: Communities for a Better Environment (Richmond, CA), NRDC, BlueGreen Alliance, United Steelworkers International Union, and Asian Pacific Environmental Network. See also Michael P. Wilson, Ctr. for Occupational and Env'tl. Health (COEH), Labor Occupational Health Program, UC Berkeley, Refinery Safety in California: Labor, Community and Fire Agency Views, Summary Report (June 4, 2013).

<sup>640</sup> RAC Memo at 3 (citing U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability. Energy Assurance Daily. Available: <http://www.oe.netl.doe.gov/ead.aspx>).

<sup>641</sup> Cal., Improving Public and Worker Safety at Oil Refineries (Feb. 2014), <http://www.calepa.ca.gov/Publications/Reports/2014/RefineryRpt.pdf>.

refineries, which includes developments in safety and pollution-control practices that EPA can and should require at the national level, to prevent toxic air releases.<sup>642</sup>

### Refinery Safety and Catastrophic Releases Are Not Isolated Incidents.

There is widespread recognition of serious problems with the safety of US refineries.

Reports from Utah, Louisiana, and Texas show frequent upsets and other catastrophic events that have caused or can cause substantial amounts of toxic air pollution, as discussed in Part I.D, *supra*.

The Louisiana Bucket Brigade has documented the extensive safety problems and resulting air pollution problems in four major reports called “Common Ground,” provided accompanying these comments.<sup>643</sup> These reports also outline how many of these problems can be prevented through a focus on safety.

As additional examples not included in the CSB’s investigation, there were also recent incidents at Utah refineries, including:

- **April 30, 2008 – Holly Oil Refinery fire, SLC, Utah**<sup>644</sup>
- **Oct. 21, 2009 – Tesoro Refinery flare stack explosion, North Salt Lake City, UT.**<sup>645</sup>

And, the Center for Public Integrity found that “24 of the 58 refineries examined by federal officials as of November 2010 had fires or explosions after [OSHA] inspections were completed.”<sup>646</sup>

### EPA Must Evaluate Available Evidence From Other Agencies and Experts to Prevent Safety Hazards Associated With Toxic Air Releases.

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<sup>642</sup> Draft PSM Regulatory Text, Process Safety Management for Refineries, Proposed General Industrial Safety Order 5189.1 (Sept. 9, 2014), <http://www.dir.ca.gov/dosh/doshreg/Process-Safety-Management-for-Refineries/PSM-Draft-Regulation.2014-09-09.pdf>.

<sup>643</sup> Louisiana Bucket Brigade Reports: Common Ground I-IV, available at <http://www.labucketbrigade.org>.

<sup>644</sup> Video, Holly refinery oil fire (Apr. 30, 2008), <http://www.youtube.com/watch?v=2eLeEMVrrBw>.

<sup>645</sup> Testimony before Congress, CSB Chairman, Rafael Moure-Eraso, <http://www.asse.org/assets/1/7/061313-CSB-Draft-Response-Waxman-Markey-10-04-2010-FINAL.pdf> (describing that at Tesoro in 2009, “[t]he CSB began an investigation due to similarities with the BP Texas City refinery disaster of 2005, sending a team from its Denver office,” but was unable to complete its investigation because “the company removed and destructively examined or repaired evidence from the fire before the CSB could examine it”).

<sup>646</sup> Jim Morris, Chris Hamby & M.B. Pell, Ctr. for Pub. Integrity, *Regulatory flaws, repeated violations put oil refinery workers at risk: Industry can stall penalties and fixes despite rash of fires, explosions* (Feb. 28, 2011; Updated: May 19, 2014), <http://www.publicintegrity.org/2011/02/28/2111/regulatory-flaws-repeated-violations-put-oil-refinery-workers-risk> (“CPI Report”).

A recent letter from the Department of Labor to domestic refinery managers made this statement: “In the last fifteen years, the petroleum refining industry . . . has had more fatal or catastrophic incidents related to the release of highly hazardous chemicals (HHCs) than any other industry sector . . . . We are particularly concerned that our inspection teams are seeing many of the same problems repeatedly.”<sup>647</sup>

According to the Center for Public Integrity Report: Michael Silverstein, head of the Washington State Department of Labor & Industries’ Division of Occupational Safety and Health and a former federal OSHA policy director, stated that the regulatory scheme is not effective, and “Right now, it’s a catch-me-if-you-can system, and the consequences of being caught are relatively small.”<sup>648</sup>

An investigation by the Center for Public Integrity with interviews of refinery workers described:

a climate in which safety takes a back seat to ramped-up production. Rather than schedule top-to-bottom maintenance outages, which take units out of operation for extended periods, equipment is being pushed hard, sometimes beyond its design life, the workers say. They have a term for it: “Run to failure.”<sup>649</sup>

Data also show that U.S. refineries have sustained losses from accidents at a rate much higher than their overseas counterparts – four times as high, according to a 2006 report by Swiss Re, the world’s second-largest reinsurer. Swiss Re officials reported that the gap between U.S. refineries and those in other parts of the world had widened. As Swiss Re found, refinery accidents are much more likely in this country than abroad, in its assessment, because of the following factors in the U.S., among others:

- A compliance-driven focus on safety;
- Conducting certain repairs, upgrades, and changes while the refinery is actively operating;
- Allowing extensive time to pass (up to 6 years) between turnarounds, when major repair and upgrade work occurs;
- A low level of attention to ongoing maintenance; and

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<sup>647</sup> U.S. Dep’t of Labor, OSHA, Letter to Refinery Managers, [https://www.osha.gov/dep/neps/refinery\\_nep\\_ltr\\_final.html](https://www.osha.gov/dep/neps/refinery_nep_ltr_final.html).

<sup>648</sup> CPI Report, *supra* note 646.

<sup>649</sup> *Id.*

- Vessel and pipe inspection processes that are largely self-regulated by individual companies.<sup>650</sup>

Each of these are issues that affect both routine air pollution problems, like leaks, and catastrophic air pollution and safety problems that can occur when there is an upset, fire, or explosion. And these are also issues that EPA can and should address in this rulemaking to reduce the amount of toxic air pollution refineries emit, by requiring and incentivizing preventive measures. In this rulemaking, EPA should consider implementing all recommendations from both community advocates and experts, which would prevent and reduce toxic air pollution.

**B. In this rule, EPA must apply the recommendations of experts on refinery safety and require the use of inherently safer technologies, practices, and processes at refineries under its § 7412(d) and (f) authorities.**

The recommendations of refinery safety experts generally come down to a focus on: prevention and substituting less dangerous chemicals and techniques whenever possible. In short, the use of inherently safer techniques, known as “IST,” can be summarized as: “What you don’t have, can’t leak.”<sup>651</sup> As Trevor Kletz explained:

If we can avoid hazards instead of keeping them under control, the resulting designs will usually be cheaper as well as safer, for two reasons: less added-on protective equipment will be needed and, if we can intensify, the plants will be smaller and therefore cheaper to operate.<sup>652</sup>

As explained in a 2010 report prepared by the Center for Chemical Process Safety (“CCPS”) (The American Institute of Chemical Engineers):

Inherently Safer Technology (IST), also known as Inherently Safer Design (ISD), permanently eliminates or reduces hazards to avoid or reduce the consequences of incidents. . . . IST is an iterative process that considers such options, including eliminating a hazard, reducing a hazard, substituting a less hazardous material, using less hazardous process conditions, and designing a process to reduce

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<sup>650</sup> RAC Memo at 3 (citing Zirngast, Ernst. (January 28, 2006). Oil and Petrochemical Industry Regional Differences. Different Loss Burden According to Cluster of Countries. Chemical Safety Board presentation, Washington D.C. Risk Engineering Services, SwissRe. p. 34. (comparing USA, Canada, UK and Australia with Europe, Singapore, S. Korea, Japan, Saudi Arabia, Gulf States and Egypt).

<sup>651</sup> At 1-2 (quoting Trevor Kletz).

<sup>652</sup> Trevor Kletz’s Forward in the AIChE CCPS Inherently Safer Chemical Processes (2nd Edition 2009).

the potential for, or consequences of, human error, equipment failure, or intentional harm.<sup>653</sup>

Inherently safer technology is not a new concept, but new techniques and methods have been newly identified or improved over the last decade for refineries, and those techniques are also ways of reducing toxic air pollution that EPA should require in the refineries air toxics rule. In an examination of 63 CSB reports, studies, and bulletins, CCPS reviewer, Paul Amyotte of Dalhousie University, concluded, “Simply put, inherent safety works – and the CSB reports show what can happen when the concept is not given its full measure of consideration.”<sup>654</sup>

For example, in its April 2013 report, the CSB documented Chevron’s lack of attention to maintenance and certain upgrades, and its decision to ignore a number of recommendations by its own personnel, which would likely have prevented the piping failure and fire on August 6, 2012.<sup>655</sup>

EPA has authority to and must directly account for updates in safer technologies and practices as “developments” relevant to toxic air emission control and must consider reducing the public’s exposure to these source categories’ toxic air pollution releases under both section 7412(d)(6) and 7412(f)(2) in this rule.<sup>656</sup> Doing so would be consistent with other components of the proposed rule. For example, EPA has recognized the need, in this rule, to take action to help prevent certain types of malfunction-related incidents (such as releases from pressure relief devices) that will violate the standards. It can and should do the same for other types of substantial air releases that can occur when there are dangerous upsets or other incidents of a large scale at a refinery.

**C. In this Rule, EPA must require the application of inherently safer techniques currently available to be used at refineries.**

Safer technologies, practices, and processes that can prevent toxic releases before they happen at refineries include the following list. EPA should also investigate whether there are

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<sup>653</sup> Center for Chemical Process Safety (The American Institute of Chemical Engineers), Final Report: Definition for Inherently Safer Technology in Production, Transportation, Storage, and Use, Exec-1 (2010) [https://www.aiche.org/sites/default/files/docs/embedded-pdf/ist\\_final\\_definition\\_report.pdf](https://www.aiche.org/sites/default/files/docs/embedded-pdf/ist_final_definition_report.pdf).

<sup>654</sup> An Analysis of CSB Investigation Reports for Inherent Safety Learnings, 7th Global Congress on Process Safety. Amyotte P, et al., [http://www.allriskengineering.com/library\\_files/AIChe\\_conferences/AIChe\\_2011/data/papers/P207547.pdf](http://www.allriskengineering.com/library_files/AIChe_conferences/AIChe_2011/data/papers/P207547.pdf).

<sup>655</sup> U.S. Chemical Safety and Hazard Investigation Board (CSB), Interim Investigation Report on the Chevron Richmond Refinery Fire at 36-39, [http://www.csb.gov/assets/1/19/Chevron\\_Interim\\_Report\\_Final\\_2013-04-17.pdf](http://www.csb.gov/assets/1/19/Chevron_Interim_Report_Final_2013-04-17.pdf) (Apr. 2013); RAC Memo. (citing maintenance and upgrade recommendations ignored from 2002, 2006, 2007, 2009, 2011, 2012).

<sup>656</sup> Although EPA also has authority to address and must work to prevent chemical disasters under § 112(r), 42 U.S.C. § 7412(r), EPA’s authority to regulate toxic air pollution resulting from accidents and other dangerous incidents at refineries is clearly not limited to that provision.

other similar techniques available that Commenters are not aware of. EPA must assess and require all of these as “developments” under § 7412(d)(6). And, EPA must assess and require all of these as methods to assure an “ample margin of safety to protect public health” under § 7412(f)(2).

### **1. The phase-out of hydrofluoric acid.**

Some refineries do not use hydrofluoric acid (HF) at all, and others use methods (*e.g.*, an additive) to reduce the catastrophic impact of a release. Because of the severe health impacts associated with such releases, and the fact that there are developments available to prevent this type of HF pollution, EPA must set standards that will limit and assure the phase-out of HF, as discussed below.

Health impacts of this pollutant cannot be understated. Hydrofluoric acid is a very corrosive and toxic inorganic acid. It can cause severe health problems including death, permanent organ damage to the eyes, skin, nose, throat, respiratory and bone systems. It can cause lung congestion, inflammation, and severe burns of the skin and digestive tract.

HF exhibits release characteristics in some circumstances that can make it uniquely hazardous over large areas. HF molecules may associate with one another (*i.e.*, form larger molecules like  $H_4F_4$ ,  $H_6F_6$ ,  $H_8F_8$ ) via hydrogen bonding; such molecules may form a cloud that is heavier than air, therefore less likely to disperse.

As described in an EPA Report to Congress:

During the summer of 1986, certain facilities and Lawrence Livermore National Laboratory conducted a series of experiments involving the atmospheric release of HF, to evaluate its behavior. These studies, known as the “Goldfish Studies,” were conducted at the Department of Energy Liquefied Gaseous Fuels Spill Test Facility in Nevada and showed that the HF did not remain a liquid following accidental release. Instead, under the conditions simulating a petroleum refinery explosion (HF above its boiling point and liquefied under pressure), 100 percent of the released liquid HF formed dense, rolling clouds of toxic vapor. The clouds expanded rapidly, and researchers measured dangerous concentrations at distances of three to six miles downwind.<sup>657</sup>

A person caught in this cloud would experience burning eyes, nose, and throat. Soon their lungs would become inflamed and overwhelmed with fluid, followed by acute respiratory distress syndrome (ARDS) and potential death within a few hours. Furthermore the fluoride ion can enter the body when HF is inhaled or through a skin burn, where it can interfere with calcium metabolism and cause death by cardiac arrest.

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<sup>657</sup> EPA Report at 1-2, <http://www.epa.gov/oem/docs/chem/hydro.pdf>.



Despite decades-old warnings about the potential for mass casualties, 50 refineries across the nation still use the toxic chemical HF.<sup>658</sup> Many are located in or near major cities including Houston, Philadelphia, Salt Lake City, and Memphis.<sup>659</sup> A joint investigation of the Center for Public Integrity and ABC News found that “[a]t least 16 million Americans” live in an area where they would be exposed to HF from a refinery, if it were to be released in an accident or a terrorist attack, according to refinery owners’ worst case scenario reports (which the Center analyzed but are not publicly released).<sup>660</sup> And the Center also found that 23 refineries using HF had at least 29 fires since the start of 2009.<sup>661</sup> A majority – 32 of the 50 refineries using HF – were cited “for willful, serious or repeat violations of rules designed to prevent fires, explosions and chemical releases, according to U.S. Occupational Safety and Health Administration data analyzed by the Center,” over a recent 5-year period.<sup>662</sup> The United Steelworkers’ survey found that over a five year period, there were about 131 HF releases or near misses.<sup>663</sup> Additional evidence shows violations at other refineries.

Modeling of worst case scenarios of HF explosions at refineries reveal the potential for truly catastrophic outcomes. EPA requires refineries using HF to estimate lives at risk from a release, and half have a radius endpoint greater than 20 miles. EPA has these reports, which it should consider and use in this rulemaking to phase out HF.<sup>664</sup> For example, the Chevron refinery in Salt Lake City had to conclude that an accident could release up to 286,000 lbs. of HF, risking a population of 1.1 million people in a potential exposure radius of 22 miles. An HF release from the BP refinery in Texas City, for example, could total 800,000 pounds, travel 25 miles, and put 550,000 people at risk of death or serious injury. A release from the Marathon refinery near Minneapolis could total 110,000 pounds, travel 25 miles, and threaten the health and safety of about 2.2 million people.

As examples, the Center for Public Integrity reported that: on October 30, 1987, at the Marathon Petroleum refinery in Texas, City, Texas, an HF release occurred involving between 30,000-53,000 pounds of HF over a 44-hour period, near a residential area. Approximately 4,000 residents were evacuated; more than 1,000 were treated for health problems; and nearby vegetation was also damaged.<sup>665</sup> In July 2009, an HF explosion blasted the Citgo East oil

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<sup>658</sup> USW Report, *supra* note 617, at xvi.

<sup>659</sup> *Id.*

<sup>660</sup> Jim Morris & Chris Hamby, Ctr. for Pub. Integrity, Use of toxic acid puts millions at risk (Feb. 28, 2011), <http://www.publicintegrity.org/2011/02/24/2118/use-toxic-acid-puts-millions-risk> (“CPI HF Report”).

<sup>661</sup> *Id.*

<sup>662</sup> *Id.*

<sup>663</sup> USW Report, *supra* note 617, at vi-vii.

<sup>664</sup> See CPI HF Report, *supra* note 660, citing § 7412(r) risk management reports.

<sup>665</sup> *Id.*

refinery in Corpus Christi, Texas, critically injuring a worker and sparking a fire that burned for more than two days.<sup>666</sup>

**Alternatives to Pure HF.** The best available information shows that refineries can reduce the catastrophic impacts of HF if it is used, and avoid the resulting threats to community and worker health and safety, with various mitigation techniques or simply by not using HF at all.<sup>667</sup> For example, refineries using HF can:

- Change the alkylation process to use a solid acid catalyst;
- Convert the hydrofluoric acid alkylation unit into a sulfuric acid unit; or
- Add modifiers to the hydrofluoric acid that decrease the gaseous nature of hydrofluoric acid and install mitigation systems.<sup>668</sup>

The best way to prevent catastrophic HF releases is not to use HF.

New refineries should not be able to use HF because safer alternatives are available that do not pose the same amount of health threats and immediate casualties that releases of HF can cause.<sup>669</sup>

In view of these facts, EPA must set a limit on HF that protects public health, under § 7412(f)(2), and addresses developments in reducing HF emissions, under § 7412(d)(2)-(3) and (d)(6). There is no current emission standard for refineries that directly controls HF. This violates the Act, as the D.C. Circuit explained in *National Lime Association*.<sup>670</sup> Moreover, EPA has not satisfied the surrogacy test for HF, outlined elsewhere in these comments.<sup>671</sup>

Even if it had done so, the developments in the ability to reduce HF emissions would require at least the following actions. First, EPA must set as the standard for new sources an emission limit of zero, to satisfy § 7412(d)(3)'s requirement that EPA set a standard based on the best-performing single source. There are refineries that do not use HF and EPA has data on HF emissions from only 24 refineries, showing that many refineries are not currently emitting HF.<sup>672</sup>

EPA should also follow the Act's floor and beyond-the-floor requirements in 42 U.S.C. § 7412(d)(2), (3) to set an HF limit for existing sources that assures that if there is a catastrophic

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<sup>666</sup> *Id.*

<sup>667</sup> See USW Report, *supra* note 617 at 3, 8; Meghan Purvis & Margaret Herman, U.S. PIRG Education Fund, *Needless Risk* at 16-20 (Aug. 2005), <http://www.uspirg.org/reports/usp/needless-risk> ("U.S. PIRG Report"); CPI HF Report, *supra* note 660.

<sup>668</sup> U.S. PIRG Report, *supra* note 667, at 16.

<sup>669</sup> *Id.* at 16-20; see also USW Report, *supra* note 617, at 7.

<sup>670</sup> 233 F.3d at 642.

<sup>671</sup> *Sierra Club v. EPA*, 353 F.3d 976, 984 (D.C. Cir. 2004) (quoting *Nat'l Lime Ass'n*, 233 F.3d at 639).

<sup>672</sup> Draft Risk Assessment (-0225) at 33.

release, this will plainly violate those standards, to provide additional incentive for sources to take steps needed to protect public health and safety, and encourage more refineries to use safer alternatives to pure HF.<sup>673</sup>

Finally, as the use of HF is associated with such a high health threat, EPA has strong grounds to require ultimate phase-out of its use. EPA has done this under § 7412 in another rule, and should follow the same approach here. Specifically, in the chrome plating rule, EPA recognized that the health hazards associated with perfluorooctane sulfonic acid-based fume suppressants were substantial enough that it should be phased out, and ultimately banned.<sup>674</sup> Section 7412(d)(2) requires EPA to assure the “maximum achievable degree of emission reduction,” and this includes consideration of whether emissions can be “eliminated.” Moreover, phasing out the use of HF would dramatically reduce the health threats associated with potential releases of this dangerous pollutant at refineries, and thus would satisfy the § 7412(f)(2) requirement to assure an “ample margin of safety to protect public health.”

## **2. Requirement for anonymous near-miss and other types of anonymous safety and maintenance reporting.**

A system for anonymous worker reporting of maintenance or potential safety problems that can lead to toxic air pollution spikes is a development that has occurred in various industries. It takes its name from the Federal Aviation Administration technique to avoid plane crashes, which other industries, including firefighters, have also adopted.<sup>675</sup> This system is being implemented in the offshore oil and gas drilling industry, and EPA should consider that development and require something similar for petroleum refineries.

As the Director of the Bureau of Safety and Environmental Enforcement (“BSEE”) Brian Salerno described:

One tool we will soon make available to the industry is the near miss reporting system. This completely anonymous system, which is being developed by the Bureau of Transportation Statistics, will enable offshore workers to report near misses in a way that protects their identity. BSEE will only receive aggregated data and

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<sup>673</sup> 42 U.S.C. § 7412(d)(2).

<sup>674</sup> Final Rule, Chromium Electroplating, 77 Fed. Reg. 58,220, 58,230, 58,243-44 (Sept. 19, 2012) (40 C.F.R. § 63.342(c)(1)) (finalizing phase-out of PFOS-based fume suppressants, also described as perfluorooctyl sulfonate); Proposed Rule, 75 Fed. Reg. at 65,068, 65,094 (Oct. 21, 2010) (citing report, EPA-HQ-OAR-2010-0600-0072).

<sup>675</sup> See FAA Aviation Reporting System; National Firefighters [www.firefighternearmiss.com](http://www.firefighternearmiss.com); CIRAS, (Confidential Incident Reporting and Analysis System), the confidential reporting system for the British railway industry; CHIRP, (Confidential Human Factors Incident Reporting Programme / Confidential Hazardous Incident Reporting Programme), British aviation and maritime industries; CROSS (Confidential Reporting on Structural Safety), structural and civil engineering industry/

analysis, and that will help us identify leading and lagging indicators. This tool has the potential to help prevent catastrophic incidents that endanger lives and the environment. However the tool is only as good as the information provided. We will need offshore workers to feel empowered to report near misses and be active participants in creating a robust safety culture.<sup>676</sup>

Under the BSEE system, U.S. Department of Transportation’s Bureau of Transportation Statistics (“BTS”) will “maintain control of the individual confidential reports. Progress reports, trends analyses and aggregated data will be developed by BTS and made publicly available on the BTS website. The BTS reports will enable BSEE to work with the offshore oil and gas industry as a whole to identify important trends and enhance safety across all operations.”<sup>677</sup>

In this system, “The identity of individuals and companies who submit reports will be completely confidential and protected under the Confidential Information Protection and Statistical Efficiency Act, legally protecting them from disclosure and from release under the Freedom of Information Act.”<sup>678</sup>

As the National Firefighter Near Miss website explains: “A near-miss event is defined as an unintentional unsafe occurrence that could have resulted in an injury, fatality, or property damage. Only a fortunate break in the chain of events prevented an injury, fatality or damage.”<sup>679</sup> EPA can define a “near-miss” air pollution event similarly. As further explained, for fire fighters:

The Near Miss Reporting System is an integrated learning environment that assists fire department personnel in turning shared lessons learned into actions that are applied. Through the program, fire fighters and EMS personnel can share their near miss experiences in the field in a voluntary, confidential, non-punitive and secure way. They are also able to find training resources, gleaned from the collected real-world experiences, that help responders apply the lessons learned and leading safety practices in their own departments.<sup>680</sup>

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<sup>676</sup> BSEE, Director’s Corner (Feb. 18, 2014) <http://www.bsee.gov/Safety/Directors-Corner/>.

<sup>677</sup> BSEE, Press Release, BSEE and BTS to Host Public Meetings to Discuss Near-Miss Reporting System (Mar. 31, 2014), <http://www.bsee.gov/BSEE-Newsroom/Press-Releases/2014/BSEE-and-BTS-to-Host-Public-Meetings-to-Discuss-Near-Miss-Reporting-System/>.

<sup>678</sup> *Id.*

<sup>679</sup> <http://www.firefighternearmiss.com/About>.

<sup>680</sup> <http://www.firefighternearmiss.com/About>.

Creating a system like this to try to avoid emission spikes, and especially catastrophic toxic air pollution releases, is one of the types of requirements that can prevent major problems that result when basic activities like maintenance and leak detection and repair do not occur at all, or in a timely way. Providing an anonymous method for workers to report the need for maintenance and other safety and air pollution-prevention activities can ensure such activities happen, before it is too late.

The California Interagency Taskforce recommended this type of provision and it is part of a rule in progress in California.<sup>681</sup> For refineries, under § 7412(d)(6), to reflect “developments,” and under § 7412(f)(2), to prevent unacceptable risk and assure the requisite “ample margin of safety to protect public health,” EPA should require this and set up anonymous worker reports to go directly to EPA and state regulators, as well as to the facility itself.

### **3. Requirement for back-up power, to prevent unnecessary flaring.**

EPA must require a system for back-up power, to prevent high emissions that can occur as a result of a power failure. Such systems represent a “development” within the meaning of § 7412(d)(6), which EPA must update the § 7412(d) standards to reflect. They also would assure an “ample margin of safety to protect public health” from all of the toxic air emissions likely to occur when power fails, as required by § 7412(f)(2). And they would also assist in assuring compliance, by reducing the likelihood that violations or exceedances of the emission standards would occur as a result of a preventable power failure.

According to a February 2014 report, in the U.S., “there were over 2,200 refinery shutdowns between 2009 and 2013 according to the Department of Energy, and at least one out of five were caused by power supply disruptions and electrical equipment failures.”<sup>682</sup> Power outages frequently lead to unnecessary flaring and other health and air pollution risks.<sup>683</sup> Even

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<sup>681</sup> Draft PSM Regulatory Text, Process Safety Management for Refineries, Proposed General Industrial Safety Order 5189.1 (Sept. 9, 2014), <http://www.dir.ca.gov/dosh/doshreg/Process-Safety-Management-for-Refineries/PSM-Draft-Regulation.2014-09-09.pdf>.

<sup>682</sup> Multi-Client Strategic Report: REFINERY POWER OUTAGE MITIGATIONS: LATEST TECHNOLOGIES AND STRATEGIES TO MINIMIZE FINANCIAL IMPACTS (Feb. 2014) (“Multi-Client Strategic Report”), <http://www.hydrocarbonpublishing.com/store10/product.php?productid=C01300>.

<sup>683</sup> See, e.g., Shelter ordered after refinery power outage: <http://www.chron.com/business/energy/article/Shelter-order-lifted-in-Texas-City-1692573.php>. Multiple power refiner power outage reports: [www.advn.com/nyse/StockNews.asp?stocknews=ENB&article=52112605](http://www.advn.com/nyse/StockNews.asp?stocknews=ENB&article=52112605)

weather-related problems from the loss of power can be prevented or mitigated from requiring on-site back-up power.<sup>684</sup>

Thus, evidence shows requiring back-up power on-site would reduce releases from pressure relief devices, and other upsets that cause emission spikes. It would also save the industry financial and other costs associated with shutdowns and resulting safety and air pollution problems.<sup>685</sup>

**4. Leak detection and repair requirements, described above, which can prevent leaks from turning into catastrophes.**

When various catastrophes occurred as a result of leaks, evidence supports ensuring leaks are detected and repaired more promptly than the standards currently require. *See* Part V.B, above.

**5. The use of the best available fence-line monitoring techniques, as described in these Comments.**

*See* Part VII.A, below.

**VII. COMPLIANCE AND ENFORCEMENT PROVISIONS**

**A. EPA must set strong fence-line monitoring requirements.**

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<sup>684</sup> For example, a report from Hurricane Isaac found that a power outage at the Marathon Garyville refinery resulted in 3 tons of volatile organic compounds, and other pollutants, being released; back-up power would have prevented or mitigated this. Gulf Monitoring Consortium Report, Lessons from Hurricane Isaac, Gulf Coast Coal and Petrochemical Facilities Still Not Storm Ready at 16 (Aug. 6, 2013), <http://www.gulfmonitor.org/gmc-isaac-report/>.

<sup>685</sup> Multi-Client Strategic Report, *supra* note 682. As the website summary states:

The cost of missed production for a US refinery with an average-sized FCCU of 80K b/d will range from \$340K a day at profit margins of \$5/bbl to \$1.7MM a day at profit margins of \$25/bbl, based on a conservative estimate. Furthermore, a rapid shutdown will increase the danger of mechanical damage requiring costly repairs. Unit shutdowns and restarts are also known to reduce energy efficiency.

Excessive and prolonged flaring will create environmental concerns, incur fines by environmental agencies, and cause public nuisance that may lead in civil lawsuits. Emergency shutdowns because of power failure can also pose safety issues. From the business point of view, missed shipments to retail outlets at a time of strong demand will cause a price surge at the pump resulting in public outcry and possible governmental investigations. Undoubtedly, both environmental and retail price issues will generate negative media coverage and damage a company's public image.

*Id.*

Fence-line monitoring is an important tool to identify sources of fugitive emissions and other undercounted sources of toxic pollution. As EPA has acknowledged in the record, refinery emissions are sometimes higher than currently allowed by the standards and the current standards fail to target all fugitive emissions.<sup>686</sup>

EPA must require fence-line monitoring for four reasons.

First, the Clean Air Act requires EPA to set monitoring provisions to assure continuous compliance with emission standards. For example, 42 U.S.C. § 7414(a)(3) mandates that EPA “shall in the case of . . . a major stationary source . . . require enhanced monitoring and submission of compliance certifications.” The Clean Air Act also requires permits to contain “conditions as are necessary to assure compliance with applicable requirements of [the Act].”<sup>687</sup> 40 C.F.R. Part 70 adds detail to this requirement. 40 C.F.R. § 70.6(a)(3) requires “monitoring sufficient to yield reliable data from the relevant time period that are representative of the source’s compliance.” Section 70.6(c)(1) requires all Part 70 permits to contain “testing, monitoring, reporting, and recordkeeping requirements sufficient to assure compliance with the terms and conditions of the permit.”<sup>688</sup>

The refinery sector has a long history of violations, malfunctions and other exceedances of the standards. That is presumably part of the reason why EPA itself created a refinery enforcement initiative.<sup>689</sup> EPA is now removing the unlawful SSM exemption that is included in the current standards, but in view of the record of the industry’s reliance on that exemption, effective monitoring is required to assure compliance with the standards at all times, as discussed in Part VII.A, *supra*. EPA must follow the Act’s plain direction to require “enhanced monitoring” in this rulemaking that will assure compliance with the standards.

Second, EPA has acknowledged that its policy is to implement the Act’s enhanced monitoring requirements by setting such requirements in air toxics standards. EPA previously stated that it recognized the need to implement this requirement in connection with specific air toxics rulemakings, and that it intended to do so. EPA’s own Enforcement Division is also implementing enhanced monitoring requirements to assure compliance in its refinery enforcement initiative, and EPA must require, at least, what its division is requiring as part of its “next generation compliance” policy, as discussed in Part I.F, *supra*. EPA therefore must follow this policy and implement the Act’s enhanced monitoring requirements in this rulemaking.

Third, significant “developments” in monitoring have occurred in recent years and 42 U.S.C. § 7412(d)(6) requires EPA to “take account of” such developments by revising the

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<sup>686</sup> 79 Fed. Reg. at 36,920 (citing concerns with fugitive emissions).

<sup>687</sup> 42 U.S.C. § 7661c(a).

<sup>688</sup> 40 C.F.R. § 70.6(a)(3).

<sup>689</sup> <http://www2.epa.gov/enforcement/petroleum-refinery-national-case-results>.

standards. As EPA acknowledges, there are newly available technologies and monitoring techniques available now to assure compliance with the standards. In particular, more time-resolved, higher data-quality-producing fence-line monitoring protocols have been implemented at specific refineries through enforcement suits brought by EPA and negotiations with community groups. As examples, Commenters highlight the EPA consent decrees attached to these comments at Shell Deer Park and BP Whiting, and the community monitoring protocol set up at Chevron Richmond.

Fourth, 42 U.S.C. § 7412(f)(2) requires EPA to assure an “ample margin of safety to protect public health” and “prevent . . . an adverse environmental effect.” Because of the risk EPA has found, which as discussed above, in Part II, *supra*, EPA should find is currently unacceptable, and because it is possible for EPA to provide more of a margin of safety from refinery emissions than now exists for public health using fence-line monitoring, EPA should do so. Strong fence-line monitoring provisions would assure not only that the standards are met, but that, due to the increased public information available to assure compliance, there is indeed a “margin of safety” such that no community faces greater health risks than EPA has found to exist, because of fugitive and other emissions it acknowledges that it has not accounted for.

As explained below, to meet each of these legal responsibilities, EPA must adopt a rule that requires open-path monitoring because that is the type of monitoring system that can achieve EPA’s intended and required objective of reducing fugitive emissions and it is also a feasible technology. Open-path monitoring is technologically feasible, cost-effective, and will resolve EPA’s and the industry’s longstanding problem with excess fugitive emissions and malfunctions. Commenters thus urge EPA to strengthen the proposed fence-line monitoring provisions by requiring open-path monitoring. Passive sampling alone, with the protocol EPA has proposed, is insufficient to assure compliance or satisfy each of EPA’s legal duties, outlined above, and as further explained below.

### **1. Developments in Fence-line Monitoring**

EPA found significant developments in fence-line monitoring technology and appropriately recognizes the need to set fence-line monitoring requirements to supplement existing LDAR practices.<sup>690</sup> EPA’s stated goal for the fence-line monitoring program is to reduce fugitive emissions. To achieve that goal and satisfy the Act’s requirements as described above, to account for developments and assure compliance, and follow own EPA policies, EPA must finalize a fence-line monitoring protocol that satisfies each of the following criteria, which developments in fence-line monitoring make possible.

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<sup>690</sup> See, e.g., 79 Fed. Reg. at 36,920-22; Fence-line Monitoring Technical Support Document, EPA-HQ-OAR-2010-0682-0210.



- **Time Resolution** – Ability to measure multiple pollutants and report data to the public in real-time or near real-time, at least every 5 minutes to 1 hour.
- **Multi-Pollutant Monitoring** – Measure multiple hazardous air pollutants accurately at low concentrations.
- **Geographic Coverage** – Cover a significant portion of the fence-line to assure measurement of pollution regardless of wind direction.
- **Assure Compliance and Incentivize Emission Reductions** – Establish enforceable corrective action levels that create an incentive to identify fugitive and undercounted sources of toxic pollution.

**On each of these criteria, open-path monitoring is the method EPA should require.**

EPA has recognized open-path monitoring is a “development” in fence-line monitoring technology. Moreover, open-path monitoring technology satisfies the needs of a fence-line monitoring system because it: (1) provides real-time analysis and data on air pollution; (2) can analyze multiple pollutants simultaneously and at low, near-ambient concentrations; (3) has complete geographic coverage; and (4) the above qualities of open-path monitoring make it possible for EPA to assure emissions reductions through mandating enforceable corrective actions. For all of these reasons, the Bay Area Air Quality Management District is now working to finalize open-path fence-line monitoring requirements, and EPA should ensure that its final rule assures at least equal protection around the U.S. as people living near the BAAQMD refineries will soon have.<sup>691</sup>

**By contrast, EPA’s proposed protocol, for passive sampling, is insufficient alone to satisfy these criteria or achieve EPA’s ultimate goal of monitoring and reducing fugitive emissions.** As written, the protocol will require facilities to take certain actions if the measured benzene concentration at the fence-line exceeds  $9 \mu\text{g}/\text{m}^3$  on an annual average. Refinery operators are required to determine the annual average benzene concentration by measuring the two-week average concentration using passive sorbent tubes. EPA’s rule provides a protocol for determining and subtracting out the background benzene concentration. If, based on a year’s worth of data, a facility exceeds the  $9 \mu\text{g}/\text{m}^3$  threshold it will have to create a corrective action plan. This passive sampling protocol is not adequate alone to identify and reduce emissions because it does not measure or report data in real-time and EPA has not established a corrective action level that will incentivize the identification and reduction of fugitive pollution, as further discussed below.

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<sup>691</sup> See BAAQMD, Draft Air Monitoring Guidelines for Petroleum Refineries, Regulation 12, Rule 15, 5 (Aug. 25, 2014) [hereinafter BAAQMD Fence-line Monitoring Proposal].

- **Time Resolution**

Open-path monitoring is capable of measuring the ambient concentration of multiple pollutants in as low as five minute increments.<sup>692</sup> High time resolution is an important characteristic for fence-line monitoring because it enables facilities and regulators to identify the source of fugitive emissions. The underlying principle is that an individual can trace a particular measurement back to its source by analyzing the wind during the period of the measurement. Data that is collected every five minutes makes this possible because specific wind direction and speed can be matched to a specific pollutant reading. EPA’s proposal to use 14-day averages makes this a difficult to impossible task, except in localities with the extremely steady wind patterns. This is because the wind can switch direction based on diurnal patterns and other meteorological phenomena. EPA’s pilot study recognized this inherent problem with long-averaging periods.<sup>693</sup> Data EIP collected on five cities with significant refining capacity shows just how variable the wind can be on a day to day basis.

**Table I: Recorded Changes in Wind Direction from One Hour to the Next in Seven Cities With Significant Refining Capacity Within a 100 Mile Radius (2009-2013).**<sup>694</sup>

	<b>Wind Direction Changes by More than 45° Between Hourly Monitoring Periods</b>	
<b>City</b>	<b>Instances</b>	<b>Percent (%)</b>
Houston	8,835	18
New Orleans	9,249	18
San Francisco	8,406	19
Los Angeles	10,939	23
Memphis	8,803	17
Philadelphia	8,226	14

Highly time resolved data also provides the benefit of enabling plant operators and regulators to trace pollutants to specific process operations, or specific refineries – so the right refinery operator takes the right kind of corrective action.

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<sup>692</sup> *Id.*; Shell Deer Park Consent Decree, *supra* note 117; *see also* BP Whiting Monitoring Site Data, *available at* <http://raqis.radian.com/pls/raqis/bpw.whiting>.

<sup>693</sup> Thoma et al., Facility Fence Line Monitoring Using Passive Samplers, [http://cfpub.epa.gov/si/si\\_public\\_file\\_download.cfm?p\\_download\\_id=501667](http://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=501667) (finding significant difficulty in attributing source of benzene during variable wind periods).

<sup>694</sup> NOAA Quality Controlled Local Climatological Data (final), Hourly Observations, <http://cdo.ncdc.noaa.gov/qclcd/QCLCD>.

Thus, real-time monitoring would be able to differentiate emissions from a batch process, such as a delayed coker, and a consistently leaking cooling tower. Again 14-day averages will not provide this level of information to help identify the source of fugitive emissions.<sup>695</sup> In the alternative to open-path monitoring, EPA has no valid basis not to require the use of active sorbent tubes, deployed daily, and gas chromatographs to assure that operators have data that has the time resolution needed to find and fix the source of fugitive emissions.

Also, real-time monitoring significantly alleviates the problem identifying background concentrations. This is a direct result of the fact that it is easier to triangulate the source of the pollution. EPA's protocol proposes a necessarily cruder method to identify background sources that will cause the fence-line concentration attributed to the regulated facility to be biased low. Under the proposal, each sampling period will have its own background concentration that is defined as the lowest reading during the period.<sup>696</sup> Of course, as EPA recognizes, a facility's own emissions will contribute to the lowest reading at the fence-line, especially during periods with calm or variable winds.<sup>697</sup> This would result in the background concentration being overestimated and the facility's contribution being underestimated.<sup>698</sup>

And although EPA asserts that the methodology could also underestimate background concentration due to offsite near-field sources, background concentration is more likely to be biased high. This is because the facilities' samplers are likely to be located closer to the facilities' own sources of benzene than an external source. Therefore, because of the proximity of a facility to its own fence-line, it will be more likely to contribute to the measured benzene concentration. Furthermore, EPA allows facilities to propose site-specific monitoring options when the facility believes that a near-field source is underestimated by the general method.<sup>699</sup> There is no equivalent option for EPA, the public, or refinery communities to require an alternate method when the general methodology overestimates background concentrations. This is fundamentally unfair and, more importantly, will cause a general bias towards using the general method only when it underestimates the facility's contribution to the fence-line measurements.

Thus, even if EPA does not require all facilities to implement open-path monitoring, it must address the problem discussed above regarding the bias towards underestimating the contribution of the regulated facility to the ambient concentration of benzene.

- **Multiple Pollutants, Not Just Benzene**

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<sup>695</sup> 79 Fed. Reg. at 36921 (“There are several drawbacks of time integrated sampling, including . . . the loss of short-term temporal resolution.”).

<sup>696</sup> 79 Fed. Reg. at 36978.

<sup>697</sup> 79 Fed. Reg. at 36924-25.

<sup>698</sup> *Id.*

<sup>699</sup> *Id.*

Open-path monitoring is capable of measuring multiple pollutants simultaneously. For example the Bay Area AQMD is proposing to require facilities to measure benzene, toluene, ethyl-benzene, and xylene simultaneously.<sup>700</sup> While EPA’s consent decree with Shell Deer Park will only require the facility to measure benzene, the technology is capable of monitoring all the BTEX pollutants as well as several others.<sup>701</sup> Monitoring for multiple pollutants is important because different fugitive sources at a refinery will have different concentrations of the various HAPs. Readings on multiple pollutants can help profile and identify the pollutant source. For example, if the measured concentrations of the pollution matches diesel a regulator would be able to pinpoint the source to a process stream or tank that stores diesel. EPA’s own analysis recognizes this benefit of monitoring for multiple pollutants.<sup>702</sup>

EPA’s proposed protocol will only require refineries to use sorbent tubes to monitor for benzene.<sup>703</sup> While this technology has the capability of measuring other pollutants, EPA concluded that additional monitoring is not necessary because benzene “is ubiquitous at refineries, and is present in nearly all process streams such that leaking components generally will leak benzene at some level.”<sup>704</sup>

This conclusion is irrational and unlawful for at least three reasons. First, it is irrational because EPA has not provided any analysis of the ICR data showing that benzene is present in nearly all leaking process streams. Rather, data from ambient air quality monitors show that there are many instances when toluene and hexane are present in the absence of benzene.

**Table J: Gas Chromatograph Monitoring Data from BP Whiting Showing Readings of Hexane and Toluene in the Absence of Benzene.**<sup>705</sup>

Monitoring Condition	Total Hours	Percent of Total Readings
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<sup>700</sup> BAAQMD Fence-line Monitoring Proposal, *supra* note 691 ,5.

<sup>701</sup> See Shell Deer Park Consent Decree, *supra* at 117; 79 Fed. Reg. at 36921-22.

<sup>702</sup> 79 Fed. Reg. at 36,924.

<sup>703</sup> 79. Fed. Reg. at 36,924

<sup>704</sup> *Id.*

<sup>705</sup> BP Whiting, Fenceline Monitoring Data, available at <http://raqis.radian.com/pls/raqis/bpw.whiting>.

Monitoring Periods with no Benzene Detected	1048	26%
Monitoring Periods with Hexane but no Benzene Detected	534	19%
Monitoring Periods with Toluene but no Benzene Detected	303	13%
Monitoring Periods with Toluene or Hexane but no Benzene Detected	609	12%
Total Monitoring Periods	4032	100%

Second, just as the Act requires EPA to set limits on all hazardous air pollutants<sup>706</sup>, EPA needs to assure compliance with all of the limits, not just for benzene.

Third, EPA has not demonstrated that benzene may be used as a surrogate for all other relevant fugitive pollutants. A surrogate might be reasonable only if it meets, at least, the following three conditions: (1) the target pollutant(s) must invariably be present in the surrogate; (2) the control technology used to control the surrogate must indiscriminately capture both the surrogate and the target pollutant(s); and (3) control of the surrogate must be “the only means by which facilities achieve reductions in the target pollutant.”<sup>707</sup> The same principle is applicable to monitoring for a surrogate, in order to monitor for other pollutants. Due to the fact that benzene is not actually present in all refinery pollution streams, as discussed above, EPA has failed to meet the surrogacy test to require monitoring of only benzene.

- **Fence-line Coverage**

Maximum fence-line coverage is important to assure that all fugitive plumes are detected. Fence-line monitoring can only measure and identify the pollutants that are encountered by the sampler. An open-path system addresses this concern by monitoring all of the air between two points, an energy source that emits an electromagnetic beam and a detector that can translate disturbances in the beam into pollutant concentrations for various pollutants.<sup>708</sup> Each energy source and detector pair can be placed between 100-500 meters apart,<sup>709</sup> ensuring complete coverage within that span. But EPA’s proposed monitoring protocol only guarantees the placement of monitors every 2,000 feet along the fence-line.<sup>710</sup> While EPA does require operators to deploy extra samplers when there is a potential VOC source within 50 ft. of the fence-line, this is insufficient to plug a gap that is nearly seven football fields long. For example, the distance between a source 75 feet away from the fence-line and a monitor would be about 900 feet. The resulting angle between the monitor and the fugitive source would make it extremely unlikely that it would ever detect emissions from this source. EPA should strengthen

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<sup>706</sup> *Nat’l Lime Ass’n v. EPA*, 233 F.3d 625, 634 (D.C. Cir. 2000).

<sup>707</sup> *Sierra Club v. EPA*, 353 F.3d 976, 984 (D.C. Cir. 2004) (quoting *Nat’l Lime Ass’n*, 233 F.3d at 639).

<sup>708</sup> 79 Fed. Reg. at 36,921.

<sup>709</sup> *Id.*

<sup>710</sup> 79 Fed. Reg. at 37,049-37,051.

the requirements in this rule to assure that it does not miss major emissions it has recognized the need to monitor for.

## **2. Corrective Action Requirements Must Assure Compliance And Incentivize Emissions Reductions**

A meaningful fence-line monitoring program requires strict implementation provisions and adequate reporting and corrective action requirements. Proper implementation of the fence-line monitoring program is essential for ensuring that facilities place monitors properly and that major sources of potential VOCs are not missed. Real-time reporting is necessary to provide operators, regulators, and citizens with prompt data about pollution concentrations and potential problems. And, the corrective action requirements must set a level that is low enough to protect public health and include mandatory requirements to fix the source of the elevated HAP readings as expeditiously as practicable.

### **a. Public Review and Comment.**

Regardless of the technology that EPA chooses, EPA must require all facilities to submit monitoring plans, data, and corrective action plans for agency review and public comment. Under the current requirement EPA only proposes this for a plan that aims to account for offsite upwind sources or onsite excluded sources.<sup>711</sup> When EPA has acknowledged that the monitoring requirements are needed to assure compliance, it cannot rationally allow sources to set up their monitoring plans with no oversight whatsoever. Public notice and comment would be consistent with EPA's commitment to environmental justice and ensure that concerned community members have the ability to review and offer concerns or ways to strengthen monitoring plans before they are implemented. This also would make sure EPA has the ability to consider community concerns in deciding whether to approve a plan.

EPA also must require corrective action plans to be submitted for notice and comment. That can occur at the same time as EPA is reviewing the plans, without causing delay. Sources should be required to begin implementing corrective action while receiving input from the public and EPA, and EPA must then decide whether to add or modify corrective action requirements after considering public comment. If community members have no opportunity to review or provide comment on corrective action plans, they will be cut out of the most important part of the fence-line monitoring plan: the part that is supposed to reduce harmful fugitive emissions.

The proposal has the added problem that it deems approved any monitoring plan and any corrective action plan that EPA does not act on within 90 days.<sup>712</sup> Plans should not be approved

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<sup>711</sup> 79 Fed. Reg. at 36,978-79 (§ 63.658(i)).

<sup>712</sup> 79 Fed. Reg. at 36,978, 36,979.

by default. EPA should require plans that are not formally approved by a given date to take effect and be implemented, to avoid delay in monitoring. But, EPA should still review and ensure they meet applicable requirements. If they do not, EPA can and should require improvements to the plan after it is implemented.

**b. Real-Time Public Reporting**

Open-path monitoring allows facilities to provide real-time public reporting of emissions. Making pollution data public is a low-cost, efficient manner to drive pollution reduction. It is widely recognized that this is a key benefit of the Toxic Release Inventory program.<sup>713</sup> Further, contemporaneous data enables all stake holders to respond to problem in real-time before the damage of excess exposure has already occurred. The data become less and less valuable to the community the longer facilities wait to report them.

EPA's proposal would not provide prompt public reporting and this problem is exacerbated by the lag-times the agency has built into the analysis and reporting of data. First, sorbent tubes must be placed in the field for two weeks. This means, that before the data is even analyzed, it is two weeks old. On top of this, EPA only requires refinery operators to report the data in its semi-annual report. Therefore, some of the data that operators are required to collect will be more than six months old by the time it is available to the public and regulators for review. Secretly exposing communities to excess levels of benzene and other pollutants for six months is unacceptable, given that it is not difficult to prevent this. Even if EPA were to finalize the passive sampling proposal, facilities should be required to report data, at least, every two weeks, as soon as it is collected from the tubes. Finally, reporting "through EPA's electronic reporting and data retrieval portal" is not sufficient. EPA must provide a public website that makes these data accessible to a layperson community member near a refinery who is not aware of and has not had training on that portal.

**c. EPA's Proposed Corrective Action Level Is Too High.**

EPA has proposed to set the concentration action level at 9  $\mu\text{g}/\text{m}^3$  on an annual average.<sup>714</sup> EPA must lower this standard to one that is consistent with the best available science on health risk and impacts, and must set a short-term average that will serve the purpose of

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<sup>713</sup> Archon Fung, Reinventing Environmental Regulation From the Grassroots Up: Explaining and Expanding the Success of the Toxics Release Inventory, 25 *Env. Mgmt.* 2, 115-127 (Feb. 2000) *available at* <http://www.ncbi.nlm.nih.gov/pubmed/10594186>.

<sup>714</sup> 79 Fed. Reg. at 36,926.

helping operators, regulators, and community members identify and rectify problematic sources of fugitive emissions.

**(i) EPA must reduce the concentration action level because 9  $\mu\text{g}/\text{m}^3$  will not protect public health.**

Setting a benzene concentration level that is higher than the level at which harm to human health occurs would be unlawful, arbitrary, and capricious. Instead of setting the number so high, EPA should ensure that benzene concentration levels at refinery fence-lines do not exceed the level that is harmful to human health.

The number EPA has selected is higher than the threshold at which harm is known to occur. For example, in 2014, California updated its 8-hour and chronic reference exposure level for benzene to be 3.0  $\mu\text{g}/\text{m}^3$ , which is equivalent to 1 ppb, three times lower than EPA's proposed concentration action level.<sup>715</sup> As EPA has recognized, it frequently uses the California EPA numbers – and does so in this risk assessment for many other chemicals, including arsenic, dioxins, and hydrofluoric acid, as just a few examples.<sup>716</sup> EPA recognizes the value of the Cal. EPA OEHHA assessment values because “[t]he process for developing these assessments is similar to that used by EPA to develop IRIS values and incorporates significant external scientific peer review.”<sup>717</sup> EPA should set the benzene concentration action level to be no higher than 3.0  $\mu\text{g}/\text{m}^3$ . As further evidence that EPA's number is too high from a health perspective, the European Union recognizes the need to prevent ambient benzene concentration levels from surpassing an annual level of 5.0  $\mu\text{g}/\text{m}^3$  – which is also well below the action level of 9 that EPA has proposed here.<sup>718</sup>

Furthermore, EPA's methodology for setting the corrective action level at 9  $\mu\text{g}/\text{m}^3$  is arbitrary and capricious. The value is based on what EPA modelled as the highest fence-line concentration expected at any facility fence-line in the country.<sup>719</sup> Using this, the worst case scenario, to establish an action threshold level makes little sense. First, only two of the 142 modeled facilities are expected to have fence-line concentrations above 4  $\mu\text{g}/\text{m}^3$ .<sup>720</sup> Furthermore, the average modeled benzene concentration is 0.8  $\mu\text{g}/\text{m}^3$ , more than an order of magnitude less than the proposed corrective action level.<sup>721</sup> It is arbitrary and capricious to expect that this proposed corrective action threshold, allowing half of the nation's refineries to

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<sup>715</sup> Cal. EPA, OEHHA, June 27 2014 Final Benzene REL:

[http://www.oehha.ca.gov/air/chronic\\_rels/BenzeneJune2014.html](http://www.oehha.ca.gov/air/chronic_rels/BenzeneJune2014.html).

<sup>716</sup> See Draft Risk Assessment (-0225) tbl.2.6-2, at 22-24.

<sup>717</sup> *Id.* at 15 (explaining why EPA often considers the CalEPA Office of Environmental Health Hazard Assessment numbers).

<sup>718</sup> <http://ec.europa.eu/environment/air/quality/standards.htm> (EU benzene standard set January 2010).

<sup>719</sup> *Id.*

<sup>720</sup> Palma Memo Re: Fence-line Ambient Benzene Concentrations surrounding Petroleum Refineries at 2 (Jan. 7, 2014) (-0208) [hereinafter Fence-line Ambient Benzene Concentrations].

<sup>721</sup> *Id.*



emit more than 10 times the benzene than expected, will help identify and lead to reductions in uncontrolled or inadequately controlled sources of fugitive emissions. EPA's extremely high action level number is inconsistent with the statutory text and objectives of § 7412(d) and § 7412(f). Section 7412(d) directs EPA to focus on the best-performing, lowest-emitting sources, in order to require the "maximum achievable" emission reductions. 42 U.S.C. § 7412(d)(2)-(3). Section 7412(d)(6) requires EPA to review and update § 7412(d)(2)-(3) standards. As EPA has recognized that its action under § 7412(d)(6) is a "continuation of the technology-based section 112(d) standard-setting process," it thus must serve the same goals of 42 U.S.C. § 7412(d) overall to assure emission reductions.<sup>722</sup> Section 7412(f)(2) requires EPA to focus on the health of the "individual most exposed" to a source category's toxic emissions, in order to ensure the most health-protective standards. Yet, EPA has selected a benzene concentration level based on the highest emitting facility. As EPA states: "this concentration is comparable to the highest modeled fence-line concentration."<sup>723</sup> While the governing statutory provisions focus on the greatest emission reductions and health protections, EPA has chosen a number that does the opposite: it codifies the worst, highest fence-line ambient air concentration and thus the performance of a single source. And, it sets as the national protection the weakest possible concentration level, again, of the source with the highest levels of benzene at the fence-line.

As a result, nearly every facility will be allowed to release more than two times the benzene that is expected before any corrective action is necessary.

EPA has failed to justify setting the action level so high based on the record and the objectives of the Act, when it will neither assure that most facilities reduce their fugitive emissions, nor achieve public health protection. Setting such a high action number is the very definition of arbitrary and capricious.

#### **(ii) EPA must set a Short-Term Corrective Action Threshold**

The long-term corrective action threshold EPA proposes would allow for shorter-term spikes in HAP emissions that endanger the health and welfare of refineries' neighbors. Accordingly, EPA must also set a short-term corrective action threshold to protect communities, including the most-exposed person under § 7412(f)(2), from those spikes.

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<sup>722</sup> See, e.g., Subpart N: Summary of Public Comments on Chromium Electroplating and Steel Pickling Risk and Technology Review (RTR) at 3, EPA-HQ-OAR-2010-0600-0691.

<sup>723</sup> 79 Fed. Reg. at 36,926.

The agency's enforcement division recognizes that short-term corrective action thresholds are essential requirements for fence-line monitoring programs to help identify sources of illegal fugitives.<sup>724</sup> At Shell Deer Park, EPA is requiring corrective action based on a five minute standard and an hourly standard. Any five-minute period, where the fence-line monitor picks up benzene concentrations above 50 ppb triggers a corrective action requirement. Additionally, corrective action is required if the benzene level exceeds 15 ppb for three five-minute periods during a single hour. At Flint Hills Resources in Port Arthur, EPA's consent decree has corrective action requirements for fence-line readings of 1-3 butadiene or benzene that average above 25 ppb for an hour. By comparison, under the proposed rule, a facility could have a significant spill of benzene causing one two week sample to spike above 100 µg/m<sup>3</sup>. Yet at all but two refineries, that accident would not cause the facility to exceed the annual corrective action requirement according to EPA's modelling of maximum off-site ambient benzene concentrations.<sup>725</sup> Thus EPA's proposed average will ignore the health risks of short-term exposure to high pollution levels. Therefore, to be consistent with its enforcement actions, reflecting the expertise of its enforcement division, EPA should set a short-term corrective action level to help identify and reduce the significant health risks created by refinery malfunctions.

**d. Corrective Action Requirements**

**(i) EPA must shorten the timeline for corrective action.**

The proposed rule would require corrective action to begin within 5 days of a facility determining that it has exceeded a 12-month rolling average (or no later than 35 days after completion of the sampling episode showing this).<sup>726</sup> The proposed requirements include the following:

<b>Event</b>	<b>Timeframe</b>	<b>Corrective Action Requirement</b>
First Exceedance of Corrective Action Threshold	Within 5 days of detection (but no longer than 35 days after sampling shows an exceedance)	Initiation of root cause analysis.
	Within 45 days of detecting	Root cause and corrective action

<sup>724</sup> Shell Deer Park Consent Decree, *supra* note 118; Flint Hills Resources Consent Decree, *supra* note 118.

<sup>725</sup> EPA's model shows that only two refineries are expected to have fence-line concentrations above 4 µg/m<sup>3</sup>. Assuming these facilities only measured benzene levels at 4 µg/m<sup>3</sup> for 25 out the 26 monitoring episodes and 100 µg/m<sup>3</sup> for the final one, the annual average would be 9.33 µg/m<sup>3</sup> and not subject to corrective action. *See* Fence-line Ambient Benzene Concentrations, *supra* note 720.

<sup>726</sup> 79 Fed. Reg. at 36,978.

	an exceedance	analysis must be complete.
	None	Completion of corrective action.
Exceedance of Corrective Action Threshold Immediately After Completion Corrective Action of First Exceedance	60 days from second exceedance.	Submit corrective action plan to EPA; EPA has 90 days to review and approve the plan.
If there is another exceedance.	See above.	Another plan is required.

EPA should strengthen these requirements in, at least, the following ways:

- **Root Cause Analysis and Corrective Action Analysis** – EPA must require facilities to complete these actions within 5 days of initiating the root cause analysis.
- **Initial Corrective Action** – EPA must require facilities to complete the corrective action within 5 days. Without a concrete deadline, a problem could linger indefinitely and become catastrophic. Furthermore, facilities could delay completing the initial corrective action and might never trigger the second corrective action requirement of submitting a plan to EPA.
- **Further Corrective Action** – A facility should have no longer than 14 days to develop a new corrective action plan and begin to implement it. A facility also should not wait to implement that plan until receiving EPA approval. EPA should review promptly, but if it does not, the facility should be required immediately to start implementing the plan to reduce fugitive emissions. EPA should set a shorter deadline, such as 14 days, for the agency to review and decide whether to approve a plan, or if changes are needed. Otherwise, leaking air toxics can go on for 5 months after repeated exceedances, before a facility takes any corrective action.
- **Specific Reporting and Action** – The rules should require immediate reporting and specific corrective action, such as automatic shutdown and additional higher-quality monitoring (such as UV-DOAS), with oversight such as an inspection and audit by EPA expert staff or an independent expert, until the problem has been fully resolved to prevent its repetition.

**(ii) EPA must strengthen the root cause analysis and corrective action requirements.**

First, the root cause analysis under the proposed rule contains no specific requirements, only suggestions.<sup>727</sup> EPA suggests sources do leak inspection or “visual inspection.” EPA should, at minimum, require sources to inspect for leaks and repair all leaks found. A root cause analysis with no actual requirements is not likely to produce meaningful corrective action.

Second, if after corrective action a facility still has an exceedance for the next sampling episode, then the proposed rule would require the facility to “develop a corrective action plan,” including actions completed to date, “additional measures that the owner or operator proposes to employ to reduce fence-line concentrations below the action level, and a schedule for completion of those measures.”<sup>728</sup> Again, the proposed rule requires no specific corrective action. At least the facility should be required to do more than it did after the first root cause analysis, as the prior corrective action clearly did not correct the problem.

One corrective action measure EPA should include in all such instances is higher-quality monitoring. As UV-DOAS, real-time technology will ensure a source actually finds and addresses a problem with fugitive emissions, where a source has more than one exceedance in the same year, EPA should require as corrective action that that refinery employ UV-DOAS for at least 1 year to monitor, identify, correct, and assure ongoing compliance after the exceedance problem is fixed. In addition, EPA should consider requiring: automatic shutdown and other independent oversight actions by EPA expert staff or an independent expert.

Third, as discussed above, it is important that EPA proposes to review and decide whether to approve corrective action plans, as well as take public notice and comment on these plans. But EPA should not deem plans approved if it has not acted within 90 days. If it takes EPA longer than that to review and make a decision, as discussed above, the facility should be required to implement the plan, but EPA must still act on the plan.

Fourth, an exceedance of the action level should clearly be deemed a violation of the emission standards, such that all applicable Clean Air Act penalties will apply until the facility ends and corrects the problem. Anything less is a malfunction exemption, and thus is unlawful under the Act and D.C. Circuit precedent.<sup>729</sup>

Finally, to design meaningful corrective action requirements, EPA must consider requiring at least what its own enforcement division is including in consent decrees, such as the Shell Deer Park decree.

### **3. EPA Has No Valid Grounds Not To Require Open-Path Monitoring.**

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<sup>727</sup> 79 Fed. Reg. at 36,978 (§ 63.658(g) (providing that root cause analysis and corrective action “may include, but is not limited to...”).

<sup>728</sup> *Id.* (§ 63.658(h)).

<sup>729</sup> *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008); 42 U.S.C. § 7602(k).

**a. Open-path Monitoring Is A Feasible and Widely Available Technology.**

EPA believes it needs to consider feasibility as a factor in what technology to use. In considering this, it cannot ignore the fact that better technologies are required or in use at existing refineries, including Shell Deer Park, BP Whiting, and Chevron Richmond. EPA has the burden to show, based on evidence in the record, that its choice of monitoring protocol is rational in that the proposed technology will actually do the job. The data it has cited does not demonstrate that its proposed technique, alone, will be reliable throughout the United States. By contrast, data is available showing other technologies are in use and that EPA's enforcement division has chosen them, not passive sampling, as the appropriate methods for fence-line monitoring at certain facilities.

EPA's enforcement division are experts in the form of technology that would be the best to employ to achieve the goal EPA has stated for this rule: assuring compliance. Most recently, that division and the experts within it, have required the use of UV-DOAS, an open-path technology at the Shell Deer Park refinery.<sup>730</sup> Prior Consent Decrees require the use of gas chromatographs which, while not open-path, are multi-pollutant detectors that provide highly time-resolved data.<sup>731</sup> The Bay Area AQMD is working to require all facilities within its jurisdiction to implement an open-path monitoring program for all BTEX pollutants.<sup>732</sup> Such technology is also in place at other refineries, including Chevron Richmond. Yet EPA is proposing to require a weaker form of monitoring technology in this rule: passive sampling only.

In view of these significant developments, EPA should not finalize a rule that is any less stringent than what local air districts are planning to require for refineries. Doing so would create inequality – weaker protections for communities elsewhere in the U.S. – and not reward local refineries who will be providing better community air monitoring data for the investments they will make under the new rules.

It is not clear in the record that EPA even consulted its own enforcement experts. There is no document in the record in which EPA rulewriters have summarized any input they received from enforcement experts. At minimum, EPA must consider requiring what its enforcement experts have shown in practice is the best, or even a good, way to assure compliance. And, before finalizing the rule, EPA should also consult with enforcement experts and request input on whether its proposal is indeed what they would recommend, to assure compliance, and how it should be strengthened to inform the goal of assuring compliance.

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<sup>730</sup> Shell Deer Park Consent Decree, *supra* note 118.

<sup>731</sup> See BP Whiting Consent Decree, *supra* note 118.

<sup>732</sup> BAAQMD Proposed Fence-line Monitoring Rule, *supra* note 700.

**b. Open-path Monitoring is Necessary to Provide an Ample Margin of Safety**

Finally, open-path monitoring will enable EPA to assure an “ample margin of safety to protect public health” and “prevent . . . an adverse environmental effect,” as required by 42 U.S.C. § 7412(f)(2). As discussed above, in Part II, because of the health risks EPA has found, which are currently unacceptable, and because it is possible for EPA to provide more of a margin of safety from refinery emissions than now exists for public health using fence-line monitoring, EPA must do so. Strong fence-line monitoring provisions would assure not only that the standards are met, but that there is indeed a “margin of safety” such that no community faces greater health risks than EPA has found to exist, because of fugitive and other emissions it acknowledges that it has not accounted for.

**c. Open-path Monitoring is Required to Comply With EPA’s Stated Policy to Mandate Enhanced Monitoring.**

Also, open-path monitoring will enable EPA to comply with the Act’s requirement to assure enhanced monitoring and its own policy to implement the Act’s enhanced monitoring requirements by setting such requirements in air toxics standards.<sup>733</sup> EPA previously stated that it recognized the need to implement this requirement in connection with specific air toxics rulemakings, and that it intended to do so.<sup>734</sup>

Although EPA is proposing to choose the passive sampling technology based on its lower cost, available evidence shows that other better technologies, in addition to open-path monitoring, are equally or nearly as inexpensive.<sup>735</sup> Even so, EPA should not prioritize cost over effective monitoring when the implementation of the best available monitoring technologies shows that they clearly are not cost-prohibitive.

**B. EPA Must Eliminate the Startup, Shutdown, and Malfunction Exemption and Uncontrolled Emissions from Pressure Relief Devices, Bypass Lines, and Other Sources.**

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<sup>733</sup> See, e.g., 42 U.S.C. § 7414; Notice, 78 Fed. Reg. 69,082.

<sup>734</sup> Proposed Compliance Assurance Monitoring Rule, 58 Fed. Reg. 54,648, 54,661 (Oct. 22, 1993) (“EPA intends to address the enhanced monitoring requirements pursuant to section 114(a)(3) in the requirements developed for such pollutants”; “EPA intends that the general provisions of part 63, MACT standards promulgated by rulemaking in individual subparts of part 63 . . . will include, pursuant to the authority in section 114(a)(3) of the Act, appropriate enhanced monitoring provisions.”); see also Final Compliance Assurance Monitoring Rule, 62 Fed. Reg. 54,900 (Oct. 22, 1997) (“One method is to establish monitoring as a method for directly determining continuous compliance with applicable requirements. The Agency has adopted this approach in some rulemakings and, as discussed below, is committed to following this approach whenever appropriate in future rulemakings.”).

<sup>735</sup> EPA should consult the new cost report on monitoring that is scheduled to be released by California.

EPA must remove the unlawful exemptions that it proposes to remove here.<sup>736</sup> The Clean Air Act requires emission standards to apply continuously, as EPA acknowledges.<sup>737</sup>

EPA may not allow any exemptions for any toxic air pollution emitted.<sup>738</sup> EPA also correctly proposes not to create an unlawful “affirmative defense” to civil penalties for malfunction emissions that exceed the standards. As it acknowledges, EPA has no authority to create such a defense by rule under the Act.<sup>739</sup>

Moreover, the emissions that can occur during periods of startup, shutdown, and malfunction are a serious problem for public health.<sup>740</sup> Such emissions can spike to as much as 100 times the usual emissions allowed. For example, where control equipment fails, emissions could be at least 100 times greater (*e.g.*, in the circumstance where a control device has 99% efficiency, such that an uncontrolled release would cause 100 times the usual amount of emissions). And, “[u]psets are a significant problem for many areas, including rural ones, but they are a particular problem for the predominantly lower income communities of color surrounding many refinery and chemical complexes.”<sup>741</sup>

As EPA is well aware, some refineries have frequently relied on the startup, shutdown, and malfunction exemptions in the past to avoid reducing their emissions. It is important that EPA finally remove this unlawful loophole so that all sources start following the Act and applicable emission standards.

Similarly, data available on other uncontrolled releases show that these also can cause substantial toxic air emissions. For example, the Bay Area and South Coast Air Quality Management Districts have both collected information on refineries’ emissions from pressure relief devices, showing that PRD emissions can range from 0.4 to 89 tons per year.<sup>742</sup>

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<sup>736</sup> 79 Fed. Reg. at 36,912-13, 36,942.

<sup>737</sup> 42 U.S.C. §§ 7602(k), 7412; *see Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008).

<sup>738</sup> 79 Fed. Reg. at 36,900 n.25; *Nat’l Lime Ass’n*, 233 F.3d at 639, 642.

<sup>739</sup> 42 U.S.C. §§ 7604(a)(c), 7413; *See NRDC v. EPA*, 749 F.3d 1055, 1062-63 (D.C. Cir. 2014).

<sup>740</sup> *See, e.g.*, Kelly Haragan, Evtl. Integrity Project, “Gaming the System: How Off-the-Books Industrial Upset Emissions Cheat the Public Out of Clean Air” (Aug. 2004), 1-2, 5, [http://www.environmentalintegrity.org/news\\_reports/Report\\_Gaming\\_System.php](http://www.environmentalintegrity.org/news_reports/Report_Gaming_System.php) (finding significant likelihood of an upset at refineries, chemical plants, gas plants and a carbon black plant, and finding that the resulting emissions release is many times higher than the amount of otherwise-reported annual emissions and that “releases from upsets actually dwarf a facility’s routine emissions.”).

<sup>741</sup> *Gaming the System*, *supra* note 737, at 1-2; *Accident Prone*, *supra* note 222; EIP SSM Enforcement Letter, *supra* note 222. *See also* Appendix Microsoft Excel File containing TCEQ Emission Event Database (2012-2013) *also available at* <http://www11.tceq.texas.gov/occeer/index.cfm>; ICR Component 1, *supra* note 103, at Part III. LABB data,

<sup>742</sup> *See, e.g.*, South Coast AQMD, Final Staff Report for Proposed Amended Rule 1173—Control of Volatile Organic Compound Leaks and Releases from Components at Petroleum Facilities and Chemical Plants (May 15, 2007).

EPA should require, as the Bay Area Air Quality Management District does, that any refinery that has a reportable pressure relief device event must take certain steps to prevent such releases in the future.<sup>743</sup> In particular, such a refinery must create a Process Hazard Analysis, meet the Prevention Measures Procedures specified in Section 8-28-405, and conduct a failure analysis of the incident, to prevent recurrence of similar incidents.<sup>744</sup> If a second release occurs, then, within one year, the facility must vent its pressure relief devices to a vapor recovery or disposal system that meets certain requirements.<sup>745</sup> EPA's prohibition on uncontrolled pressure relief devices will ensure that refineries take the necessary steps to prevent such releases, or install control devices so that any releases from PRDs that must occur are vented through a device to reduce the amount of toxic air pollution they emit. EPA's prohibition is consistent with requirements in place in these jurisdictions, and is a common-sense measure to protect public health, as well as a measure that the Act legally requires to remove unlawful exemptions. At minimum, EPA must prohibit these uncontrolled emissions and require monitoring and reporting to assure compliance and ensure that the emission standards apply at all times, as required by the Act. EPA must also, however, consider requiring the additional developments that have been put into place in the BAAQMD and also require control devices to be used for all pressure relief devices, as some local air districts require.<sup>746</sup>

In addition, Commenters support EPA's monitoring and reporting requirements for PRD releases. Commenters also support the proposed electronic reporting requirements, which EPA recognizes are needed to assure compliance and assist with future rulemakings.<sup>747</sup> EPA can and should require this reporting under its 42 U.S.C. § 7414 authority, and as that provision requires, EPA also must make all information reported publicly available online promptly and in an accessible and understandable format.

**i. EPA May Not Finalize Special Startup or Shutdown Standards.**

Although EPA generally removes the unlawful SSM exemption, which it is required to remove, EPA also proposes special standards for startup or shutdown periods in three instances: (1) PM standard for startup of FCCU controlled with an ESP; (2) organic HAP from FCCU; and (3) SRU during shutdown.<sup>748</sup> EPA has failed to provide a reasoned explanation in the record for

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<sup>743</sup> BAAQMD Rule 8-28-304, <http://www.baaqmd.gov/Divisions/Planning-and-Research/Rules-and-Regulations.aspx>.

<sup>744</sup> *Id.* Reg. § 8-28-304.1.

<sup>745</sup> *Id.* Reg. § 8-28-304.2.

<sup>746</sup> *See* BAAQMD and SCAQMD Rules, attached in Appendix.

<sup>747</sup> 79 Fed. Reg. at 36,948.

<sup>748</sup> 79 Fed. Reg. at 36,943-44.



why these special standards are required, and why it is not unlawful, arbitrary, and capricious to authorize more toxic air emissions during these periods for these emission points.<sup>749</sup>

The Act requires sources to comply at all times with emission standards.<sup>750</sup> There is no exemption for any time periods. Thus, special standards for emission points during any time periods are plainly unlawful.

Thus, EPA has not demonstrated and cannot demonstrate that special standards during startup or shutdown periods for any emission points satisfy the Act generally, or the floor and beyond-the-floor requirements of § 7412(d)(2)-(3). EPA may not set any standards for any emission points that do not satisfy these provisions.

Even if an alternate limit is permissible under the act, emissions event data from the Texas Commission on Environmental Quality demonstrates that a special standard for SRU shutdowns is not justifiable. There are 62 SRUs at refineries in Texas according to the 2011 Petroleum Refinery ICR.<sup>751</sup> Between 2012 and 2013, not one facility reported any reduced sulfur HAP emissions during shutdown periods from these SRUs.<sup>752</sup> Facilities are required to report these emissions to TCEQ pursuant to 30 Tex. Admin. Code § 101.201 and .211. The lack of any reported reduced sulfur HAP emissions demonstrates that an alternate shutdown emission limit is not necessary for SRUs.

If an alternate reduced sulfur SRU limit for refinery shutdowns is supported by other evidence not provided in the record and is also deemed legally permissible, EPA must clarify that the alternate limit only applies when a shutdown is planned and the entire facility is shutdown. First, EPA's proposal explains that facilities are expected to run the SRU "continuously" and "only shutdown its operation during a complete turnaround or shutdown of the facility."<sup>753</sup> Yet the proposed rule does not clearly circumscribe the limit to complete facility shutdowns. Specifically, the proposed rule states "during periods of shutdown only, you can choose from the three options" without any further limitations or definition of a shutdown.<sup>754</sup>

Second, EPA must clearly prohibit the availability of the alternate limit to planned shutdowns. An alternate shutdown limit that is available beyond planned shutdowns would create an unlawful exception to the reduced sulfur HAP limit for malfunctions and other unplanned events. Without narrowing its availability, an alternate limit for shutdowns would

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<sup>749</sup> *Id.*

<sup>750</sup> *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008).

<sup>751</sup> See EPA, Comprehensive Data Collected for the Petroleum Refining Sector; ICR Component 1 Data - Questionnaire on Processes Controls [hereinafter ICR Component 1] available at <http://www.epa.gov/airtoxics/petref/petrefpg.html>.

<sup>752</sup> Microsoft Excel File containing TCEQ Emission Event Database (2012-2013) *supra* note 741.

<sup>753</sup> 79 Fed. Reg. at 36943.

<sup>754</sup> *Id.*

permit compliance with a weaker limit caused by poor maintenance, planning, or other preventable event. For example, many of the cited causes for SRU shutdowns, reported to the ICR component 1, identify the loss of power or the loss of third-party hydrogen supply.<sup>755</sup> As discussed in the context of inherently safer technologies, facilities can eliminate or reduce the frequency of power outages through maintaining back-up power sources. Further, facilities are in the best position to ensure a reliable source of hydrogen through bringing those processes on site or through the terms of their contract. Providing an alternate standard for all shutdowns reduces the incentive to take these measures that would ensure reliable refinery operations and the utilities that supply them. Therefore an alternate limit that is not narrowly drawn to only apply during planned shutdowns is an end-run around the Clean Air Act's mandate that standards must apply at all times and must be removed from the final rule.

To ensure that the alternate limit is only available for planned shutdown events, EPA's final regulation must require facilities to submit a shutdown plan for public notice and comment and approval by the appropriate authority. The plan should specifically explain the reason for the shutdown and the measures the facility will take to minimize emissions. These measures will ensure that the alternate emission limit is only utilized when absolutely necessary and that the resulting emissions are minimized to the maximum extent possible.

Finally, providing special standards during some time periods will increase the health risks during those times, and EPA has failed to consider much less show how these standards could be lawful under § 7412(f)(2). EPA must prevent unacceptable risk and assure an "ample margin of safety to protect public health," under this provision. EPA does not discuss these requirements, much less show, how the special standards will meet these, when they will allow additional toxic air pollution to be released during regular periods of startup and shutdown.

**ii. EPA has not met the test under § 7412(i) to delay compliance with the proposed § 7412(d) standards.**

For all of the standards EPA proposes under § 7412(d), EPA proposes a 3-year compliance delay for existing sources to comply.<sup>756</sup> Yet EPA has failed to show, as required, that three years is "as expeditious[] as practicable" for sources to comply with each of these

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<sup>755</sup> See ICR Component 1, *supra* note 751.

<sup>756</sup> 79 Fed. Reg. at 36,950-51.

standards.<sup>757</sup> In enacting the provision governing the compliance schedule for section 7412(d), which is 42 U.S.C. § 7412(i), “Congress stated it wanted ‘expeditious[]’ compliance.”<sup>758</sup> This provision does not authorize an automatic 3-year compliance delay for all § 7412(d) standards. EPA must meet the test the statute provides. Yet EPA has included only conclusory statements on this question, unsupported by evidence showing why sources need a full 3 years to comply.<sup>759</sup>

Commenters also oppose the 3-year compliance delay that applies to EPA’s new prohibition on currently uncontrolled emissions from pressure relief devices and bypass lines.<sup>760</sup> This prohibition is legally required, for reasons EPA has explained. All uncontrolled emissions of this kind are unlawful. Thus, allowing them to continue for three additional years is equivalent to allowing the unlawful malfunction exemption to continue for another 3 years. As the Act and the D.C. Circuit Court have made clear, EPA may not create such an exemption. For the same reasons that EPA must require and assure that emission standards apply “at all times,” it may not allow an exemption to continue for an additional three years, such that they will apply at no time until three years from the final rule date.<sup>761</sup>

Finally, Commenters support the compliance date EPA proposes for the new storage vessel standards. EPA appropriately recognizes that it does not have authority to extend this compliance date beyond 90 days, as § 7412(f) provides.<sup>762</sup> Section 7412(f)(3) provides that “[a]ny emission standard established pursuant to this subsection [§ 7412(f)] shall become effective upon promulgation.”<sup>763</sup> Section 7412(f)(4) establishes a prohibition on violating the new standard, stating that “[n]o air pollutant to which a standard under this subsection applies may be emitted from any stationary source in violation of such standard, except that in the case of an existing source . . . such standard shall not apply until 90 days after its effective date.”<sup>764</sup>

### **iii. EPA should require the use of continuous emission monitoring.**

EPA must require continuous monitoring of emissions from refineries. As EPA is aware, there is technology available to perform CEMS for Hg, HCl, HF, PM, and opacity.<sup>765</sup> EPA should require the use of all developments in continuous emission monitoring under § 7412(d)

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<sup>757</sup> 42 U.S.C. § 7412(i)(3).

<sup>758</sup> *NRDC v. EPA*, 489 F.3d 1364, 1374 (D.C. Cir. 2007) (holding that EPA could not rely on this provision to reset a prior rule’s effective date).

<sup>759</sup> 79 Fed. Reg. at 36,950-51.

<sup>760</sup> 79 Fed. Reg. 36,970.

<sup>761</sup> *See Sierra Club v. EPA*, 551 F.3d at 1028.

<sup>762</sup> *See ABR v. EPA*, 716 F.3d 667, 672 (D.C. Cir. 2013); 79 Fed. Reg. at 36,950.

<sup>763</sup> 42 U.S.C. § 7412(f)(3).

<sup>764</sup> *Id.* § 7412(f)(4).

<sup>765</sup> Inst. of Clean Air Companies (ICAC), Continuous Emissions Monitoring Systems (CEMS), [http://www.icac.com/?page=Emissions\\_Monitoring](http://www.icac.com/?page=Emissions_Monitoring).

and § 7412(f), for the same reasons described above regarding fence-line monitoring. Stronger emission monitoring is particularly needed due to the problematic compliance and exceedance history. EPA should require immediate reporting on the Internet of all monitoring reports.

**iv. EPA should also require additional compliance and corrective action requirements, when exceedances and violations occur.**

The past history of the SSM exemption and compliance problems for refineries demonstrate the need for the stronger and more frequent monitoring, testing, and reporting requirements described above, and additional enforcement provisions. EPA must implement strong enforcement provisions to prevent and remedy emission spikes, malfunctions and other violations in a way that will be enforceable by citizens in the Title V permits for refineries.<sup>766</sup> Considering that the emissions from these source categories cause disproportionate risk in minority and economically disadvantaged communities, additional monitoring and stronger enforcement provisions would help provide environmental justice. As discussed elsewhere in these comments, EPA must finalize strong continuous emission monitoring and fence-line ambient air monitoring to assure compliance.

In addition, EPA must promulgate specific public reporting and notification requirements for malfunctions, or any emission exceedance that occurs. Commenters support the fact that EPA is requiring reporting for pressure relief device releases, bypass line releases, flares, and other failures to meet the standards.

However, EPA proposes to delay reporting for much of these until the “periodic report,” which may occur as long as 8 months after the alleged malfunction.<sup>767</sup> This proposed reporting requirement provides only delayed, after-the-fact information to the community. For people near the facility, a written report 8 months later is too late to find out about emission spikes, uncontrolled emissions, and alleged malfunctions that may have threatened public health and may be continuing to do so if they have gone uncorrected in the intervening time period.

EPA must require telephone reporting by the facility to EPA (not just a state regulator) no later than 24 hours after the malfunction, flaring, pressure relief device release, bypass, or any other excess emissions or exceedance. EPA must require that when a facility provides EPA with telephone notification of a malfunction or emission exceedance under the regulations, this notice will be made publicly available on EPA’s website and through ECHO within 24 hours.

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<sup>766</sup> See, e.g., NYPIRG & Earth Day Coalition, *The Proof Is In the Permit: How to Make Sure a Facility in Your Community Gets an Effective Title V Air Pollution Permit* (June 19, 2000), available at <http://www.epa.gov/oar/oaqps/permits/partic/proof.html>.

<sup>767</sup> 79 Fed. Reg. at 36,947; 40 C.F.R. §63.655(g) (requiring periodic reports to be submitted “no later than 60 days after the end of the 6-month period when any of the information specified.... is collected.”).

EPA should require that the EPA Administrator provide this information to its Regional office within 24 hours of receiving notification, and direct the Regional office to notify the local community on the Internet, by direct communication, and through all available means.

In addition, EPA must promulgate the requirement that when such notification is made, the facility must also provide for community notification of the malfunction or emission standard exceedance within 24 hours, through an appropriate public forum that is designed to reach residents who live near the facility, including but not limited to a notice on the facility's own website (if it has one), a written notice to the local municipality and local school district, and a press release to the local newspaper, radio, and TV news station that contains any information community members may need to try to protect themselves and their families from the additional air pollution.

EPA should also require a written report to be submitted within 7 days, and use the same distribution method as outlined above, including publication on ECHO, EPA's Regional website, and distribution to active local community members who are interested (such as through setting up an email list, a local listserv, Twitter, and other media).

In the written report, EPA should require the facility to report: (1) the nature of the event; (2) the duration of the event; (3) emissions released during the event; and (4) a description and timing of corrective actions that were taken and any planned to be taken. EPA should also require a follow-up report within one week providing information on whether the problem was ended or corrected, including monitoring data showing that the problem no longer exists. If the problem was not ended or corrected, the report must explain what additional steps are planned and EPA must provide these reports on-line in a format that the public can access.

Fourth and very importantly, a prohibition on and reporting of malfunctions or other exceedances are not enough to protect the most exposed people from the HAP emissions from the source categories under review in this rulemaking. EPA also must promulgate additional requirements that apply in the event of a malfunction or violation of the emission standards. As EPA has recognized, the Clean Air Act requires continuous compliance with the emission standards.<sup>768</sup> Data from Texas and other sources cited in these comments, as well as EPA's own ICR Component 1 data, demonstrate significant spikes in emissions and an unusual record of exceedances and violations that EPA cannot ignore for the refinery sector. EPA must take action to protect local communities from health risk caused by refineries. Facilities must not be able to emit in an unlimited manner for an unlimited period of time.

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<sup>768</sup> See *Sierra Club v. EPA*, 551 F.3d 1019, 1028 (D.C. Cir. 2008).

Thus, in addition to the removal of the exemptions and addition of reporting requirements EPA has proposed, EPA also should require the following when an exceedance, malfunction, pressure relief device release, bypass, flaring, or similar event occurs:

1. EPA must require automatic shut-off of the malfunctioning equipment or process for the time needed to take corrective action whenever an exceedance or malfunction occurs.
2. EPA must assign responsibility and liability to the plant manager or a high-up staff member which allows only that person to restart the equipment or process.
3. EPA must require specific corrective measures to be taken immediately to remedy and prevent recurrence of the malfunction or violation.
4. For a facility that has had one or more malfunction, exceedance, or other violation incident in the prior month, written authorization by EPA must be required to restart equipment or processes. EPA should only authorize restart after making a public determination that provides information on the corrective measures that EPA is requiring. EPA should release this public determination on the Internet and require its Regional office to communicate this determination to all interested members of the public, including local community representatives.
5. If a facility has more than four exceedances or malfunctions during the same quarter, then EPA must require automatic shut down of the operation for a period of time needed to conduct and publish a full investigation and ensure systematic correction of the problem/s.
6. EPA should create a community complaint mechanism in the standards that ensures that citizen complaints of clouds, plumes, exceedances, odors, other air pollution incidents or health concerns receive an immediate response, in which EPA commits to initiate an investigation and provide a publicly available report of the result of the investigation, including whether it leads to an enforcement outcome from EPA's enforcement division within seven days.

## **VIII. CONCLUSION**

For the reasons explained above, Commenters urge EPA to fully satisfy all legal requirements and protect public health in this important rulemaking for petroleum refineries. EPA must address and incorporate each issue discussed in these comments, including by considering new science and taking a health-protective approach where there is uncertainty, in order to fulfill the important regulatory duties of CAA §§ 7412(f)(2) and 7412(d)(2)-(3) and 7412(d)(6).

These comments attach Tables, Addenda, and major sources cited as an Appendix, which are provided on the accompanying discs, delivered to the docket on October 28, 2014. We welcome the opportunity to provide any additional information that may be useful as you work to finalize action on this important rule.

Commenters appreciate EPA's time and consideration of these comments. For more information regarding these comments, please contact: Emma Cheuse, Earthjustice, (202) 667-4500 or [echeuse@earthjustice.org](mailto:echeuse@earthjustice.org) or Sparsh Khandeshi, Environmental Integrity Project, (202) 263-4446, or [skhandeshi@environmentalintegrity.org](mailto:skhandeshi@environmentalintegrity.org).

Cc: Janet McCabe, Assistant Administrator, Office of Air and Radiation  
Matthew Tejada, Director, Office of Environmental Justice  
Joel Beauvais, Associate Administrator, Office of Policy  
Lek Kadeli, Acting Assistant Administrator, Office of Research and Development

**Enc:**

**TABLES - T-1**

**ADDENDA A, B, and C**

## LIST OF APPENDIX DOCUMENTS

### EPA Documents

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