UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 88 Fed. Reg. 24,854 (Apr. 24, 2023)

Docket No. EPA–HQ–OAR–2018–0794

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June 23, 2023

COMMENTS OF PUBLIC HEALTH AND ENVIRONMENTAL ORGANIZATIONS

The undersigned organizations[1] respectfully submit these comments on the Environmental Protection Agency's proposed "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review, 88 Fed. Reg. 24,854," published at 88 Fed. Reg. 24,854 (Apr. 24, 2023) (Proposal).

We strongly support strengthening the Mercury and Air Toxics Standards (MATS) for coal- and oil-fired electric utility steam generating units under section 112 of the Clean Air Act. The MATS rule must be updated to reflect modern pollution controls, require continuous monitoring of harmful emissions, expand meaningful pollution limits to a more complete range of coal-fired power plants, operating conditions, and toxic pollutants, and correct other deficiencies in the original regulation. We urge EPA to finalize the revisions discussed in these comments expeditiously.

[1] Air Alliance Houston, Chesapeake Bay Foundation, Citizens for Pennsylvania's Future, Clean Air Council, Clean Air Task Force, Clean Wisconsin, Downwinders at Risk, Earthjustice, Environmental Defense Fund, Environmental Integrity Project, Environmental Law & Policy Center, Montana Environmental Information Center, Natural Resources Council of Maine, Natural Resources Defense Council, Sierra Club, and Southern Environmental Law Center.

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INTRODUCTION AND SUMMARY

The 2012 Mercury and Air Toxics Standards (MATS) for coal- and oil-fired electric generating units (EGUs) have proven to be one of the U.S. Environmental Protection Agency's (EPA's) greatest success stories. Under this rule, emissions of mercury, toxic metals, and acid gases from the electric power sector have declined dramatically,[2] while compliance costs have remained far below projected levels.[3] Yet, even when EPA issued MATS, the rule did not fulfill the mandate that Congress set forth in section 112 of the Clean Air Act (CAA) to achieve the maximum reductions in emissions of all hazardous air pollutants (HAPs) spewed by regulated sources. And, in the intervening years, control measures have improved beyond what was known at the time: better-than-expected removal capabilities, lower costs, and enhanced materials and control techniques have all unlocked further reductions in harmful emissions from coal-fired EGUs. EPA has a statutory obligation to secure the cleaner air now available.

The Proposal lays out welcome revisions to MATS, which are necessary yet insufficient and incomplete. In these comments, Public Health and Environmental Organizations discuss the statutory basis for EPA's proposed action and the further revisions that are needed to meet statutory requirements. Specifically, we make the following points:

Part I: In a subsequent, separate proceeding, EPA should reconsider its 2020 determination that the risks remaining after implementation of MATS are acceptable, and that the original standards provide an ample margin of safety to protect human health and prevent an adverse environmental effect. Many of the undersigned organizations submitted a petition for reconsideration documenting the numerous ways in which the 2020 determination failed to evaluate all of the risks posed by HAP emissions from coal- and oil-fired EGUs. In acting on this petition, the agency should consider newly available information concerning the health harms posed by EGUs' emissions of mercury, as well as emerging scientific evidence of the risks of non-mercury metals.

Part II: EPA's actions in the present rulemaking have no bearing on its March 2023 reaffirmation that it is "appropriate and necessary" to regulate coal- and oil-fired EGUs under section 112. That threshold determination, first made in 2000 and reaffirmed in 2012, 2016, and 2023, cannot now be challenged and has always been legally distinct from—and, under the statutory design, was to be temporally removed from—any revisions that the agency makes to the original standards.

Part III: The technology-based review conducted under section 112(d)(6) need not account for any information learned during the residual risk review under section 112(f)(2), unless that information pertains to the statutory factors relevant to the section 112(d)(6) review, such as the

[2] National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Revocation of the 2020 Reconsideration and Affirmation of the Appropriate and Necessary Supplemental Finding, 88 Fed. Reg. 13,956, 13,974 (Mar. 6, 2023).
[3] *Id.* at 13,976.

cost of achieving maximal emission reductions. Nor does section 112(d)(6) require EPA to find unacceptable risk or the absence of an ample margin of safety as a prerequisite to determining that it is necessary to strengthen standards. Where achievable at reasonable cost, EPA must secure the deepest HAP reductions possible, apart from any identified health or environmental impacts.

Part IV: To fulfill its current duties under section 112(d)(6), EPA must make several revisions to MATS. In doing so, the agency should focus on the ability of the regulated industry to absorb compliance costs and consider the full range of developments that could achieve greater or less costly emission reductions than were initially required. Specifically, EPA should lower the standard for non-mercury metal HAP emissions (with filterable particulate matter as a surrogate pollutant used to demonstrate compliance) to no higher than 0.0024 lb/MMBtu; the standards for mercury emissions to no higher than 0.15 lb/TBtu for not-low-rank coal units and 0.5 lb/TBtu for low-rank coal units; and the standard for HCl emissions to no higher than 0.0006 lb/MMBtu. Both individually and in combination, these strengthened standards are cost-reasonable and reflect widely available control measures documented in a new analysis by Andover Technology Partners. Moreover, the resulting emission reductions are worth pursuing given the highly toxic substances emitted by coal-fired power plants and the disproportionate impacts that these emissions have on disadvantaged and environmental justice communities. In addition, EPA should require continuous emission monitoring systems (CEMS) for both particulate matter (PM) and HCl, to ensure consistent performance of controls and provide transparency to nearby communities and the public at large. EPA must also replace the weak work practice standard for toxic organic HAPs with health-protective numeric standards. The agency should finalize its proposal to remove the unlawful definition of startup that allows excess emissions during this period; and eliminate the waste coal subcategory, applying the same MATS limits to those units as well. Finally, EPA should require timely compliance: within two years of the effective date of the rule, unless owners and operators demonstrate on a unit-specific basis that implementation of the necessary controls demands more time.

I. IN A FUTURE PROCEEDING, EPA SHOULD RECONSIDER ITS CONCLUSIONS FROM THE RESIDUAL RISK REVIEW.

A. EPA should promptly initiate a reconsideration proceeding to address the NGOs' July 2020 reconsideration petition.

EPA should immediately commence the long-overdue reconsideration proceeding needed to address the issues that commenters raised in their petition for reconsideration of the 2020 RTR. The petition makes a variety of objections that could not have been raised during the 2020 RTR notice-and-comment process, because they respond to arguments that EPA made only in the final RTR. Almost three years have passed since the submission of this petition. Although EPA now proposes to grant one of the requests from that petition, it continues to delay its resolution of the others. Because those objections are of central relevance to the outcome of the RTR, EPA should immediately begin a reconsideration proceeding.

1. The petition for reconsideration identified significant shortcomings in the 2020 RTR.

On July 21, 2020, several of the commenters were among the organizations that submitted a petition under section 307(d)(7)(B), asking the Administrator to reconsider EPA's May 2020 RTR decision.[4] This petition requested, among other things, that EPA reconsider its:

- risk analysis for lead emissions, which improperly assumed that emissions at or below the lead NAAQS are sufficient to protect the public with an ample margin of safety;
- failure to consider multipathway risks for hexachlorobenzene, hexachlorocyclohexane, lead compounds, PCBs, nickel, manganese, and hexavalent chromium;
- refusal to account for risks from mercury to people who fish in large waterbodies; and
- refusal to add the risks from inhalation exposure to the risks from other forms of exposure.

Some of the groups that submitted the petition also filed suit challenging the 2020 RTR.[5] The D.C. Circuit is holding that case in abeyance pending the agency's evaluation of the reconsideration petition.[6] In its status reports to the court, EPA has continued to state—as recently as January of this year—that its "consideration of the administrative petition is ongoing."[7]

EPA now proposes to grant the petition in part—specifically, with respect to the startup and shutdown provisions.[8] At the same time, however, EPA acknowledges that it "continues to review and will respond to [the petition] in a separate action" with respect to the other issues petitioners raised regarding the 2020 residual risk review and the organic HAP work practice standards.[9]

2. The petition raised issues of central relevance to the rulemaking that it was not practicable to raise during the comment period.

Under section 307(d)(7)(B) of the CAA, if grounds for an objection to a final rule arose after the end of the comment period, or if it was otherwise not practicable to raise the objection during the comment period, and if the "objection is of *central relevance* to the outcome of the rule," then EPA "*shall* convene a proceeding for reconsideration of the rule and provide the same procedural rights as would have been afforded had the information been available at the time the

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[4] Air Alliance Houston *et al.*, Petition for Reconsideration of the Final RTR, EPA–HQ–OAR–2018–0794–4565 (submitted July 21, 2020).
[5] Petition for Review, *Air Alliance Houston v. EPA*, No. 20-1268 (D.C. Cir. July 21, 2020).
[6] EPA's Status Report, *Air Alliance Houston v. EPA*, No. 20-1268 (D.C. Cir. Jan. 11, 2023).
[7] *Id.* at 2.
[8] 88 Fed. Reg. 24,854, 24,885 (Apr. 24, 2023).
[9] *Id.* at 24,866; *id.* at 24,882.

rule was proposed."[10] Although nearly three years have passed since commenters submitted the petition, EPA has not yet convened a reconsideration proceeding.

The 2020 petition for reconsideration raised several issues of key importance to the residual risk review, involving EPA's analysis of the risks from lead emissions, failure to consider multipathway risks for several HAPs, refusal to account for HAP risks to people who fish in large waterbodies, and failure to add the risks from inhalation exposure to the risks from other forms of exposure. As EPA correctly notes in the Proposal, its duty to carry out the residual risk review under section 112(f)(2) is independent of its duty to perform the technology review under section 112(d)(6).[11] The petitioners' objections identify serious flaws in the section 112(f)(2) risk review, which are of central relevance to the rulemaking because of EPA's failure to impose any standards under that provision. Moreover, as discussed below, the evidence of residual risks from power plant HAP emissions has only grown since 2020. Given that EPA has understood section 112(f)(2) to impose a one-time requirement, there is all the more reason to reconsider the 2020 residual risk review to make sure the process is done correctly.

Furthermore, each of the objections in the petition responded to new arguments raised by EPA in its response to comments and therefore could not have been raised in the notice-and-comment process. These arguments and petitioners' objections to them are described at length in the petition for reconsideration.[12] To give just one example: EPA asserted for the first time in the response to comments that it was "reasonable" to ignore multipathway risks presented by hexachlorobenzene, hexachlorocyclohexane, lead compounds, PCBs, nickel, manganese, and hexavalent chromium.[13]

In sum, the petition for reconsideration presents multiple objections to the 2020 RTR, which are both centrally relevant to the rulemaking and were impossible to raise during the public comment period. EPA should therefore promptly initiate a reconsideration proceeding.

3. The agency should not predetermine the outcome of the reconsideration proceeding.

In the Proposal, despite acknowledging that its work to review and respond to the petition for reconsideration is ongoing, EPA states that it "has determined that the [2020 residual] risk analysis was a rigorous and robust analytical review using approaches and methodologies that are consistent with those that have been utilized in residual risk analyses and reviews for other industrial sectors."[14] Until EPA has convened a full reconsideration proceeding, it should not make statements about the adequacy of the 2020 RTR's risk review. The agency cannot know whether its characterization of that review is correct until it has addressed the objections raised in the petition for reconsideration. Moreover, when EPA does initiate a reconsideration

[10] 42 U.S.C. § 7607(d)(7)(B) (emphasis added).
[11] 88 Fed. Reg. at 24,866 & n.17; *see* Part III, *infra*.
[12] *See* Petition for Reconsideration, *supra* note 4, at 28-40.
[13] *See id.* at 34.
[14] 88 Fed. Reg. at 24,866.

proceeding, such statements could be considered an improper prejudgment of the outcome of the proceeding.

4. Neither the CAA nor Executive Order 13,990 requires EPA, before it acts on an outstanding petition for reconsideration, to determine whether the 2020 RTR met statutory requirements.

Nothing in either the CAA or Executive Order 13,990 requires that EPA make any determination regarding whether the 2020 RTR satisfied statutory requirements before the agency acts on the aspects of the petition that it has yet to address. Under section 307(d)(7)(B) of the CAA, the proper mechanism for addressing a petition for reconsideration is to invoke a reconsideration proceeding. Unless and until EPA has convened such a proceeding—or has made an affirmative finding that the petition raised only objections that it was practicable to raise during the comment period or that were not of central relevance to the outcome of the rule—EPA has no basis for concluding that the 2020 RTR satisfied the CAA.

E.O. 13,990 does nothing to change this analysis. E.O. 13,990, "Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis," directed EPA to "review" and to "consider suspending, revising, or rescinding" all actions taken between January 20, 2017, and January 20, 2021, that "may be inconsistent with, or present obstacles to, the policy set forth in section 1" of the Executive Order.[15] It also specified that EPA, "as appropriate and consistent with applicable law, shall consider publishing for notice and comment a proposed rule suspending, revising, or rescinding" the 2020 RTR no later than August 2021.[16] The Proposal incorporates the proposed results of EPA's review of the RTR carried out pursuant to this Executive Order.[17]

Nothing in this Executive Order requires that EPA predetermine the outcome of its consideration of the petition for reconsideration in this proceeding. It mandates only that EPA "shall *consider*" whether to propose to revise or rescind the 2020 RTR—something that EPA has done in the Proposal. It does not require that this proposal include EPA's last say on all aspects of the 2020 RTR. Moreover, by specifying that its instruction applies only "as . . . consistent with applicable law," the E.O. makes clear that it does not attempt to supersede or replace EPA's duty under section 307(d)(7)(B) of the CAA to convene a reconsideration proceeding when the triggering circumstances are met. Here, as explained above, the petition for reconsideration raised objections that it was not practicable to raise during the notice-and-comment process for the 2020 RTR and that are of central relevance to the outcome of the rule.

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[15] 86 Fed. Reg. 7,037, 7,038 (Jan. 25, 2021).
[16] *Id.*
[17] 88 Fed. Reg. at 24,856.

B. In addition to the objections raised in the reconsideration petition, EPA should consider new evidence pertaining to the health and environmental effects of HAP emissions from coal- and oil-fired EGUs.

Since the time commenters submitted their 2020 reconsideration petition, additional evidence has accumulated regarding the public health and environmental impacts of coal- and oil-fired power plant HAP emissions. EPA has the authority to consider this new information when reconsidering its residual risk analysis.[18] Commenters described this new evidence at length in their comments on the 2022 "appropriate and necessary" reconsideration.[19] We present here the results of new research on sociodemographic disparities in exposure to mercury emitted by U.S. coal-fired power plants and a new review and synthesis of studies on the effect of non-mercury metals, both of which further support the conclusion that EPA must reconsider its residual risk analysis in response to the petition.

1. <u>A recent analysis finds that some individuals who consume fish caught near coal-fired EGUs in North Dakota and Texas could be exposed to mercury at levels above the reference dose that are attributable to EGU emissions.</u>

A new study led by researchers at the Harvard John A. Paulson School of Engineering and Applied Sciences finds continuing sociodemographic disparities in exposure to mercury emitted by power plants despite the overall reductions in emissions since the promulgation of MATS.[20] For some consumers of self-caught fish near the largest power plants, methylmercury exposure could exceed the EPA reference dose.

The researchers determined the locations and mercury emissions of all coal- and oil-fired power plants in the United States in both 2010 and 2020, to represent the situations before and after the promulgation of MATS in 2012. For each of the 507 plants in operation in 2010, they determined whether the plant remained fully operational (215 plants), was partially retired (62), or was fully retired in 2020 (230). Using a version of the GEOS-Chem atmospheric chemical transport model, they simulated the atmospheric deposition of these plants in 2010 and 2020.

Next, the authors compiled information on the sociodemographic characteristics of populations living near U.S. power plants. They compared the sociodemographic attributes of residents living within a 5-km circular buffer around the plants with those of residents living outside the buffer region. This analysis showed that the population within 5 km of active coal-

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[18] *Nat'l Ass'n for Surface Finishing v. EPA*, 795 F.3d 1, 16-17 (D.C. Cir. 2015).

[19] Comments of Public Health and Environmental Organizations, EPA–HQ–OAR–2018–0794–4962, at 29-49 (submitted Apr. 11, 2022); *see also* Comment submitted by Emmett Environmental Law & Policy Clinic on Behalf of Elsie M. Sunderland, Charles T. Driscoll, Jr., Joel Blum, and Celia R. Chen, EPA–HQ–OAR–2018–0794–4954 (submitted Apr. 12, 2022).

[20] Mona Q. Dai *et al.*, *Sociodemographic Disparities in Mercury Exposure from United States Coal-Fired Power Plants*, Envtl. Sci. & Tech. Letters (2023), https://pubs.acs.org/doi/10.1021/acs.estlett.3c00216?ref=pdf.

fired power plants in 2020 had a greater proportion of people with incomes below 200% of the Federal poverty line than the population around plants that had closed between 2010 and 2020. The same was true of the proportion of households with an annual income of less than $20,000. Both results suggest that plants were more likely to close in more affluent areas, meaning that the reductions in exposures to power plant mercury emissions have been inequitably distributed.

To estimate the magnitude of the remaining exposures, the researchers then looked at the areas where plants were responsible for the largest fraction of local atmospheric mercury deposition in 2020. These plants were in North Dakota and Texas. Next, they calculated the range of total mercury concentrations in fish that would result in the power plant-attributable mercury on its own exceeding the methylmercury reference dose. These fish mercury concentrations ranged from 0.22-1.28 $\mu g\ g^{-1}$. Finally, they compared these values to measured fish mercury concentrations in North Dakota and in the South-Central states (Texas, Louisiana, Oklahoma, and Arkansas). They found that 64% of the North Dakota samples and 54% of the South-Central samples exceeded the 0.22 $\mu g\ g^{-1}$ lower bound, and that 3% of the North Dakota samples and 5% of the South-Central samples exceeded the 1.28 $\mu g\ g^{-1}$ upper bound.

Based on these results, the authors concluded that "exposures exceeding the U.S. EPA [reference dose] for methylmercury are still possible for the most highly exposed individuals residing next to the largest remaining power plants in 2020." In other words, "residual risks associated with methylmercury exposures from U.S. power plants are still plausible from the largest emitters." These results provide an additional reason that EPA should reconsider its 2020 residual risk finding.[21]

2. <u>Recent studies on the toxicity of metals emitted by coal-fired power plants indicate that individual metals and mixtures of metals may harm health in more ways, and at lower concentrations, than previously understood.</u>

Emerging findings on the health impacts of individual non-mercury metals suggest that EPA should revisit the reference concentrations that it uses when conducting risk reviews. These recent studies indicate that non-mercury metals may have impacts on different organ systems or may have effects at lower levels than previously understood. Specifically, we draw the agency's attention to the following findings:

- A study investigating gestational cadmium (Cd) exposure and fetal growth in Ulaanbaatar, Mongolia, found that doubling blood Cd levels was associated with a 95g reduction in birth weight in regression models.[22]

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[21] In addition, these findings could support strengthening of the mercury standard for the subcategory of EGUs burning lignite coal. *See* Benzene Standard, 54 Fed. Reg. 38,044 (Sept. 14, 1989) ("[T]he effect on the most exposed individuals can be reviewed as well as the impact on the general public.").

[22] Prabjit Barn *et al.*, *Coal smoke, gestational cadmium exposure, and fetal growth*, 179 Envtl. Res. 108830 (2019).

- An *in vitro* study found that lung epithelial cells experienced higher oxidative DNA damage when exposed to particulate arsenic trioxide than when exposed to soluble arsenite, highlighting the importance of inhalation as an exposure pathway for arsenic (As).[23]

- An epidemiology study found a dose-dependent relationship between prolonged As exposure and increased risk of type 2 diabetes, even at low As levels.[24]

- An *in vitro* study found significantly positive correlation coefficients between metal concentrations and DNA damage for lead (Pb), chromium (Cr), and cadmium (Cd).[25]

- An *in vitro* study found a significant positive correlation for Cd and antimony (Sb) with particle-induced DNA damage rates.[26]

- A literature review found that *in vivo* and *in vitro* studies showed that As exposure may induce oxidative stress, apoptosis, inflammatory responses, epithelial-to-mesenchymal transition, airway dysfunction, and abnormal lung development.[27]

- An epidemiological study found significant positive correlations between Cr, vanadium (V), Pb, and Cd and skin damage, as well as a significant positive correlation between V and liver damage.[28]

- An epidemiological study found correlations between several metals present in $PM_{2.5}$ and health effects among children in Poland.[29]

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[23] Karen Cooper *et al.*, *Particulate arsenic trioxide induces higher DNA damage and reactive oxygen species than soluble arsenite in lung epithelial cells*, 457 Toxicol. Appl. Pharmacol. 116320 (2022).
[24] Lulu Dai *et al.*, *Elevated whole blood arsenic level is associated with type 2 diabetes in coal-burning areas in Guizhou*, 403 Toxicol. Appl. Pharmacol. 115135 (2020).
[25] Xiaolei Feng *et al.*, *Oxidative potential and water-soluble heavy metals of size-segregated airborne particles in haze and non-haze episodes: Impact of the 'Comprehensive Action Plan' in China*, 814 Sci. Total Environ. 152774 (2022).
[26] Xiaolei Feng *et al.*, *Particle-induced oxidative damage by indoor size-segregated particulate matter from coal-burning homes in the Xuanwei lung cancer epidemic area, Yunnan Province, China.*, 256 Chemosphere 127058 (2020).
[27] Deepa Gandhi *et al.*, *Non-malignant respiratory illness associated with exposure to arsenic compounds in the environment*, 94 Envtl. Toxicol. Pharmacol. 103922 (2022).
[28] Yong Hu *et al.*, *Associations between and risks of trace elements related to skin and liver damage induced by arsenic from coal burning*, 208 Ecotoxicol. Envtl. Saf. 111719 (2021).
[29] Anna Mainka & Peter Fantke, *Preschool children health impacts from indoor exposure to PM(2.5) and metals*, 160 Environ. Int. 107062 (2022).

- A case-control study found that the risk of orofacial clefts in humans increases in a dose-dependent, statistically significant manner with increases in Cr concentrations in umbilical cord serum and tissue.[30]

- A case-control study found increasing adjusted odds ratios for unexplained male infertility with each successive quartile of exposure to As.[31]

- A human population-based case study identified a mechanism for arsenic-induced renal dysfunction.[32]

- A cross-sectional study found risk of anemia in children increased with higher exposures to Cd, and with higher exposures to manganese (Mn).[33]

Additional studies are summarized in the literature review attached to these comments.[34]

In addition, a synthesis of recent studies by researchers at the University of Arizona and University of New Mexico underscores the need to consider health impacts of mixtures of metals and exposures through multiple pathways. Their findings are discussed in greater detail below. These complex health effects not only reveal, qualitatively, some of the value of reducing hazardous pollution further, but also call into question the conclusion that EPA's 2020 risk review "was a rigorous and robust analytical review."[35] EPA should address these findings on reconsideration.

II. EPA'S RISK AND TECHNOLOGY REVIEW IS DISTINCT FROM THE APPROPRIATE AND NECESSARY DETERMINATION, AND BASED UPON DIFFERENT STATUTORY STANDARDS.

On March 6, 2023, EPA issued a final action reaffirming its 2016 Supplemental Finding that regulation of hazardous air pollutants from electric generating units is "appropriate and necessary," and revoked its 2020 finding that such regulation is not appropriate and necessary.[36]

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[30] Tian Tian *et al.*, *Elevated concentrations of chromium in maternal serum, umbilical cord serum, and cord tissue are associated with an increased risk for orofacial clefts*, 214 Envtl. Res. 113799 (2022).
[31] Xiaofei Wang *et al.*, *Low-level environmental arsenic exposure correlates with unexplained male infertility risk*, 571 Sci. Total Environ. 307-13 (2016).
[32] Y. Xu *et al.*, *miR-191 is involved in renal dysfunction in arsenic-exposed populations by regulating inflammatory response caused by arsenic from burning arsenic-contaminated coal*, 39 Hum. Exp. Toxicol. 37-46 (2020).
[33] Keyang Zheng *et al.*, *Kindergarten indoor dust metal(loid) exposure associates with elevated risk of anemia in children*, 851 Sci. Total Environ. 158227 (2022).
[34] Mona Dai, Annotated Bibliography of Health Impacts from Exposure to Non-Mercury Hazardous Metals (June 2023), Att. 4.
[35] 88 Fed. Reg. at 24,866.
[36] *Id.* at 13,956.

In that action, EPA identified the serious risks associated with emissions of HAPs from EGUs, and the corresponding benefits of regulating those emissions, and took account of costs under a number of different approaches.

EPA's reaffirmation of its determination that it is appropriate to regulate power plants under section 112(n)(1)(A),[37] was not challenged by any party during the 60-day statutory review period provided for in 42 U.S.C. § 7607(b)(1), which expired on May 5, 2023, and accordingly, is no longer reviewable.

This proceeding concerns the distinct statutory inquiries whether EPA should amend MATS pursuant to the risk and technology reviews required by section 112(f) and 112(d)(6).[38] Addressing risk and technology reviews separately from the threshold "appropriate and necessary" finding is consistent with the design of Section 112 – under which the "appropriate and necessary" finding occurs before regulations are promulgated, and the risk and technology reviews would occur years after national emission standards for hazardous air pollutants (NESHAPs) were promulgated for EGUs. Both section 112(f) and 112(d)(6), by their terms, demand information that EPA could not have had during the threshold "appropriate and necessary" determination. Section 112(f) asks EPA to assess the residual risk to public health remaining after it sets standards for the source category.[39] That assessment requires accurate knowledge, not just of the initial technology-based standards set under section 112(d)(2) and (3), but of the effect of those standards on real-world emissions. For that reason, any such standards are established "8 years after promulgation of the standards under [section 112(d)]."[40] Section 112(n)(1)(A)'s "appropriate" inquiry—meant to occur well before EPA had established section 112(d) standards—could not require EPA to determine whether any such risks would exist, what the resulting standards would demand, and what costs might follow. Section 112(d)(6) similarly contemplates, along with any other necessary changes, updates to take account of "developments in practices, processes, and control technologies" after the initial standards were promulgated that EPA did not address in those standards.[41]

While the statutory standards governing EPA's risk and technology reviews are separate and distinct from those informing the prior reaffirmed A&N finding, much of the information compiled in the A&N proceeding—including about the hazards associated with HAP emissions and the costs of controlling their emissions by EGUs—will help to inform EPA's analysis under its risk and technology reviews.

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[37] 42 U.S.C. § 7412(n)(1)(A).
[38] *Id.* § 7412(f) & (d)(6).
[39] *Id.* § 7412(f).
[40] *Id.* § 7412(f)(2)(C).
[41] *Id.* § 7412(d)(6).

III. EPA CORRECTLY INTERPRETS CAA SECTION 112(d)(6) AS IMPOSING OBLIGATIONS DISTINCT FROM AND INDEPENDENT OF THOSE IMPOSED BY SECTION 112(f)(2)'S RISK REVIEW.

The Proposal correctly observes, in keeping with EPA's longstanding interpretation, that section 112 "create[s] a two-pronged structure" for updating air toxics standards, within which EPA's obligation to revise its standards under section 112(d)(6)[42] is independent from its separate obligation to promulgate a health-based standard under section 112(f)(2).[43, 44] EPA accordingly proposes to update the standards based solely on its assessment of developments in practices, processes, and technologies, without regard to the results of its risk assessment.[45]

That result necessarily follows from the statutory text. Section 112(d)(6) and (f)(2) set out distinct requirements—each mandatory and each governed by different criteria. Section 112(d)(6) mandates that EPA "shall" update its technology-based standards "as necessary" considering "developments in practices, processes and control technologies."[46] Section 112(f) likewise demands that EPA "shall" promulgate a separate health-based standard if "required in order to provide an ample margin of safety to protect public health," or "to prevent . . . an adverse environmental effect," considering cost and other factors.[47] The text thereby clearly separates the two inquiries, and requires EPA to act if either set of criteria is met.

Section 112's structure further separates section 112(d)(6)'s technology-based inquiry from the health-based assessment described by section 112(f)(2). The two sections refer to different standards, focusing on different objectives: ensuring continued application of the maximum achievable control technology promulgated under section 112(d);[48] and avoiding undue risks through standards separately established under subsection 112(f)(2).[49] Those separate foci are reflected in differing implementation timelines: Section 112(d)(6)'s review repeats every eight years, while EPA has understood section 112(f)(2) to impose a one-time requirement.[50] It is further reflected in the narrow and specific bounds that section 112(d)(4)

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[42] *Id.*
[43] *Id.* § 7412(f)(2).
[44] 88 Fed. Reg. at 24,866 & n.17 (citing prior applications of interpretation that these two inquiries are independent).
[45] As set forth below, however, there are more than ample remaining risks from EGU-generated HAPs to warrant revision of EPA's standards.
[46] 42 U.S.C. § 7412(d)(6).
[47] *Id.* § 7412(f)(2)(A). *See Ass'n of Battery Recyclers v. EPA*, 716 F.3d 667, 672 (D.C. Cir. 2013) (Section 112(d)(6) directs EPA to "tak[e] into account developments in practices, processes, and control technologies," "not public health objectives or risk reduction achieved by other controls.").
[48] 42 U.S.C. § 7412(d).
[49] *Id.* § 7412(f)(2).
[50] *Nat'l Ass'n for Surface Finishing*, 795 F.3d at 5 (noting "distinct, parallel analyses" required by two sections).

places on EPA's consideration of health risks when setting standards under subsection 112(d).[51] An interpretation of section 112(d)(6) that allowed EPA's decision to be governed by the results of its one-time risk-assessment under section 112(f)(2) would improperly collapse those two expressly separate regulatory tracks, and also render superfluous the statute's demand for periodic, repeated technology assessments.

Historical context confirms section 112(d)(6)'s sole focus on developments in practices, processes and control technologies, and its exclusion of risk-related criteria. The current version of section 112 reflects Congress's frustration with the prior regulatory regime, and in particular with its dependence on EPA's assessment of the health risks of hazardous air pollution.[52] Congress's response was to fundamentally re-orient the statute towards "technology-based standards" and—critically—to make those standards independent of EPA's "[a]uthority to issue health-based standards."[53] That technology-focused approach contradicts any interpretation that would introduce the residual-risk inquiry into section 112(d)'s standard-setting criteria, and clearly precludes an interpretation that would make EPA's technology-based standards once again contingent upon its assessment of air toxics' risks to public health.

IV. EPA MUST MAKE SEVERAL REVISIONS TO MATS TO FULFILL ITS OBLIGATIONS UNDER CAA SECTION 112(d)(6).

A. Under section 112(d)(6), EPA must require the greatest reductions of hazardous emissions achievable at reasonable cost, considering the full range of technological developments.

1. <u>In considering the cost of achieving maximum emission reductions, EPA should focus on the ability of the regulated industry to absorb compliance costs.</u>

EPA requests comment on how to consider costs in this rulemaking, specifically identifying, as potential cost metrics, dollar-per-ton of pollution abated and comparisons of total compliance costs to historical revenues, total compliance costs to historical total expenditures, and capital costs to historical capital expenditures.[54] Considering all of these cost metrics, the agency concludes that "the cost of the proposed standards is reasonable, and modest in the context of this industry."[55] We agree that the statute permits EPA to evaluate the various metrics

[51] 42 U.S.C. § 7412(d)(4) (allowing EPA to "consider" a health-based threshold, only "[w]ith respect to pollutants for which a health threshold has been established," when "establishing emission standards under this subsection").
[52] S. Rep. No. 101-228, at 131-2 (1989), *reprinted in* Legis. History of the Clean Air Act Amendments of 1990, at 8,471-77 (describing "record of false starts and failed opportunities," partially ascribing that record to "statutory language" emphasizing "emission standards which provide an ample margin of safety to protect public health").
[53] *Id.* at 8,473.
[54] 88 Fed. Reg. at 24,870-71.
[55] *Id.* at 24,871.

proposed, and we encourage the agency to focus on the ability of the regulated industry to absorb compliance costs in determining whether those costs are reasonable.

Under section 112(d)(2), which should guide EPA's decision whether revisions are "necessary" under section 112(d)(6),[56] EPA is required to "tak[e] into consideration the cost of achieving [maximum] emission reduction."[57] The statute does not specify how EPA is to consider cost, and the agency's approach should receive deference from a reviewing court.[58] Moreover, although not necessary to establish the most stringent standards identified in these comments, an interpretation that cost becomes a limiting factor only when compliance would compromise the ability of the regulated industry as a whole to continue to serve its function represents the best reading of the statute. Section 112(d)(2) requires a "prohibition on [] emissions [of hazardous air pollutants], where achievable."[59] This language closely resembles the text of statutory provisions that could require the most stringent standards that the industry could bear, as suggested by the Supreme Court in *Entergy Corp. v. Riverkeeper, Inc.*[60] EPA is to select the maximum achievable control technology, which, in contrast to other technological controls contemplated by the Act, need not be "best," or optimal from an environmental and economic standpoint.[61] Indeed, because hazardous air pollutants are frequently carcinogenic or harmful at low exposure levels, because their health effects are sometimes not well understood, and because limits on hazardous emissions apply to all of the sources responsible, an approach that requires maximum feasible effort—rather than the greatest quantified net benefits or lowest cost-per-ton—best reflects congressional intent.[62]

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[56] *See Ass'n of Battery Recyclers*, 716 F.3d at 673-74.
[57] 42 U.S.C. § 7412(d)(2).
[58] *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 217-18 (2009); *Nat'l Ass'n of Surface Finishing*, 795 F.3d at 9-10.
[59] 42 U.S.C. § 7412(d)(2).
[60] *Entergy Corp.*, 556 U.S. at 218.
[61] *See id.* at 219 n.5 ("Regardless of the criteria that render a technology 'available,' the EPA would still have to determine which available technology is the 'best' one. And as discussed above, that determination may well involve consideration of the technology's relative costs and benefits."). Even under CAA section 111, however, which requires standards reflecting the "best system of emission reduction," EPA may impose compliance costs up to the point that the industry could not absorb them. *See Essex Chem. Corp. v. Ruckelshaus*, 486 F.2d 427, 433 (D.C. Cir. 1973) (indicating that the cost of achieving section 111 standards cannot be "exorbitantly costly in an economic . . . way"); *Portland Cement Ass'n v. Train*, 513 F.2d 506, 508 (D.C. Cir. 1975) (opining that it suffices for EPA to show that "the costs of meeting [section 111] standards would [not] be greater than the industry could bear and survive" and that the industry can "adjust itself in a healthy economic fashion").
[62] *See* S. Rep. No. 100-231 (1987) ("Hazardous air pollutants regulated under section 112 are presumably of a different character. There are a smaller number of large point sources. . . . The process for setting a standard is long and uncertain. The Agency first conducts a preliminary health assessment on a air pollutant of concern. If the preliminary study indicates possible adverse health effects, a detailed assessment is conducted leading up to the publication of a Health Assessment Document which is reviewed by the Science Advisory Board. . . . [T]he

Thus, in determining whether a degree of emission reduction is "achievable," comparisons of compliance costs to industry revenues, of compliance costs to total expenditures, and of the capital costs of compliance to total capital expenditures,[63] are all legitimate and relevant considerations because they have some bearing on whether the industry could successfully absorb the costs of compliance. Indeed, as EPA explained in reaffirming the finding that it is appropriate and necessary to regulate coal- and oil-fired electric generating units under section 112, "[t]hese metrics are relevant measures for evaluating costs to the utility sector in part because they are the types of metrics considered by the owners and operators of EGUs themselves."[64]

In that rulemaking, the agency reiterated that the projected compliance costs of MATS "in 2015 represented between 4.3 and 6.2 percent of total annual power sector capital and operating expenditures over 2000 to 2019 and is well within the substantial range of annual variability."[65] Yet the actual compliance costs proved far lower,[66] proportionally lowering the percentage of historic revenues equivalent to costs, the percentage of historic total expenditures equivalent to costs, and the percentage of historic capital expenditures equivalent to capital expenditures for compliance.[67] Even assuming actual costs of complying with MATS only amounted to half of projected costs, the actual costs would nonetheless represent upwards of 3 percent of overall total expenditures within the time period examined. By comparison, the estimated total, annualized compliance costs of the more stringent alternative considered in the Proposal amount to about 0.44 percent of the annual total expenditures for the power sector in

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reported legislation makes fundamental changes in the basic provisions of section 112. The bill establishes a list of 224 air pollutants and a mandatory schedule for issuing emissions standards for the major sources of these pollutants. The standards are to be based on the maximum reduction in emissions which can be achieved by application of best available control technology.").

[63] 88 Fed. Reg. at 24,870.

[64] *Id.* at 13,962.

[65] *Id.* at 13,976.

[66] *See id.* at 13,976 ("This overestimate was significant—for just one part of the original compliance cost estimate, the EPA was able to quantify a range of at least $2.2 to $4.4 billion in projected costs related to the installation, operation, and maintenance of controls which were not expended by industry.").

[67] *See, e.g., id.* at 13,977 ("[W]ith the overestimation of capital expenditures in mind, actual investments by the power sector to comply with MATS would have comprised an even smaller percentage of historical annual capital expenditures.").

2019,[68] and about 0.26 percent of revenues in 2019,[69] a low point for inflation-adjusted annual sales.[70] Accordingly, projected compliance costs of the more stringent alternative here are modest and well within the cost benchmarks that the industry readily absorbed in complying with MATS.

Although EPA has discretion to consider cost-effectiveness under section 112(d)(2),[71] dollar-per-ton-reduced is less relevant under section 112 than under other Clean Air Act provisions because the agency is not charged with equitably distributing the costs of emission reductions through a uniform compliance strategy, as EPA has done in its transport rules,[72] nor with choosing among different industries to secure a target level of pollution reduction. Because the agency must require maximum reductions of hazardous emissions from each regulated source category and has no authority to aim to balance cross-industry efforts to reduce those emissions, comparisons to cost-effectiveness values for HAP reductions in other industries do not necessarily set the benchmark for reasonable costs.

Nonetheless, it may be useful to consider the cost-per-ton of fine particulate matter reduced, as an indication of the degree of pollution-reduction efforts considered worthwhile in other section 112(d)(6) reviews. For instance, EPA has found cost-effective an emissions-control measure resulting in $185,000 per ton of $PM_{2.5}$ removed.[73] This value is comparable to

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[68] *See* EPA, Regulatory Impact Analysis for the Proposed National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Review of the Residual Risk and Technology Review at 3-9, Tbl. 3-4 (Apr. 2023) [hereinafter 2023 MATS RIA] (showing annualized costs of the more stringent alternative in 2030 of $1.061 billion ($2019)); EPA, Supplemental Data and Analysis for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking at 20, Tbl. A-6 (Sept. 2021) (showing total expenditures of 200.7 billion dollars ($2007) in 2019). Total expenditures were converted to $242.9 billion ($2019) using the Gross Domestic Product: Implicit Price Deflator. *See* Federal Reserve Bank of St. Louis, Gross Domestic Product: Implicit Price Deflator, https://fred.stlouisfed.org/series/GDPDEF#.

[69] *See* 2023 MATS RIA at 3-9, Tbl. 3-4 (showing annualized costs of the more stringent alternative in 2030 of $1.061 billion ($2019)); U.S. Energy Info. Admin., Electric Power Annual 2021, Tbl. 2.3 (Nov. 2022), https://www.eia.gov/electricity/annual/ (showing total revenue from sales of electricity to ultimate customers of $401.738 billion in 2019).

[70] *See* 87 Fed. Reg. 7,624, 7,657 (Feb. 9, 2022).

[71] *NRDC v. EPA*, 749 F.3d 1055, 1060-61 (D.C. Cir. 2014).

[72] *See EPA v. EME Homer City Generation L.P.*, 572 U.S. 489, 492 (2014).

[73] *See* 80 Fed. Reg. 37,366, 37,381 (June 30, 2015). The figure of $165,000 dollars per ton of $PM_{2.5}$ referenced in that notice is adjusted from 2012 dollars to 2019 dollars, to align with the costs described in the Regulatory Impact Analysis for the proposed rule using the Gross Domestic Product: Implicit Price Deflator noted above. *Compare* EPA, Final Cost Impacts of Control Options Considered for the Ferroalloys Production NESHAP to Address Fugitive HAP Emissions, at 4-1 (May 2015) ("All costs are estimated in 2012 dollars."), *with* 2023 MATS RIA

the $209,000 per ton of $PM_{2.5}$ removed under the more stringent alternative in this proposal.[74] EPA has also proposed a technology review for secondary lead smelting sources costing an inflation-adjusted $114,000 per ton of total fPM,[75] which is greater than the $103,000 per ton of total fPM for EPA's more stringent alternative.

Under section 112(d)(2), EPA is not required to compare costs to the benefits of achieving the maximum degree of HAP emission reduction.[76] Certainly Congress did not intend for the agency to weigh costs against the quantifiable benefits of HAP reductions when it replaced the risk-based approach to regulating under section 112 with the technology-based approach.[77] Here, EPA observes that modeled exposures from sources subject to MATS are below the reference doses for various HAPs but that some risk remains even at these levels, and that the ecosystem impacts of HAP contamination are difficult to estimate.[78] The agency should go further: cumulative exposures to HAPs from multiple sources likely mean that many individuals would experience meaningful risk reductions from the emissions reduced under this rule. Even if these cumulative exposures could be estimated, most of the health and environmental benefits of HAP emission reductions are not readily quantified.[79] For this reason as well, the non-monetized (but surely non-zero) benefits of HAP reductions under a strengthened MATS should not be compared to monetized costs. Overall, quantified benefits vastly exceed the costs of compliance with the more stringent alternative, yet another indication that the costs of this alternative are more than reasonable.[80]

For the reasons discussed above, EPA should focus on the ability of the regulated industry to absorb compliance costs, which, for the power sector, is beyond dispute. Nonetheless, if EPA chooses to put costs in the context of health and environmental impacts by dividing costs by the tons of emissions reduced or by comparing costs to quantifiable benefits,

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at 3-9, Tbl. 3-4 (showing annualized costs of the more stringent alternative in 2030 of $1.061 billion ($2019)).

[74] *See* EPA, 2023 Technology Review for the Coal- and Oil-Fired EGU Source Category, EPA–HQ–OAR–2018–0794–5789, at 12, Tbl. 7 (Jan. 2023) [hereinafter 2023 Technology Review Memo].

[75] National Emissions Standards for Hazardous Air Pollutants; Secondary Lead Smelting, 76 Fed. Reg. 29,032, 29,060 (May 19, 2011) (proposed rule). Costs were converted to about $114,000 ($2019) using the Gross Domestic Product: Implicit Price Deflator. *See* Federal Reserve Bank of St. Louis, Gross Domestic Product: Implicit Price Deflator, https://fred.stlouisfed.org/series/GDPDEF#.

[76] *See Sierra Club v. EPA*, 353 F.3d 976, 990 (D.C. Cir. 2004) (upholding as reasonable EPA's interpretation of section 112(d)(2) not to require consideration of non-air quality health and environmental impacts resulting from HAP emission reductions).

[77] *See U.S. Sugar Corp. v. EPA*, 830 F.3d 579, 592-93 (D.C. Cir. 2016) (discussing legislative history).

[78] 88 Fed. Reg. at 24,889.

[79] *See id.* at 13,971-72.

[80] *Cf. Entergy Corp.*, 556 U.S. at 225-26.

the agency must recognize that not all tons reduced are of equal value and must give greater weight to reductions of HAPs that affect disadvantaged communities[81] or that have more serious health or welfare impacts.[82] Giving greater weight to impacts on certain populations—including people living far below the poverty level, who are overrepresented in communities within 10 kilometers of MATS-regulated power plants[83]—would be consistent with the guidance in the draft update to the Office of Management and Budget's Circular A-4.[84] Further, communities of color and economically disadvantaged communities frequently are home to the individuals most exposed to toxic emissions from various industrial sources,[85] and the statute specifically directs EPA to reduce or eliminate risks to the most-exposed individuals[86] and consider risks to "sensitive populations" in deciding whether to regulate.[87] For these reasons as well, it would be appropriate for EPA to give greater weight to emission reductions affecting disadvantaged communities in any cost-effectiveness or cost-benefit analysis.

2. EPA must consider the full range of technological developments that have occurred since the standards were originally promulgated.

Section 112(d)(6) directs EPA to revise standards "as necessary," "taking into account developments in practices, processes, and control technologies."[88] The developments that EPA must take into account are non-exclusive, meaning EPA must consider other relevant factors that may necessitate revisions even if they do not qualify as "developments in practices, processes, and control technologies."[89] Nonetheless, this phraseology is intentionally broad, and certainly at least broad enough to encompass the measures that EPA must consider in originally setting standards.[90] We therefore agree that any of the types of developments that EPA identifies in this proposal could necessitate strengthening standards, including: add-on control technologies not identified and considered in the original rulemaking; improvements to controls that were identified and considered in the original rulemaking; work practices or operational procedures

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[81] *See* 87 Fed. Reg. 35,608, 35,618 & Tbl. 5 (June 10, 2022) (proposed rule taking comment on this question).
[82] *See, e.g.*, 68 Fed. Reg. 70,904, 70,919 (Dec. 19, 2003) ("Based on our analysis, we concluded that the costs/benefits of going beyond the floor are warranted. Given the persistent nature of mercury in the environment and its associated health and welfare impacts, we continue to feel that the additional emission reductions that will be achieved by the beyond-the-floor option are warranted considering the associated costs.").
[83] 88 Fed. Reg. at 24,892.
[84] Office of Mgmt. and Budget, Proposed Update to Circular A-4, at 65-66 (Apr. 2023), https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf.
[85] *See* Emma Rutkowski, Alfredo Rivera, and Eric G. O'Rear, Justice40 Initiative: Mapping Race and Ethnicity (Feb. 2022), https://rhg.com/research/justice40-initiative-mapping-race-and-ethnicity/.
[86] 42 U.S.C. § 7412(c)(9)(B)(i); *see id.* § 7412(f)(2)(A).
[87] *Id.* § 7412(n)(1)(C).
[88] *Id.* § 7412(d)(6).
[89] *See La. Envtl. Action Network v. EPA*, 955 F.3d 1088, 1097 (D.C. Cir. 2020).
[90] *Cf.* 42 U.S.C. § 7412(d)(2).

not identified and considered in the original rulemaking; a process change or pollution prevention alternative not identified and considered in the original rulemaking; a significant change in the cost or cost-effectiveness of controls; and any operational change or other factors not considered in the original rulemaking.[91] Notably, the fact that developments may have been considered in prior reviews of the original standards does not disqualify those developments in future revisions; indeed, they must be considered.

We encourage the agency to expand this already broad list to include other factors, whether "developments" or not, that necessitate revisions. Under the EPA's administrative precedent, those factors may include not only improvements in the components and inputs to controls[92] and lower costs of controls,[93] but also lower emissions rates[94] and gained experience with monitoring.[95] Further, EPA need not identify the incremental emission reductions that each development achieves; rather, the agency may point to the collective effect of developments,

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[91] *See* 88 Fed. Reg. at 24,863.
[92] *Cf.* National Emissions Standards for Hazardous Air Pollutants for Mineral Wool Production and Wool Fiberglass Manufacturing, 80 Fed. Reg. 45,280, 45,284-85 (July 29, 2015) ("[T]he control technologies in place on wool fiberglass manufacturing furnaces were essentially the same as existed at the time the MACT standards were promulgated, but . . . there have been improvements in both the operation and the design of furnaces and their control technologies since that time.").
[93] *Cf.* National Emission Standards for Hazardous Air Pollutants: Site Remediation Residual Risk and Technology Review, 85 Fed. Reg. 41,680, 41,690 (July 10, 2020) ("The commenter has not identified 'developments' in relation to this technology, such as a significant decrease in cost or a change in applicability to the Site Remediation source category.").
[94] *Cf.* National Emissions Standards for Hazardous Air Pollutants: Ferroalloys Production, 80 Fed. Reg. 37,366, 37,380 (June 30, 2015) ("The PM emissions, used as a surrogate for metal HAP, that were reported by the industry in response to the 2010 ICR, were far below the level specified in the current NESHAP, indicating improvements in the control of PM emissions since promulgation of the current NESHAP.").
[95] *Cf.* Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 80 Fed. Reg. 75,178, 75,193-94 (Dec. 1, 2015) ("[F]enceline monitoring is a type of equipment that we did not identify and consider during development of the original MACT standards . . . . [F]enceline monitoring is a development in practices, processes or control technologies that would improve management of fugitive emissions in a cost-effective manner."); Review of Standards of Performance for Lead Acid Battery Manufacturing Plants and National Emission Standards for Hazardous Air Pollutants for Lead Acid Battery Manufacturing Area Sources Technology Review, 87 Fed. Reg. 10,134, 10,148 (Feb. 23, 2022) ("We consider the use of bag leak detection systems a development in operational procedures that will assure compliance with the area source NESHAP by identifying and correcting fabric filter failures earlier than would be indicated by the daily pressure drop monitoring or daily VE monitoring. The EPA has promulgated other recent rulemakings that have included this requirement for units that do not have a secondary filter such the 2012 Secondary Lead Smelting NESHAP amendments (77 FR 3, 556, January 5, 2012).").

including lower emissions rates, to justify strengthening standards.[96] This more holistic, inclusive view of the factors that may necessitate revisions to standards under section 112(d)(6) aligns better with the statutory language, and EPA must consider all such factors in its reviews. For instance, emission rates far below the current limits, coupled with identifiable improvements in control technologies, practices, and monitoring, present a compelling reason to lower the standards for each of the classes of HAPs emitted by coal- and oil-fired power plants.

3. Although EPA is not required to consider risk reductions under section 112(d)(6), the potential to reduce emissions of a wide range of highly toxic HAPs underscores the need to strengthen MATS.

The serious health impacts caused by the hazardous pollutants regulated under the MATS program emphasize the importance of EPA's prompt action to strengthen the limits for EGU HAP emissions. Under section 112(d)(2), and thus section 112(d)(6), EPA is not required to consider any potential benefits of achieving the maximum degree of HAP emission reduction as directed by the statute.[97] Nonetheless, while the potential regulatory benefits are not a criterion that EPA must give any consideration—much less a determinative factor—in deciding whether to strengthen standards under section 112(d)(6), we note that these benefits elucidate Congress's judgment that the maximum feasible effort to reduce hazardous emissions should be required and refute any arguments that strengthening standards is unwarranted. As discussed in greater detail below, the record on the health and environmental impacts of toxic air emissions from coal- and oil-fired EGUs supports strengthening MATS for all of these reasons.

The health risks from EGU HAPs are well documented. These risks were in record evidence available when EPA promulgated MATS and have been significantly developed through new research since 2011.

Many of the benefits of reducing mercury and other HAPs from power plants were documented in the MATS rule and the 2011 RIA supporting it. In the MATS rule, EPA determined that emissions of mercury and other HAPs posed a "hazard" to public health—a term EPA understood to demand inquiry into "severity" and "magnitude."[98] EPA identified substantial public health harms from the HAPs in question, including "about 580,000 women" of child-bearing age with blood mercury levels sufficient to endanger a developing fetus.[99] EPA also found, based on a peer-reviewed risk assessment, that power plant emissions of mercury in 2016 would cause or significantly contribute to human exposures exceeding safe levels in nearly

[96] *See Nat'l Ass'n for Surface Finishing*, 795 F.3d at 11.
[97] *See Sierra Club v. EPA*, 353 F.3d at 990 (upholding as reasonable EPA's interpretation of section 112(d)(2) not to require consideration of non-air quality health and environmental impacts resulting from HAP emission reductions).
[98] 76 Fed. Reg. 24,976, 24,992 (May 3, 2011) (proposed rule).
[99] *Id.* at 24,995; *see id.* at 25,007-11 (finding that power plants were substantial contributors to these levels).

a quarter of modeled watersheds "with populations at-risk";[100] and that power plants were responsible for significantly higher mercury pollution in the areas nearest to them.[101] In addition, EPA found that MATS would reduce harm to those currently exposed to the highest risks[102] and produce "substantial health improvements for children."[103]

The 2011 RIA also documented the benefits associated with reduction in HAPs other than mercury, examining the hazards posed by acetaldehyde, arsenic, benzene, cadmium, chlorine, chromium, formaldehyde, hydrogen chloride, hydrogen fluoride, lead, manganese, nickel, and selenium.[104] The RIA acknowledged that exposure to these HAPs is "associated with a variety of adverse health effects," including chronic health disorders, such as irritation to the lungs, skin, and mucus membranes, effects on the central nervous system, and damage to the kidneys, as well as acute health disorders including lung irritation and congestion, alimentary effects such as nausea and vomiting, and effects on the kidneys and central nervous system.[105] Three of the HAPs were classified as human carcinogens and five others as probable human carcinogens.[106]

In addition to cancer risks, the 2011 RIA thoroughly documented effects associated with chronic and acute inhalation exposures to air toxics, including neurological, cardiovascular, liver, kidney, and respiratory effects, as well as effects on the immune and reproductive systems.[107] However, the 2011 RIA acknowledged that, due to methodology and data limitations, estimations of the benefits associated with the reduction of HAPs were not available.[108] In light of this absence, EPA relied on unit risk factors that were designed to be conservative.

Since 2011, significant advances have been made in the scientific understanding of the effects of mercury and other HAPs on children and adult populations. These findings are discussed in the context of each recommended level of strengthening below. For each class of HAPs, new evidence on the health effects of HAP emissions since EPA finalized the original MATS rule in 2011 strongly supports EPA's swift strengthening of the standards.

The persistently large representation of disadvantaged communities—including communities of color and low-income communities—near MATS-covered EGUs, and the ongoing heightened risks to some subpopulations posed by hazardous air pollution attributable to these EGUs, also compel the conclusion that it is necessary to strengthen the standards.

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[100] 77 Fed. Reg. 9,304, 9,355 (Feb. 16, 2012).
[101] 76 Fed. Reg. at 25,013.
[102] 77 Fed. Reg. at 9,445-46.
[103] *Id*. at 9,441.
[104] EPA, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards, EPA-452/R- 11-011, at 4-73 to 4-79 (Dec. 2011) [hereinafter 2011 MATS RIA].
[105] *Id*. at 4-73.
[106] *Id.*
[107] *Id.* at 4-69.
[108] *Id.*

Communities of color and low-income communities bear significant impacts of EGU HAP emissions based on proximity to MATS-regulated sources.[109] Furthermore, certain subpopulations, such as Indigenous communities, communities of color, and low-income communities, continue to face higher exposure to methylmercury attributable to EGU emissions through consumption of fish, as well as exposure to EGU non-mercury metal emissions.[110]

Communities of color and low-income communities made up very large—indeed, disproportionately large—shares of the populations within five kilometers of MATS-covered EGUs when EPA reaffirmed its "appropriate" finding in 2012.[111] EPA has observed that "air quality modeling experience has shown that the area within three miles of an individual source of emissions can generally be considered the area with the highest ambient air levels of the primary pollutants being emitted for most sources, both in absolute terms and relative to the contribution of other sources."[112] Thus, communities of color and low-income communities likely bore a significant share of the local exposures to EGU HAP emissions.

Congress expressed a clear intent to reduce the harms that HAPs inflict on these often disadvantaged, overburdened communities through regulation under section 112.[113] These impacts on overburdened communities refute any hypothetical claims by opponents that it is not necessary to strengthen the standards, in light of multiple statutory indicia of Congress's concern with protecting the most exposed individuals and sensitive populations—which have been shown

[109] *See* EPA, Risk and Technology Review - Analysis of Demographic Factors for Populations Living Near Coal- and Oil-Fired Electric Utility Steam Generating Units Regulated Under the Mercury and Air Toxics Standards (MATS), at 10, Tbl. 2 (May 2018) (showing 41% of the population living within 5 kilometers of MATS-covered facilities operating in 2018 as "Minority," compared to 38% of the total U.S. population); *id*. (showing 17% of the population living within 5 kilometers of MATS-covered facilities operating in 2018 as "Below the Poverty Level," compared to 14% of the total U.S. population).

[110] *See* Elsie Sunderland *et al.*, *A Template for a State-of-the-Science Assessment of the Public Health Benefits associated with Mercury Emissions Reductions for Coal-fired Electricity Generating Units*, at 13 (Apr. 2022) [hereinafter Mercury Benefits Template]; *id.* at 14, fig. 8; *see also* Raina M. Maier *et al.*, Nat'l Inst. of Envtl. Health Sciences Superfund Research Centers at the University of Arizona and University of New Mexico, *Toxicity Review of Metals Emissions from Coal-Fired Power Plants*, at 11 (Mar. 2022) [hereinafter 2022 Metals Toxicity Review]; 88 Fed. Reg. at 24,892, 24,896.

[111] *See* 2011 MATS RIA at 7-39, Tbl. 7-5 (showing 37% of the population within 5 kilometers of MATS-covered sources as "Minority," compared to 25% of the total U.S. population); *id.* (showing 17% of the population within 5 kilometers of MATS-covered sources as "Below Poverty Line," compared to 13% of the total U.S. population).

[112] *Id.* at 7-36.

[113] *See* 42 U.S.C. § 7412(n)(1)(C) (focusing on mercury impacts on "sensitive populations"); *id.* § 7412(f)(2)(A) (requiring further regulation where residual risk to the "individual most exposed" does not fall below a specified threshold); *id.* § 7412(c)(9)(B)(i) (prohibiting deregulating a source category where residual risk to the "individual . . . most exposed" does not fall below a specified threshold).

largely to overlap with environmental justice communities because of historical and ongoing discrimination and other chemical, environmental, physical, and social stressors and extrinsic vulnerabilities.[114] Because these considerations are important to the threshold decision whether to regulate—and conduct ongoing risk evaluations for—this source category,[115] they would dispel any argument that EPA's action to strengthen the standards under section 112(d)(6) is unreasonable or unwarranted.

Under section 112(d)(6), EPA's review is a recurring regulatory requirement that Congress intended to achieve maximum feasible reductions in HAP emissions regardless of remaining risks.[116] From a policy standpoint, that obligation is all the more important where HAP emissions are inflicting cumulative—though unquantifiable—harms on already overburdened communities, which are often communities of color or low-income communities. Moreover, certain "developments," such as improvements in pollution monitors that could benefit fenceline communities,[117] may enhance equitable outcomes under the standards. Accordingly, EPA's strengthening of the standards is important to address persistent impacts from EGUs' HAP emissions on environmental justice communities.

Benefits to communities of color, Indigenous communities, and low-income communities foreclose any arguments that a strengthening of the standards that reflects developments in pollution controls is not necessary.[118] Executive Order 12,898 directs each federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."[119] It is appropriate for EPA to address disproportionate impacts on communities of color, Indigenous communities, and low-income communities based on several statutory considerations as well.

Congress required EPA to set standards reflecting the maximum achievable emissions reductions for hazardous air pollution because Congress understood the importance of protecting

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[114] *See* Emma Rutkowski, Alfredo Rivera, and Eric G. O'Rear, Justice40 Initiative: Mapping Race and Ethnicity (Feb. 2022), https://rhg.com/research/justice40-initiative-mapping-race-and-ethnicity/; *see also* Gina M. Solomon *et al.*, *Cumulative Environmental Impacts: Science and Policy to Protect Communities*, 37 Annual Rev. Pub. Health 83, 86, Tbl. 1 (2016).
[115] *See, e.g.*, 42 U.S.C. § 7412(f)(2)(A) (requiring further regulation where residual risk to the "individual most exposed" does not fall below a specified threshold); *id.* § 7412(n)(1)(C) (requiring study of the threshold level of methylmercury in fish tissue that would begin to harm sensitive populations).
[116] *See* 87 Fed. Reg. at 7,634-35.
[117] *See, e.g.*, Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 80 Fed. Reg. 75,178, 75,194-95 (Dec. 1, 2015) (identifying fenceline monitoring as a "development" that could reduce fugitive emissions).
[118] *See* 87 Fed. Reg. at 7,646-47 (citing Exec. Order No. 12,898, 59 Fed. Reg. 7,629 (Feb. 16, 1994); Exec. Order No. 14,008, 86 Fed. Reg. 7,619 (Feb. 1, 2021)).
[119] Exec. Order No. 12,898, § 1-101, 59 Fed. Reg. at 7,629.

the public from this especially dangerous class of pollutants.[120] Congress also required that special attention be given to reducing harm to "sensitive populations."[121] Based on the evidence showing the numerous severe health concerns implicated by HAPs, we strongly support strengthening the MATS limits, which will protect the health of all Americans, but especially the sensitive populations impacted by EGU hazardous pollution who are disproportionately communities of color, Indigenous communities, and low-income communities.[122]

B. EPA must strengthen the non-mercury metal HAP standards to require maximum achievable emission reductions.

1. <u>EPA must revise the filterable PM (fPM) limit to no higher than 0.0024 lb/MMBtu.</u>

EPA must revise the limit for filterable particulate matter (as a surrogate for non-mercury metal HAPs) under section 112(d)(6) to no higher than 0.0024 lb/MMBtu, which would better reflect the greatest reductions achievable consistent with developments in practices, processes, and control technologies. This revision to the standards is necessary to reflect emissions reductions that units would be capable of achieving at reasonable cost and that many have already achieved. As discussed in section IV.A.2 above, the language in section 112(d)(6) is intentionally broad, and, therefore, the "developments in practices, processes, and control technologies" that EPA takes into account should include lower emissions rates for controls that were already in existence when MATS was promulgated, improvements in components and inputs to controls, lower costs of controls, and experience with monitoring for compliance. Practices, processes, and control technologies that were considered previously should not be excluded from consideration in this review, and information showing emissions rates far below the current standards should be considered as indicative of improvements to previously considered controls that justify revising the standard. And while EPA need not identify the incremental emissions reduction associated with each specific development, developments in the cost and effectiveness of proven fPM controls considered individually or collectively in addition to current performance of emission reduction control equipment and strategies clearly justify a revision of the fPM standard to a much lower level.

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[120] 42 U.S.C. § 7412(d). The design of section 112 shows Congress's interest in ensuring reductions in coal- and oil-fired EGU HAPs primarily to protect human health and safety. *See, e.g.*, *id.* § 7412(n)(1)(A) (requiring EPA to conduct a study on the public health hazards of all HAPs emitted by EGUs as a threshold requirement to determining whether to regulate EGU HAPs under section 112); *id.* § 7412(n)(1)(B) (requiring EPA to study the health and environmental impacts of mercury from all sources).
[121] *See id.* § 7412(n)(1)(C); *id.* § 7412(f)(2)(A); *id.* § 7412(c)(9)(B)(i).
[122] 88 Fed. Reg. at 24,892, 24,896; 2023 MATS RIA at ES-13.

a. An fPM limit of 0.0024 lb/MMBtu is technologically feasible and demonstrated for a range of control configurations, and EPA's analysis overstates emissions and underestimates the performance that controls can achieve.

Coal-fired EGUs can and have achieved fPM emissions rates of 0.0024 lb/MMBtu or lower using available control technologies in various configurations. Electrostatic precipitators (ESP) and baghouses (or fabric filters) are the primary fPM control technologies—EPA's analysis in the 2023 Technology Review Memo shows all but two units having one or both—and EGUs have seen significant improvements in fPM emissions rates since 2011 due to wider deployment of fPM controls, improved practices at EGUs, and improvements in monitoring and ESP and fabric filter technology. For units that are not already achieving this level of performance, there are a number of options for improving the performance of existing fPM controls and installing new controls to reduce fPM emissions to various degrees that would be effective for a range of existing control configurations. An fPM standard of 0.0024 lb/MMBtu would encourage many coal-fired EGUs to choose better-performing controls to achieve greater emissions reductions.

The ATP Assessment of Revisions to Mercury and Air Toxics Standards (2023 ATP Assessment) identifies a variety of ways to achieve very low fPM emissions rates, including through ESP upgrades and improved fabric filter performance.[123] The S&L PM Incremental Improvement Memo identifies some similar options for fPM controls, though with an overly conservative view of the performance they are capable of achieving. For units with baghouses installed, achieving very low emissions may only require modest improvements to the efficacy of the control, such as through the use of more effective polytetrafluoroethylene (PTFE) bags, or through changes to processes such as through more frequent replacement of the fabric filter bag. The 2023 ATP Assessment also finds there are a number of other "upgrades" that may improve performance, including options for units with ESPs that are arguably normal maintenance like repairing casing leaks, failed insulators, electrodes, and plates, but which have not been a priority for facility owners. For units with ESPs, owners may also install high frequency transformer rectifier sets at low cost, which both the PM Incremental Improvement Memo and the 2023 ATP Assessment suggest could improve performance by 20 to 30 percent.[124] There may also be ways to improve performance by increasing treatment time, including adding fields, or by replacing or rebuilding internals. And, if necessary, a unit with an ESP may also install a fabric filter downstream to reduce fPM emissions.

While the S&L PM Incremental Improvement Memo and the 2023 ATP Assessment identify similar upgrades that are available to reduce fPM emissions, the S&L Memo

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[123] Andover Technology Partners, Assessment of Potential Revisions to Mercury and Air Toxics Standards (June 2023) [hereinafter 2023 ATP Assessment], https://www.andovertechnology.com/wp-content/uploads/2023/06/C_23_CAELP_Final.pdf.

[124] Sargent & Lundy, PM Incremental Improvement Memo, Docket ID No. EPA–HQ–OAR–2018–0794–5836, at 7 (Mar. 2023) [hereinafter S&L PM Incremental Improvement Memo].

significantly understates the emissions reductions and performance possible with available control technologies and upgrades. EPA should not assume that available control technologies, particularly ESPs, are incapable of consistently achieving very low emissions rates based on the S&L Memo, particularly because the data available to the agency shows units with ESPs achieving very low fPM rates. It would be irrational and arbitrary for EPA to rely on assumptions about the performance of control technologies that lack support and are contradicted by the data on their actual performance. Assumptions and information regarding ESPs are critically important to EPA's analysis, because, as EPA notes, "ESPs are the most common PM control devices at coal- and oil-fired EGUs."[125] Understating the performance of ESPs and their potential upgrades can lead to inflated estimates regarding new controls and associated costs required to achieve lower emissions.

The S&L Memo provides mixed messages, stating that "it is clear that emissions levels down to 0.010 lb/MMBtu and below are achievable in most ESP applications based on the reported emissions data," which would appear to acknowledge that ESPs can achieve very low emissions rates, but also suggesting "to achieve emission levels equivalent to or lower than the NSPS standard [of 0.010 lb/MMBtu], a new baghouse would likely be required to guarantee these emissions are consistently achieved."[126] The S&L Memo does not provide data on actual performance of units with ESPs to support the suggestion that even with the most effective ESP upgrades, units would not be able to achieve performance better than 0.010 lb/MMBtu, which is inconsistent with the actual data on performance of units with an ESP in EPA's 2023 Technology Review Memo and the 2023 ATP Assessment. The S&L Memo also appears to suggest vendors have historically guaranteed an emissions rate down to 0.03 lb/MMBtu for ESPs and 0.010 lb/MMBtu for baghouses, but does acknowledge "some vendors considering guaranteeing even lower emissions for future applications" of baghouses. In fact, at least one supplier has indicated guarantees of ESP performance to a level as low as 0.010 lb/MMBtu as far back as 2008.[127] The S&L Memo does not provide specific or compelling reasons why vendors would not be willing to guarantee lower rates for technologies that are already achieving them in practice, but even if that were the case, vendor reluctance to guarantee low rates should not prevent EPA from setting tighter standards. Also, if EPA revises the fPM standard to a level below 0.010 lb/MMBtu, vendors who are able to guarantee rates below that level would be incentivized to do so to gain a competitive advantage.

The 2023 Technology Review Memo clearly shows that for 109 units with only ESPs as the primary control device for fPM, median performance is 0.0047 lb/MMBtu and the mean is 0.0056 lb/MMBtu. The data makes clear that many units with only an ESP for fPM control have achieved performance far better than 0.010 lb/MMBtu, and EPA should not assume that units with an ESP are limited to that level of performance for the purpose of this technology review. Rather than focusing on unsupported assertions about performance limitations, EPA should

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[125] 2023 Technology Review Memo at 7.
[126] S&L PM Incremental Improvement Memo at 2.
[127] 2023 ATP Assessment at 12-13.

consider the data showing far better performance and the information from the 2023 ATP Assessment, which is consistent with that data. The 2023 ATP Assessment indicates that units can achieve up to 20 percent improvement in performance with minor upgrades, up to 40 percent improvement with medium upgrades, and up to 55 percent improvement with major upgrades.[128] Therefore, based on the 2023 ATP Assessment, many units are likely able to achieve far better performance that would enable them to comply with lower standards without installing a new baghouse for fPM control. And, for those units that are not achieving acceptable performance, a baghouse may be warranted to achieve the required level of emissions reduction.

As EPA found in the Proposal, "the vast majority of existing coal-fired EGUs are performing well below the 2012 MATS fPM emission requirements, and that they are achieving these levels at lower costs than the EPA assumed in the 2012 rulemaking."[129] This finding and the "fact that emissions performance still varies significantly" not only support revising the standards, but also provide support for a standard significantly below the proposed level of 0.010 lb/MMBtu. The lagging performers in the coal fleet in particular are not even close to achieving the maximum degree of reduction in HAP emissions that can be achieved with proven controls, and should be required to reduce their emissions further under section 112(d)(6).

Furthermore, EPA's analysis of the performance of EGU fPM controls in the 2023 Technology Review Memo is excessively conservative, specifically the choice of the 99th percentile of the lowest quarter as a baseline fPM rate. While EPA's choice of the lowest quarterly emissions rate is reasonable, the 99th percentile rate is overly conservative, and even EPA acknowledges that "since the EGU-specific fPM emissions rate is calculated using the largest 1 percent of fPM rates for the quarter with the lowest emissions, some EGUs may readily achieve lower fPM rates with improved operation,"[130] and that "[t]his approach may conservatively overestimate emissions."[131] The 99th percentile running average is overly conservative and not a very useful baseline as it may not be indicative of the level of performance units are capable of. Starting from an excessively conservative baseline fPM rate is problematic because it leads to the analysis suggesting that existing controls perform worse than they are capable of and greater emissions reductions (with more expensive controls) will be required to achieve more stringent standards than are actually likely to be required to comply with those standards. EPA suggests that because "the variability of the lowest quarter's 99th, 90th, 85th, 80th, 75th, and 50th percentiles is very similar, there is little impact on the amount of emission reductions and total annualized costs when looking at the fleet on whole." But EPA bases this conclusion on aggregate data, noting that the average difference in the 99th and 50th percentiles is 0.000985 lb/MMBtu, but also recognizing that there may be a significant difference for a particular unit.

[128] *Id.* at 21, Tbl. 4.
[129] 88 Fed. Reg. at 24,871.
[130] *Id.* at 24,870.
[131] 2023 Technology Review Memo at 4.

EPA admits that "[t]he largest difference between the 99th and 50th percentiles of 1.42E-02 lb/MMBtu is for Harrington unit 62B" which is obviously very large as it would be greater than EPA's proposed standard of 0.010 lb/MMBtu. The EGU at the Big Bend plant is another example of a unit with a large difference between the 99th and 50th percentiles according to EPA's 2023 Technology Review Memo Appendix B, as the difference for the Big Bend plant is 0.008 lb/MMBtu, or greater than the 0.006 lb/MMBtu standard EPA is soliciting comment on in the Proposal. Using the 99th percentile as the baseline for units with differences this large likely makes them appear as if they would fail to comply with a tighter standard, and according to the data in Appendix B, there are 19 units for which the 99th percentile of their lowest quarterly emissions is greater than 0.006 lb/MMBtu but the 50th percentile is less than or equal to 0.006 lb/MMBtu, while 17 of the units EPA identifies in Appendix D of the 2023 Technology Review Memo as requiring upgrades to achieve 0.006 lb/MMBtu have a 50th percentile rate of 0.006 lb/MMBtu or lower. Therefore, there are a significant number of units for which the choice of percentile could make a difference in determining whether upgrades to controls would be required for an fPM standard set at that level. EPA's analysis should be seen as inherently and excessively conservative with regard to the level of performance units have already achieved for fPM emissions.

An fPM limit of 0.0024 lb/MMBtu, which reflects the average performance of the top 50 percent of units evaluated by EPA for the Proposal, would represent a better balance of the statutory factors than the proposed rate and is "technologically feasible and demonstrated for a range of control configurations."[132] More specifically, the numbers in EPA's 2023 Technology Review Memo for units with fabric filters or with ESPs—the two most common controls for this pollution—as a primary PM control device, suggest many units with either or both of these controls have already been achieving performance levels that would be in compliance or close to compliance with an fPM standard of 0.0024 lb/MMBtu. As EPA notes in the Proposal, the average performance of the top 75 percent of units evaluated was 0.0031 lb/MMBtu and the average performance of the top 95 percent of units evaluated was 0.0042 lb/MMBtu. According to EPA's 2023 Technology Review Memo, 72 percent of evaluated capacity was below 0.006 lb/MMBtu. These numbers suggest the vast majority of units across various control configurations emit far below the proposed standard of 0.010 lb/MMBtu and either have already demonstrated they are capable of achieving an fPM standard of 0.0024 lb/MMBtu or have performed close to that level. This suggests that many of those units currently emitting above a level of 0.0024 lb/MMBtu are not far from achieving this level and could likely achieve it with modest performance improvements. At the very least, EPA's analysis also shows that many units with various control configurations have already achieved levels far below the current standard and proposed standard of 0.010 lb/MMBtu.

EPA's 2023 Technology Review Memo finds that even under the current fPM limit of 0.03 lb/MMBtu, the median fPM rate for both the group of 97 units with only a fabric filter for fPM control and the group of 21 units with fabric filter and additional non-ESP control was

[132] 88 Fed. Reg. at 24,871.

0.003 lb/MMBtu, while the median for the group of 32 units with fabric filter and ESP was 0.004 lb/MMBtu. These median numbers are more useful than the mean numbers for looking at the number of units that might be affected by a tighter standard, as they are not as affected by the worst performers. The 2021 ATP PM & Hg Report and EPA's median numbers in the 2023 Technology Review Memo together suggest that many of the 150 units with a fabric filter are either already achieving or close to achieving a standard of 0.0024 lb/MMBtu and should be able to achieve that level of performance. This level should also be technically feasible for units with ESPs, with about half of units with ESPs able to achieve 0.003 lb/MMBtu with modest upgrades and the other half needing to install baghouses, particularly those with older ESPs.[133] Also, in the 2023 Technology Review Memo, EPA found "no major differences in the baseline fPM rate distribution between units that use [dry sorbent injection] and units that do not utilize [dry sorbent injection]." This is further evidence that the limit is feasible and demonstrated for a range of control configurations, as DSI—which involves injecting sorbent particles into the flue gas—does not appear to have a significant effect on fPM emissions, and therefore configurations that use DSI to control acid gas emissions should be capable of achieving a low fPM emissions rate.

Every category of control configurations assessed in EPA's 2023 Technology Review Memo includes units that have already demonstrated that they are capable of achieving performance better than 0.0024 lb/MMBtu except for the two categories with the fewest units (four total), specifically the two units with ESP and Cyclone and the two units with only wet scrubber for PM control. These units—particularly the two with only a wet scrubber, which have relatively high emissions rates—may require a fabric filter to achieve an emissions rate of 0.0024 lb/MMBtu for fPM. This information shows that a broad range of control configurations can achieve this level of performance.

EPA's 2023 Technology Review Memo also categorized coal units by capacity, and found that the median performance across all categories of capacity was below 0.006 lb/MMBtu, and every capacity bin had medians that were less than or equal to 0.004 lb/MMBtu except for 21 units in the 800-1000 MW bin, which had a median rate of 0.0052 lb/MMBtu. Furthermore, the 5th percentile performance of every bin was below 0.0024 lb/MMBtu, with the highest at 0.002 lb/MMBtu for the 800-1000 MW bin. This data suggests units of various capacities have already achieved a rate of 0.0024 lb/MMBtu, and therefore there should not be any particular limitations related to capacity that would prevent units from achieving this level of performance.

The ATP report also notes that the highest emitting units have the oldest equipment, particularly those with scrubbers and ESPs. Therefore, it appears likely that the age of controls may be negatively impacting the performance of some units, and replacing or upgrading degraded controls may fix some of the issues that come with age. This is particularly true for

[133] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, at 8 (Aug. 2021) [hereinafter 2021 ATP Report], https://www.andovertechnology.com/wp-content/uploads/2021/08/PM-and-Hg-Controls_CAELP_20210819.pdf.

units with ESPs, as there may be significant upgrades and improvements in performance that would result from replacing older equipment with new or better control technologies at significantly less cost than installing a new baghouse on a unit.

i. The 2021 ATP PM & Hg Report and 2023 ATP Assessment find EGUs could comply with this limit through ESP upgrades or installation of baghouses.

The 2021 ATP PM & Hg Report evaluated levels close to 0.0024 lb/MMBtu and found that for a standard set at 0.003 lb/MMBtu, about 25 percent of the fleet could achieve this performance with little to no cost, and indeed, the analysis showed that 25 percent of units analyzed (or 26 percent of capacity) had average annual emission rates less than or equal to 0.003 lb/MMBtu.[134] More specifically, the 2023 ATP Assessment finds that 20 percent of units with only an ESP for fPM had emissions at or below 0.0027 lb/MMBtu,[135] and therefore may not need to install a baghouse to comply with a standard of 0.0024 lb/MMBtu. Many facilities with baghouses already installed would be expected to be able to meet that level with little to no costs, while some units may need to make modest improvements that would be achievable at relatively low cost, such as replacing the bag every 3 years instead of 5.

EPA also makes excessively conservative assumptions regarding the reductions in emissions that may be achieved with ESP upgrades based on the S&L PM Incremental Improvement Memo. EPA assumes minor upgrades to ESPs can achieve 5 to 10 percent reduction in fPM emissions but limits this to units not already achieving 0.010 lb/MMBtu. For typical upgrades, EPA assumes 10 to 20 percent emissions reduction but with the same limitation. As discussed previously, these assumptions are problematic and the 2023 ATP Assessment points out that the assumption that these upgrades will not improve performance at units with ESPs already achieving 0.010 lb/MMBtu is inconsistent with the actual data that EPA presents on performance of units with ESPs. The 2023 ATP Assessment assumes fPM emissions reductions up to 20 percent are possible with minor ESP upgrades (comparable to what EPA refers to as minor upgrades) and emissions reductions up to 40 percent for medium upgrades (comparable to what EPA refers to as typical upgrades), without the limitation that they would not apply at units already achieving 0.010 lb/MMBtu.[136] For the most expensive ESP upgrades, EPA assumes performance is limited to 99.9 percent of fPM removal, while ATP assumes reductions up to 55 percent of current emissions are possible.[137] The differences in these assumptions can cause significant differences in projections regarding what controls would need to be upgraded/installed (and the associated costs) to achieve a particular standard.

It is also worth noting that plantwide averaging may provide compliance flexibility to many of the worst performing units in EPA's analysis, as the information in Appendix B

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[134] *Id.* at 39.
[135] 2023 ATP Assessment at 17.
[136] 2023 ATP Assessment at 21, Tbl. 4.
[137] *See id.*; *see also id.* at 13 & Tbl. 2.

suggests that many of the units with high fPM emissions rates are located at plants with multiple units. As a result, some units at multi-unit plants could significantly exceed the prescribed limit.

ii. PM CEMS could be used to demonstrate compliance with this emission limit, based on compliance reports showing even lower levels at units with PM CEMS and technical information about the capability of PM CEMS.

Compliance with a revised standard of 0.0024 lb/MMBtu can be demonstrated using PM CEMS, as compliance reports show that units have been able to measure even lower levels. The 2023 ATP Assessment notes that PM CEMS are used to demonstrate compliance in a majority of units in all deciles of performance except for the two worst performing deciles (which have the *highest* levels of PM emissions).[138] The fact that PM CEMS have been used to demonstrate compliance in a majority of units in the eight best performing deciles provides strong evidence that PM CEMS can be used effectively to measure low levels of PM emissions. Furthermore, EPA's memorandum on PM CEMS Random Error Contribution by Emissions Limit (PM CEMS Memo) suggests that by increasing the sampling time to 8 hours for a standard of 0.003 lb/MMBtu an average random error contribution of less than 41 percent can be achieved.[139] While the cost of the PM CEMS may increase as a result, it is still reasonable, and PM CEMS can and should be required for compliance with a standard of 0.0024 lb/MMBtu. Furthermore, the 2023 ATP Assessment notes that PM CEMS are capable of demonstrating PM levels down to 0.0015 lb/MMBtu or less, and that the main concern is calibration.[140] The 2023 ATP Assessment suggests that this issue can be addressed through a longer sampling period or Quantitative Aerosol Generators.

b. An fPM limit of 0.0024 lb/MMBtu would also be cost-reasonable, especially when taking into account planned retirements and retirements that would likely already occur given the current policy environment and other regulations.

As discussed in section IV.A.1, when considering the costs of these HAP emission reductions, EPA should focus on the power sector's ability to absorb these costs. The statutory language on the maximum degree of emissions reduction and the expectation that EPA prohibit these emissions entirely where achievable as expressed in section 112(d)(2), suggests these limits on HAPs should be particularly stringent. Further, while not necessary to justify strengthening the standards here, the best reading of the statute is that cost becomes a limiting factor only when it would compromise the ability of the regulated sector as a whole to serve its function. A filterable particulate matter limit of 0.0024 lb/MMBtu would not compromise the ability of the power sector to provide affordable and reliable electricity and can be achieved at a reasonable cost, particularly when taking into account coal unit retirements that are likely to occur due to the

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[138] *Id.* at 11 & Fig. 4; *id.* at 29.
[139] EPA, PM CEMS Random Error Contribution by Emission Limit, EPA–HQ–OAR–2018–0794–5829, at 2 (Mar. 2023) [hereinafter PM CEMS Memo].
[140] 2023 ATP Assessment at 27-29 & Fig. 12.

current policy environment and other regulations. The Inflation Reduction Act is particularly likely to support and accelerate trends in the power sector, which has been transitioning to cleaner options. The resulting coal plant retirements would reduce emissions regardless of what EPA does with this proposal and may significantly reduce the costs of control upgrades/installations needed to comply with the updated standard.

The 2023 ATP Assessment estimates that EGUs could comply with a limit of 0.0024 lb/MMBtu at an annual cost of $1.6 billion, with 91 units needing to install a new baghouse and six units requiring minor ESP upgrades.[141] This is likely an overestimate of the cost because ATP's assumptions regarding the achievable emissions reductions with ESP upgrades are conservative. But even if compliance with this standard was achieved at a cost of $1.6 billion, this cost would not compromise the power sector's ability to serve its main function.

The $1.6 billion projected annual cost to comply with an fPM standard of 0.0024 lb/MMBtu is also reasonable in light of the power sector's annual revenues, capital expenditures, and overall costs. The projected cost of achieving the reductions required by this revision would be significantly less than the projected or actual cost of the initial MATS rule, and about 0.66 percent of the power sector's total expenditures ($242.9 billion) and about 0.40 percent of the power sector's revenue ($401.738 billion) in 2019. As discussed above in section IV.A.1, the costs in the original MATS rule were a significantly greater percentage of power sector expenditures and revenue. Furthermore, based on the U.S. Census Bureau Annual Capital Expenditures Survey, EPA determined that power sector capital expenditures totaled $113 billion ($2007) in 2019, a $15.7 billion increase from the previous year.[142] The $1.6 billion required to comply with this standard would be a small fraction of 2019 power sector capital expenditures and within the range of historical variability in capital expenditures. These are clearly costs that the power sector can absorb while continuing to serve its function.

2. <u>The proposed alternative fPM limit of 0.006 lb/MMBtu would be achievable and cost-reasonable.</u>

EPA's proposed alternative fPM limit of 0.006 lb/MMBtu as a surrogate for HAP metals is cost effective and achievable at a reasonable cost. While a standard of 0.0024 lb/MMBtu would be better at balancing the statutory factors and achieving the maximum degree of emissions reduction for HAP metals from coal units, an fPM standard of 0.006 lb/MMBtu would be achievable at a much lower cost because many units would be able to achieve this standard without installing a new baghouse.

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[141] *Id.* at 23-24 & Fig. 9.

[142] EPA, Cost TSD for 2022 Proposal, EPA–HQ–OAR–2018–0794–4632, at 18, Tbl. A-5 (Sept. 2021).

a. An fPM emission limit of 0.006 lb/MMBtu, which has been achieved by the top 72 percent of units evaluated, is technologically feasible and demonstrated for a range of control configurations.

An fPM limit of 0.006 lb/MMBtu is technologically feasible and has been demonstrated by a broad range of control configurations, with even EPA's conservative assessment in the 2023 Technology Review Memo showing that the median fPM rates for all configurations of primary PM control devices are below 0.006 lb/MMBtu except for 2 units with wet scrubbers only.[143] This shows that an fPM limit of 0.006 lb/MMBtu is not only feasible and demonstrated, but has in fact been achieved by a majority of units across nearly all configurations. Also, according to the 2021 ATP Report, 50 percent of units had average annual emissions rates at or below 0.006 lb/MMBtu.

i. The 2023 ATP Assessment finds that EGUs could comply with this limit primarily through ESP upgrades,[144] contrary to EPA's assumption that 65 units would need to install or upgrade FFs.[145]

Although many units would be able to comply with an fPM standard of 0.006 lb/MMBtu without any control upgrades, the 2023 ATP Assessment finds that for the units that would need to improve upon past performance, most would be able to comply with minor or medium ESP upgrades, and 11 fabric filter retrofits would be required.[146] Units that must improve their performance by greater than 55 percent may require a baghouse, but many units will likely be able to achieve this standard with smaller improvements in performance, and therefore not require a baghouse.

EPA's estimate of the cost of this standard is likely an overestimate because EPA overestimates the amount of baghouse installations that will be required. This is similar to the situation with the original MATS rule, for which EPA acknowledges fabric filters were installed for 69 percent less capacity (roughly 100 GW) than the agency projected.[147] As discussed previously, EPA assumes that baghouses will be required to comply with a standard below 0.010 lb/MMBtu, which is inconsistent with the data showing units with no fabric filters achieving well below 0.010 lb/MMBtu, and even the S&L PM Incremental Improvement Memo acknowledges that "it is clear that emissions levels down to 0.010 lb/MMBtu and below are achievable in most ESP applications based on the reported emissions data." EPA assumes that the most expensive and impactful ESP upgrade (ESP Rebuild) is limited to 99.9 percent fPM removal, but the 2023 ATP Assessment points out that, considering the average ash content of various coals, actual

[143] EPA's analysis suggests the 2 units with only wet scrubbers may be required to install fabric filters even with a standard of 0.010 lb/MMBtu.
[144] 2021 ATP Report at 8.
[145] 88 Fed. Reg. at 24,869.
[146] 2023 ATP Assessment at 23; *id.* at 25 Fig. 10.
[147] 88 Fed. Reg. at 13,975-76.

mean and median emission rates for these units appears to exceed 99.9 percent removal.[148] Therefore, the 2023 ATP Assessment's projection that most units would be able to comply with a standard of 0.006 lb/MMBtu through ESP upgrades (or no significant upgrades), with new baghouse installations for 11 units, represents a more realistic projection of how units would comply with this standard and the associated costs.

Furthermore, as mentioned previously, plantwide averaging may provide additional compliance flexibility by not requiring every unit to achieve the standard on its own. For example, EPA's data in Appendix B shows units at the Ghent Generating Station that have emitted above and below 0.006 lb/MMBtu that may be averaged to determine compliance. To the extent that upgrades to the plant's ESPs would be required, the plant would have considerable flexibility in determining how to achieve compliance with a standard of 0.006 lb/MMBtu using plantwide averaging.

ii. PM CEMS could be used to demonstrate compliance with an fPM emission limit of 0.006 lb/MMBtu based on compliance reports showing even lower levels at units with PM CEMS and technical information about the capability of PM CEMS.

As with the lower standard discussed in Section IV.B.1, compliance with a standard of 0.006 lb/MMBtu can be demonstrated using PM CEMS. Compliance reports have shown units have been able to measure lower levels and, as discussed previously, the fact that PM CEMS have been used to demonstrate compliance in a majority of units in the eight best performing deciles provides strong evidence that PM CEMS can effectively measure low levels of PM emissions. Furthermore, the 2023 ATP Assessment notes that PM CEMS are capable of demonstrating PM levels down to 0.0015 lb/MMBtu or less, and that the main concern is calibration.[149] The 2023 ATP Assessment suggests that this issue can be addressed through a longer sampling period or Quantitative Aerosol Generators. Also, EPA's memorandum on PM CEMS Random Error Contribution by Emissions Limit suggests that an acceptable average random error contribution (less than 43 percent) could be achieved by increasing the run sampling time to 3.8 hours per run, and that "should have a minimal increase in cost."[150]

b. An fPM emission limit of 0.006 lb/MMBtu would be cost effective and cost-reasonable, especially when taking into account planned retirements and retirements that would likely already occur given the policy environment and other regulations.

An fPM emission limit of 0.006 lb/MMBtu would be particularly cost-effective and achievable at a very low and reasonable total cost, particularly when considered in the context of the power sector. The 2023 ATP Assessment finds that EGUs could comply with this limit at an

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148 2023 ATP Assessment at 18-19.
149 2023 ATP Assessment at 29.
150 PM CEMS Memo at 2.

annual cost of about \$442 million,[151] while EPA estimates the annual costs would be \$633 million.[152] While EPA likely overestimates the cost of achieving this standard due to overestimating the number of baghouses that will need to be installed, even an annual cost of \$633 million is reasonable in the context of the power sector, which can easily absorb that cost while continuing to provide affordable and reliable power. Indeed, these costs would be a small fraction of the cost of the original MATS rule (projected and actual).

As discussed in section IV.A.1, these costs should be considered in the context of the power sector, and even EPA's likely overestimated cost would represent only about 0.26 percent of power sector total expenditures in 2019 (\$242.9 billion) or about 0.16 percent of 2019 revenues (\$401.738 billion). While the power sector can absorb much larger costs, it is clear that the costs associated with an fPM standard of 0.006 lb/MMBtu are very small compared to power sector total expenditures, capital expenditures, and revenues—and well within the range of historic variability in total expenditures[153]—and therefore can be absorbed without preventing the power sector from serving its function.

Though cost-effectiveness on a dollar-per-ton basis is less relevant in the section 112 context than with other CAA provisions as discussed in Section IV.A.1, the \$103,000 per ton of fPM and \$209,000 per ton of $fPM_{2.5}$ estimates that EPA calculated for the 0.006 lb/MMBtu standard are reasonable and comparable to past practice regarding technology reviews under section 112(d)(6). EPA has previously found a control measure that resulted in an inflation-adjusted cost of \$185,000 per ton of $PM_{2.5}$ to be feasible and cost effective for the ferroalloys production source category,[154] and proposed a technology review for secondary lead smelting sources costing an inflation-adjusted \$114,000 per ton of fPM.[155] Using the ATP cost estimate, the 0.006 lb/MMBtu standard has even better cost effectiveness at about \$72,000 per ton of fPM and \$146,000 per ton of $fPM_{2.5}$. EPA also calculated the cost effectiveness based on unit-specific heat input and allowable emissions at \$1,610 per ton, showing that a standard of 0.006 lb/MMBtu allows far less pollution at low cost to the power sector. All of these metrics and approaches to considering costs show that an fPM standard of 0.006 lb/MMBtu would require cost-effective reductions and can be achieved at a reasonable cost that would not jeopardize the power sector's function.

While there are better and more appropriate cost metrics and considerations in the context of section 112, it is also worth noting that the benefits of an fPM standard of 0.006 lb/MMBtu far outweigh the costs. EPA projects annual net benefits of this standard to be \$1.1 billion in the

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[151] 2023 ATP Assessment at 24, Fig. 9.
[152] 88 Fed. Reg. at 24,870, Tbl. 3.
[153] *See* 88 Fed. Reg. at 13,976-77.
[154] 80 Fed. Reg. at 37,381.
[155] Secondary Lead Smelting, 76 Fed. Reg. 29,032, 29,060 (proposed May 19, 2011). Costs were converted to about \$114,000 (\$2019) using the Gross Domestic Product: Implicit Price Deflator. *See* Federal Reserve Bank of St. Louis, *Gross Domestic Product: Implicit Price Deflator*, https://fred.stlouisfed.org/series/GDPDEF# (last visited June 21, 2023).

regulatory impact analysis.[156] Due in part to the challenge of monetizing the benefits of HAP reductions these benefits are primarily co-benefits, but the combination of quantified and unquantified benefits clearly justifies the modest cost, and the fact that EPA likely underestimates the benefits and overestimates the costs of this standard in the RIA suggests the net benefits may be even higher than projected. But even based on EPA's projections, the environmental and public health benefits of setting the fPM standard at 0.006 lb/MMBtu clearly far outweigh the costs, further indicating that the costs of this standard are reasonable.

3. The proposed fPM standard of 0.010 lb/MMBtu would not make an adequate and necessary improvement to the standards in light of developments in practices, processes, and control technologies, and therefore fails to adequately address hazardous air pollutant emissions from coal-fired power plants.

EPA's proposed fPM standard of 0.010 lb/MMBtu fails to adequately reduce hazardous air pollutant emissions from coal-fired power plants and would be setting the standard at a level that is not even close to "fulfill[ing] Congress's direction to require the *maximum degree* of reduction of HAP taking into account the statutory factors."[157] As EPA notes in the Proposal, "[t]he technological standard approach of CAA section 112 is based on the premise that, to the extent there are controls available to reduce HAP emissions, sources should be required to use them."[158] The fact that many units are already significantly outperforming the proposed fPM standard of 0.010 lb/MMBtu suggests the proposed level leaves significant emissions reductions that are achievable and affordable with available controls on the table, and therefore is inconsistent with the approach of section 112. Section 112, including the technology review, was intended to improve performance of lagging industrial sources, and a standard that falls far behind what the vast majority of sources have already achieved is inadequate. It is also worth noting that, based on EPA's projections, the monetized annual net benefits of a 0.010 lb/MMBtu fPM standard are only $350 million, a small fraction of the $1.1 billion in annual net benefits associated with the more stringent alternative. Furthermore, to the extent that EPA agrees that strengthening this standard is warranted because the majority of sources are vastly outperforming the MACT standards while some sources' performance lags behind, a standard of 0.010 lb/MMBtu would require very few units to improve their performance.

4. The incremental reductions in emissions of non-mercury metal HAPs under the recommended revision are worth pursuing.

Information available in the early years of MATS

In the original MATS rule, EPA determined that non-mercury metals like chromium and nickel, emitted by power plants as particulates, pose cancer risks,[159] and that power plants

[156] 2023 MATS RIA at 0-15.
[157] 88 Fed. Reg. at 24,856 (emphasis added).
[158] *Id.* at 24,871.
[159] 76 Fed. Reg. at 24,978, 25,011; 77 Fed. Reg. at 9,319.

continued to be a significant source of these and other toxic metals, such as arsenic and cadmium, which have serious health effects.[160]

In 2012, EPA conducted a Non-Mercury Inhalation Case Study[161] estimating the chronic inhalation risk from HAPs other than mercury emitted by a small subset of potentially regulated facilities (n = 16).[162] Using updated emissions estimates, dispersion modeling, and risk characterization, EPA found that one facility with oil-fired EGUs posed a highest estimated lifetime cancer risk of 20 in one million (driven by nickel emissions), five facilities with coal-fired EGUs posed such a risk above one in one million (driven mainly by hexavalent chromium emissions), and two facilities with coal-fired EGUs posed such a risk at one in one million (driven mainly by hexavalent chromium and arsenic emissions).[163] As the Case Study points out, however, it examined only a handful of facilities and did not consider potential cumulative effects from exposures to non-mercury metals emitted by multiple facilities in the source category (or emitted by any facilities outside the source category). While this case study captured only a small fraction of the full risk from EGU HAP emissions, it provided further support for EPA's original standards.

Improved understanding of the health impacts of non-mercury metals since 2011

A 2023 literature review illustrates the growing evidence of the significant adverse health effects from exposures to both individual metals and groups of non-mercury metals in air pollution.[164] We briefly summarize this literature review here, requesting that the EPA review the report in its entirety as part of our comment submission.

The researchers whose work is cited in the 2023 literature review document numerous adverse health effects from exposures to individual metals:

- Recent studies bolster a growing literature on risks from arsenic exposure, including an association with type 2 diabetes; lung disease; adverse birth outcomes, such as infant mortality and reduced lung function for children from maternal exposure; skin and liver damage; reduced immune defense; and

[160] *See* 76 Fed. Reg. 25,003-4, 25,006, Tbl. 5; *see also* 77 Fed. Reg. at 9,380 (most non-mercury metallic toxics are emitted, and best controlled, as particulates).
[161] 77 Fed. Reg. at 9,363.
[162] EPA, Supplement to the Non-Hg Case Study Chronic Inhalation Risk Assessment In Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units, EPA-452/R-11-013, at 1 (Nov. 2011) [hereinafter Case Study].
[163] *Id.* at 12-13 & Tbl. 9.
[164] Mona Dai, Annotated Bibliography: Health Impacts of Exposure to Non-Mercury Hazardous Metals (June 2023), Att. 4.

significantly elevated cancer risks where exposure occurs from both inhalation and ingestion.[165]

- Several recent studies provide further evidence of the harmful effects of cadmium and cadmium oxide, including effects on the endocrine system; brain development; increased cancer risk; reduced birth weight; renal injury; lung and liver morphology; and other adverse effects in the lungs, liver, kidneys, and circulatory system.[166]

- Two studies on cobalt show potential respiratory system threats, including lung toxicity, increases in inflammatory cells, and larynx metaplasia.[167]

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[165] *See* Lulu Dai *et al.*, *Elevated whole blood arsenic level is associated with type 2 diabetes in coal- burning areas in Guizhou*, 403 Toxicol. Appl. Pharmacol. 115135 (2020); Deepa Gandhi *et al.*, *Non-malignant respiratory illness associated with exposure to arsenic compounds in the environment*, 94 Environ. Toxicol. Pharmacol. 103922 (2022) (literature review); Yong Hu *et al.*, *Associations between and risks of trace elements related to skin and liver damage induced by arsenic from coal burning*, 208 Ecotoxicol. Environ. Saf. 111719 (2021); Cara L. Sherwood *et al.*, *Arsenic compromises conducting airway epithelial barrier properties in primary mouse and immortalized human cell cultures*, 8 PLoS One e82970 (2013); Lei Zhang *et al.*, *Global impact of atmospheric arsenic on health risk: 2005 to 2015*, 117 Proc. Nat'l Acad. Sci. 13975-13982 (2020).

[166] *See* Obaid Faroon *et al.*, *Minimal Risk Level Derivation for Cadmium: Acute and Intermediate Duration Exposures*, 1 J. Exp. Clin. Toxicol. 1-12 (2017) (literature review establishing a toxicological profile); Sahadat Hossain, *et al.*, *Review of Cadmium Pollution in Bangladesh*, 9 J. Health Pollut. 190913 (2019); Prabjit Barn, *et al.*, *Coal smoke, gestational cadmium exposure, and fetal growth*, 179 Envtl. Res. 108830 (2019); Jason L. Blum *et al*., *Effects of Maternal Exposure to Cadmium Oxide Nanoparticles During Pregnancy on Maternal and Offspring Kidney Injury Markers Using a Murine Model*, 78 J. Toxicol. Envtl. Health 711-724 (2015); Jana Dumkova *et al.*, *Inhaled Cadmium Oxide Nanoparticles: Their in Vivo Fate and Effect on Target Organs*, 17 Int. J. Mol. Sci. 874 (2016); J. Lebedová *et al.*, *Impact of acute and chronic inhalation exposure to CdO nanoparticles on mice*, 23 Environ. Sci. Pollut. Res. Int. 24047-24060 (2016); Wen-Jing Wang *et al.*, *Long-term cadmium exposure induces chronic obstructive pulmonary disease-like lung lesions in a mouse model*, 879 Sci. Total Environ. 163073 (2023).

[167] *See* Mohammed T. Al Samri *et al.*, *Lung toxicities of core-shell nanoparticles composed of carbon, cobalt, and silica*, 8 Int. J. Nanomedicine 1223-1244 (2013); Arne Burzlaff *et al.*, *A tiered approach to investigate the inhalation toxicity of cobalt substances. Tier 4: Effects from a 28-day inhalation toxicity study with tricobalt tetraoxide in rats*, 130 Regul. Toxicol. Pharmacol. 105129 (2022).

- A 2022 literature review of hexavalent chromium shows the potential for DNA damage, loss of mitochondrial functions that may increase cancer risk, and toxicity to reproductive and nervous systems.[168]

- Seven recent studies underscore the adverse impacts of lead and lead oxide, which include lung inflammation and increased severity of asthma; impacts to children's mental functioning; oxidative stress in the liver; morphology and tissue damage in the lungs and liver; as well as other adverse effects on the lungs, liver and kidneys.[169]

- Studies focusing on the negative impacts of manganese, nickel, and nickel oxide indicate risks including decreased dopamine in the brain, male reproductive toxicity, pulmonary hypertension, and cytotoxicity.[170]

In addition to studies focusing on the harmful properties of individual metals, the 2023 literature review also presents an expanding literature documenting significant evidence of adverse outcomes resulting from exposures to multiple metals:

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[168] *See* Shehnaz Islam *et al.*, *Toxic and carcinogenic effects of hexavalent chromium in mammalian cells in vivo and in vitro: a recent update*, 40 J. Envtl. Sci. Health 282-315 (2022); *see also* Tian Tian *et al.*, *Elevated concentrations of chromium in maternal serum, umbilical cord serum, and cord tissue are associated with an increased risk for orofacial clefts*, 214 Envtl. Res. 113799 (2022) (linking chromium exposure with incidence of orofacial clefts).

[169] *See* Mohammad H. Boskabaddy & Tahere Farkhondeh, *Inhaled lead exposure affects tracheal responsiveness and lung inflammation in guinea pigs during sensitization*, 154 Biol. Trace Elem. Res. 363-371 (2013); Mohammad H. Boskabady *et al.*, *Inhaled lead affects lung pathology and inflammation in sensitized and control guinea pigs*, 31 Envtl. Toxicol. 452-460 (2016); Richard L. Canfield, *et al.*, *Airborne particulate lead and children's mental functioning*, 81 Neurotoxicology 288-293 (2020); T. Farkhondeh, *et al.*, *The effect of lead exposure on tracheal responsiveness to methacholine and ovalbumin, total and differential white blood cells count, and serum levels of immunoglobulin E, histamine, and cytokines in guinea pigs*, 33 Hum. Exp. Toxicol. 325-333 (2014); Elena S. González Rendón, *et al.*, *Lead inhalation and hepatic damage: Morphological and functional evaluation in mice*, 34 Toxicol. Ind. Health 128-138 (2018); J. Dumková *et al.*, *Sub-chronic inhalation of lead oxide nanoparticles revealed their broad distribution and tissue-specific subcellular localization in target organs*, 14 Part. Fibre Toxicol. 55 (2017); J. Lebedová *et al.*, *Impact of acute and subchronic inhalation exposure to PbO nanoparticles on mice*, 12 Nanotoxicology 290-304 (2018).

[170] *See* Devina Saputra *et al.*, *Short-term manganese inhalation decreases brain dopamine transporter levels without disrupting motor skills in rats*, 41 J. Toxicol. Sci. 391-402 (2016); Lu Kong *et al.*, *Exposure effects of inhaled nickel nanoparticles on the male reproductive system via mitochondria damage*, 23 NanoImpact 100350 (2021); Ophélie Germande *et al.*, *NiONP-Induced Oxidative Stress and Mitochondrial Impairment in an In Vitro Pulmonary Vascular Cell Model Mimicking Endothelial Dysfunction*, 11 Antioxidants (2022).

- More than 20 recent studies investigating the effects of exposures to multiple metals show associations with adverse health effects, including reduced life expectancy; DNA damage; precancerous skin lesions; adverse birth outcomes; carcinogenicity to the kidneys and bladder; autism spectrum disorder; increased emergency cardiovascular hospitalization; elevated cholesterol; pulmonary inflammation; lung cancer risk; high blood pressure; airway inflammation in children; neurological effects; and effects on brain and nervous system development in children, among other health risks.[171]

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[171] *See, e.g.*, Ananya Das *et al*., *Estimating seasonal variations of realistic exposure doses and risks to organs due to ambient particulate matter-bound metals of Delhi*, 260 Chemosphere 127451 (2020) (documenting body tissue deposition of metals); Grzegorz Dziubanek *et al.*, *Long-term exposure to urban air pollution and the relationship with life expectancy in cohort of 3.5 million people in Silesia*, 580 Sci. Total Environ. 1-8 (2017); Xiaolei Feng *et al.*, *Particle-induced oxidative damage by indoor size-segregated particulate matter from coal-burning homes in the Xuanwei lung cancer epidemic area, Yunnan Province, China*, 256 Chemosphere 127058 (2020); Xiaolei Feng *et al.*, *Oxidative potential and water-soluble heavy metals of size-segregated airborne particles in haze and non-haze episodes: Impact of the 'Comprehensive Action Plan' in China*, 814 Sci. Total Environ. 152774 (2022); Lindsey M. Horton *et al.*, *What do we know of childhood exposures to metals (arsenic, cadmium, lead, and mercury) in emerging market countries?*, Int. J. Pediatr. 872596 (2013); Yong Hu *et al.*, *Effects of Essential Trace Elements and Oxidative Stress on Endemic Arsenism Caused by Coal Burning in PR China*, 198 Biol. Trace Elem. Res. 25-36 (2020); Eman M. Khalaf *et al.*, *Relationship between exposure to heavy metals on the increased health risk and carcinogenicity of urinary tract (kidney and bladder)*, Rev. Envtl. Health (2023), doi:10.1515/reveh-2022-0245; Noah Kittner *et al.*, *Trace Metal Content of Coal Exacerbates Air-Pollution-Related Health Risks: The Case of Lignite Coal in Kosovo*, 52 Envtl. Sci. Technol. 2359-2367 (2018); Carolyn Klocke *et al.*, *Enhanced cerebellar myelination with concomitant iron elevation and ultrastructural irregularities following prenatal exposure to ambient particulate matter in the mouse*, 30 Inhal. Toxicol. 381-396 (2018); Jenna R. Krall *et al.*, *A hierarchical modeling approach to estimate regional acute health effects of particulate matter sources*, 36 Stat. Med. 1461-1475 (2017); Julia Kravchenko & H. Kim Lyerly, *The Impact of Coal-Powered Electrical Plants and Coal Ash Impoundments on the Health of Residential Communities*, 79 N.C. Med. J. 289-300 (2018) (conducting a literature review of several metals); Tingting Ku *et al.*, *PM(2.5)-bound metal metabolic distribution and coupled lipid abnormality at different developmental windows*, 228 Envtl. Pollut. 354-362 (2017); Anna Mainka & Peter Fantke, *Preschool children health impacts from indoor exposure to PM(2.5) and metals*, 160 Environ. Int. 107062 (2022) (documenting health impact assessment of 11 metals); Suzanne McDermott *et al.*, *Systematic Review of Chromium and Nickel Exposure During Pregnancy and Impact on Child Outcomes*, 78 J. Toxicol. Envtl. Health 1348-1368 (2015) (conducting literature review of chromium and nickel); Michal Pardo *et al*., *Single Exposure to near Roadway Particulate Matter Leads to Confined Inflammatory and Defense Responses: Possible Role of Metals*, 49 Envtl. Sci. Technol. 8777-8785 (2015); O. Raaschou-Nielsen *et al.*, *Particulate matter air pollution components and risk for lung cancer*, 87 Environ. Int. 66-73 (2016); Humairat H. Rahman *et al.*, *Environmental exposure to metals and the risk of high blood pressure: a cross-sectional study from NHANES*

- Researchers now better understand than at the time MATS was promulgated how exposure to multiple metals in addition to other air pollutants impairs human health more severely than exposure to metals individually.[172]

As this literature review shows, improved scientific understanding of the health effects of non-mercury metals reinforces the need to set a stringent emissions standard to protect communities from these dangerous pollutants.

Other recent studies on the health impacts of non-mercury metals that are emitted by EGUs, in addition to those described above as part of the 2023 literature review, provide further evidence of the severe health outcomes that may result from several exposure pathways, including disproportionate harm to communities of color, Indigenous communities, and low-income communities.

As the above discussion of the 2023 literature review indicates, the health risks posed by non-mercury metals emitted by coal-fired power plants are now better understood than they were when EPA initially set these standards. In the original MATS rule, EPA did not have a complete picture of the impacts of: the full array of metals, some of which were not evaluated in its characterization of risks; the metals that it did consider; or mixtures of metals.[173] Specifically,

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2015-2016, 29 Envtl. Sci. Pollut. Res. 531-542 (2022); Maria J. Rosa *et al.*, *Association of recent exposure to ambient metals on fractional exhaled nitric oxide in 9-11 year old inner-city children*, 40 Nitric Oxide 60-66 (2014); Sara P. Egendorf *et al.*, *Soil toxicants that potentially affect children's health*, 50 Curr. Probl. Pediatr. Adolesc. Health Care 100741 (2020); Eric Amster, *Public health impact of coal-fired power plants: a critical systematic review of the epidemiological literature*, 31 Int. J. Envtl. Health Res. 558-580 (2021); Deborah L. Gray *et al.*, *Respiratory and cardiovascular effects of metals in ambient particulate matter: a critical review*, 234 Rev. Environ. Contam. Toxicol. 135-203 (2015); Yanwen Hou *et al.*, *Prenatal PM(2.5) exposure impairs spatial learning and memory in male mice offspring: from transcriptional regulation to neuronal morphogenesis*, 20 Part. Fibre Toxicol. 13 (2023); Hui Chen *et al.*, *Effects of air pollution on human health- Mechanistic evidence suggested by in vitro and in vivo modeling*, 212 Envtl. Res. 113378 (2022).

[172] *See, e.g.*, Grzegorz Dziubanek *et al.*, *Long-term exposure to urban air pollution and the relationship with life expectancy in cohort of 3.5 million people in Silesia*, 580 Sci. Total Environ. 1-8 (2017) (finding cadmium and lead exposures together with other air pollutants to be significantly associated with reduced life expectancy while exposures to the individual metals lack such a significant association); Colleen E. Johns *et al.*, *The Cd/Zn Axis: Emerging Concepts in Cellular Fate and Cytotoxicity*, 13 Biomolecules (2023) (documenting axis between cadmium and zinc and finding that zinc plays an antagonizing role increasing the severity of heavy metal toxic effects); Guiping Yuan *et al.*, *Toxicological assessment of combined lead and cadmium: acute and sub-chronic toxicity study in rats*, 65 Food Chem. Toxicol. 260-268 (2014) (finding the metal mixture of lead and cadmium to be additive-toxic, causing anemia as well as liver and kidney damage).

[173] *See* 2022 Metals Toxicity Review at 10-11.

EPA did not examine the risks of the full set of metals emitted by coal-fired EGUs;[174] did not consider the chemical toxicity of certain radioisotopes;[175] did not investigate the risks of specific compounds of arsenic;[176] and lacked scientific information that is now emerging on the risks posed by exposures to multiple metals.[177] New findings on the health hazards posed by metals individually and in combination, as referenced in the above summary of the 2023 literature review and further summarized below, provide additional support for EPA's strengthening of the non-mercury metals standard.[178]

Recent studies suggest that the impacts from radiation emitted by certain metals such as uranium and vanadium is not the only health risk that they pose, and that they may be toxic in certain forms. Uranium as uranyl acetate has been observed to suppress immune cells in the gastrointestinal tract, which could impair systemic immune health.[179] Uranyl acetate may also cause retention of damaged DNA, potentially leading to the development of chronic disease in the physiologic systems relying on the damaged cells.[180] Uranium or vanadium in solution increases vascular contraction and decreases vascular relaxation, thereby increasing the likelihood of hypertension.[181]

The findings of the studies included in the 2023 literature review advance a growing field of research showing how specific compounds of arsenic are associated with potentially severe health impacts.[182] Additional studies beyond those in the 2023 review, for instance, show that calcium arsenite may induce precursors to chronic lung damage in mice; cell cultures exposed to arsenite have failed to destroy DNA-damaged cells, threatening co-carcinogenic health outcomes; and metabolites of inorganic arsenic appear to be especially effective in disrupting the production of red blood cells, compared to arsenic as arsenite.[183] More generally, arsenic has long been known to be a carcinogen and has recently been recognized as having several noncancer effects in humans, including effects on respiratory system development and function, dermal effects, gastrointestinal effects, anemia, peripheral neuropathy, and liver and kidney damage.[184]

In addition to those studies included in the 2023 literature review, other recent epidemiological and economic studies have also assessed the health impacts of exposure to lead. A 2018 investigation of the risk of mortality from cardiovascular disease resulting from lead

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[174] *Id.* at 10.
[175] *Id.* at 10-11.
[176] *Id.* at 11.
[177] *Id.* at 10.
[178] *See id.* at 15 & Tbl. 3.
[179] *See id.* at 31.
[180] *See id.* at 31-32.
[181] *See id.* at 32.
[182] *Id.* at 11.
[183] *Id.* at 30-31.
[184] *Id.* at 29.

exposure found an association at blood lead levels less than 5 μg/dL, well below the threshold level for this effect of 10 μg/dL identified in the 2012 National Toxicology Report.[185] Among the elderly population, reductions in airborne lead from use of unleaded fuel in auto races have been tied to lower mortality from cardiovascular impacts, respiratory impacts, and despair (*i.e.*, fewer instances of suicide).[186] Another natural experiment examining the effects of switching to unleaded fuel in auto races found that extended exposures over the first few years of life reduced standardized test scores—even where background lead exposures were low.[187] Exposures to airborne lead among sensitive populations such as children have also been shown to have profound, lifelong effects beyond cognitive impairments: blood lead levels above 7 μg/dL are associated with higher rates of property and violent crime, and levels above 5 μg/dL with lesser high school completion and reduced noncognitive skills, with a reduction from 10 μg/dL to 5 μg/dL in early childhood leading to as much as 4.4% higher lifetime earnings.[188] And airborne lead reductions in the U.S. from 1978 to 1988, corresponding to the phaseout of leaded gasoline and other pollution reductions, improved fertility, leading to about 85,000 more births per year by the end of this period.[189]

Beyond exposures to single metals and their compounds, several studies in addition to those included in the 2023 literature review have been published since EPA conducted its risk review, revealing serious risks from exposure to mixtures of metals emitted by coal-fired EGUs. These studies represent a "paradigm shift in environmental health science that goes beyond single-pollutant biomedical models."[190]

Evidence suggests that metals mixtures may increase the risk of hypertension, immune dysfunction and autoimmunity, preterm birth, oxidative stress, and retention of DNA damage.[191] These potential synergistic impacts are not merely hypothetical or necessarily limited in geographic scope: several states rank among the top ten in terms of EGU emissions of multiple metals, and certain counties and the Navajo Nation have high reported emissions of multiple

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[185] Bruce P. Lanphear *et al.*, *Low-level lead exposure and mortality in US adults: a population based cohort study*, 3 Lancet Pub. Health e177, e183 (2018).
[186] Alex Hollingsworth & Ivan Rudik, *The Effect of Leaded Gasoline on Elderly Mortality: Evidence from Regulatory Exemptions*, 13 Am. Econ. J.: Econ. Pol'y 345, 364 (2021).
[187] Alex Hollingsworth *et al.*, *Lead Exposure Reduces Academic Performance: Intensity, Duration, and Nutrition Matter*, at 26 (Nat'l Bureau of Econ. Rsch., Working Paper No. 28250, 2021).
[188] Hans Grönqvist *et al.*, *Understanding How Low Levels of Early Lead Exposure Affect Children's Life Trajectories*, 128 J. Pol. Econ. 3376, 3423-24 (2020); *see also id.* at 3388 n.16 (noting that differential exposure from reductions of airborne lead following the phaseout of leaded gasoline likely explain reduced risks of adverse life impacts).
[189] Karen Clay *et al.*, *Toxic Truth: Lead and Fertility*, 8 J. Ass'n Env't & Res. Economists 975, 976, 993 (2021), working paper available at: https://www.nber.org/papers/w24607.
[190] 2022 Metals Toxicity Review at 10.
[191] *Id.* at 34-36.

metals.[192] And, on the Navajo Nation, women and children have shown above-average exposures to multiple metals, including uranium, cadmium, lead, and arsenic, which may have partially resulted from mine wastes.[193] EPA should consider the substantial risks that emissions of these metals pose in combination, including heightened risks for sensitive populations and highly exposed individuals, as well as the additional unquantified benefits of reducing exposures to mixtures of such metals.[194]

Exposures to multiple metals are particularly dangerous, and toxic metals may reach humans through multiple exposure pathways and may have cumulative impacts on communities located within range of multiple sources of metals emissions. "Once emitted into the airstream, airborne metal-particulates can settle out into soils and surface waters, creating a potential for multiple complex exposure pathways beyond direct inhalation, and allowing for exposures to occur far away from their sites of emission."[195] For example, a recent community-based analysis assessing the risk of exposure to arsenic from a coal-fired power plant showed greater carcinogenic effects with exposures through multiple routes of exposures, including inhalation, dermal exposure, and ingestion.[196] Risks from ingestion of arsenic may be more pronounced for children, who have higher soil contact and thus more exposure through this pathway.[197] Furthermore, coal-fired EGU emissions of metals pose a distinct threat of widespread exposure through multiple pathways, as these metals are present in finer particle fractions that are lofted more readily into air currents and are often accompanied by acidifying sulfur dioxide, which may enhance the mobility of metals from soil to water, and carbon, which may increase the bioavailability and toxicity of metals that are ingested.[198] Regarding exposures to metals from multiple sources, "in the Western US both electrical generation plants such as those in the 4-Corners region, and the abandoned mine origins of metal mixtures, while not necessarily co-located, frequently exist in proximity to Indigenous communities," potentially leading to cumulative impacts.[199]

With the ingestion pathway alone, cumulative exposures to toxic metals from multiple sources and through multiple environmental media are especially concerning. A 2013 study of the concentrations of arsenic in vegetables grown in home gardens near a mine and a smelter that are no longer operating identifies a direct, significant correlation between arsenic in the edible

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[192] *Id.* at 22-23 & Tbl. 7.
[193] *Id.* at 33-34.
[194] *See* 42 U.S.C. § 7412(n)(1)(A) (requiring EPA to consider the hazards to public health from *all HAPs* emitted by EGUs); *id.* § 7412(n)(1)(C) (focusing on risks to sensitive populations); *id.* § 7412(f)(2)(A) (requiring further regulation where residual risk to the "individual most exposed" does not fall below a specified threshold).
[195] 2022 Metals Toxicity Review at 16; *see also id.* at 25; *id.* at 36-37.
[196] *See id.* at 29-30.
[197] *Id.* at 30.
[198] *Id.* at 36-37.
[199] *Id.* at 26-27.

portions of plants and soil concentrations for most of the vegetable families examined.[200] Most of the sampled vegetables had concentrations of arsenic above representative concentrations for the respective plant family according to the U.S. FDA Market Basket Study.[201] Considering ingestion of arsenic from food and water in this community, total exposures averaged 2.33 μg/kg-day, approaching the FAO/WHO benchmark for cancer risk of 3.0 μg/kg-day—not including additional exposures from inhalation.[202] The cumulative health risks of exposures to HAP metals and mixtures of metals from multiple sources and multiple exposure pathways bolsters EPA's proposal to strengthen the standards for non-mercury metals emitted from EGUs.

Environmental justice impacts of non-mercury metal HAPs emitted by EGUs

The significant environmental justice benefits of reducing various air pollutants further elucidate Congress's judgment that maximum feasible control is worthwhile, and forestall any hypothetical arguments that EPA's action to require this level of control under section 112(d)(6) is unreasonable. EPA's proposal to require strengthened filterable PM standards as a surrogate for non-mercury metals would reduce the pollution burden of communities of color, low-income communities, and Indigenous communities disproportionately impacted by the pollution emitted from the covered coal plants.[203] Because $PM_{2.5}$ contains toxic metals, strengthened filterable PM standards would reduce the toxic metals exposures disproportionately experienced by these communities.[204] In addition, recent studies more closely link exposures to PM and ozone to a range of health impacts and risks, especially among communities facing multiple stressors and vulnerabilities, which are often communities of color, Indigenous communities, or low-income communities.

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200 Mónica D. Ramírez-Andreotta *et al.*, *A greenhouse and field-based study to determine the accumulation of arsenic in common homegrown vegetables grown in mining-affected soils*, 443 Sci. Total Env't 299, § 3.3 (2012).
201 Mónica D. Ramírez-Andreotta *et al.*, *Home Gardening Near a Mining Site in an Arsenic-Endemic Region of Arizona: Assessing Arsenic Exposure Dose and Risk via Ingestion of Home Garden Vegetables, Soils, and Water*, 454-55 Sci. Total Env't 373, Tbl. 3 (2013).
202 *Id.* §§ 4.3, 4.4.
203 *See* 88 Fed. Reg. at 24,892 (describing exposure analysis of populations living within 10 km of coal plants subject to the proposed filterable PM standards as including a "higher percentage of people living below two times the poverty level than the national average"); *id.* (finding likelihood of "potential EJ concerns associated with ozone and PM2.5 exposures" due to higher exposures for groups including "Hispanics, Asians, those linguistically isolated, those less educated, and children"); *id.* at 24,896 (finding that PM2.5 and ozone exposures existing prior to the action "result in disproportionate and adverse human health or environmental effects on people of color, low-income populations and/or Indigenous peoples").
204 *See* 2022 Metals Toxicity Review at 24 (citing Cristina Gonzalez-Maddux *et al.*, *Elemental composition of PM2.5 in Shiprock, New Mexico, a rural community located near coal–burning power plants and abandoned uranium mine tailings sites*, 5 Atmospheric Poll. Res. 511-19 (2014)).

In summarizing the benefits from $PM_{2.5}$ and ozone reductions achieved under MATS, EPA has observed that "[n]ewer scientific studies strengthen our understanding of the link between $PM_{2.5}$ exposure to a variety of health problems, including: premature death, lung cancer, nonfatal heart attacks, new onset asthma, irregular heartbeat, aggravated asthma, decreased lung function, and respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing."[205] We note that the agency, in the 2019 Integrated Science Assessment for Particulate Matter, also determined that there is a "likely to be causal relationship" between long-term $PM_{2.5}$ exposure and nervous system effects such as cognitive decrements and dementia.[206] And the 2020 Integrated Science Assessment for Ozone finds a "likely to be causal relationship" between short-term ozone exposure and key metabolic effects such as disruptions in the body's processes to maintain stable levels of glucose and insulin.[207]

New research also indicates that $PM_{2.5}$ exposures from coal-fired power plants disproportionately harm Black populations.[208] In 2011, EPA concluded that MATS would significantly reduce the risks of $PM_{2.5}$-related premature mortality in the counties with the highest preexisting risk, but that those counties were correlated with low-income and low-education populations, rather than with any race.[209] From 2010 to 2016, however, inequalities in exposure to $PM_{2.5}$ for people of color and low-income populations have increased even as overall levels have declined.[210] While MATS may or may not have improved equality in exposures to $PM_{2.5}$, it is highly likely that the large reductions that it achieved have been critical to lessening the absolute harm of $PM_{2.5}$ exposures and therefore the severity of inequitable harms. This advantage to strengthening the standards for EGUs under section 112 only underscores that revisions are necessary.

It is important that—in addition to disproportionate impacts from coal-fired EGUs' HAP emissions viewed in isolation—cumulative metals emissions from various source types such as EGUs and mine waste dumps may disproportionately harm some populations, such as Native American tribes in the Southwest.[211] The Navajo Nation has experienced high reported emissions of multiple metals and above-average exposures to multiple metals, including uranium, cadmium, lead, and arsenic, which may have partially resulted from mine wastes.[212] Further, zinc deficiencies may have an additive effect on oxidative stress and inflammation

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[205] 87 Fed. Reg. at 7,669.

[206] *See* EPA, Integrated Science Assessment for Particulate Matter, at ES-10, Tbl. ES-1 (Dec. 2019); *id.* at ES-15.

[207] *See* EPA, Integrated Science Assessment for Ozone, at ES-6, Tbl. ES-1 (Apr. 2020); *id.* at ES-8.

[208] *See* Christopher W. Tessum *et al.*, *$PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States*, 7 Sci. Advances 1-2 (2021).

[209] 2011 MATS RIA at 7-37 to 7-38.

[210] *See* Abdulrahman Jbaily *et al.*, *Air pollution exposure disparities across US population and income groups*, 601 Nature 228, 231-32 & Fig. 4 (2022).

[211] 2022 Metals Toxicity Review at 11.

[212] *Id.* at 22-23 & Tbl. 7; *id.* at 32-34.

response, which calls for consideration of nutritional deficits among some groups when evaluating the impacts of EGU HAP emissions.[213]

HAP emissions from coal-fired power plants continue to disproportionately impact people of color and low-income communities in the Southeast as well. An assessment of the demographic data in the vicinity of three power plants—Plant Barry in Alabama, and Winyah Generating Station (Winyah) and Wateree Station (Wateree) in South Carolina—reveals that disproportionate numbers of people of color and people with low incomes live in the vicinity of all three plants compared to the overall demographics of the state in which the plants are located.[214]

Specifically, the population living within 10 kilometers of Plant Barry in Alabama consists of 47% people of color overall, and 39% Black people, compared to statewide percentages of 35% and 27%, respectively. Within 5 kilometers of the plant, the disparities are even greater: the population comprises 53% people of color and 43% Black people. Likewise, the two plants in South Carolina are particularly striking examples of the disproportionate burdens that people of color and low-income communities face. The overall population of South Carolina is 37% people of color and 27% Black people, and the state poverty rate is 15%. But within 10 kilometers of the Winyah plant, the population is 54% people of color and 47% Black people, and the poverty rate is 21%. Moreover, within 1 kilometer of the Winyah plant, the percentages of people of color and of Black people jump to 69% and 68%, respectively. Finally, the population within 10 kilometers of the Wateree plant in South Carolina is 85% people of color and 82% Black people—more than double the statewide percentages of 37% and 27%—and the poverty rate is 23% while the state-wide poverty rate is 15%.

The Southern Environmental Law Center (SELC), in comments submitted April 11, 2022, on EPA's proposed reaffirmation of the Appropriate and Necessary Finding,[215] included a technical analysis by Dr. Ranajit (Ron) Sahu.[216] As set forth in Dr. Sahu's report, he, along with Dr. Andrew Grey, conducted air dispersion modeling of emissions, including PM_{10}, from Plant Barry and Winyah. PM_{10} is the non-mercury metal HAP surrogate for the generating units at both plants. This modeling revealed that "the maximum impacts from the plant's emissions were predicted to be around 5 km or less distant from the plant, with potential impacts on those living

[213] *See id.* at 30-31.

[214] This assessment used block-level data from the 2020 decennial census and tract-level data from the 2015–2019 American Community Survey 5-Year Estimate, with findings expressed as a percentage rounded to the nearest whole number.

[215] Comments of SELC on Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding, EPA–HQ–OAR–2018–0794 (submitted Apr. 11, 2022), Att. 9.

[216] Dr. Ranajit Sahu, Technical Analysis in Support of SELC's Comments on EPA's Proposed Reaffirmation of the MATS Appropriate and Necessary Finding (submitted Apr. 11, 2022), Exh. C to Att. 9 [hereinafter Sahu 2022 Technical Analysis].

near the plants."[217] Thus, perhaps not surprisingly, the individuals living closest to these plants are also the individuals most exposed to the emissions of non-mercury metal HAPs.

Stricter standards under MATS certainly would reduce some of the impacts from non-mercury metal HAPs on the individuals most exposed to emissions from Barry, Winyah, and Wateree. For these comments, Dr. Sahu assessed the expected reduction in emissions of non-mercury metal HAPs from Plant Barry Unit 5,[218] and from all units at Winyah and Wateree, using the surrogate of filterable particulate matter (fPM) with fPM emissions based on (1) EPA's proposed limit of 0.010 lb/MMBtu; (2) the agency's proposed alternative fPM limit of 0.006 lb/MMBtu; and (3) a stricter limit of 0.0024 lb/MMBtu discussed above.[219] For example, with respect to Plant Barry Unit 5, for 2022, using the heat input reported for 2022, fPM emissions under the current limit of 0.03 lb/MMBtu could have been up to 1,120,308 lbs., or approximately 560.15 tons.[220] Under the proposed limit of 0.010 lb/MMBtu, fPM for 2022 would be limited to 373,436 lbs., or about 186.72 tons. Under EPA's alternative limit of 0.006 lb/MMBtu, and assuming the same 2022 heat input, fPM for Unit 5 would be limited to 224,062 lbs., or about 112.03 tons. Finally, under a stricter limit of 0.0024 lb/MMBtu, discussed above, fPM emissions in 2022 would have been limited to 89,625 lbs., or 44.81 tons. This represents more than a twelve-fold decrease in the limit for fPM emissions as compared to the present 0.03 lb/MMBtu standard.

C. EPA must require CEMS for PM.

We strongly support EPA's proposal to require EGUs to monitor their non-mercury metal HAP emissions using CEMS for PM. PM CEMS are now more widely deployed than when MATS was first promulgated, and experience with PM CEMS has enabled operators to more promptly detect and correct problems with pollution controls as compared to other monitoring and testing options allowed under MATS (*i.e.*, periodic stack testing and parametric monitoring for PM), thereby lowering HAP emissions. EPA must likewise revise the emission standards for non-mercury metal HAPs (where PM is used as a surrogate) to reflect these developments in monitoring techniques and require PM CEMS.

Employing PM CEMS as the only monitoring option for non-mercury metal HAPs—and complying with the revised emissions standards reflecting these improvements in monitoring—is "achievable" because this monitoring method is both cost-reasonable and readily available. Regarding PM CEMS, an Andover Technology Partners' report observes:

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[217] *Id.* at 2.
[218] Plant Barry's Unit 4 has been converted to gas.
[219] The complete results of Dr. Sahu's analysis are set forth in the spreadsheet attached hereto as Attachment 10 [hereinafter Sahu 2023 Technical Analysis]. For each of the units, Dr. Sahu analyzed emissions data for the years 2018 through 2022.
[220] *See id.*

- PM CEMS were considered a "new" or "emerging" technology in 2011, with limited application…The technology is common today.

- PM CEMS cost roughly $250,000 to install.[221]

EPA's Proposal estimates the cost of PM CEMS at even lower numbers, with EPA's models estimating installation costs averaging $109,420 and manufacturers estimating installation costs averaging $57,095. EPA estimates the average Equivalent Uniform Annual Costs (EUAC) for PM CEMS in their models at $87,623, while estimates from manufacturers average just $32,559.[222] As EPA notes, the EUAC for PM CEMS is also "less expensive than quarterly [stack testing]."[223] Given the cost estimates in the Proposal and the estimate by Andover Technology Partners, total costs of installing PM CEMS for the set of plants that do not currently have PM CEMS would be clearly reasonable, especially since PM CEMS is both more effective and less costly than periodic stack testing.

Additionally, PM CEMS are demonstrably capable of measuring PM at emission levels that might be required by a strengthened fPM standard. PM CEMS are currently being used to demonstrate compliance at emissions levels below EPA's proposed fPM standard. As a report by Andover Technology Partners points out using data from EPA's Proposal "about 10% of the units with PM CEMS reported emissions levels of about 0.0015 lb/MMBtu or below (similar percentage for stack sampling), over 20% of the units with PM CEMS reported emissions levels of 0.0025 lb/MMBtu or below (about 30% for stack sampling), and nearly half of the units with PM CEMS reported emissions levels of 0.005 lb/MMBtu or below (70% for stack sampling)."[224] This demonstrates that PM CEMS are already being used to measure emissions rates far below EPA's proposed fPM rate, and "are capable of demonstrating PM emissions levels down to 0.0015 lb/MMBtu or even less."[225]

Beyond their utility in measuring and achieving lower emissions rates, requiring PM CEMS is also "necessary" under section 112(d)(6) because PM CEMS would better ensure that EGUs are meeting current emission standards. Currently, in addition to PM CEMS, MATS allows EGUs to demonstrate compliance with the PM standard using quarterly stack testing and parametric monitoring.[226] But stack tests conducted once per quarter (or less frequently, for those units with low emitting EGU status) tell regulators and the public (and source operators, for that matter) little about emissions in the many days and hours between stack tests, when emissions could be much higher than during a planned test. Similarly, directly monitoring filterable PM levels through a PM CEMS would more accurately reflect actual PM emission levels than indirect monitoring using operating parameters established through a periodic stack

[221] 2021 ATP Report at 6.
[222] 88 Fed Reg. at 24,873, Tbl. 4.
[223] *Id.* at 24,872.
[224] 2023 ATP Assessment at 29.
[225] *Id.*
[226] 40 C.F.R. § 63.10021; 40 C.F.R. Part 63, Subpart UUUUU, Tbl. 7.

test. As EPA states in the Proposal, having PM CEMS supplies data "that can lead to improved control device and power plant operation, which, in turn, can lead to fPM emission reductions."[227]

PM CEMS should also be required—and EPA would act well within its authority in requiring PM CEMS to ensure that EGUs are complying with the relevant standards—under other provisions of the CAA. Section 112(b)(5) provides: "The Administrator may establish, by rule, test measures and other analytic procedures for monitoring and measuring emissions, ambient concentrations, deposition, and bioaccumulation of hazardous air pollutants."[228] Separately, section 114(a)(1)(C) authorizes the Administrator to require operators "on a…continuous basis…to…install, use, and maintain such monitoring equipment, and use such audit procedures, or methods…as the Administrator may reasonably require."[229] And section 114(a)(3) provides: "The Administrator shall in the case of any…owner or operator of a major stationary source…require enhanced monitoring…."[230] None of these provisions explicitly requires EPA to consider cost in requiring the installation or use of monitoring equipment.[231] Nonetheless, as noted above, requirements to deploy PM CEMS would be cost-reasonable.

Nor would EPA's conclusions as to these monitoring techniques in the original MATS rulemaking pose any obstacle to adopting such requirements now. Regarding PM CEMS, in the 2011 proposal, EPA stated:

> We evaluated the feasibility and cost of applying PM CEMS to EGUs. Several electric utility companies in the U.S. have now installed or are planning to install PM CEMS. In recognition of the fact that PM CEMS are commercially available, EPA developed and promulgated [performance specifications (PSs)] for PM CEMS (69 FR 1786, January 12, 2004). Performance Specifications for PM CEMS are established under PS 11 in appendix B to 40 CFR part 60 for evaluating the acceptability of a PM CEMS used for determining compliance with the emission standards on a continuous basis. For PM CEMS monitoring, initial costs were estimated to be $261,000 per unit and annualized costs were estimated to be $91,000 per unit. We determined that requiring PM CEMS for EGUs combusting coal or oil is a reasonable monitoring option. We are requesting comment on the application of PM CEMS to EGUs, and the use of data from such systems for compliance determinations under this proposed rule.[232]

[227] *Id.*
[228] 42 U.S.C. § 7412(b)(5).
[229] *Id.* § 7414(a)(1)(C), (G).
[230] *Id.* § 7414(a)(3).
[231] *See also Mexichem Specialty Resins, Inc. v. EPA*, 787 F.3d 544, 561 (D.C. Cir. 2015) (rejecting petitioners' argument that certain monitoring requirements amounted to a "beyond-the-floor" standard under section 112(d)(2) that would necessitate consideration of costs).
[232] 76 Fed. Reg. at 25,051-52.

In the final rule, EPA explained its decision to allow owners and operators to demonstrate compliance with the filterable PM limit though other means by noting:

> A source may also elect to use a PM CEMS to demonstrate compliance with the filterable PM emission limit. If this option is selected, then the same provisions as noted above for other CEMS will apply. (Note that EPA anticipates that the PM monitoring device that may most often will [sic] be used is a PM continuous parameter monitoring system (CPMS) in conjunction with an operating limit, as more fully described below.)[233]

EPA did not, however, depart from its position in the proposal that PM CEMS was a reasonable monitoring option: the Response to Comments document addressed comments that PM CEMS were "very expensive" and "not proven to be reliable for the electric utility industry":

> The final rule also does provide for the use of a PM CEMS to determine compliance with the filterable PM emission limit if the source elects to use this approach (see the final preamble for further discussion).
>
> Although PM CEMS are no longer required under the final rule, the EPA disagrees with the commenters that indicate a general concern that PM CEMS are not an adequately reliable technology. PM CEMS have been demonstrated for a variety of applications. PM CEMS performance specifications and QA procedures have been around quite a while with PS-11 and Procedure 2 promulgated January 2004. There have been at least 65 successful installations in the United States and in other countries.[234]

Since 2011, PM CEMS have continued to be installed and used throughout the industry, further supporting EPA's conclusion that PM CEMS are adequately demonstrated, and further illustrating that they are cost-reasonable.[235]

In addition to requiring the use of PM CEMS, EPA should require the collected emissions data to be posted on the internet and used for automatic reporting of violations, including automatic posting of the violation on EPA's website. This would provide public transparency around an EGU's emissions of dangerous pollutants while also encouraging EGUs to swiftly fix any issue with their emission control equipment. As EPA stated in the Proposal, "transparency of EGU emissions as provided by PM CEMS, along with real-time assurance of compliance has intrinsic value to the public and communities as well as instrumental value in

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[233] 77 Fed. Reg. at 9,370.

[234] EPA, MATS Response to Comments Document, Vol. 2, at 155-56; *see also id*. at 158, 159, 160-61 (similar).

[235] *See* 2021 ATP Report at 6; *see also* 88 Fed. Reg. at 24,873, Tbl. 4.

holding sources accountable."[236] Transparency and accountability are best accomplished through public posting of data and automatic reporting and public notice of violations.

In light of EPA's conclusion in the 2011 proposal that PM CEMS is a reasonable monitoring option, the presentation of low and reasonable costs for PM CEMS, and EGU operators' experience with PM CEMS gained since 2011 (which has likely led to lower non-mercury metal emissions and proven that PM CEMS is capable of measuring low levels of emissions), it would be more than "reasonabl[e]" within the meaning of section 114(a)(1)(C) for EPA to require this monitoring technique as part of a strengthened rule. In addition, it is well within EPA's authority to require CEMS for PM and any other pollutants regulated under MATS through sections 112(b)(5) and 114(a)(3), which place no express limitation on the Agency's authority to require continuous monitoring of HAP emissions. Further, the use of these monitoring techniques lead to lower emissions rates as operators detect and respond to problems with pollution controls, rendering them a "development" that would require revisions of the standards reflecting their use under section 112(d)(6). Thus, we support EPA's proposal to require PM CEMS under sections 112(d)(6), 114(a)(1)(C), 114(a)(3), and/or section 112(b)(5), while strengthening the corresponding standards under section 112(d)(6) based in part on developments in these monitoring techniques.

D. EPA must strengthen the mercury standards for both not-low-rank and low-rank coal-fired EGUs to require maximum achievable emission reductions.

1. <u>EPA must revise the mercury limits to no higher than 0.15 lb/TBtu for not-low-rank coal units, and to no higher than 0.5 lb/TBtu for low-rank coal units.</u>

EPA must revise the mercury limits to no higher than 0.15 lb/TBtu for not-low-rank coal units and no higher than 0.5 lb/Tbtu for low-rank coal units based on developments in practices, processes, and control technologies. The 2021 ATP Report notes advances in control technologies that support stronger mercury standards like more advanced activated carbons with higher capture at lower injection rates and carbons that are tolerant of flue gas species. [237] These developments have made over 90% mercury capture possible under virtually any circumstances. Other advances in fuel additives, scrubber operation, scrubber systems like Gore Technology, and scrubber additives provide additional ways to reduce mercury emissions, and further support stronger mercury limits for all coal plants.[238]

[236] 88 Fed. Reg. at 24,872.
[237] *See* 2021 ATP Report at 48.
[238] *Id.* at 46.

a. These emission limits could be achieved in various ways, including by increasing usage of activated carbon.[239]

Mercury emissions limits of 0.15 lb/TBtu for not-low-rank coal units and 0.5 lb/TBtu for low-rank coal units would be achievable for units with a range of control configurations. For units with an ESP but no scrubber, which are particularly challenging to control for mercury, activated carbon injection (ACI) can be used and the rate of injection increased to improve the rate of mercury removal. To the extent that some units with an ESP may be required to install a baghouse to comply with a more stringent fPM standard, the baghouse by itself is likely to improve the mercury emissions rate without an increase in injection rate.

There is likely to be some cost associated with achieving a 0.5 lb/TBtu mercury standard for low-rank coal units, as none of the 20 low-rank coal units that do not have announced retirement dates by 2027 have achieved a mercury emissions rate at or below that level, but all of them have a baghouse or a scrubber installed which suggests they are capable of achieving very low emissions.[240] The use of a baghouse or scrubber means very high capture efficiencies are expected to be achievable, as ACI or chemical additives should be effective for lowering mercury emissions rates.[241] ACI has been very effective in reducing mercury emissions to well below 0.5 lb/TBtu in not-low-rank coal units, which suggests this rate should be achievable for low-rank coal units.

For not-low-rank coal units, 35 of the units that have not announced plans to retire by the end of 2027 had mercury emissions under 0.15 lb/TBtu with a variety of PM control devices.[242] These include units with an ESP, a baghouse, both an ESP and a baghouse, or a venturi scrubber, which shows that this level of mercury emissions is achievable for a range of control configurations. Units with a scrubber, baghouse, or REACT technology (using activated coke to capture NO_x, SO_2, and mercury) may be capable of achieving this rate without ACI, and in some cases these units may use fuel additives or scrubber chemical additives instead of ACI to achieve lower mercury emissions rates. Four of the units that have achieved mercury emissions below 0.15 lb/TBtu have only an ESP but no scrubber for acid gas control.[243] Therefore, available information regarding these units shows that a mercury emissions rate of 0.15 lb/TBtu is feasible for not-low-rank coal units and demonstrated for a range of control configurations.

Furthermore, though EPA has access to information regarding types of sorbents used by units in the Air Market Program Data, the type of sorbent and rate of injection are not required to

[239] *See* Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants – Addendum, Analysis of the Cost of Complying with Lower Hg Emissions Levels, at 8 (Jan. 2023) [hereinafter ATP Hg Addendum], https://www.andovertechnology.com/articles-archive/.
[240] *Id.* at 6-7.
[241] *Id.* at 7.
[242] *Id.* at 4.
[243] *Id.* at 5.

determine whether additional mercury reductions are feasible and cost-effective at coal units.[244] ATP has previously estimated incremental costs of controls to lower mercury emission rates for low-rank and not-low-rank units, and for not-low-rank units there is significantly more data available to EPA that can be used to evaluate costs of compliance with a lower mercury standard than was available when MATS was promulgated. EPA has years of mercury emissions data, information regarding coal type, air pollution control configuration, and the type of carbon being used. Published material on ACI and other approaches, as well as publicly available data relevant to control costs at different rates and for different configurations, provides adequate information to determine additional reductions that are achievable at reasonable costs.

b. The incremental costs of achieving these limits are reasonable, especially when taking into account planned retirements and retirements that would likely already occur given the policy environment and other regulations.

Mercury standards of 0.15 lb/TBtu for not-low-rank coal units and 0.5 lb/TBtu for low-rank coal units can be achieved at a reasonable incremental cost, particularly if combined with a stringent fPM standard. ATP's Assessment finds that, if units implemented measures to meet a revised fPM limit of 0.0024 lb/MMBtu, the incremental annualized costs to meet these mercury limits would be about $166 million total—about $155 million for not-low-rank coal units and about $11 million for low-rank coal units.[245] If EPA sets an fPM limit of 0.006 lb/MMBtu, the cost to comply with these mercury standards would be about about $468 million—about $405 million for not-low-rank coal units and about $63 million for low-rank coal units.[246] These costs may also be overestimated if more units retire due to the current policy environment (particularly IRA) and other regulations on coal units.

The costs of these revisions to the mercury standards are reasonable considering the industry's annual revenues, capital expenditures, and total expenditures. As discussed in Section IV.A.1, EPA should consider costs in the context of what the power sector can absorb while continuing to serve its function of providing power. These costs are eminently reasonable in the context of the power sector's 2019 total expenditures of $242.9 billion and revenue of $401.738 billion. If EPA strengthens the fPM standard to 0.0024 lb/MMBtu, the $166 million incremental cost of the mercury standards would be about 0.07% of the power sector's 2019 total expenditures, or about 0.04% of 2019 revenue. If EPA strengthens the fPM standard to 0.006 lb/MMBtu, the $468 million incremental cost of the mercury standards would be about 0.19% of 2019 total expenditures or about 0.12% of 2019 revenue. These cost estimates are also small compared to power sector capital expenditures and within the range of historical variability in capital expenditures. These are clearly costs that the power sector can easily absorb while continuing to serve its function of providing power.

[244] *See* 2023 ATP Assessment at 31-32. *Contra* 88 Fed. Reg. at 24,879.
[245] 2023 ATP Assessment at 50-51.
[246] *Id.*

2. The incremental reductions in emissions of mercury under the recommended revision are worth pursuing.

Information available in the early years of MATS

Despite substantial limitations and gaps in coverage, research known to the EPA as it created the original MATS program in 2011 compellingly demonstrated the severity of the health concerns associated with EGU mercury emissions. EPA documented the neurologic, cardiovascular, genotoxic, and immunotoxic effects of mercury emissions, which it found posed disproportionate risks for certain groups, including female low-income and Indigenous subsistence fish consumers.

EPA published a technical support document (Mercury Risk TSD) in 2011 providing a description of the national-scale risk assessment for mercury that was completed to inform the finding that it is appropriate and necessary to regulate electric utility steam generating units.[247] The Mercury Risk TSD estimated 22% to 29% of the watersheds modeled have populations potentially at-risk due to U.S. EGU mercury emissions (together with mercury emissions from other sources) in 2016.[248]

The Mercury Risk TSD assessment was designed to assess whether a potential public health hazard is associated with mercury emitted from U.S. EGUs.[249] The EPA generated hazard quotient (HQ) estimates by comparing estimates of modeled potential exposure for subsistence fisher populations to the methylmercury reference dose (RfD).[250] HQ values above one for a population represent a potential exposure considered to be a public health hazard. The TSD concluded that, by 2016, between 2% and 12% of the 3,141 watersheds modeled for high-end female consumers could have an HQ >1 from U.S. EGU-attributable mercury deposition when considered alone, without taking into account other sources of deposition.[251] These HQ values, which are based on an RfD that reflects a wider range of neurological endpoints in children, such as delayed development of memory, language, and motor skills, provides a better sense of the risk posed by mercury emissions than does an assessment that focuses exclusively on reductions in IQ.[252] Nonetheless, the Mercury Risk TSD does provide estimates of IQ loss in children born to mothers from high fish-consuming subsistence fishing populations.[253]

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[247] EPA, Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish in Support of the Appropriate and Necessary Finding for Coal- and Oil-Fired Electric Generating Units, EPA452/R-11-009, at viii (Dec. 2011) [hereinafter Mercury Risk TSD].
[248] *Id.* at x.
[249] *Id.* at 6.
[250] *Id.* at 10.
[251] *Id.* at 86.
[252] *See id.* at 10 n.16.
[253] *Id. at* 117.

The Mercury Risk TSD also provides risk percentiles for HQs for female subsistence fish consumers, including six subpopulations analyses. The EPA found that three groups— low-income Blacks, low-income Whites in the Southeast, and Laotians—face risks higher than those for the typical subsistence fish consumer.[254] Furthermore, although the Mercury Risk TSD concluded that U.S. EGU-attributable risks for Tribes were similar to those for the typical female subsistence fish consumer, *total risks* to Tribal members were generally higher.[255]

These findings emphasize the value of further reductions in mercury emissions from coal-fired power plants. The Mercury Risk TSD itself cautions that "our coverage for high U.S. EGU impact areas remains limited. For this reason, we continue to believe that the actual number of 'at-risk' watersheds (i.e., watersheds where U.S. EGUs could contribute to public health concern) could be substantially larger than estimated."[256] Thus, the benefits of reducing mercury likely exceed EPA's conservative estimates.

To quantify the risks associated with mercury, the 2011 RIA conducted a national-scale assessment focusing on exposure to methylmercury in populations who consume self-caught freshwater fish. The benefit analysis focused on reductions in IQ points and economically quantified the effects associated with this loss. The analysis estimated benefits from avoided IQ loss under various regulatory scenarios and included analysis for 32 subpopulations with an emphasis on relatively high levels of fish consumption.

Of these 32 subpopulations, EPA identified six high-risk subpopulations: low-income African American recreational/subsistence fishers in the Southeast region, low-income White recreational/ subsistence fishers in the Southeast region, low-income female recreational/ subsistence fishers, Hispanic subsistence fishers, Laotian subsistence fishers, and Chippewa/ Ojibwe Tribe members in the Great Lakes area. The 2011 RIA found that members of these subpopulations were potentially disproportionately harmed by methylmercury exposure.[257]

In the 2011 RIA, EPA used census tract data from 2000 and applied county-level population growth projections to predict populations in later years (2005 and 2016). The analysis examined 63,978 census tracts in the contiguous United States located within 100 miles of at least one HUC-12 watershed with freshwater mercury fish-tissue sampling data.[258] To estimate the size and spatial distribution of freshwater recreational angler populations and activities in the United States, the National Survey of Recreation and the Environment (NSRE) and the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) were used. To characterize the spatial distribution of mercury concentration estimates in freshwater fish, EPA compiled data from three sources, the National

[254] *Id.* at 81-83.
[255] *Id.* at 111.
[256] *See id.* at 110-11.
[257] 2011 MATS RIA at 7-40 to 7-49.
[258] *Id.* at 4-66.

Listing of Fish Advisory (NLFA) database, a U.S. Geological Survey (USGS) compilation of mercury datasets, and EPA's National River and Stream Assessment (NRSA) study data.

As EPA has acknowledged, there are several noteworthy limitations that led the 2011 RIA to understate the benefits of mercury reduction. A 2016 study gave three reasons for this underestimate: (1) that EPA only included mercury exposure through consumption of fish for a small population of recreational fishers, (2) that neurological outcomes actually can occur at a lower concentration than used by EPA, and (3) that there are potentially other health outcomes that should be quantified by EPA.[259] A second study, also in 2016, quantified cumulative U.S. economy-wide benefits and estimated them to be at least $43 billion.[260] This study also found, using updated deposition modeling, that a large portion of mercury is deposited locally and those consuming locally caught freshwater fish could benefit from domestic action. A third study found that including cardiovascular risks from mercury in a cost-benefit assessment is critical because a probabilistic assessment of the health and economic benefits from a reduction in mercury exposure found that 80% of the monetized health benefits come from reduction in fatal heart attacks, with the remainder coming from IQ gains.[261]

EPA's model of fish consumption also assumes all the freshwater fish that anglers consume comes from water bodies within a set distance of the anglers' census tract.[262] This assumption does not take into account those who travel for leisure fishing. Finally, recent epidemiological findings indicate that there are more-sensitive neurodevelopmental endpoints than full-scale IQ, as used by EPA. Further, these impacts have been documented at lower levels than the reference dose established by a National Research Council panel in 2000.[263] Due to the limitations of the data available at the time the RIA was published in 2011, the estimates of the health impacts of EGUs' emissions of mercury were greatly understated.

In addition, in its 2016 supplemental finding, EPA found that the 2011 RIA significantly underestimated mercury health impacts due to "gaps in toxicological data, uncertainties in extrapolating results from high-dose animal experiments to estimate human effects at lower doses, limited monitoring data, difficulties in tracking diseases such as cancer that have long latency periods, and insufficient economic research to support valuation of the health impacts often associated with exposure to individual HAP."[264] Many of the benefits of reducing mercury were not quantified because, at the time the RIA was written, the literature was

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[259] Elsie M. Sunderland *et al.*, *Benefits of regulating hazardous air pollutants from coal- and oil-fired utilities in the United States*, 50 Env't Sci. & Tech. 2117, 2117-19 (2016).
[260] Amanda Giang & Noelle E. Selin, *Benefits of mercury controls for the United States*, 113 Proc. Nat'l Acad. Sci. 286, 290 (2016).
[261] Glenn E. Rice, James K. Hammitt & John S. Evans, *A probabilistic characterization of the health benefits of reducing methyl mercury intake in the United States*, 44 Env't Sci. & Tech. 5216, 5216 (2010).
[262] 2011 MATS RIA at 4-43.
[263] Sunderland *et al., supra* note 259, at 2118.
[264] 81 Fed. Reg. 24,420, 24,441 (Apr. 25, 2016).

incomplete as to the extent to which mercury had an effect on many potential health and ecosystem outcomes. However, the 2011 RIA did acknowledge the neurologic, cardiovascular, genotoxic, and immunotoxic effects of mercury on humans.[265] It also examined the impact of mercury on ecosystems and wildlife with focus on the effects on fish, birds, and mammals, noting a host of potential negative effects.[266]

Improved understanding of the health impacts of mercury since 2011

New research reinforces the importance of strengthening EGU mercury emissions standards, including a 2022 analysis from researchers at Harvard University and Syracuse University showing greater methylmercury exposures attributable to EGU emissions from consuming commercially caught fish than previously thought.[267]

EPA's three risk screening analyses conducted as part of the agency's 2022 review of its 2020 appropriate and necessary finding calculated health risks including deaths from heart attack in the general population, lost IQ points from fish consumption, and high fish-consuming subsistence fisher risk of fatal heart attack.[268] Although these analyses likely underestimate the health impacts of mercury EGU HAP because of their conservative design, they illustrate the severe threats posed by EGU mercury HAP.[269]

In 2022, researchers at Harvard University and Syracuse University developed a refined methodology to assess the effects of mercury EGU emissions producing more accurate and reliable results showing significantly greater health impacts attributable to mercury HAP.[270] This new analysis of exposures to methylmercury through consumption of commercially caught fish indicates that the health impacts attributable to EGUs' emissions before implementation of MATS are greater than previously thought.[271] This highly credible, state-of-the-science analysis

[265] 2011 MATS RIA at 4-4 to 4-5.
[266] *Id.* at 4-6 to 4-9.
[267] *See* Mercury Benefits Template at 6-10.
[268] *See* EPA, National-Scale Mercury Risk Estimates for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking, at 1 (Sept. 2021) [hereinafter 2022 Risk TSD].
[269] Comments of Public Health and Environmental Organizations, EPA–HQ–OAR–2018–0794–4962, at 29-36 (submitted Apr. 11, 2022).
[270] *See* Mercury Benefits Template.
[271] *See generally* Mercury Benefits Template. We refer the agency to the description of this analysis, conducted by researchers at Harvard University and Syracuse University, in the comments submitted by Emmett Environmental Law & Policy Clinic at Harvard Law School on EPA's review of the 2020 appropriate and necessary finding. *See* Comment submitted by Emmett Environmental Law & Policy Clinic, EPA–HQ–OAR–2018–0794–4954 (submitted Apr. 11, 2022).

shows much greater EGU HAP risks—and benefits of regulating those emissions under section 112—than were previously quantified.

To evaluate more precisely the reductions in health impacts of mercury emitted by EGUs before and after implementation of MATS, the researchers conducted a step-by-step analysis of: EGU emissions of mercury in 2010 and in 2020; atmospheric transport and deposition of that mercury; uptake of the mercury in the environment and changes in fish-tissue mercury concentrations as a result; incremental human exposures to mercury through consuming this fish; and the ensuing health impacts. The analysis uses a more refined method of quantifying the impacts of EGU emissions of mercury than EPA's 2022 risk screening analyses:

- **Emissions.** The analysis uses data on EGU emissions of mercury before implementation of MATS from the MATS Information Collection Request and the National Emissions Inventory (NEI) as well as data on emissions after implementation of MATS from compliance reports and the NEI.[272] Using multiple data sets helps control for uncertainties and misreporting, allowing for a more accurate estimate of emissions.

- **Air quality modeling and deposition.** The analysis deploys an updated atmospheric chemical transport model that incorporates more-recent findings about atmospheric mercury chemistry.[273] This approach shows that greater mercury deposition attributable to EGU emissions is occurring, and that reductions in mercury emissions from EGUs result in greater declines in mercury deposition, in comparison to what was previously understood.[274]

- **Exposure through fish consumption.** The analysis uses probabilistic modeling to simulate changes in mercury exposure from consumption of seafood meals of differing fish types and harvesting origins, based on previous work by these researchers, and the number of seafood meals and meal sizes, based on NHANES and EPA's 2011 Exposure Factors Handbook.[275] The changes in mercury doses are then converted to blood or hair mercury concentrations using a previously published probabilistic version of EPA's one-compartment toxicokinetic model.[276] Changes in fish-tissue concentrations of mercury are assumed to respond proportionally to changes in deposition from reduced EGU emissions, with this deposition modeled for freshwater bodies across the contiguous U.S., Atlantic coastal U.S. waters, and Pacific coastal U.S. waters.[277] A more granular analysis of the spatial variability in EGU deposition (examining five regions) was conducted for recreationally caught fish.[278] This approach to measuring exposure to mercury

[272] Mercury Benefits Template at 4-5 & Fig. 1.
[273] *Id.* at 5.
[274] *Id.*
[275] *Id.* at 7.
[276] *Id.*
[277] *Id.* at 9.
[278] *Id.* at 9-10.

attributable to EGU emissions may be conservative, as crops have also been shown to take up mercury emitted by coal-fired power plants and contain concentrations of mercury (usually in toxic non-methylated forms) above safe levels for human consumption,[279] such that changes in EGU emissions could also affect those background exposures. Emissions from other anthropogenic sources of mercury, such as mine waste, have led to high concentrations of methylmercury in rice,[280] and it would be reasonable to assume that some mercury from EGU emissions also accumulates in rice.

- **Cumulative exposures.** The analysis develops a relative source contribution for EGUs, which allows the researchers to calculate ongoing exposures from other sources.[281] These higher levels of exposure mean that reductions in mercury emissions from EGUs may result in greater health benefits than if they were considered alone, because they may lower exposures to a level below the reference concentration at which adverse effects would begin to occur.[282]

- **Cardiovascular impacts.** The analysis examines the relationship between methylmercury exposure and hypertension and other intermediary effects that could lead to cardiovascular mortality, through modes of action beyond acute myocardial infarction.[283] Accounting for such effects adds substantially to the incidences of mortality likely caused by EGU emissions of mercury before implementation of MATS (and that MATS likely prevented).[284]

- **Neurological impacts.** The analysis leverages the well-established relationship between methylmercury exposure to fetuses and loss of IQ points to quantify the impacts that result from the new, higher exposures ascertained in previous steps.[285] It then converts the lost IQ points to monetized value by applying an economic valuation of lost IQ points.[286] Further, the analysis observes that monetized benefits associated with

[279] Rui Li *et al.*, *Mercury pollution in vegetables, grains and soils from areas surrounding coalfired power plants*, 7 Sci. Rep. 46,545 (2017); *see also* EPA, Integrated Risk Information System Assessment: Mercury, elemental; CASRN 7439-97-6 (1995), https://iris.epa.gov/ChemicalLanding/&substance_nmbr=370.
[280] *See* Barbara Gworek *et al.*, *Mercury in the terrestrial environment: a review*, 32 Env't Sci. Europe 128, at 8 (2020).
[281] Elsie M. Sunderland *et al.*, *Mercury Science and the Benefits of Mercury Regulation*, at 21 (Dec. 2021).
[282] *See id.*
[283] Mercury Benefits Template at 10-11.
[284] *See id.* at 10-12 & Tbl. 1.
[285] *See id.* at 10.
[286] *Id.* at 13.

preserved IQ points from avoided societal impacts beyond lost earnings would likely be greater.[287]

Applying their enhanced methodology, the researchers estimate that EGU emissions of mercury before implementation of MATS caused annual incidences of death from cardiovascular disease numbering 204 and annual lost IQ points of 2,600.[288] The decreased incidences of these health impacts attributable to EGU emission reductions from 2010 to 2020 convert to monetized benefits of $1.2 billion from avoided cardiovascular deaths and $25 million from saved IQ points, at a 3% discount rate.[289] These results confirm that EPA's assumptions in the 2022 risk screening analyses were conservative, and they provide independent support for the additional significant benefits that would be obtained through strengthening EGU mercury emissions standards.

Environmental justice impacts of mercury emitted by EGUs

Certain low-income and minority populations may face greater exposures to methylmercury from local deposition of EGU emissions than others do. The refined modeling exercise discussed above produces results that may be examined through a demographic lens by considering that, in 2010, EGUs with large mercury emissions frequently were located near low-income and minority communities.[290]

Congress's special concern for these communities may be inferred from the requirement for EPA to study the threshold for mercury concentrations in fish tissue that may be consumed by "sensitive populations" without adverse effects to public health.[291] Congress does not define the term "sensitive populations," but it is reasonable to interpret the phrase to include populations who face exposures to one or more HAPs that affect the same physiological functions, whether from EGUs or other source categories, as well as cumulative exposures to individual pollutants through different pathways. It is also reasonable to include populations who are overburdened by other air or water pollution, environmental or social stressors, and vulnerabilities such as nutrient deficiencies that could exacerbate the health harms of HAP exposures. There is no reason to believe that Congress meant sensitivity only from intrinsic vulnerabilities (*e.g.*, existing health conditions, genome), when many other stressors (*e.g.*, other chemical exposures, discrimination, poverty, poor housing quality) and extrinsic vulnerabilities (*e.g.*, low socioeconomic status, lack of access to health care) may also render a person more susceptible to exposures to a HAP.[292]

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[287] *See id.*
[288] *See id.* at 10, 12 & Tbl. 1.
[289] *See id.* at 13.
[290] *See* Mercury Benefits Template at 13-14 & Fig. 8.
[291] *See* 42 U.S.C. § 7412(n)(1)(C).
[292] *See* Gina M. Solomon *et al.*, *Cumulative Environmental Impacts: Science and Policy to Protect Communities*, 37 Annual Rev. Pub. Health 83, 86, Tbl. 1 (2016).

In addition to the methylmercury subpopulation risks based on information known to EPA in 2011, as discussed above, new research highlights the heightened risks to Native American communities in particular. EPA's proposed removal of the lignite loophole and tightening of the standards for lignite plants would reduce mercury emissions at these plants and yield substantial health benefits for the Native American communities that disproportionately live near lignite-burning coal plants.[293]

EPA's extension of the 2011 Mercury Risk Assessment as part of its 2022 review of the 2020 appropriate and necessary finding provides additional evidence for the risks to Native American Tribes.[294] EPA observed in its 2022 risk assessment that its estimates for fish consumption among Native American Tribes may be too low or missing in some areas, and that these populations' fish-consumption rates may be similar to the rates observed for other populations in those areas, such as low-income Whites and Blacks in the Southeast.[295]

A 2023 study conducted by Harvard researchers documenting the sociodemographic disparities in exposure to mercury from lignite-burning coal plants found possible heightened Native American exposures to methylmercury through fish consumption near some of the largest mercury-emitting power plants in the U.S., in North Dakota and South Dakota.[296] The authors determined that individuals consuming self-caught fish may be exposed to levels of methylmercury exceeding the EPA reference dose.[297] Regions containing the U.S. plants with the lowest reductions in mercury deposition from 2010 to 2020 overlap with higher-than-average high-frequency fish consumers, raising specific concern over elevated methylmercury exposures for Native American populations in the Dakotas who frequently consume seafood.[298] In addition, the research reinforces prior findings that show a lack of distributional justice in power plant siting. Specifically, the "significantly greater proportions of low-income individuals" living within 5-km of active facilities in 2020, as compared to plants that retired since 2010, suggests that plant retirement decisions may be impacted by the relative wealth of the surrounding communities.[299]

The cumulative impacts of legacy mercury pollution, especially pronounced in urban settings, speak to the importance of reducing mercury pollution in order to correct inequality in health risk, which is disproportionately borne by marginalized communities. Urban rivers are often important food sources for lower-income urban populations; thus, urban anglers are at

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[293] *See* 88 Fed. Reg. 24,854, 24,892 (Apr. 24, 2023).
[294] *See* 2022 Risk TSD at 1.
[295] *Id.* at 23.
[296] Mona Q. Dai *et al.*, *Sociodemographic Disparities in Mercury Exposure from United States Coal-Fired Power Plants*, Env't. Sci. & Tech. Letters at D (2023), https://pubs.acs.org/doi/10.1021/acs.estlett.3c00216?ref=pdf.
[297] *Id.* at A.
[298] *See id.* at D; *id.*, Supporting Information, Figure S4 (modeling that North Dakota contributed 8% to total U.S. atmospheric mercury deposition attributable to U.S. power plants in 2020).
[299] *Id.* at A.

higher risk of exposure to contaminants via fish consumption,[300] and Lawrence freshwaters like the Concord and Merrimack Rivers are affected by legacy mercury contamination (including from Superfund and Brownfield sites, in addition to the deposition from coal-fired EGU emissions) that persists in previously deposited and emitted pools. The cumulative effects of this mercury act as threat multipliers and put urban, under-resourced populations at risk for other health and environmental impacts, including exposure to other toxins.

In addition, EPA has observed that there may be benefits from regulating EGUs under section 112 insofar as society places a premium on reductions of inequality in terms of health risks.[301] This altruistic benefit "is particularly important as exposure to HAP is often disproportionately borne by underserved and underrepresented communities."[302] That individuals prefer equality in health risks over equality in income and are willing to accept *greater additional risk overall* in exchange for equality reveals the worth of these improvements.[303] Improvements in equity not only provide an altruistic benefit to society—an important, yet previously unmentioned, class of benefits—but also address risks to the most exposed individuals and to sensitive populations.

As is the case for non-mercury metal HAPs, power plant emissions of mercury have disproportionate impacts on communities of color and low-income communities in the Southeast as well. As discussed above,[304] in comparison to the overall demographics in Alabama and in South Carolina, a disproportionate number of people of color and people with low incomes live in communities near Plant Barry in Alabama and near the Winyah and Wateree plants in South Carolina. According to Dr. Sahu and Dr. Grey's air dispersion modeling in 2022 of mercury emissions from Plant Barry and Winyah, the maximum impact from mercury emissions was "predicted to be around 5 km or less distant from the plant, with potential impacts on those living near the plants."[305]

As EPA has acknowledged, consumption of mercury-contaminated fish and shellfish is the primary pathway by which mercury exposure occurs in the U.S.[306] In the Southeast, individuals living near coal-fired power plants often are people with low incomes and people of color; for these individuals, fishing can provide an inexpensive food source. Because of higher rates of fish consumption, however, these individuals are also disproportionately impacted by mercury emissions from coal-fired power plants. EPA, in its 2011 Regulatory Impact Analysis for the Final Mercury and Air Toxic Standards (2011 RIA), assessed the impacts from power

[300] T. Bruce Lauber *et al.*, *Urban anglers' adherence to fish consumption advisories in the Great Lakes region*, 43 J. Great Lakes Rsch. 180 (2017).
[301] *See* 87 Fed. Reg. 7,624, 7,646.
[302] *Id.*
[303] *See* Maureen Cropper *et al.*, *Preferences for Equality in Environmental Outcomes*, Nat'l Bureau of Econ. Rsch., Working Paper No. 22644 (2016).
[304] *Supra* section IV.B.4.
[305] Sahu 2022 Technical Analysis at 2.
[306] 2011 MATS RIA at 4-4.

plant mercury emissions on demographic groups with significant potential risks of mercury exposure, including African Americans with low incomes living in the Southeast and with high rates of consumption.[307] Looking at the only subset of public health benefits attributable to reductions in mercury emissions that could be quantified at the time, *i.e.*, IQ loss in children, EPA noted that "an African-American child in the Southeast born in 2016 to a mother consuming fish at the 90th percentile of published subsistence-like levels" would experience a substantial loss of IQ points "as a result of in-utero [methylmercury] exposure from all sources in the absence of a Toxics Rule."[308]

We urge EPA to adopt a stricter mercury standard not only for low-rank coal units but also for not-low-rank coal units in order to reduce the impacts on individuals and communities who have been disproportionately burdened from exposure to mercury and other HAPs. Dr. Sahu compared mercury emissions at Plant Barry, Winyah, and Wateree, based on the current standard for mercury of 1.2 lb/TBtu, with the expected reductions in emissions from a tighter standard of 0.15 lb/TBtu. Under the current limit, Plant Barry unit 5 would have been permitted to emit 44.81 pounds in 2022 based on the actual heat input for that year, although actual emissions reported were 15.62 pounds. Under the stricter limit of 0.15 lb/TBtu, emissions in 2022 would have been reduced to 5.60 pounds. At Wateree unit 1 for 2022, permitted emissions of mercury would have been 12.91 pounds under the current limit of 1.2 lb/TBtu.; actual reported mercury emissions for 2022 were 4.38 pounds; and mercury emissions under a limit of 0.15 lb/TBtu would have been limited to 1.61 pounds. The data show similar results for Winyah unit 2 for 2022: under the current limit, Winyah could emit 10.50 pounds of mercury; actual reported mercury emissions were 4.41 pounds; and under a stricter limit of 0.15 lb/TBtu, mercury emissions from this unit would have been limited to 1.31 pounds.[309]

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[307] *Id.* § 7.11.2, at 7-40 to 7-44. The RIA identified these individuals based on census tracts that had at least 25 African Americans living below the poverty line and that had at least one water body, within 20 miles, with available data on mercury fish tissue concentrations. 2011 MATS RIA § 7.11.2, at 7-43. The RIA defined the "southeast" to include Alabama, Georgia, North Carolina, South Carolina, Tennessee, and Virginia, as well as Arkansas, Florida, Kentucky, Louisiana, Mississippi, and West Virginia. *See id.* § 7.11.2, at 7-41 n.5. EPA modeled risks for both white and Black subsistence fishers in the southeast, by linking poverty with higher rates of subsistence fishing. EPA noted that a 2002 survey by J. Burger, *Daily consumption of wild fish and game*, 12 Internat'l J. of Environ. Health Research 343-354 (2002), supported this linkage. *See* 2011 MATS RIA § 7.11.2, at 7-41.
[308] *Id.* at 4-3.
[309] *See* Sahu 2023 Technical Analysis.

E. EPA must strengthen the HCl standard to require maximum achievable emission reductions.

1. <u>EPA must revise the HCl limit to no higher than 0.0006 lb/MMBtu.</u>

Under section 112(d)(6), EPA must strengthen the HCl limit to no higher than 0.0006 lb/MMBtu to reflect developments in control technologies that have occurred since 2012, including the following:

- Wet FGD systems have operated with enhanced efficiency by balancing and improving flow through the absorption vessel, improving liquid/gas contact through enhanced absorber spray patterns, and adopting engineering that reflects computational fluid dynamics.[310] Emissions of acid gases specifically associated with already installed wet FGD systems decreased overall between 2011 and 2019.[311] Costs of upgrading wet FGD systems, estimated at $43/kW (2019$), are well below the $100/kW that EPA assumed in its 2011 modeling.[312, 313] Most units with wet FGD systems should be able to achieve HCl emissions rates of 0.0006 lb/MMBtu with little to no additional costs.[314] Already some units are performing at rates of 0.0001 lb/MMBtu, which should be achievable for other units with wet FGD systems with additional upgrades.[315]

- Dry FGD systems have operated with enhanced efficiency by deploying circulating dry scrubbers, adopting engineering that reflects computational fluid dynamics, increasing treatment rates, using upgraded fabric filter materials, and improving spray dryer absorber atomizers.[316] Emissions of acid gases specifically associated with already installed dry FGD systems decreased overall between 2011 and 2019.[317] Costs of upgrading dry FGD systems, estimated to be as low as $17/kW, are well below the

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[310] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants, at 16-20 (Apr. 2022) [hereinafter 2022 ATP Report], https://www.andovertechnology.com/articles-archive/.
[311] *Id.* at 13-16 & Figs. 7, 9.
[312] 2023 ATP Assessment at 45 & n.67; EPA, Documentation Supplement for EPA Base Case v.4.10_MATS – Updates for Final Mercury and Air Toxics Standards (MATS) Rule, at 44 (Dec. 2011), https://www.epa.gov/sites/default/files/2015-07/documents/suppdoc410mats.pdf.
[313] The comparison is actually more favorable, as EPA's cost estimate from 2011 is expressed in 2009 dollars and would be even greater in 2019 dollars.
[314] *See* 2022 ATP Report at 54, Tbl. 6.
[315] *Id.*
[316] 2022 ATP Report at 23, 30.
[317] *Id.* at 27-29 & Figs. 16, 18.

$100/kW that EPA assumed in its 2011 modeling.[318, 319] Costs have also come down as fabric filter technology has improved, allowing for these components of the dry FGD to be smaller and less expensive.[320] These upgrades could lower HCl emissions to a rate of 0.0006 lb/MMBtu with no further changes.[321] However, based on data that EPA released with the proposed rule, no units equipped with dry FGD systems would need to make changes to achieve an HCl standard of 0.0006 lb/MMBtu.[322]

- Dry sorbent injection (DSI) systems now need less reagent or sorbent to achieve the same levels of acid gas reduction, partly because of advances in equipment and design of injectors that improve performance by better dispersing the reagent.[323] Costs are lower than anticipated because fabric filters are typically not needed.[324] These upgrades, on the order of $10/kW, could lower HCl emissions to a rate of 0.0006 lb/MMBtu.[325] However, considering data that EPA released with the proposed rule, most if not all DSI-equipped units could achieve an HCl standard of 0.0006 lb/MMBtu by increasing sorbent injection rates, without making additional capital investments.[326]

In sum, an HCl emission limit of 0.0006 lb/MMBtu could be achieved through improvements to wet flue gas desulfurization (FGD) systems and dry sorbent injection (DSI) systems.[327]

The agency asserts that "[i]t is not clear that improvements in a wet or dry FGD scrubber would result in additional HCl emission reductions since HCl emissions are already much easier to control than SO_2 emissions."[328] Recent HCl and SO_2 emissions data from units equipped with wet FGD systems or DSI show a strong correlation between emissions rates for these two pollutants, and all units with dry FGD are already emitting below a rate of 0.0006 lb/MMBtu.[329] These data indicate that improvements to wet FGD or DSI systems that would reduce SO_2 emissions would also reduce HCl and HF emissions.

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[318] *Id.* at 31; EPA, Documentation Supplement for EPA Base Case v.4.10_MATS – Updates for Final Mercury and Air Toxics Standards (MATS) Rule, at 44 (Dec. 2011), https://www.epa.gov/sites/default/files/2015-07/documents/suppdoc410mats.pdf.
[319] The comparison is actually more favorable, as the lower cost estimate cited here is a fraction of the cost estimates produced by an engineering analysis that are expressed in 2016 dollars, whereas EPA's cost estimate from 2011 is expressed in 2009 dollars and would be even greater in 2016 dollars.
[320] 2022 ATP Report at 23.
[321] *See id.* at 54, Tbl. 6.
[322] 2023 ATP Assessment at 44.
[323] 2022 ATP Report at 38-40.
[324] *See id.* at 38; 2023 ATP Assessment at 46.
[325] *See* 2022 ATP Report at 50-51; *id.* at 54, Tbl. 6.
[326] *See* 2023 ATP Assessment at 46.
[327] *See id.* at 44-46.
[328] 88 Fed. Reg. at 24,883.
[329] 2022 ATP Report at 43, Fig. 30; *id.* at 44, Fig. 31; *see also* 2023 ATP Assessment at 44.

The agency further posits that it "does not have information on the sorbent injection rates for DSI systems; so, we cannot assess whether increased sorbent injection would result in additional HCl emission reductions."[330] Yet units equipped with DSI are among the best performers in terms of HCl emissions rates, according to EPA's data.[331] EPA does not need more information on DSI rates to determine whether reductions in HCl and HF are feasible and cost-effective. Emissions data are available that would allow EPA to calculate achievable reductions at each unit using DSI, or at a generic, model unit.[332]

The incremental costs of achieving an HCl limit of 0.0006 lb/MMBtu are reasonable, especially when taking into account planned retirements and retirements that would likely already occur given the IRA, industry trends, and other regulations. Andover Technology Partners' report—which does not account for retirements projected to occur under the IRA or cost reductions from fabric filter installations to reduce fPM emissions—finds that coal-fired units could comply with this limit at an annualized cost of $191 million.[333] The total cost is reasonable, as illustrated by comparisons to the industry's annual revenues (0.048% of 2019 revenue of $401.738 billion) and total expenditures (0.078% of 2019 total expenditures of $242.9 billion). If units implemented measures to meet a revised fPM limit, the incremental annualized costs to meet this acid gas limit would be even lower.

We urge EPA to leverage the improvements to controls that will likely result from a strengthened fPM standard and secure further reductions in harmful acid gas emissions as well. The fact that most units with acid gas controls are already complying with an HCl limit of 0.0006 lb/MMBtu, while most units without such controls are not,[334] suggests that this revised standard would better reflect the emissions levels achievable through measures that have been widely implemented and have proven cost-effective. Section 112(d)(6) thus requires that EPA revise the standard on HCl emissions to no more than 0.0006 lb HCl/MMBtu.

2. <u>The incremental reductions in emissions of acid gases under the recommended revision are worth pursuing.</u>

Information available in the early years of MATS

In 2011, recognizing that power plants account for an overwhelming share of the hydrogen chloride and hydrogen fluoride emitted in the U.S. (and are significant sources of hydrogen cyanide), and that these acid gases have serious acute and chronic health effects,[335]

330 88 Fed. Reg. at 24,883.
331 *See* 2023 Technology Review Memo at 30, Fig. 5.
332 *See* 2023 ATP Assessment at 46.
333 *See id.* at 45-47.
334 *See* 2023 Technology Review Memo at 29, Fig. 4.
335 76 Fed. Reg. at 25,004-5.

EPA expressed its concern "about the potential for [power plant] acid gas emissions to add to already high atmospheric levels of other chronic respiratory toxicants."[336]

Improved understanding of the health impacts of acid gases since 2011

Since 2011, our understanding of the health impacts of acid gases has substantially improved. Regarding information on the health impacts of acid gases that has become available since the 2011 RIA, we refer the agency to the summary provided by a public health expert in the original litigation over the MATS rule.[337] That summary documents the adverse health effects of both acute and low-level exposures to chlorine, hydrogen chloride, hydrogen fluoride, and hydrogen cyanide. Recent work cited therein includes evidence of respiratory effects and cardiovascular pathology from exposure to chlorine;[338] pulmonary injury from exposure to hydrogen fluoride;[339] and lethality from acute exposures to hydrogen cyanide.[340] Below, we discuss two additional articles presenting recent findings on the health impacts of acid gases.

In 2017, the American Thoracic Society published the report of its Inhalational Lung Injury Workshop, which in part addresses the adverse health effects of exposures to chlorine.[341] The report references recent animal studies finding acute lung injury, small airway disease, and cardiovascular effects from chlorine exposures, as well as increased chlorine-induced hyperresponsiveness following infection with a respiratory virus.[342] These findings—including the potential for the ongoing COVID-19 pandemic and future epidemics to exacerbate the health impacts of exposure to acid gases—illustrate the value of strengthening limits on emissions of chlorine gas and other acid gases from coal-fired EGUs.

A 2021 study of lung injury and pulmonary fibrosis in mice following a single exposure to hydrochloric acid (HCl) found that young individuals can suffer from long-term complications as well as chronic lung injury with stronger, persistent inflammation differently from adults.[343] The authors conclude that their "initial data support the further investigation for HCl toxicity in children and the development of potential countermeasures."[344] These findings are relevant to

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[336] *Id.* at 25,016; *see also* 77 Fed. Reg. at 9,363, 9,405-06.
[337] Declaration of Amy B. Rosenstein submitted in support of the Joint Motion of State, Local Government and Public Health Respondent Intervenors for Remand Without Vacatur, *White Stallion v. EPA*, No. 12-1100 (D.C. Cir. Sept. 24, 2015).
[338] *Id.* ¶¶ 12-13.
[339] *Id.* ¶¶ 16-17.
[340] *Id.* ¶¶ 18-19.
[341] Am. Thoracic Soc'y, *An Official American Thoracic Society Workshop Report: Chemical Inhalational Disasters Biology of Lung Injury, Development of Novel Therapeutics, and Medical Preparedness*, 14 Annals Am. Thoracic Soc'y 1060, 1064 (2017).
[342] *Id.*
[343] Ruben M. L. Colunga Biancatelli *et al.*, *Age-Dependent Chronic Lung Injury and Pulmonary Fibrosis following Single Exposure to Hydrochloric Acid*, 22 Int'l J. Molecular Sci. 8833 (2021).
[344] *Id.*

the statutory direction to protect sensitive populations from HAP exposures.[345] Thus, more-severe health effects from children's exposure to HCl provide further support for Congress's decision to require maximum feasible reductions of hazardous acid gases and would refute any argument that strengthening the standards to reflect current pollution controls is unwarranted.

Environmental justice impacts of acid gases emitted by EGUs

As discussed above,[346] a disproportionate number of people of color and people with low incomes, compared to the states' overall demographics, live near Plant Barry in Alabama, and the Winyah and Wateree plants in South Carolina. Emissions from these power plants of acid gases—like the emissions of mercury and non-mercury metal HAPs—also have disproportionate impacts on people of color, Black people, and people with low incomes. Dr. Sahu and Dr. Grey's air dispersion modeling last year for Plant Barry and the Winyah also looked at SO_2 emissions, an acid gas surrogate. As with mercury emissions and non-mercury metal HAPs, the maximum impact for SO_2 was "predicted to be around 5 km or less distant from the plant, with potential impacts on those living near the plants."[347]

A stricter acid gas standard could alleviate some of the impacts that people of color and low-income communities disproportionately experience from exposure to acid gas emissions from Plant Barry, Winyah, and Wateree. Dr. Sahu analyzed emissions of HCl under the current standard of 0.002 lb/MMBtu for Plant Barry Unit 5 in Alabama, and for each unit at Wateree and Winyah in South Carolina, in comparison to the use of a stricter standard for HCl of 0.0006 lb/MMBtu.[348] For Plant Barry, using the year 2022 heat input, emissions of HCl were limited to 74,687 lbs.; under a stricter limit of 0.0006 lb/MMBtu, emissions of HCl would have been limited to 22,406 lbs. For Wateree Unit 1 and Winyah Unit 4, the results were also significant: under the current HCl limit, emissions of HCl at Wateree were limited to 21,519 lbs., while under the proposed limit of 0.0006 lb/MMBtu, emissions would be limited to 6,456 lbs. Finally, at Winyah Unit 4, under the current limit for HCl, emissions for 2022 were limited to 2,328 lbs., whereas using the stricter limit for HCl of 0.0006 lb/MMBtu, emissions of HCl would have been limited to 698 lbs.[349]

[345] *See* 42 U.S.C. § 7412(n)(1)(C).
[346] *Supra* Section IV.B.4.
[347] Sahu 2022 Technical Analysis at 2.
[348] While Barry Unit 5, Wateree, and Winyah designate SO_2 as a surrogate to demonstrate compliance with the HCl limit, the intent of Dr. Sahu's analysis is to show the extent to which HCl mass emissions to the atmosphere could be reduced by lowering the HCl limit in the MACT standard. If the HCl limit were lowered, as urged in these comments, SO_2 could still be used as a surrogate for compliance, but EPA would need to consider lowering the present limit of 0.2 lb/MMBtu for SO_2 accordingly.
[349] *See* Sahu 2023 Technical Analysis.

F. EPA must require CEMS for HCl.

As part of its section 112(d)(6) review, EPA must require units that use HCl as a surrogate for acid gas HAPs to monitor HCl using CEMS for HCl. HCl CEMS are now more widely deployed than when MATS was first promulgated, and experience with HCl CEMS has enabled operators to more promptly detect and correct problems with pollution controls as compared to other monitoring and testing options allowed under MATS (*i.e.*, periodic stack testing), thereby lowering HAP emissions. Given the availability and effectiveness of HCl CEMS, EPA must likewise revise the emission standards for HCl to reflect these developments in monitoring techniques.

For units that demonstrate compliance using the HCl limit, employing HCl CEMS as the only monitoring option for HCl—and complying with the revised emissions standards reflecting these improvements in monitoring—would be "achievable" because this monitoring method is both cost-reasonable and readily available. HCl CEMS are well demonstrated and cost-reasonable, allowing operators to achieve lower HCl emissions rates.[350] HCl CEMS analyzers cost approximately $80,000 to $250,000, not including the costs of commissioning and startup testing, which may be in similar amounts.[351] Given this range of cost estimates, it is clear that total costs of installing HCl CEMS for the set of plants that do not currently have HCl CEMS (for those plants that have elected to comply with the acid gas limits by measuring HCl emissions) would be reasonable.

Beyond their utility in achieving lower emissions rates, requiring HCl CEMS is also "necessary" under section 112(d)(6) because HCl CEMS would better ensure that EGUs are meeting current emission standards. Currently, in addition to HCl CEMS, MATS allows EGUs to demonstrate compliance with the HCl standard using quarterly stack testing.[352] But stack tests conducted once per quarter (or less frequently, for those units with low emitting EGU status) tell regulators and the public (and source operators, for that matter) little about emissions in the many days and hours between stack tests, when emissions could be much higher than during a planned test.

HCl CEMS should also be required—and EPA would act well within its authority in requiring HCl CEMS to ensure that EGUs are complying with the relevant standards—under other provisions of the CAA. Section 112(b)(5) provides: "The Administrator may establish, by rule, test measures and other analytic procedures for monitoring and measuring emissions, ambient concentrations, deposition, and bioaccumulation of hazardous air pollutants."[353] Separately, section 114(a)(1)(C) authorizes the Administrator to require operators "on a…continuous basis…to…install, use, and maintain such monitoring equipment, and use such

[350] *See* 2022 ATP Report at 6 & n.7.
[351] *See id*. at 49.
[352] 40 C.F.R. § 63.10021; 40 C.F.R. Part 63, Subpart UUUUU, Tbl. 7.
[353] 42 U.S.C. § 7412(b)(5).

audit procedures, or methods…as the Administrator may reasonably require."[354] And section 114(a)(3) provides: "The Administrator shall in the case of any…owner or operator of a major stationary source…require enhanced monitoring…."[355] None of these provisions explicitly requires EPA to consider cost in requiring the installation or use of monitoring equipment.[356] Nonetheless, as noted above, requirements to deploy HCl CEMS would be cost-reasonable.

Nor would EPA's conclusions as to HCl CEMS in the original MATS rulemaking pose any obstacle to adopting such requirements now. The 2011 MATS rule presents lower initial costs and annual costs for HCl CEMS than for PM CEMS.[357] In finalizing the rule, EPA responded to comments about HCl CEMS' cost, accuracy, and reliability:

> The EPA disagrees with commenters' contention that continuous HCl monitoring is premature or not available for the measurement at the limits set in the proposed standard. We understand from vendors of HCl CEMS that they have been used on source categories such as municipal waste combustors, cement plants, and biomass and other power generation units. We have reviewed HCl CEMS vendor technology claims and found sufficient capability to support this rule requirement. We are presently engaged with representative stakeholders to develop a generic performance specification for HCl CEMS. . . .[358]
>
> As mentioned elsewhere, the agency finds that the operation and maintenance issues for the CEMS mentioned are no different than for other CEMS now in wide use and acceptance by the industry. The agency is aware that the calibration gas issue is to be rectified well in advance of the rule's compliance date.[359]

In addition to requiring the use of HCl CEMS, EPA should require the collected emissions data to be posted on the internet and used for automatic reporting of violations, including automatic posting of the violation on EPA's website. This would provide public transparency around an EGU's emission of dangerous pollutants while also encouraging EGUs to swiftly fix any issues with their emission control equipment. EPA's statement in the Proposal regarding PM CEMS is similarly applicable to HCl CEMS: "transparency of EGU emissions as provided by PM CEMS,

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[354] *Id*. § 7414(a)(1)(C), (G).
[355] *Id*. § 7414(a)(3).
[356] *See also Mexichem Specialty Resins, Inc. v. EPA,* 787 F.3d 544, 561 (D.C. Cir. 2015) (rejecting petitioners' argument that certain monitoring requirements amounted to a "beyond-the-floor" standard under section 112(d)(2) that would necessitate consideration of costs).
[357] *See* 76 Fed. Reg. at 25,052 & Tbl. 14.
[358] EPA established this performance specification in 2015, setting "consistent requirements for ensuring and assessing the quality of HCl data measured by CEMS." *See* Performance Specification 18—Performance Specifications and Test Procedures for Hydrogen Chloride Continuous Emission Monitoring Systems at Stationary Sources, 80 Fed. Reg. 38,628, 38,628 (July 7, 2015).
[359] EPA, MATS Response to Comments Document, Vol. 2, at 193, 199.

along with real-time assurance of compliance has intrinsic value to the public and communities as well as instrumental value in holding sources accountable."[360] Transparency and accountability are best accomplished through public posting of data and automatic reporting and public notice of violations.

In light of EPA's conclusion in the 2011 proposal that HCl CEMS is a reasonable monitoring option, the presentation of low and reasonable costs for HCl CEMS, and EGU operators' experience with HCl CEMS gained since 2011 (which has likely led to lower acid gas emissions), it would be more than "reasonabl[e]" within the meaning of section 114(a)(1)(C) for EPA to require this monitoring technique as part of a strengthened rule. In addition, it is well within EPA's authority to require CEMS for HCl and any other HAPs regulated under MATS through sections 112(b)(5) and 114(a)(3), which place no express limitation on the agency's authority to require continuous monitoring of HAP emissions. Further, as discussed above, the use of these monitoring techniques appears to lead to lower emissions rates as operators detect and respond to problems with pollution controls, rendering them a "development" that would require revisions of the standards reflecting their use under section 112(d)(6). Thus, EPA must require HCl CEMS under sections 112(d)(6), 114(a)(1)(C), 114(a)(3), and/or section 112(b)(5), while strengthening the corresponding standards under section 112(d)(6) based in part on developments in these monitoring techniques.

G. EPA must set numeric emission limits for toxic organic HAPs.

As EPA is well aware, CAA section 112 unambiguously requires the agency to set emission limits for each hazardous air pollutant that a source category emits.[361] The only exception to this requirement is that section 112(h) allows EPA to set work practice requirements in lieu of emission limits for a pollutant when it is "not feasible" to prescribe or enforce an emission limit for that pollutant.[362]

When EPA promulgated its original air toxics standards for power plants, the agency set work practice limits for all organic hazardous air pollutants they emit, including dioxins, claiming "the significant majority of data for measured organic HAP emissions from EGUs are below the detection levels of the EPA test methods."[363] According to EPA, this claim showed that measurement of organic hazardous air pollutant emissions is "not practicable" under section 112(h)(2) and, therefore, that it is "not feasible" to prescribe an emission limit for them.[364]

Even if that claim was valid when made, it is refuted by the record for this rulemaking, which shows that for several organic hazardous air pollutants – including dioxins, benzene,

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[360] 88 Fed. Reg. at 24,872.
[361] 42 U.S.C. § 7412(d); *Nat'l Lime Ass'n v. EPA*, 233 F.3d 625, 633-634 (D.C. Cir. 2000); *Sierra Club v. EPA*, 479 F.3d 875, 883 (D.C. Cir. 2007).
[362] 42 U.S.C. § 7412(h)(1); *Sierra Club*, 479 F.3d at 883-884.
[363] 77 Fed. Reg. 9,304, 9,369 (Feb. 16, 2012).
[364] *Id.*

carbon disulfide, dichloromethane, and toluene – EPA has emissions data from at least fifty sites and that at least fifty percent of these data are above detection limits.[365] Further confirming that power plants' emissions of at least some organic hazardous air pollutants can be measured, EPA states that of the 322 power plants it modeled for its residual risk assessment, 307 reported emissions of dioxins and polycyclic organic matter (POM) at levels high enough to support a risk assessment and demonstrate a cancer screening level greater than 1.[366] Applying EPA's own stated rationale for setting work practice requirements in the first place, it is "practicable" to measure emissions for dioxins, POM, benzene, carbon disulfide, dichloromethane, and toluene and therefore "feasible" to set numeric emission limits for them.[367]

Because it is "feasible" to set numeric emission limits for dioxins, benzene, carbon disulfide, dichloromethane, and toluene even under EPA's own reading of section 112(h), EPA must do so. The CAA plainly requires numeric emission limits for these pollutants and the agency's continued failure to promulgate them violates the CAA.[368]

EPA cannot, as it assumes in the proposed rule, wait to address this fundamental statutory defect at its leisure.[369] Nor does it matter whether EPA believes there are "no developments that would result in cost-effective emission reductions of organic HAP."[370] EPA's obligation to set numeric emission limits for power plants' emissions of dioxins, benzene, carbon disulfide, dichloromethane, and toluene is not conditional on the agency's beliefs about their cost-effectiveness. Where, as here, EPA's existing emission standards for a source category fall short of the basic requirements for section 112 emission standards, EPA must fix such defects in its RTR for the category.[371]

It bears emphasis that the Clean Air Act lists organic hazardous air pollutants, including dioxins, benzene, carbon disulfide, dichloromethane, and toluene, separately.[372] The possibility that it may be impracticable to measure emissions of other organic hazardous air pollutants does not excuse the agency from setting numeric emission limits for these hazardous air pollutants, which are practicable to measure.

Even absent the data provided by EPRI, EPA's assumption that it meets the statutory precondition for setting work practice requirements—*i.e.*, that "the application of measurement

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[365] Electric Power Research Institute, Hazardous Air Pollutants (HAPs) Emission Estimates and Inhalation Human Health Risk Assessment for U.S. Coal-Fired Electric Generating Units (2018), EPA–HQ–OAR–2018–0794–1646, Attachment 1, at 4-22 (Tbl. 4-13).
[366] 88 Fed. Reg. 24, 854, 24,864 (Apr. 24, 2023).
[367] 42 U.S.C. § 7412(h)(1)-(2); 77 Fed. Reg. at 9,369.
[368] 42 U.S.C. § 7412(d), (h); *National Lime Ass'n*, 233 F.3d at 634; *Sierra Club*, 479 F.3d at 883-884.
[369] 88 Fed. Reg. at 24,882 (claiming EPA will address this issue "in a separate action").
[370] *Id.*
[371] *La. Envtl. Action Network v. EPA*, 955 F.3d 1088, 1098 (D.C. Cir. 2020).
[372] 42 U.S.C. § 7412(b).

methodology to a particular class of sources is not practicable due to technological and economic limitations"[373]—is unlawful and arbitrary. Application of emission measurement methodology is not "impracticable" just because emission measurements are below detection levels. Rather, in those circumstances, the emission measurement technology has been applied and has yielded measurements. Specifically, it is showing that emissions are below detection levels. Such information allows EPA to both set emission limits and implement emission limits, in the same sense that a very low or zero emission test result allows EPA to do so, and the agency has used non-detect results for these purposes in the past.

Finally, EPA has argued in the past that it "expect[s] organic HAP emissions are lower than the values from the 2010 ICR testing when the EPA concluded that it was not feasible to accurately measure organic HAP emissions because EGUs are now required to conduct periodic tune-ups and more efficient combustion leads to additional reductions in organic HAP."[374] That argument is both irrelevant and misleading. EPA must set emission limits for each hazardous air pollutant that a source category emits, and they must be numeric emission limits unless it is not feasible to prescribe or enforce a numeric limit. Because the record shows that application of measurement technology is practicable for at least some of the organic HAPs that power plants emit, EPA's professed belief that organic HAP emissions are lower now than in 2010 is irrelevant. In any event, EPA neglects to mention its own conclusion that the only work practice it established for organic HAPs—periodic tune-ups—would not reduce emissions. Thus, EPA's claim that organic HAP emissions are lower now than in 2010 is inconsistent with the agency's own statements in the record.

H. EPA must remove the extended startup period.

EPA properly proposes to remove EGUs' option to use an extended startup period during which only work practice standards apply. Although EPA does not recognize this in its proposed rule, EPA must eliminate the extended startup period because the agency has no valid statutory basis for retaining work practice standards in lieu of numeric standards during this period.

EPA revised MATS in 2014 to give EGUs the option of complying with a second, more expansive definition of "startup" that ends four hours after EGUs generate electricity—while retaining the first definition of startup, under which startup ends at electricity generation.[375] During those four hours for EGUs that choose the second definition, only work practice standards—and no numeric standards—apply.[376] EPA based its 2014 revisions on its assertion that EGUs cannot measure their emissions—one of two limited circumstances in which CAA

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[373] *Id.* § 7412(h)(2).
[374] EPA, Final Supplemental Finding and Risk and Technology Review for the NESHAP for Coal- and Oil-Fired EGUs: Response to Public Comments on February 7, 2019 Proposal, EPA–HQ–OAR–2018–0794–4560, at 112 (Apr. 2020).
[375] 79 Fed. Reg. 68,777, 68,792 (Nov. 19, 2014) (40 C.F.R. § 63.10042).
[376] 40 C.F.R. § Pt. 63, Subpt. UUUUU, Tbl. 3.

section 112(h) allows EPA to promulgate work practice standards[377]—during the first four hours they generate electricity.[378]

Now, EPA proposes to remove the extended startup period under Clean Air Act section 112(d)(6) and in response to *Chesapeake Climate Action Network v. EPA*, 952 F.3d 310 (D.C. Cir. 2020), in which the D.C. Circuit vacated EPA's denial of a reconsideration petition filed by environmental groups and remanded the extended startup period to EPA. EPA now reasons that the extended startup period does not represent what the best performers are able to do since the majority of EGUs are not using this extended period.[379] EPA's survey of EGUs shows that only 14 units with the ability to generate up to 8.4 GW chose the second definition of startup—and that six of those EGUs with the ability to generate up to 3.2 GW have retired and one of those EGUs with the ability to generate up to 0.7 GW will retire by 2025.[380] EPA states:

> "After the planned retirements in 2025, just seven EGUs with the ability to generate up to 4.5 GW will remain; this represents less than 0.4 percent of electrical generation from all affected sources and less than 1.7 percent of the 278 GW of coal-fired and other, nonnatural gas fossil-fired electrical generation available in 2022."[381]

EPA's survey is consistent with our review last year of EGUs' choices of startup definition. As listed in the table below, our review showed that nearly all the coal-fired EGUs that were apparently operating as of 2021 chose 40 C.F.R. § 63.10042's first, shorter definition of startup. Specifically, 97% of the coal-fired EGUs that we could discern choices for chose the shorter definition.

Startup Definition	**Number of Coal-fired Units**
1 (startup ends at electricity generation)	**457**
2 (startup ends four hours after generation)	**12**
Unable to determine	**26**

[377] 42 U.S.C. § 7412(h)(1)-(2).
[378] 79 Fed. Reg. at 68,782.
[379] 88 Fed. Reg. 24,854, 24,885-88 (Apr. 24, 2023).
[380] *Id.* at 24,885.
[381] *Id.*

For more details regarding our review, see the accompanying attachment, which details these choices by EGUs.[382] At least some of the units that chose the second startup definition as shown by our review have since ceased operation.[383]

While we agree with EPA that the agency should remove the extended startup period, EPA fails to recognize that it must remove the second startup definition because the agency has no valid statutory basis under CAA section 112(h) to retain work practice standards in lieu of numeric standards during the first four hours after electricity generation. The CAA only allows work practice standards in two specific, very limited situations, only one of which EPA relied upon to establish the extended startup period here—when "the application of measurement methodology to a particular class of sources is not practicable due to technological and economic limitations."[384] In the 2014 rule establishing the extended startup period, EPA took the position that the length of startup should be based on when a group of "best-performing" 12% of coal-fired EGUs (in terms of the ability to measure emissions) could purportedly begin to measure emissions.[385] That the vast majority of coal-fired EGUs—far more than 12% (over eight times more)—have chosen the first startup definition shows that the best performers (in terms of the ability to measure emissions) can measure emissions during the four hours in question.

In its Proposal, EPA is apparently again taking the position that the length of startup should be based on what the best performers can achieve. But if EPA were to take the position that the length of startup should not be based on when the "best performers" can first measure emissions but instead sought to ensure that the source category of EGUs as a whole could

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[382] MATS Startup Definition Choices for Coal-Fired EGUs, Att. 14.

[383] For example, Dallman (Illinois) Unit 33 shut down permanently in 2021. *See* Jakob Emerson, *Springfield to shutter Dallman Unit 33, leaving city with single coal-fired power plant*, Channel 20 News (Oct. 7, 2021), https://newschannel20.com/newsletter-daily/springfield-to-shutter-dallman-unit-33-leaving-city-with-single-coal-fired-power-plant.

And the unit at Dolet Hills Power Station (Louisiana) was scheduled to cease operation at the end of 2021. *See* Kristen Mosbrucker, *One of the last coal-fired power plants in Louisiana to close, laying off dozens*, The Advocate (Oct. 28, 2021), https://www.theadvocate.com/baton_rouge/news/business/article_190562bc-3824-11ec-bcfa-239aa1f91d40.htm.

[384] 42 U.S.C. § 7412(h)(2)(B).

[385] *See* EPA, Assessment of startup period at coal-fired electric generating units - Revised, EPA–HQ–OAR–2009–0234–20451, at 21 (Nov. 2014) [hereinafter Measurability Analysis] (arriving at four-hour extended startup period by identifying when "best performing 12 percent" of coal-fired EGUs could purportedly begin to measure emissions). The best performers that EPA identified in 2014 in terms of measuring emissions were a different group than the best performers EPA identified in 2012 for the purpose of establishing the MATS numeric limits for acid gases, non-mercury metals, and mercury. For the 2014 final startup rule, EPA performed a new "best performer" analysis that supposedly identified the 12% of coal-fired EGUs that could most quickly engage their sulfur dioxide and nitrogen oxide pollution controls (which EPA equated with the ability to measure emissions).

measure their emissions during the four hours in question,[386] then the agency must still remove the second definition. That the vast majority of units have chosen the first definition strongly suggests that the category of EGUs as a whole can measure emissions during these four hours. And CEMS for PM, SO_2, HCl, and mercury and sorbent trap monitors for mercury can measure emissions from the point of electricity generation forward.[387]

If EPA were to take the position that each and every EGU must be able to measure its emissions during the extended startup period before requiring compliance with numeric standards during these four hours, that position would be contrary to the plain language of the statute, which only allows EPA to establish work practice standards due to inability to measure emissions when measurement is not practicable for a "particular class of sources."[388] The small number of EGUs that have chosen the second definition do not constitute a "particular class of sources." Regardless, there is no reason to suspect that the very small remainder of EGUs that have chosen the second definition cannot measure emissions beginning at generation. And there is nothing distinctive about the EGUs that have chosen the second definition that could possibly render them any less capable of measuring emissions during the extended startup period than those units that have chosen the first definition: our review of the characteristics of EGUs that have chosen the second definition shows that they burn a range of different types of coals and use a range of different pollution controls.

That EGUs have chosen to comply with numeric standards beginning at electricity generation is consistent with EPA's Acid Rain Program, which—for more than two decades—has required all EGUs to measure emissions using CEMS any time units are combusting fuel, including the first four hours of electricity generation, and count those emissions for compliance

[386] Under section 112(h), it is the substance of any work practice standards that must meet the stringency requirements of 42 U.S.C. § 7412(d)(2)-(3). *See* 42 U.S.C. § 7412(h)(1) (work practice standards must be "consistent with the provisions of subsection (d) or (f) [of section 7412]"). Section 112(h) says nothing about using a best-performer approach for determining the length of any work practice period—*i.e.*, when EPA may set work practice requirements instead of numeric limits.

[387] As discussed above, EPA should remove EGUs' ability to demonstrate compliance through quarterly stack testing for PM and HCl or parametric monitoring for PM. The agency should instead require the use of PM and HCl CEMS. Regardless, parametric monitoring for PM can measure emissions during the first four hours of electricity generation.

[388] 42 U.S.C. § 7412(h)(2)(B).

purposes.[389] EPA has attested to the accuracy of that Acid Rain emissions data.[390] EPA continues to assert that all emissions measured under the Acid Rain Program are accurate and complete. For example, EPA's *Plain English Guide* to the program's monitoring regulations states: "Part 75 . . . [e]nsur[es] that the emissions from all sources are consistently and accurately measured and reported. In other words, a ton of emissions from one source is equal to a ton of emissions from any other source."[391] Similarly, the agency's *Policy Manual* for these monitoring requirements states: "To ensure that allowances are consistently valued and . . . all of the projected emission reductions are in fact achieved, it is necessary that actual emissions from each affected utility unit be accurately determined. To fulfill this function, Title IV requires that affected units continuously measure and record their SO_2 mass emissions."[392]

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[389] EPA's Acid Rain regulations require emissions to be measured every hour that an EGU is operating, including startup periods. Specifically, the regulations provide that, except for certain limited exceptions, facilities "shall ensure that all continuous emission . . . systems required by this part are in operation and monitoring unit emissions . . . at all times that the affected unit combusts any fuel . . . ." 40 C.F.R. § 75.10(d). *See also id.* §§ 75.11(a) (coal-fired units "shall meet the general operating requirements in § 75.10 for [a sulfur dioxide] continuous emission monitoring system . . . while the unit is combusting coal and/or any other fuel"), 75.12(a) (requirement to "meet the general operating requirements in § 75.10 . . . for a [nitrogen oxides] continuous emission monitoring system . . . ."). EPA's Acid Rain regulations count the emissions measured during startup in determining whether a plant has complied with its limits: 40 C.F.R. § 72.9(b)(2) provides that the "emissions measurements recorded and reported in accordance with part 75 . . . shall be used to determine compliance . . . with the Acid Rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides . . . ." *See also id.* §§ 72.9(c)(1)(i) (each plant to "[h]old allowances . . . not less than the total annual emissions of sulfur dioxide for the previous calendar year . . . ."), 72.2 (defining "[e]missions" as "air pollutants . . . as measured, recorded, and reported . . . in accordance with the emissions monitoring requirements of part 75 . . . .").

[390] When EPA promulgated the Acid Rain Program's monitoring regulations, it specifically noted that, "[t]o function effectively, the allowance trading component . . . requires a complete and accurate accounting of emissions." 58 Fed. Reg. 3,590, 3,636 (Jan. 11, 1993). In particular, EPA concluded that the program's monitor certification measures "fulfill[ed] a . . . demanding objective under the Acid Rain [P]rogram with its allowance trading market—namely, to ensure the accurate and consistent measurement of emissions across the entire range of expected [sulfur dioxide] concentrations." 56 Fed. Reg. 63,002, 63,068 (Dec. 3, 1991). Likewise, regarding the program's quality assurance requirements, EPA concluded that "[t]imely and accurate emissions data will help foster certainty in the market, thus facilitating trades . . . ." *Id.* at 63,071.

[391] EPA, *Plain English Guide to the Part 75 Rule*, at 6 (June 2009), https://www.epa.gov/sites/default/files/2015-05/documents/plain_english_guide_to_the_part_75_rule.pdf.

[392] EPA, *Part 75 Emissions Monitoring Policy Manual*, at iii (2013), https://www.epa.gov/sites/default/files/2019-10/documents/part_75_emissions_monitoring_policy_manual_10-18-2019.pdf.

EPA has never suggested that section 112(h)'s other avenue for promulgating work practice standards—when "a hazardous air pollutant or pollutants cannot be emitted through a conveyance designed and constructed to emit or capture such pollutant, or [when] any requirement for, or use of, such a conveyance would be inconsistent with any Federal, State or local law"[393]—applies during the first four hours of electricity generation. Nor could EPA: HAPs from EGUs can be and are emitted through units' stacks (the conveyances designed and constructed to emit such pollutants), and no requirement for or use of EGU stacks would be inconsistent with any federal, state, or local law.

Because there is no statutory basis for work practice standards during the four hours in question, EPA must remove the extended startup period and impose numeric standards during those four hours. Further, that there is no statutory basis for the extended startup period makes it "necessary" under CAA section 112(d)(6) to remove this extended work practice period. The statute plainly states that EPA "shall . . . revise" previously-promulgated standards when "necessary."[394] The D.C. Circuit has made clear that the "section 112(d)(6) requirement that EPA . . . revise emission standards 'as necessary' means that EPA must conform them to the basic requisites of 'emission standards' under section 112 . . . ."[395] Here, with no statutory basis under section 112(h) for retaining work practice standards during these four hours, EPA must remove the extended startup period to conform MATS to section 112's basic requirements.

In addition, the fact that EGUs have overwhelmingly opted for—and filed reports and notifications detailing their choice of—the first, more narrow definition of startup is a "development[] in practices [and] processes" under section 112(d)(6) that makes it necessary to revise MATS to remove the second, more expansive startup definition.

Eliminating the extended startup period is also necessary because it would achieve emissions reductions. As discussed in environmental groups' comments on the 2019 proposed RTR rule, startups can take place many times every year.[396] For example, EPA found that the "average EGU had between 9 and 10 startup events per year during 2011 - 2012, but data from a small number of EGUs indicated significantly more startup events (e.g., the EGUs with the most startup events had over 100 startup events in 2011 and over 80 in 2012)."[397] More recently, the National Association of Regulatory Utility Commissioners (NARUC) found that the average coal-fired EGU had 10.64 startups in 2018.[398] As also explained in environmental groups' 2019 comments, emissions from EGUs that choose the second startup definition can be elevated

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[393] 42 U.S.C. § 7412(h)(2)(A).
[394] *Id.* § 7412(d)(6).
[395] *La. Envtl. Action Network v. EPA*, 955 F.3d 1088, 1098 (D.C. Cir. 2020).
[396] *See* Comments of Chesapeake Climate Action Network *et al.*, EPA–HQ–OAR–2018–0794–4560, at 60-61 (submitted Apr. 17, 2019) [hereinafter NGO RTR Comments].
[397] Measurability Analysis at 4.
[398] NARUC, *Recent Changes to U.S. Coal Plant Operations and Current Compensation Practices*, 9 (Jan. 2020), https://pubs.naruc.org/pub/7B762FE1-A71B-E947-04FB-D2154DE77D45.

during the extended startup period because the applicable work practice standards allow EGUs to burn dirty fuels such as coal and not operate their pollution controls at all (for non-particulate controls) or not operate them at levels that would fully reduce emissions (for electrostatic precipitators for particulate control).[399] Electrostatic precipitators typically are designed to remove 90 to 99.9% of particulate matter released during coal combustion.[400] Thus, when ESPs are not fully operational while coal is being fired during startup, particulate emissions could be roughly 10 to 100 times higher than they would be were this pollution control equipment fully operative.

Requiring all EGUs to comply with the MATS numeric standards during the first four hours they generate electricity would better ensure reductions of HAPs to the levels required by CAA section 112(d) during this period. This is especially important because, as coal-fired EGUs are forced into more and more intermittent use by less expensive gas-fired units and renewable energy, the amount of cycling and number of (at least cold) startups will likely increase.[401]

Removing the extended startup period now is also important because EPA characterized the 2014 startup rule as a stopgap and asserted—both in the administrative record and in the D.C. Circuit—that it would assess whether to maintain this work practice period during the RTR.[402] In fact, EPA vowed to the D.C. Circuit that it would consider removing the four-hour extended startup work practice period from the NESHAP for industrial boilers (a period that was based primarily on when <u>EGUs</u> can purportedly begin to measure emissions[403]) in exactly the circumstances that are present here—when operators choose and comply with the first startup definition:

> [EPA's] approach was crafted with one eye to the future periodic reviews the Act requires. *See* 42 U.S.C. § 7412(d)(6). Once boiler operators either provide improved data to EPA or <u>opt for the shorter startup period and succeed in</u>

[399] *See* NGO RTR Comments at 61-63 (discussing elevated EGU emissions during startup in general).
[400] *See* EPA, *Air Pollution Control Technology Fact Sheet: Dry Electrostatic Precipitator (ESP) - Wire-Pipe Type*, 1, https://www3.epa.gov/ttncatc1/dir1/fdespwpi.pdf.
[401] *See, e.g.*, NARUC, *supra* note 398, at 9 ex. 7. For example, NARUC found that the average number of startups at ambient temperature per coal-fired EGU increased between 2008 and 2018. In 2018, each coal-fired EGU experienced on average 6.91 startups at ambient temperature (2.79 "cold" startups after the boiler was offline for 48 to 120 hours, plus 4.12 startups after the boiler experienced a long-term outage of over 120 hours), compared to 5.86 startups at ambient temperature in 2008 (3.37 "cold" startups, and 2.49 startups after a long-term outage). *Id.* at 9.
[402] *See* NGO RTR Comments at 63-65. For example, EPA stated in the 2014 final startup rule: ". . . collection of startup and shutdown information will provide the EPA with information to more fully analyze the ability and appropriateness of establishing numeric emissions and operating limits during startup periods or shutdown periods so the issue can be addressed as part of the ongoing 8-year review of this rule." 79 Fed. Reg. 68,777, 68,786 (Nov. 19, 2014).
[403] *See* NGO RTR Comments at 64.

> complying with it, EPA assures us that it will consider further refining and tightening these standards. Resp't's Br. 40.[404]

EGUs can clearly comply with MATS beginning at electricity generation: as discussed above, the vast majority of EGUs are emitting mercury, acid gases, and non-mercury metals at rates comfortably below the MATS limits—and the vast majority of coal-fired EGUs have chosen to comply with those limits beginning at electricity generation. At the very least, it is obvious that the best-performing EGUs have succeeded in complying with MATS beginning at generation—and could comply with the standards beginning at generation if the standards were tightened. Even the worst performers should have no trouble meeting MATS beginning at generation, since those standards generally have a 30-day averaging period.[405] Thus, emissions during a given hour, day, or even week could be over the MATS limits so long as the 30-day average including those emissions does not surpass the standard.

Removing the extended startup period promptly would also be administratively efficient, since—as EPA recognizes in the proposed rule here—the D.C. Circuit's decision in *Chesapeake Climate Action Network* requires the Agency to conduct 42 U.S.C. § 7607(d)(7)(B) reconsideration proceedings concerning environmental groups' objections that there is no valid basis for the extended startup period. If EPA were to finalize its proposal to remove the extended startup period, there would be no need to conduct separate reconsideration proceedings.

Cost is irrelevant here because EPA has no valid statutory basis for retaining the extended startup period. Cost is also irrelevant in the context of EPA's section 112(d)(6) review of this issue because it is "necessary" to revise MATS to correct a legal defect—that MATS allows compliance with work practice standards even though the CAA instead requires numeric standards during all of the extended startup period. Nevertheless, EPA is correct that removing the extended startup period "would result in little to no additional expenditure since the additional recordkeeping and reporting provisions associated with the work practice standards of paragraph (2) of the definition of 'startup' were more expensive than the requirements of paragraph (1) of the definition of 'startup.'"[406] Further, the fact that the overwhelming majority of EGUs have chosen the first definition makes clear that measuring emissions during the extended startup period is not cost-prohibitive.

Similarly, complying with numeric standards beginning at electricity generation is cost-reasonable, as shown by the fact that the overwhelming majority of EGUs already do so—and both because MATS allows units to average their emissions across 30 days for compliance purposes and because, in establishing the current standards in 2012, EPA used the "upper prediction limit" to account for variability and determine the maximum emission rate that any of

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[404] *Sierra Club v. EPA*, 884 F.3d 1185, 1200 (D.C. Cir. 2018) (emphasis added).

[405] 40 C.F.R. Pt. 63, Subpt. UUUUU, Tbl. 7.

[406] 88 Fed. Reg. 24,854, 24,886 (Apr. 24, 2023); *see also* 40 C.F.R. §§ 63.10020(e), 63.10031(c)(5), 63.10030(e)(8) (monitoring and reporting requirements associated with second definition).

the best-performing 12% of EGUs would reach.[407] In fact, in its 2014 final rule establishing the extended startup period, EPA recognized that the 2012 standards "contain sufficient variability to include startup periods and shutdown periods."[408]

If EPA were to retain the extended startup period, EPA's differing treatment of emissions from the first four hours of electricity generation in MATS (where EPA would presumably continue to reason that emissions during these four hours are not measurable) and the Acid Rain Program (where EPA maintains emissions are measurable) would render EPA's decision arbitrary and capricious.[409]

I. EPA should eliminate the unlawful waste coal exemption adopted in 2020.

In April 2020 EPA finalized a subcategory for plants burning coal refuse that exempts those plants from the acid-gas standards applicable to other coal-fired units.[410] That subcategory and its acid-gas standard are unlawful and EPA should, as part of this review, eliminate it.[411]

First, the subcategory is not based on any design differences that could properly be used to identify a separate class, type, or size of coal-fired power plant.[412] EPA's stated rationale for the subcategory is that coal refuse contains exceptionally high concentrations of chlorine and sulfur.[413] But the plants within the subcategory feature no design elements that require them to burn those high-HAP materials.[414] The plants in the subcategory are capable of burning (and currently burn) fuels other than coal refuse; several have used low-sulfur coals that allow for compliance with the acid gas standards applicable to other plants.[415] EPA has identified no

[407] *See* 76 Fed. Reg. 24,976, 25,041 (May 3, 2011) ("[I]f we were to randomly select a future test . . . from any of these sources . . . we can be 99 percent confident that the reported level will fall at or below the [upper prediction limit] value.").
[408] 79 Fed. Reg. at 68,778 n.1.
[409] *See Transactive Corp. v. United States*, 91 F.3d 232, 237 (D.C. Cir. 1996) ("A long line of precedent has established that an agency action is arbitrary when the agency offered insufficient reasons for treating similar situations differently.").
[410] National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Subcategory of Certain Existing Electric Utility Steam Generating Units Firing Eastern Bituminous Coal Refuse for Emissions of Acid Gas Hazardous Air Pollutants, 85 Fed. Reg. 20,838 (April 15, 2020).
[411] 42 U.S.C. § 7412(d)(6); *La. Envtl. Action Network v. EPA*, 955 F.3d 1088, 1097-98 (D.C. Cir. 2020) (holding that section 112(d)(6) imposes obligation "to bring underinclusive standards into compliance" with section 112); 88 Fed. Reg. at 24,859 ("The EPA is required to address regulatory gaps" as part of its 112(d)(6) review).
[412] 42 U.S.C. § 7412(d)(1).
[413] 84 Fed. Reg. 2,690, 2,701-02 (Feb. 7, 2019).
[414] *See* 42 U.S.C. § 7412(d)(2)(A) (prescribing "substitution of materials" as a measure to be adopted to achieve the maximum degree of reduction in toxic emissions).
[415] 85 Fed. Reg. at 20,845 (noting that "one facility" within subcategory "has met the [general] limit" for sulfur dioxide "by co-firing lower sulfur coal"). *See* Petition for Reconsideration of

design features that render the plants in the subcategory incapable of meeting the general acid gas standards.

Second, the acid gas standard established for the coal refuse subcategory does not reflect the maximum achievable reduction in emissions from those units.[416] Five of the six units within the subcategory have met enforceable sulfur dioxide limits that are more stringent than EPA's finalized standard for the subcategory, and done so over a sustained period.[417] EPA's acid-gas standard—set at the level of the *worst* performer in the subcategory—violates section 112's requirement that EPA's standards reflect the "maximum achievable reduction in emissions," and be no less stringent than the emissions reductions actually achieved by the best performing sources.[418, 419]

EPA should, for those reasons, eliminate the coal refuse subcategory from the MATS as part of this review and rule-making.

J. EPA should require prompt, efficient demonstrations of compliance.

1. <u>EPA would be well justified in requiring demonstrations of compliance with the non-mercury metal HAPs standards through the fPM surrogate.</u>

Although EPA has an obligation to set standards for "each listed HAP," it is not required to allow compliance through demonstrations for each HAP where use of a surrogate is

National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units Firing Eastern Bituminous Coal Refuse for Emissions of Acid Gas Hazardous Air Pollutants; Final Rule, 85 Fed. Reg. 20,838 (Apr. 15, 2020), at 7-8 (submitted June 15, 2020) [hereinafter Coal Refuse Reconsideration Petition] (further describing record evidence indicating that plants can, and are, burning other fuels).

416 42 U.S.C. § 7412(d)(2)-(3).

417 Summary of Public Comments and Responses Regarding Establishment of a Subcategory and Acid Gas HAP Emission Standards for Certain Existing Eastern Bituminous Coal Refuse-Fired EGUs, EPA–HQ–OAR–2018–0794–4490, at 7 (Apr. 2020) (acknowledging that two of the six plants in the new subcategory have been able to meet the 2012 MATS standard for acid gas HAPs); *id.* at 23 (acknowledging that EPA set standard so that the highest-polluting unit in the subcategory will "not have to significantly change [its] operations in order to comply with the final rule"); Coal Refuse Reconsideration Petition, *supra* note 415, at 4 & Exs. (describing enforceable requirements for other plants).

418 42 U.S.C. § 7412(d)(2)-(3).

419 That failure is further underscored by data from two sources within the definition of its sub-category that EPA unlawfully excluded from its beyond-the-floor analysis. Coal Refuse Reconsideration Petition, *supra* note 415, at 4-5.

reasonable.[420] The D.C. Circuit has previously determined that "the use of PM as a surrogate for HAP metals is not contrary to law."[421]

2. EPA should require use of PM CEMS and HCl CEMS by one year from the effective date of the rule.

According to the 2023 ATP Assessment, PM CEMS and HCl CEMS should only take a matter of months to deploy. Therefore, EPA should require that all units have PM CEMS deployed and operating to ensure compliance with the metal HAP surrogate fPM standard within one year, and that all units have HCl CEMS installed and operating within one year. A year should be more than enough time to deploy PM CEMS and HCl CEMS at all coal units.

1. EPA should require compliance with the revised fPM, mercury, and acid gas standards within two years of the effective date of the rule unless the source in question demonstrates that an additional year is needed to install controls.

EPA should require compliance with the revised standards within two years, with the possibility of a one-year extension for compliance if a source demonstrates it is necessary. A relatively short timeline is particularly warranted if EPA chooses an fPM standard of 0.006 lb/MMBtu which would require only a small number of units to install baghouses. Baghouses are the most expensive and complex technology likely to be used to control HAP emissions to comply with this rule, and it is reasonable to expect a baghouse to be deployed in two or three years. For other fPM control options, upgrades to existing baghouses can be accomplished in less than a year and upgrades to ESPs may also be completed in under a year, with the most complex ESP upgrades taking up to two years.[422] For mercury controls, fuel or scrubber chemical additive systems can be deployed in less than a year, ACI treatment rates can be increased in a similar timeframe, and a new ACI system can be installed in 12-18 months.[423] For acid gas controls, DSI systems and FGD upgrades can be installed in 12-18 months.[424] EGUs should be able to deploy and upgrade all of these controls in two years, and therefore two years with the possibility of a third year if necessary would be an appropriate timeline for compliance with the revised standards.

CONCLUSION

EPA should promptly finalize the proposed strengthening of MATS, with the necessary improvements discussed above.

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[420] *See* 80 Fed. Reg. 45,280, 45,290 (July 29, 2015) (retaining PM as a surrogate for non-mercury metal HAPs); *Nat'l Lime Ass'n*, 233 F.3d at 634 (D.C. Cir. 2000) (noting the "clear statutory obligation to set emission standards for each listed HAP").
[421] *Nat'l Lime Ass'n*, 233 F.3d at 639.
[422] 2023 ATP Assessment at 49.
[423] *Id.*
[424] *Id.*

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