UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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, 87 Fed. Reg. 7624 (Feb. 9, 2022)

Docket No. EPA-HQ-OAR-2018-0794

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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—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding," published at 87 Fed. Reg. 7624 (Feb. 9, 2022) (2022 Proposal).

We strongly support EPA's 2022 Proposal, in which the Agency proposes to revoke a May 22, 2020, finding that it is not appropriate and necessary to regulate coal- and oil-fired electric utility steam generating units under section 112 of the Clean Air Act, and to reaffirm the Agency's April 25, 2016, finding that it remains appropriate and necessary to regulate hazardous air pollutant emissions from these sources after considering cost. We urge EPA to finalize the current proposal expeditiously, and to promptly initiate a separate rulemaking to reconsider its 2020 Residual Risk and Technology Review and strengthen the Mercury and Air Toxics Standards.

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[1] Air Alliance Houston, Chesapeake Bay Foundation, Chesapeake Climate Action Network, Citizens for Pennsylvania's Future, Clean Air Council, Clean Air Task Force, Clean Wisconsin, Conservation Law Foundation, Downwinders at Risk, Earthjustice, Environmental Defense Fund, Environmental Integrity Project, Environmental Law & Policy 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 2022 Proposal to restore the legal foundation for the vital Mercury and Air Toxics Standards (MATS) for coal- and oil-fired power plants (comprising electric utility generating units, or "EGUs") is an essential step for fulfilling the requirements of the Clean Air Act (CAA). This action would correct a serious error in the Agency's judgment under the prior administration, one that trivialized or outright ignored Congress's instructions and jeopardized life-saving, health-improving protections that the public, power companies, and states have relied on since EPA established them. As it did in its 2016 Supplemental Finding responding to the Supreme Court's direction in *Michigan v. EPA* to consider the full range of costs and benefits, EPA presents two robust frameworks for making the determination whether it is "appropriate" to regulate EGUs' emissions of hazardous air pollutants (HAPs) under CAA section 112. Each approach independently confirms the finding that it is appropriate for the Agency to do so, whether considering only information in the rulemaking record when EPA first established MATS, or that prior information as well as more recent, updated information. While many of the benefits of reducing HAP emissions remain unquantified, this new information further documents the massive health and environmental benefits of reducing EGUs' HAP emissions, as well as emissions of other pollutants, and the modest compliance costs that the power sector actually incurred under MATS. Indeed, following MATS' significant steps toward achieving the CAA's goals, and in light of improvements in the power sector's ability to reduce its toxic emissions, it is imperative that the Agency promptly move forward with a rulemaking to strengthen the standards.

In these comments, Public Health and Environmental Organizations make the following points:

Part I: Given that EPA is revisiting the 2020 Final Action, the only reasonable path forward under the statute is to revoke the previous decision. The 2020 Final Action disregarded Congress's conclusion that listed HAPs are inherently dangerous to public health and the environment, and it flouted statutory directives to give significant weight to the volumes and risks of HAP emissions from EGUs in determining whether it is "appropriate" to regulate those emissions. Furthermore, the 2020 Final Action unlawfully ignored disproportionate impacts on sensitive and highly exposed populations and individuals, while failing to address environmental impacts of EGUs' HAP emissions altogether. These deficiencies alone would require revocation of the Agency's previous decision; however, the 2020 Final Action additionally ruled out any consideration of the non-HAP health and environmental benefits that necessarily result from regulation of EGUs under section 112, contrary to congressional intent and principles of reasoned decision-making. The 2020 Final Action's arbitrary failure to explain the Agency's departure from the framework established in the 2016 Supplemental Finding, and its disregard for the threat that a reversal of the 2016 Supplemental Finding poses to states, power companies, and the public who rely on MATS, also render the 2020 Final Action untenable.

Part II: EPA's preferred, totality-of-the-circumstances approach to determining whether it is "appropriate" to regulate EGUs under section 112 reflects the best reading of the statute: it is consonant with the Supreme Court's holding in *Michigan* that the term "appropriate" encompasses all of the advantages and disadvantages of regulation; it gives due weight to the statutory factors concerning the volume and risks of HAPs emitted by EGUs and the need to protect sensitive populations and highly exposed individuals; and it places compliance costs in the necessary context of the industry's revenues and expenditures, while considering effects on retail electricity prices for consumers and the industry's ability to provide reliable power.

Under this framework, the record evidence available in 2012 alone is more than sufficient to support a finding that it is appropriate to regulate EGUs under section 112. At the time, EPA acknowledged substantial quantified and unquantified HAP benefits, as well as non-HAP benefits that the Agency more completely monetized. Information that has become available since the 2011 Regulatory Impact Analysis (RIA)—including much larger estimates of the health effects of mercury emitted by EGUs, new evidence of the ecological impacts of mercury, compelling research on the health effects of toxic metals and metals mixtures, and recent research on the health effects of acid gases—confirms the finding that it is appropriate to regulate EGUs' HAP emissions under section 112. The unexpectedly large declines in these emissions since MATS was promulgated only amplify all of these considerations. Moreover, the need to address the significant and disproportionate impacts on communities of color and low-income communities from EGU HAP emissions prior to MATS further supports the finding of appropriateness. And, regarding non-HAP benefits, EPA's recent assessments of the science on the health and environmental effects of particulate matter and ozone underscore the benefits of reducing these pollutants as well. Meanwhile, lower natural gas prices, lower costs of pollution controls, and readily available, inexpensive renewable energy have all pushed compliance costs far below EPA's original projections, which were overestimates even in 2011 based on certain assumptions about the pollution controls that would be needed to comply.

Part III: EPA's alternative, benefit-cost-analysis (BCA) approach provides an independent basis for determining whether it is "appropriate" to regulate EGUs under section 112. As presented in the 2022 Proposal, the BCA approach takes into account all of the projected costs of the MATS regulation, as well as all of the projected benefits—including the full range of benefits that are quantified and unquantified, and benefits that are related to HAP and non-HAP emissions reductions. Its results are only further supported by considerations of impacts on susceptible populations and highly exposed individuals, which are necessary elements of any determination under section 112(n)(1)(A) that are not readily incorporated into BCA. The approach, as conducted here, is also consistent with longstanding EPA guidance and administrative precedent.

Under this alternative framework as well, the record evidence available in 2012 is sufficient to confirm the finding that it is "appropriate" to regulate EGUs under section 112, given substantial quantified and unquantified HAP benefits. Appropriately including monetized non-HAP benefits only magnifies those net benefits. Moreover, the new information on (much higher than projected) benefits and (much lower than projected) costs of regulation discussed in Part II validates this exercise.

Part IV: Responding to EPA's solicitation for information that would support its ongoing review of the 2020 Residual Risk and Technology Review (2020 RTR), we offer extensive evidence of improvements in the effectiveness and affordability of HAP controls for EGUs—including monitoring techniques—and we urge EPA to strengthen MATS in multiple respects.

At the outset of Part IV, we note that the "appropriate and necessary" determination under section 112(n)(1)(A) is independent of subsequent decisions whether to revise the standards under separate statutory provisions. Next, we lay out the reasons why EPA must strengthen all of the existing standards under section 112(d)(6) and/or section 112(d)(2), in light of new information on pollution-control techniques. Section 112(d)(6) additionally requires the Agency to establish numeric standards on toxic organic HAPs and on HAPs emitted during startup. And ongoing impacts of EGUs' HAP emissions on environmental justice communities render all of these revisions "necessary" under section 112(d)(6). We then urge EPA to require continuous emissions monitoring to reduce emissions of HAPs and to ensure compliance with the standards, as is required under section 112(d)(6), and as is additionally authorized by sections 112(b)(5) and 114(a)(1)(C). Finally, as further support for strengthening the standards in these ways, we explain how the 2020 RTR inadequately assessed the risks remaining after implementation of MATS and why EPA must reconsider that action. Upon reconsideration, EPA should find that there is an inadequate basis to conclude either that MATS provides an ample margin of safety to protect public health or that the risks remaining from EGU emissions of HAPs are acceptable.

I. EPA'S REVOCATION OF THE 2020 FINAL ACTION IS THE ONLY REASONABLE COURSE OF ACTION.

In the action titled "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 85 Fed. Reg. 31,286 (May 22, 2020) (2020 Final Action), EPA reversed its prior decision, 81 Fed. Reg. 24,420 (Apr. 25, 2016) (2016 Supplemental Finding), and found that regulation of emissions of mercury and other HAPs from coal- and oil-fired EGUs is not "appropriate," considering costs. The 2020 Final Action was arbitrary, capricious, and contrary to law; the 2022 Proposal is correct that it should be—indeed, must be—revoked.[2]

A. The 2020 Final Action arbitrarily disregarded key statutory factors for determining whether it is "appropriate" to regulate EGUs under section 112.

1. The 2020 Final Action unlawfully ignored HAP benefits.

In its 2022 Proposal, EPA correctly acknowledges that the framework used in the 2020 Final Action to balance costs and benefits was "ill-suited" to that task because it "gave little to no weight to the statutory concern with reducing the volume of and risks from HAP emissions to protect even the most exposed and most vulnerable members of the public." 87 Fed. Reg. 7624, 7628 (Feb. 9, 2022). In its 2020 Final Action, EPA gave no meaningful weight to the enormous health benefits associated with decreasing HAP levels across the United States. Due to its arbitrary disregard for the benefits associated with decreasing HAP emissions from the nation's largest-emitting sources, the 2020 Final Action's conclusion that the benefits of reducing HAPs are outweighed by the costs of compliance, *see* 85 Fed. Reg. at 31,304, was fundamentally unsound.

Without relevant support or citation, the 2020 Final Action essentially disregarded unquantified HAP benefits simply because it deemed them "not likely to overcome the imbalance between the monetized HAP benefits and compliance costs in the record." 85 Fed. Reg. at 31,296. The Agency downplayed those unquantified benefits by asserting that the economic value of avoided morbidity effects "generally" is small compared to the value of avoided premature deaths; that avoided premature deaths from decreased exposure to mercury could not be reliably ascertained; that avoided premature deaths from decreased exposure to other HAPs were "low"; and that disparities in health impacts from HAP exposures were unimportant because "in a cost-benefit comparison, the overall amount of the benefits stays the same no matter what the distribution of those benefits is." *Id.* at 31,296-97. This rationale is fundamentally flawed. For the reasons discussed below, the 2020 Final Action's approach flouts statutory instructions to consider all HAP benefits from regulating EGUs under section 112 by failing to accord significant weight to eliminating harms posed by listed HAPs, and to consider benefits specifically accruing to sensitive populations and highly exposed individuals.

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[2] We are attaching to these comments, and incorporating by reference, the Comments of Environmental, Public Health, and Civil Rights Organizations on "National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 84 Fed. Reg. 2670 (Feb. 7, 2019), EPA-HQ-OAR-2018-0794-1191 (submitted Apr. 17, 2019) (2019 NGO Comments), which explain in greater detail why the rationale underlying the 2020 Final Action is fundamentally flawed.

The 2020 Final Action gave no weight to the benefits of reducing the majority of the HAPs emitted by EGUs. That disregard directly contravened the congressional determination, found on the face of the statute, that the harm caused by these pollutants is significant. *See* 42 U.S.C. § 7412(b)(1). Regarding EGU emissions of HAPs and emissions of mercury in particular, the requirements to conduct studies on the risks to public health from EGU HAP emissions in section 112(n)(1)(A), the rate and mass of mercury emissions from EGUs in section 112(n)(1)(B), and the health and environmental effects of mercury emissions in section 112(n)(1)(B) all indicate Congress's concern with the risks posed by those emissions from EGUs. *See id.* § 7412(n)(1)(A), (B).

The regulatory machinery of section 112, under which EGU emissions of HAPs were to be regulated following EPA's determination that is "appropriate" to do so, even more concretely demonstrates Congress's concern with reducing the volumes of, and risks posed by, these emissions. The command in section 112(d)(2) to require the "maximum degree of reduction in emissions" of HAPs that is achievable (including to prohibit such emissions) demonstrates Congress's recognition of the dangers of HAP emissions and the centrality of volumetric reductions to the statutory scheme. 42 U.S.C. § 7412(d)(2). The review provision in section 112(d)(6), which does not require consideration of HAP risks, indicates that Congress intended EPA continually to reduce the volume of HAP emissions from regulated source categories, regardless of the quantifiable risks that those emissions pose. *Id.* § 7412(d)(6). Separately, the risk review provisions in section 112(f)(2), which apply to EGUs once an "appropriate and necessary" finding is made and EGUs are listed under section 112, potentially require more-stringent standards if needed to provide an "ample margin of safety to protect public health" or, potentially, to "prevent . . . an adverse environmental effect." *Id.* § 7412(f)(2).

To the extent that the 2020 Final Action did consider volumes and total risks of HAPs from EGUs, and the potential to reduce those volumes and risks, its treatment of these factors was arbitrary because it essentially ignored or vastly discounted unquantifiable HAP benefits. As noted above, and as discussed in greater detail below, unquantified benefits of HAP reductions—including decreased morbidity—are substantial. But EPA arbitrarily dismissed benefits of HAP reduction in several ways, including by claiming that morbidity typically has less monetized value than premature mortality, and by disregarding compelling studies on, and recommendations for, assessing the cardiovascular impacts of methylmercury exposure. *See* 85 Fed. Reg. at 31,304, 31,308-09. The scientific evidence supports a quantifiable link between exposure to methylmercury and both morbidity and premature mortality from cardiovascular effects, as discussed below.

Second, the 2020 Final Action did not adequately consider risks to the most exposed individuals and sensitive populations, as Congress intended. The explicit statutory requirement to conduct a study on both the levels of mercury exposure below which adverse human health effects would not be expected to occur and the mercury concentrations in the tissue of fish without adverse effects on public health (including sensitive populations) indicates that reducing elevated risks borne by disproportionately impacted communities was a priority for Congress. 42 U.S.C. § 7412(n)(1)(C). Furthermore, and as discussed further *infra* in Part IV.D, the risk review provisions in section 112(f)(2), which apply to EGUs once an "appropriate and necessary" finding is made and EGUs are listed, require EPA to promulgate standards if the lifetime excess cancer risk to the "individual most exposed" to HAP emissions from a source in the category equals or exceeds one in one million. *Id.* § 7412(f)(2)(A). Incorporating a similar benchmark, the delisting requirements in section 112(c)(9)(B), require near elimination of cancer risks to the most exposed individual. *Id.* § 7412(c)(9)(B). All of these provisions demonstrate that Congress was concerned not only with the widespread health risks posed by HAPs, but also with protecting the most vulnerable and most exposed people.

To the extent the 2020 Final Action considered risks to the most exposed individuals and sensitive populations, and the potential to reduce those risks, its treatment of these factors was arbitrary. In 2020, EPA entirely failed to grapple with these statutory directives indicating congressional concern with sensitive populations and highly exposed individuals, instead merely observing that distributional effects would not change the outcome of its balancing test because "the overall amount of the benefits stays the same no matter what the distribution of those benefits is." 85 Fed. Reg. at 31,297. EPA's previous failure to consider the most vulnerable and exposed populations cannot be sustained as a reasoned exercise of the Agency's discretion, and it provides an independent basis for revoking the 2020 Final Action.

Finally, EPA in 2020 did not adequately consider the prevention of adverse environmental effects from HAP emissions, contrary to Congress's objective as indicated in section 112(f)(2)(A). As discussed further in Part IV.D *infra*, more-stringent standards can be imposed if they are "necessary to prevent, taking into consideration costs, energy, safety, and other relevant factors, an adverse environmental effect." 42 U.S.C. § 7412(f)(2)(A). Congress's goal of reducing HAPs to levels that protect the environment indicates that the environmental impacts of EGUs' HAP emissions are relevant to the determination whether it is "appropriate" to regulate them under section 112. Remarkably, EPA did not respond in the preamble to the 2020 Final Action to comments pointing out that EPA had not meaningfully considered "environmental benefits from reductions in mercury emissions [that] could [not] be quantified, nor any of the health or environmental benefits attributable to reductions in other HAP." *See* 85 Fed. Reg. at 31,295-97.

EPA's 2022 Proposal properly considers a much wider range of the benefits of reducing emissions of HAPs regardless of whether those benefits can be quantified or monetized, and explains why most of the benefits cannot be monetized but are still relevant to its analysis. In addition, we agree, as EPA states, that "it is highly relevant that while EGUs generate power for all, and EGU HAP pollution poses risks to all Americans exposed to such HAP, a smaller set of Americans who live near EGUs face a disproportionate risk of being significantly harmed by toxic pollution." 87 Fed. Reg. at 7627. To comport with the statute's focus on the most impacted persons, it is essential that EPA's consideration of HAP benefits include a thorough examination of the impacts of HAP pollution on the most vulnerable and most exposed members of society.

2. The 2020 Final Action failed to consider the ancillary benefits of regulating EGU HAPs under section 112.

The 2020 Final Action was also unreasonable in failing to appropriately consider all of the benefits of regulating EGUs under section 112, including those public health and environmental benefits due to reductions of fine particulate matter ($PM_{2.5}$) and other pollution (*e.g.*, ozone) occurring as a result of controlling HAP emissions. These benefits, calculated in the 2011 RIA to include thousands of avoided premature deaths, nonfatal heart attacks, and hospitalizations for respiratory and cardiovascular diseases,[3] are real lives saved and negative health outcomes prevented, but EPA essentially ignored them in the 2020 Final Action.

The 2020 Final Action used a three-step framework that effectively dismissed these major ancillary benefits (which EPA called "co-benefits"). First, EPA "compare[d] the monetized costs of regulation against the subset of HAP benefits that could be monetized" and found that, because the "costs are disproportionate to the monetized benefits," it was not appropriate to regulate EGU HAP emissions. 85 Fed. Reg. at 31,302. Second, it "consider[ed] whether unquantified HAP benefits [could have] alter[ed] that outcome" and concluded that they did not. *Id.* Third, EPA "consider[ed] whether it is appropriate, notwithstanding the above," to make the appropriateness determination "out of consideration for the PM co-benefits that result from such regulation." *Id.* EPA determined that only HAP-specific benefits could carry significant weight in its benefit-cost calculus and that it therefore would not make an appropriateness determination on the basis of ancillary benefits; then, in performing that analysis, EPA considered only a subset of those HAP-specific benefits, *i.e.*, the benefits that had been monetized. *Id.*

EPA's 2019 proposal had claimed support for this gerrymandered approach—which contradicted decades of Office of Management and Budget guidance and Agency precedent concerning the need to account for ancillary benefits—in "[t]he statutory text of CAA section 112(n)(1)(A) and the [Supreme Court's] *Michigan* decision." 84 Fed. Reg. 2670, 2677 (Feb. 7, 2019). EPA stated in the 2020 Final Action, in response to comments, that "EPA *is* considering what significance co-benefits have for its [appropriateness determination,] but we are concluding

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[3] EPA, Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards, EPA-452/R-11-011, at ES-5, Tbl. ES-3 (Dec. 2011) (MATS RIA).

that the finding must be justified overwhelmingly by the HAP benefits due to the statutory structure." 85 Fed. Reg. at 31,300.

EPA's attempt to ground its HAP-specific approach in the statute and in the *Michigan* decision was an unreasonable interpretation of the statute because it ignored multiple ways in which Congress has acknowledged the importance of indirect benefits under section 112. It also was a misstatement of *Michigan*'s holding that a determination of whether regulation is "appropriate" is a wide-ranging inquiry that embraces all advantages and disadvantages. *Michigan v. EPA*, 576 U.S. 743, 752-53 (2015).

The Court also was very clear that it was not telling the Agency *how* it should consider costs and benefits. *Id.* at 759. The term "appropriate" in section 112(n)(1)(A) requires EPA to consider all the advantages and disadvantages of regulating. In *Michigan*, the Supreme Court emphasized the "capaciousness" of the phrase "appropriate and necessary," and went on to describe "appropriate" as "the classic broad and all-encompassing term that naturally and traditionally includes consideration of all the relevant factors." *Id.* at 752 (internal quotation marks and citation omitted). The *Michigan* Court noted that the lack of any express mention of cost in the section "shows only that §7412(n)(1)(A)'s broad reference to appropriateness encompasses *multiple* relevant factors (which include but are not limited to cost)." *Id.* at 755. While the *Michigan* Court stated that EPA has flexibility in how to consider costs and benefits in making the appropriate and necessary finding, *id.* at 759, it also made clear that "an agency may not 'entirely fai[l] to consider an important aspect of the problem' when deciding whether regulation is appropriate." *Id.* at 752 (quoting *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)). The Supreme Court reiterated the importance of considering indirect *costs* of regulation, stating that "'cost' includes more than the expense of complying with regulations; any disadvantage could be termed a cost." *Id.*; *see also id*. (noting that regulation would *not* be "appropriate" under section 112(n)(1)(A) in a hypothetical scenario where technologies needed to eliminate HAP emissions counterproductively caused "even more damage to human health"). Similarly, *any* advantages of regulation are relevant benefits, and the lives saved and heart attacks and hospitalizations avoided as ancillary benefits of controlling EGU HAP emissions are "important aspect[s]" that the Agency cannot rationally ignore.[4]

To the extent that the 2020 Final Action can be understood to have considered non-HAP benefits at all, its treatment of them was arbitrary. As noted above, in the 2020 Final Action, EPA found that it was not appropriate to regulate EGU HAP emissions because of the "imbalance" between monetized HAP benefits and monetized costs. EPA then proceeded to find that this same "imbalance" meant that the non-HAP benefits could not change this analysis. 85 Fed. Reg. at 31,303. While EPA acknowledged in the 2020 Final Action that the Agency

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[4] *See* 2019 NGO Comments at 59-60, 65-67.

"could" consider non-HAP benefits when making an appropriateness finding, it stated that "consideration of these co-benefits could permissibly play only, at most, a marginal role in that determination . . . ." *Id.*

In other words, EPA found that, because of the alleged "imbalance" between monetizable HAP benefits and costs in step one of its analysis, it would not allow non-HAP benefits to affect the balance in step three, *even if they were extremely large*. And the 2019 proposal was, if anything, even clearer that even very large non-HAP benefits could not alter EPA's conclusion:

> [I]f the HAP-related benefits are not at least moderately commensurate with the cost of HAP controls, then no amount of co-benefits can offset this imbalance for purposes of a determination that it is appropriate to regulate under CAA section 112(n)(1)(A).

84 Fed. Reg. at 2676.

EPA's treatment of non-HAP benefits under the 2020 Final Action's three-step approach was not only untethered to any statutory requirement, but it also did not conform to recognized principles of BCA. The 2020 Final Action repeatedly faulted the 2016 Supplemental Finding for giving monetized non-HAP benefits "equal weight" to monetized HAP reduction benefits. 85 Fed. Reg. at 31,302 (noting "the impropriety of giving [non-HAP benefits] equal weight to HAP-specific benefits within the context of the appropriate and necessary determination"); *id.* ("[T]he fact that the non-mercury metal HAP are emitted in a solid particulate form does not mean that the EPA should give equal weight to the benefits from removal of all PM."). However, the 2020 Final Action did not provide a reasoned basis for departing from the practice of counting all benefits at their full value, whether they are direct or indirect benefits of regulation, which is a norm of BCA under Circular A-4.[5]

Even if, contrary to OMB guidance, it were rational in principle to weight HAP and non-HAP benefits differently for purposes of the appropriateness finding, the 2020 Final Action did not provide a legally sufficient explanation of "the methodology used in obtaining the data and in analyzing the data." 42 U.S.C. § 7607(d)(3)(B); *see also State Farm*, 463 U.S. at 43 (agency must "articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made").

First, the 2020 Final Action did not explain how a supposed "imbalance" between monetized HAP benefits and monetized costs could provide the justification for giving lesser (or, as EPA did, zero) weight to non-HAP benefits. In other words, the 2020 Final Action found that,

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[5] Office of Mgmt. & Budget, Circular A-4 (Sept. 2003), https://web.archive.org/web/20220203112657/https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf (OMB Circular A-4).

because there was not enough of one kind of benefit, a different kind of benefit should be discounted or ignored but provided no rationale or precedent for doing so. EPA referred to the difference between the 2011 estimate of monetized costs and the small subset of HAP benefits that it acknowledged because they had been monetized as a "gross disparity" that "is so great as to make it inappropriate to form the basis of the necessary statutory finding," 85 Fed. Reg. at 31,301, but did not provide any rationale for why that was so. Nor did EPA explain how close the balance between monetized HAP benefits and costs would need to be in order to render non-HAP benefits relevant to the decision, saying only that it would need to be "closer." 85 Fed. Reg. at 31,303.

Second, the 2020 Final Action did not explain what lesser weight should be accorded to non-HAP benefits, using imprecise language to describe its supposed consideration of these benefits. EPA stated that "[i]f the Administrator were to consider the size of the $PM_{2.5}$-related co-benefits in deciding whether regulating EGUs under CAA section 112(d) is appropriate and necessary, he should also consider taking into account key assumptions affecting the size and distribution of these co-benefits and potential uncertainty surrounding them." 85 Fed. Reg. at 31,303. EPA did not explain exactly how those considerations should affect its hypothetical consideration of these benefits (*i.e.*, to give these benefits greater or lesser weight, or require considering them as a range instead of as a single number). Instead, the Agency noted only that it had less certainty about the health impacts of PM at levels below "the bulk of the observed PM concentrations in the epidemiological studies,"[6] and listed several assumptions that can affect estimates of PM-related benefits, including, among others, assumptions about "the shape of the concentration-response relationship for long-term exposure-related $PM_{2.5}$ and the risk of premature death; the toxicity of individual $PM_{2.5}$ particle components." 85 Fed. Reg. at 31,303. EPA also did not explain why the distribution of non-HAP benefits was a relevant consideration when it had found the distribution of HAP benefits to be essentially irrelevant to its decision. *See supra* Part I.A.1; 85 Fed. Reg. at 31,296 (in response to comment about distributional concerns, stating only that "EPA now weighs these concerns differently"); *id.* at 31,297 (stating that, because "in a cost-benefit comparison, the overall amount of the benefits stays the same no matter what the distribution of those benefits is, . . . EPA, therefore, believes it is reasonable to conclude that those factors to which the EPA previously gave significant weight—including qualitative benefits, and distributional concerns and impacts on minorities—will not be given the same weight in a comparison of benefits and costs for this action under CAA section 112(n)(1)(A).").

[6] As we noted in comments on the 2019 proposal, the scientific literature and expert responses acknowledged in the record support using a no-threshold model for particulate matter, meaning there is no concentration above zero at which health risks do not exist. *See* 2019 NGO Comments at 76; *see also* 77 Fed. Reg. at 9431. Thus, while there may be less certainty as to the effects of $PM_{2.5}$ exposure below the lowest-measured level, that uncertainty is not grounds for ignoring or discounting those effects.

Regardless, the 2020 Final Action actually gave *zero* weight to the non-HAP benefits—and did so without any valid justification. EPA did so despite recognizing that these benefits included thousands of averted deaths, heart attacks, and hospitalizations, the monetized value of which significantly outweighed any estimate of the costs of regulation. Nor did EPA recognize the fact that the $PM_{2.5}$ benefits it was ignoring were produced by the very controls that were required to reduce acid gas and non-mercury metal HAPs. While EPA stated that it "acknowledges the existence and importance of these co-benefits," and "is not turning a blind eye to the reasonably predictable consequences of MATS," 85 Fed. Reg. at 31,301, in fact, EPA did ignore these benefits. EPA stated in the 2020 Final Action, in response to comments, that "EPA *is* considering what significance co-benefits have for its [appropriateness determination,] but we are concluding that the finding must be justified overwhelmingly by the HAP benefits due to the statutory structure." 85 Fed. Reg. at 31,300. By omitting the monetized non-HAP benefits from its approach and stating that non-HAP benefits, *no matter their magnitude*, could not be a determining factor in regulation, EPA in the 2020 Final Action treated these health and environmental benefits as worth $0—nothing.

As the Supreme Court emphasized in *Michigan*, section 112 does not specify precisely how EPA should consider costs and benefits, whether direct or indirect. But the Agency's authority under the statute does not extend to completely ignoring the non-HAP benefits of regulation based on only the flimsiest of explanations. EPA's sole justification for completely ignoring these benefits was an unreasonable interpretation of both section 112 and the Supreme Court's direction in *Michigan*. The fact that the 2020 Final Action arbitrarily ignored and discounted these non-HAP benefits is another reason that supports EPA's revocation of the 2020 Final Action and EPA's correction of that failure in the 2022 Proposal.

B. The 2020 Final Action did not justify the decision to depart from EPA's prior approaches to determining whether it is appropriate to regulate EGUs under CAA section 112.

1. <u>The 2020 Final Action failed to provide a reasoned explanation for the Agency's change in position.</u>

As explained above, *see supra* Part I.A, EPA in the 2020 Final Action disregarded key statutory factors for determining whether it is "appropriate" to regulate EGUs under CAA section 112. At the same time, EPA also failed to justify its reversal of the "appropriate" determination of the 2016 Supplemental Finding by neglecting to supply a "reasoned explanation . . . for disregarding facts and circumstances that underlay or were engendered by the prior policy."[7] *See* 87 Fed. Reg. at 7659-62.

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[7] *FCC v. Fox Television Stations*, 556 U.S. 502, 516 (2009); *see id*. at 515 ([A]n agency must "display awareness that it is changing position" and demonstrate that its change in policy "is permissible under the statute, that there are good reasons for it, and that the agency believes it to

In the 2016 Supplemental Finding, EPA used two independent approaches for determining, considering costs, whether it is "appropriate" to regulate EGUs under section 112: a cost-reasonableness test (EPA's preferred approach) and, as an alternative, a benefit-cost approach. Both approaches were amply supported by the record evidence. The cost-reasonableness or preferred approach focused on "whether the cost of MATS is reasonable, and whether a consideration of such costs, when weighed against, among other things, the substantial hazards to public health and the environment posed by HAP emissions from power plants, causes the agency to alter its conclusion that regulation is appropriate and necessary." 81 Fed. Reg. at 24,424. EPA concluded that the cost of compliance "did not outweigh the [MATS] rule's many advantages." *Id*. at 24,425. For the alternative approach, EPA relied on the formal BCA set forth in the RIA for the MATS final rule, which directly compared the costs and benefits of regulation, concluding that this analysis also demonstrated that "the benefits (monetized and non-monetized) of MATS are substantial and far outweigh the costs." *Id.* at 24,425. EPA therefore concluded in the 2016 Supplemental Finding that, under either approach, regulating EGUs under section 112 remained appropriate and necessary. *Id.* at 24,420-21.

In the 2020 Final Action, however, EPA abruptly reversed course, claiming that the preferred approach was inconsistent with section 112 and the Supreme Court's decision in *Michigan v. EPA*, and that the alternative approach improperly considered ancillary benefits of MATS from non-HAP emissions reductions. 85 Fed. Reg. at 31,298. Neither rationale provides a reasoned basis for rejecting EPA's findings in the 2016 Supplemental Finding.

EPA's rejection of the preferred approach rests on a misreading of *Michigan*. EPA claimed in the 2020 Final Action that the preferred approach in the 2016 Supplemental Finding did not "meaningfully consider cost, which the *Michigan* Court observed to be a 'centrally relevant factor' in making the CAA section 112(n)(1)(A) appropriate and necessary finding." 85 Fed. Reg. at 31,292. But the Court in *Michigan* did not demand that EPA consider costs in a particular way. Instead, the majority explicitly left it up to EPA "to decide (as always, within the limits of reasonable interpretation) how to account for cost." 576 U.S. at 759. In the 2020 Final Action, EPA faulted its previously preferred approach, claiming that EPA in 2016 did not "consider cost relative to benefits," but rather "really focused only on whether the costs could be absorbed." 85 Fed. Reg. at 31,294. But both approaches in the 2016 Supplemental Finding *do* consider costs relative to benefits. The preferred approach weighed costs together with benefits, concluding that the former were reasonable and that comparing the two showed regulation was appropriate. *See, e.g.*, 81 Fed. Reg. at 24,427 ("The Administrator has weighed the cost of MATS against other relevant considerations in determining that it remains appropriate and necessary to regulate HAP emissions from EGUs. These other considerations include prior

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be better."); *see also State Farm*, 463 U.S. at 42 ("[A]n agency changing its course by rescinding a rule is obligated to supply a reasoned analysis for the change beyond that which may be required when an agency does not act in the first instance."); *Pub. Citizen v. Steed*, 733 F.2d 93, 98 (D.C. Cir. 1984) (an agency must "cogently explain" basis for reversal of prior position.).

conclusions reached regarding the significant hazards to public health and the environment from HAP emissions from EGUs, and the agency's prior determination that these hazards will not be addressed through imposition of the requirements of the CAA. The Administrator's conclusion [is] that, on balance, these factors support the appropriate finding."). And the alternative benefit-cost approach directly balanced costs against benefits, concluding again that the latter outweighed the former. *See id.* ("[T]he final RIA demonstrates that the benefits (monetized and non-monetized) of MATS are substantial and far outweigh the costs. In fact, the monetized benefits exceed the cost by 3 to 9 times." (citation omitted)).

With respect to the alternative benefit-cost approach in the 2016 Supplemental Finding, EPA claimed in the 2020 Final Action that the costs "vastly outweigh[]" the monetized HAP benefits of regulating EGUs. 85 Fed. Reg. at 31,299. But this assertion does not withstand scrutiny. In the 2020 Final Action, EPA relied on cost estimates from the 2011 RIA for MATS, *see* 85 Fed. Reg. 31,305—estimates that EPA knew were far higher than what the actual costs of controls turned out to be. *See* 85 Fed. Reg. 31,306; *infra* Part II.B.2. EPA attempted in the 2020 Final Action to justify its reliance on the out-of-date and inaccurate cost information by claiming that updating this information "would not lead to any material change in the relative magnitude of costs and HAP-related benefits." 85 Fed. Reg. at 31,307.

Such an unsupported assertion reflected EPA's skewed view not only of costs but also of the benefits of MATS in two key ways. First, EPA essentially disregarded unquantified HAP benefits claiming that such benefits likely could not overcome the wide gap between MATS compliance costs and monetized HAP benefits. *See* 85 Fed. Reg. at 31,304 ("the unquantified benefits are unlikely to overcome the significant difference . . . between the monetized HAP-specific benefits and compliance costs of the MATS rule"). In doing so, EPA simply brushed aside its correct finding in the 2016 Supplemental Finding that "the monetized health benefits in the MATS RIA significantly underestimate the HAP health benefits associated with MATS." 81 Fed. Reg. at 24,441. Indeed, the 2016 Supplemental Finding acknowledged that many benefits could not be monetized in the 2011 RIA because "data and methods for monetizing" a variety of benefits were not available, *id.* at 24,441, and that many other societal values ("such as protecting the most vulnerable among us") are not amenable to monetization at all, *id.* at 24,430. As discussed more below, EPA's arbitrary about-face was not accompanied by a reasoned explanation for the change, especially in the face of record evidence that the unquantified HAP benefits and ancillary benefits of regulating are substantial.

Second, EPA claimed that it would be inappropriate to give "equal weight" to ancillary benefits of regulating HAP emissions, such as those associated with reductions in $PM_{2.5}$ emissions. *See* 85 Fed. Reg. at 31,299. Here too, EPA failed to provide a reasoned explanation for disregarding the clear factual findings in the 2016 Supplemental Finding regarding ancillary benefits from HAP regulation. As the record in the 2016 Supplemental Finding demonstrates, particulate matter encompasses particulate-bound mercury and non-mercury metal HAPs in addition to particulate matter that is controlled as an unavoidable result of controlling acid gas HAPs (or sulfur dioxide, the regulatory surrogate for acid gas HAPs). *See, e.g.*, 81 Fed. Reg. at 24,438 n.29 ("$PM_{2.5}$ emissions are comprised in part by the mercury and non-mercury HAP metals that the MATS rule is designed to reduce."). EPA explained in the 2016 Supplemental Finding that the control technologies needed to reduce EGU HAP emissions also necessarily result in concomitant reductions of other pollutants, including directly emitted $PM_{2.5}$ and sulfur dioxide (a $PM_{2.5}$ precursor). *See* 81 Fed. Reg. at 24,438.

In the 2020 Final Action, however, EPA downplayed—or even ignored—this interrelationship, claiming that non-mercury metal HAPs represent "at most, 0.8 percent of this directly emitted filterable" particulate matter. 85 Fed. Reg. at 31,302. That misses the point. As EPA determined in the 2016 Supplemental Finding, "[t]he only way to effectively control the particulate-bound mercury and non-mercury metal HAP is with PM control devices that indiscriminately collect all PM along with the metal HAP, which are predominantly present as particles. Similarly, emissions of the acid gas HAP (hydrogen chloride, hydrogen fluoride, hydrogen cyanide, and selenium oxide) are reduced by acid gas controls that are also effective at reducing emissions of [sulfur dioxide (SO_2)] (also an acid gas, but not a HAP)." 81 Fed. Reg. at 24,438 n.29. Thus, the facts simply do not support EPA's attempt in the 2020 Final Action to dismiss or discount the ancillary benefits from regulation of HAP emissions under MATS. *See supra* Part I.A.2.

EPA, in the 2016 Supplemental Finding, also considered other important factors in finding that the significant public health and environmental benefits from controlling HAP emissions outweighed the costs, *see* 81 Fed. Reg. 24,421-22; *id.* at 24,424-25, namely the importance of "reducing the inherent hazards associated with HAP emissions" and of "protecting the public, including sensitive populations, from risks posed by HAP emissions by reducing the volume of, and thus, the exposure to, those harmful pollutants," *id.* at 24,429. Further, as EPA explained, in some cases the impacts may be impossible to quantify or cannot be represented by monetary values, "but are no less real than any other advantage of regulation." *Id.* In the 2016 Supplemental Finding, EPA specifically considered "distributional concerns," noting that "impacts to the most exposed and sensitive individuals in a population, are important for MATS." *Id*. at 24,439 n.34. EPA also acknowledged the "more severe risks from EGU HAP emissions to the most sensitive individuals, particularly subsistence fishers," *id.* at 24,429, and it recognized the disproportionate impacts of mercury emissions on Native Americans where fishing is an important part of Tribal culture and tradition, *id.* at 24,442. EPA further noted in the 2016 Supplemental Finding "the persistent nature of HAP such as mercury," and the fact that mercury, "once emitted, can be re-emitted in the future, thereby resulting in continued contribution to mercury deposition and associated health and environmental hazards." 81 Fed. Reg. at 24,429.

Conversely, EPA in the 2020 Final Action largely disregarded these factors with little explanation. For example, EPA dismissed distributional concerns, asserting instead that, "in a cost-benefit comparison, the overall amount of the benefits stays the same no matter what the distribution of those benefits is." 85 Fed. Reg. at 31,297. In addition, EPA in the 2020 Final Action gave little or no weight to factors "including unquantified benefits, impacts on tribes and Tribal culture, the latency and persistence of air toxics in the environment, and distributional concerns and impacts," 85 Fed. Reg. at 31,296, asserting that "EPA now weighs these concerns differently," *id.* Yet, as it did with all of the unquantified HAP benefits and all of the non-HAP benefits, the Agency cannot essentially ignore facts by asserting that it is weighing them differently. Simply saying that "we changed our mind" as a way to sidestep the record evidence does not suffice to justify an agency's change in position. *See FCC v. Fox*, 556 U.S. at 515.

2. The 2020 Final Action failed to account for reliance interests.

Finally, EPA in the 2020 Final Action did not provide a sufficient explanation for ignoring the serious reliance interests of states, utilities, and the public on the determination underlying the listing decision and MATS. *See id.* (agency must "provide a more detailed justification" . . . "when its prior policy has engendered serious reliance interests that must be taken into account"); *see also Encino Motorcars, LLC v. Navarro*, 579 U.S. 211, 221-22 (2016) (same). EPA claimed that its action would not affect any reliance interests because its action did not rescind or affect the MATS regulatory program. 85 Fed. Reg. at 31,298. But such justification failed to address concerns that, in various parts of the country, utility costs for MATS compliance were the subject of ongoing or pending rate reviews by state public utility commissions, and that recission of the 2016 Supplemental Finding could undermine claims by utilities that MATS compliance costs were prudent, and therefore recoverable through electricity rates.[8]

Compounding the problem, EPA willfully blinded itself to the likelihood that the 2020 Final Action would lead to litigation challenging MATS itself, a risk that EPA did not take into account but was on notice could result. By overlooking this risk, the 2020 Final Action harmed the interests of members of the public who rely on the standards' public health and environmental protections, and the interests of states that depend on MATS to preserve the economic value of their fisheries and to facilitate compliance with other pollution-control requirements.[9] There is no question that the threat of a legal challenge to MATS based on the 2020 Final Action was foreseeable to EPA: in the 2019 proposal to the Final Action, EPA had

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[8] *See, e.g.*, Comments of the Attorneys General of Massachusetts *et al.* on "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 84 Fed. Reg. 2670 (Feb. 7, 2019), EPA-HQ-OAR-2018-0794-1175, at 50 (submitted Apr. 17, 2019) (attached to these comments).

[9] *See id.* at 48-50.

specifically solicited comment on whether rescinding the appropriate and necessary finding, as EPA had proposed, also required rescission of MATS. 84 Fed. Reg. 2670, 2679 (Feb. 7, 2019). The answer is no, as the 2020 Final Action ultimately concluded, 85 Fed. Reg. at 31,314, but EPA knew or should have known that some opponents of MATS might challenge the standards on this basis anyway. And in fact, the very same day that the 2020 Final Action was published in the Federal Register, Westmoreland Mining Holdings LLC filed suit in the D.C. Circuit challenging the 2020 Final Action on the grounds that EPA's overturning of the appropriate and necessary finding required it to rescind MATS.[10] In short, EPA was aware that its dismissal of any threat to the standards was not universally seen as ironclad, and EPA should have accounted for harms to the aforementioned reliance interests related to MATS as a result.

II. EPA'S PREFERRED FRAMEWORK AND THE RESULTING CONCLUSION THAT IT IS "APPROPRIATE" TO REGULATE EGUs UNDER SECTION 112 COMPORT WITH THE STATUTE AND ARE AMPLY SUPPORTED BY RECORD EVIDENCE.

A. EPA's preferred "totality of the circumstances" approach reflects the best reading of section 112.

In the 2022 Proposal, EPA's preferred methodology—which considers "all of the impacts of the regulation," using a "totality-of-the-circumstances approach," 87 Fed. Reg. at 7627—reflects the best interpretation of section 112(n)(1)(A)'s command to determine whether regulation is "appropriate." 42 U.S.C. § 7412(n)(1)(A). As *Michigan* recognizes, that section does not "require[] the Agency… to conduct a formal cost-benefit analysis in which each advantage and disadvantage is assigned a monetary value." 576 U.S. at 759. *See Nat'l Wildlife Fed'n v. EPA*, 286 F.3d 554, 570 (D.C. Cir. 2002) (statute requiring EPA to "take costs into consideration . . . does not require that [it] conduct a cost-benefit analysis"). Rather, it leaves "to the Agency" the question of "how to account for cost," "within the limits of reasonable interpretation." *Michigan*, 576 U.S. at 759. The Agency's approach (like its 2016 finding) provides an answer that fits squarely with section 112's statutory design, by carefully adhering to the congressional judgments embedded within the section's key elements.

First, in assessing the advantages of regulation, EPA's preferred approach properly includes benefits that cannot be assigned precise monetary value. This conforms to *Michigan*'s command to take account of all "the advantages *and* disadvantages of" its decision. *Id.* at 752-53. EPA cannot reasonably assess whether regulation "does significantly more harm than good," *id.*, without including the vast benefits of MATS that cannot be rigorously monetized. There is nothing in the statute to plausibly suggest that EPA can give lesser weight to benefits that cannot be translated into dollars and cents. *See* 87 Fed. Reg. at 7644 ("[T]he vast majority of the post-control benefits of reducing HAP cannot be quantified or monetized with sufficient quality to

[10] *See* Pet., *Westmoreland Mining Holdings LLC v. EPA*, No. 20-1160 (D.C. Cir. May 22, 2020).

inform regulatory decisions . . . [b]ut that does not mean that these benefits are small, insignificant, or nonexistent."). The statute specifies the air toxics to be regulated because Congress understood that the benefits of regulation are in large part not amenable to quantification and valuation by EPA—and instructed EPA to attain those benefits nonetheless. *See* S. Rep. No. 101-228, at 131-2 (1989), *reprinted in* Legis. History of the Clean Air Act Amendments of 1990 (Leg. Hist.), at 8471-72 (describing EPA's failure to list air toxics for regulation despite "significant threat to public health in the United States" from "[r]outine and episodic releases" of air toxics). The "totality of the circumstances" framework allows EPA to give those benefits the weight they deserve.

Given the magnitude of the HAP reductions secured by MATS, EPA correctly concludes that regulation is appropriate based on those reductions alone. 87 Fed. Reg. at 7668 (noting that "it is not necessary to [EPA's] conclusion" to consider "substantial reductions in co-emitted pollutants"). The Agency should finalize that conclusion. In addition, EPA should weigh these HAP-specific benefits together with benefits associated with the particulate matter and sulfur-dioxide emissions reductions that resulted from compliance with the standards. *See Michigan*, 576 U.S. at 753 (instructing EPA to take account of all advantages and disadvantages of regulation). Those non-HAP reductions are a firm result of regulating HAP (indeed, SO_2 and PM reductions are regulatory proxies for acid gas and metallic HAP reductions) and no less relevant to the decision whether to regulate than the direct and indirect financial burden associated with compliance. EPA need not here decide whether those benefits could render regulation appropriate in a hypothetical scenario in which regulation failed to achieve substantial benefits central to the statutory scheme. Here, MATS has accomplished large reductions in HAP emissions, and concomitant improvements in public health; under these circumstances, at a minimum, it is entirely appropriate for EPA to acknowledge MATS' non-HAP benefits.

Second, EPA's preferred methodology carefully hews to the values that Congress identified within the statutory scheme. By contrast, in the 2020 rescission, EPA had unlawfully attempted to overwrite the statute's core objective with the Agency's extra-statutory assessment of the benefits associated with regulation of air toxics. *Cf. King v. Burwell*, 576 U.S. 473, 498 (2015) ("A fair reading of legislation demands a fair understanding of the legislative plan."). Section 112(n)(1)(A)'s core concerns are identified in the subjects of the studies meant to inform EPA's "appropriateness" determination: hazards to public health from power-plant HAP emissions, 42 U.S.C. § 7412(n)(1)(A), the rate and mass of power plants' mercury emissions, *id.* § 7412(n)(1)(B), and the health and environmental effects of those emissions, *id.*

The broader statutory structure further indicates the benefits that Congress directed EPA to prioritize. As the proposal recognizes, section 112 demonstrates a commitment to "reductions in the volume of HAP emissions from stationary sources," by listing HAPs directly, 42 U.S.C. § 7412(b), requiring identification and regulation of categories of major (and many area) sources, *id.* § 7412(c), and demanding regularly updated technology-based standards based on the maximum achievable reductions in emissions, *id.* § 7412(d), on an expeditious schedule, *id.* § 7412(i). 87 Fed. Reg. at 7633. The statute's mandatory, technology-based standards, 42 U.S.C. § 7412(d)(2) & (6), reflect a determination that HAP emissions are "inherently dangerous," and a refusal to allow HAP reductions to depend upon EPA's assessment of the health risks associated with HAP exposure. 87 Fed. Reg. at 7634. And the statute places express and substantial value on protecting the most vulnerable and most exposed. 42 U.S.C. § 7412(f)(2)(A) (requiring rulemaking based on risks to "the individual most exposed to emissions from a source in the category"); 42 U.S.C. § 7412(n)(1)(C) (requiring study of levels of mercury consumption that threaten adverse health effects, including through fish consumption by sensitive populations).

The assessment provided by EPA's preferred approach—unlike a rigidly quantitative approach—permits direct inquiry into whether regulation of power plants' emissions will achieve those statutorily determined objectives. It further avoids substituting *EPA's* judgment as to the value of reducing mercury, chromium, and other HAP for the judgments *Congress* wrote into section 112 itself. The preferred approach thereby "respects the role of the Legislature, and takes care not to undo what it has done," as EPA (no less than the courts) must. *King v. Burwell,* 576 U.S. at 498. Congress placed reductions in air toxics at the center of section 112 precisely because it understood that EPA could not easily assess the relative harms and burdens associated with those substances. Leg. Hist. at 8746-47 (S. Rep. No. 101-228, at 406-07) (rejecting a proposal to "balance . . . health and economic considerations" because it not only "fails to protect public health" but also "ignores the environmental threats posed by these pollutants") (statement of Sen. Lautenberg).

Third, EPA's preferred approach takes appropriate account of costs by placing them in their necessary context. Section 112(n)(1)(A) "treats power plants differently." *Michigan*, 576 U.S. at 751. That statutory asymmetry demands close attention to the specifics of the regulated sector—to the features that make power plants "different[]" (aside from their disproportionate contribution to nationwide toxic emissions). *Id.* By analyzing costs against power-sector sales, annual expenditures, impact on retail electricity prices, and impact on generating capacity, the preferred approach maintains that statutory focus on the idiosyncrasies of the power sector. *See Husqvarna AB v. EPA*, 254 F.3d 195, 200 (D.C. Cir. 2001) (where statute "does not mandate a specific method of cost analysis," EPA may look to "industry-specific factors" to select preferred method). The Agency's emphasis on retail costs and generation capacity addresses the sector's role in providing electricity to consumers, in keeping with then-Judge Kavanaugh's observation that section 112(n)(1) was meant to "*avoid[] the imposition of excessive and unnecessary costs on residential, industrial, and commercial consumers of electricity.*" *White Stallion v. EPA*, 748 F.3d 1222, 1264 (D.C. Cir. 2014) (Kavanaugh, J., dissenting) (citation omitted). Placing overall costs in the context of sales and expenditures further makes allowance for a second characteristic of the sector: its size, which could otherwise distort the Agency's assessment of the monetary costs associated with compliance.

EPA's preferred approach thus considers benefits of regulation by focusing closely on the aims and congressional judgments evident in the statutory text, and compares those benefits to an assessment of the costs of regulation that emphasizes the features underlying Congress's decision to single out EGUs for special treatment. That approach reflects the best reading of section 112's text and context.

B. Ample record evidence supports EPA's determination that it is "appropriate" to regulate EGUs under section 112, in light of the totality of the circumstances.

1. <u>The advantages of regulating EGUs under section 112 are well documented, in record evidence available when EPA promulgated MATS and developed since 2011.</u>

Information available in 2011

Many of the benefits of reducing mercury and other HAP from power plants were documented in the MATS rule and the 2011 RIA supporting it. Since 2011, significant advances have been made in the scientific understanding of the effects of mercury and other HAPs on children and adult populations. In its 2022 Proposal, EPA properly relies on well-documented benefits of reducing mercury and other HAPs as set out in the 2011 RIA, as well as more recent studies that more fully document those benefits.

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." 76 Fed. Reg. 24,976, 24,992 (May 3, 2011) (proposed rule). 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. 76 Fed. Reg. at 24,995; *see id.* at 25,007-11 (finding that power plants were substantial contributors to these levels). 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 a quarter of modeled watersheds "with populations at-risk," 77 Fed. Reg. at 9355; and that power plants were responsible for significantly higher mercury pollution in the areas nearest to them, 76 Fed. Reg. at 25,013. EPA also determined that non-mercury metals like chromium and nickel, emitted by power plants as particulates, pose cancer risks, *id*. at 24,978, 25,011; 77 Fed. Reg. at 9319, and that power plants continued to be a significant source of these and other toxic metals, such as arsenic and cadmium, which have serious health effects. *See* 76 Fed. Reg. 25,003-4, 25,006, Tbl. 5; *see also* 77 Fed. Reg. at 9380 (most non-mercury metallic toxics are emitted, and best controlled, as particulates). 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, 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," *id*. at 25,016. *See also* 77 Fed. Reg. at 9363, 9405-06. In addition, EPA found that MATS would reduce harm to those currently exposed to the highest risks, *id*. at 9445-46, and produce "substantial health improvements for children," *id*. at 9441. EPA also explained that emissions of mercury and other HAPs cause a variety of serious harms to the environment, including contamination of rivers and lakes, and poisoning of fish, birds and other wildlife. *See* 76 Fed. Reg. at 24,983, 25,012-13, 25,016; 77 Fed. Reg. at 9362, 9362-63, 9424. All of these risks plainly fall within the scope of the statutory considerations relevant to a determination whether it is "appropriate" to regulate EGUs under section 112. *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)(B) (requiring EPA to study the health and environmental impacts of mercury from *all sources*); *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); *Michigan*, 576 U.S. at 753 (finding relevant to the "appropriate" determination the studies conducted under section 112(n)(1)(B) & (C)).

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. MATS RIA at 7-4. The 2011 RIA found that members of these subpopulations were disproportionately harmed by methylmercury exposure.

Low-income African-American recreational/subsistence fishers in the Southeast region were found to be particularly harmed by mercury exposure. For example, an African-American child in the Southeast born in 2016 to a mother consuming fish at the 90th percentile of published subsistence-like levels was estimated to experience a loss of *7.711 IQ* points as a result of in-utero methylmercury exposure from all sources in the absence of MATS. The implementation of MATS would reduce the expected IQ loss for this child by an estimated 0.176 IQ points. MATS RIA at 4-3. While this calculation is an underestimate, *see infra* in this section, EPA correctly considered the disproportionate risks of exposure to mercury in reaffirming the "appropriate" finding in 2012. *See* 77 Fed. Reg. at 9362; *see also* 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).

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. MATS RIA at 4-66. 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 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.[11] A second study, also in 2016, quantified cumulative U.S. economy-wide benefits and estimated them to be at least $43 billion.[12] 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.[13]

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 (2011 RIA 43). This assumption does not take into account those who travel for leisure fishing. Finally, recent epidemiological findings indicate that there are more-sensitive neurodevelopmental

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[11] 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 (2016).
[12] Amanda Giang & Noelle E. Selin, *Benefits of mercury controls for the United States*, 113 Proc. Nat'l Acad. Sci. 286 (2016).
[13] 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 (2010).

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.[14] 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.

EPA has acknowledged—and should clearly highlight in the final rule—its inability to quantify in the 2011 MATS rulemaking more than a narrow subset of health benefits attributable to reductions in power plants' mercury emissions. EPA has explained that at the time of prior analyses "methods for monetizing these benefits" were "largely unavailable in scientific literature." 81 Fed. Reg. at 24,441. In addition, EPA at the time pointed 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." 81 Fed. Reg. at 24,441. Thus, as EPA has previously acknowledged, "the monetized mercury health benefits in the MATS RIA significantly underestimate the HAP health benefits associated with MATS." 81 Fed. Reg. at 24,441.

Many of the benefits of reducing mercury were not quantified because, at the time the RIA was written, the literature was 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. MATS RIA at 4-4 to 4-5. 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. *Id.* at 4-6 to 4-9.

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. MATS RIA 4-73 to 4-79. The RIA acknowledged that exposure to these HAPs is "associated with a variety of adverse health effects," including chronic health disorders, including 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 kidney and central nervous system. *Id.* at 4-73. Three of the HAPs were classified as human carcinogens and five as probable human carcinogens. *Id.*

The 2011 RIA pointed out that most Americans were, in 2005, exposed to ambient concentrations of air toxics at levels that had the potential to cause adverse health effects.

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[14] Sunderland *et al.*, *supra* note 11.

MATS RIA at 4-68. The average American was exposed to a cancer risk of 50 in one million, and the pollutants formaldehyde and benzene were identified as contributing the most to overall cancer risk. *Id.* In addition to cancer risks, the 2011 RIA thoroughly documented 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. *Id.* at 4-69. However, the 2011 RIA acknowledged that, due to methodology and data limitations, estimations of the benefits associated with the reduction of HAP were not available. *Id.* In light of this absence, EPA relied on unit risk factors that were designed to be conservative. EPA now notes it has continued to develop better methods for analyzing the benefits of reduction in HAPs—estimations that should be fully considered.

Moreover, communities of color and low-income communities made up very large (indeed, disproportionately large) shares of the populations within 5 kilometers of MATS-covered EGUs when EPA reaffirmed its "appropriate" finding in 2012. *See id.* 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). 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." *Id.* at 7-36. Thus, communities of color and low-income communities likely bore a significant share of the local exposures to EGU HAPs before EPA adopted and implemented MATS. Congress expressed a clear intent to reduce the harms that HAPs inflict on these often disadvantaged, overburdened communities through regulation under section 112. *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).

In addition, although EPA did not rely on non-HAP benefits in 2011, *see* 77 Fed. Reg. at 9363, the 2011 RIA properly documented the non-HAP health benefits that were projected to result from the rule. The RIA concluded that the reductions in criteria pollutants resulting from installation of controls to comply with the MATS rule would yield massive ancillary benefits in 2016 valued at $37 to $90 billion (based on a 3% discount rate) and $33 to $81 billion (based on a 7% discount rate). This estimate reflects a range of avoided health outcomes including 510 fewer mercury-related IQ points lost as well as avoided $PM_{2.5}$-related impacts, including 4,200 to 11,000 premature deaths, 4,700 nonfatal heart attacks, 2,600 hospitalizations for respiratory and cardiovascular diseases, 540,000 lost work days, and 3.2 million days when adults restrict normal activities because of respiratory symptoms exacerbated by $PM_{2.5}$. MATS RIA at ES-3.

Aside from the 2011 RIA, EPA also 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.[15] The Mercury Risk TSD estimated 22% to 29% of the watersheds modeled to have populations potentially at-risk due to U.S. EGU mercury emissions (together with mercury emissions from other sources) in 2016. *Id.* at x. EPA also estimated that for watersheds modeled in the risk assessment, U.S. EGUs would contribute up to 16% of total mercury deposition and related fish-tissue mercury concentrations by 2016, without MATS. *Id.* at x.

The Mercury Risk TSD assessment was designed to assess whether a potential public health hazard is associated with mercury emitted from U.S. EGUs. *Id.* at 6. The EPA generated hazard quotient (HQ) estimates by comparing estimates of modeled potential exposure for subsistence fisher populations to the methylmercury reference dose (RfD). *Id.* at 10. 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. *Id.* at 86. These HQ values, which are based on an RfD that reflects a wider range of neurological endpoints in children, such 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. *See id.* at 10 n.16. Nonetheless, the Mercury Risk TSD does provide estimates of IQ loss in children born to mothers from high fish-consuming subsistence fishing populations. *Id. at* 10.

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. *Id.* at 81-83. 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. *Id.* at 111. These findings matter in EPA's determination whether regulating EGUs' HAP emissions under section 112 is "appropriate" because Congress expressed concern with HAP risks to sensitive populations and highly exposed individuals. *See* 42 U.S.C. § 7412(n)(1)(C); *id.* § 7412(f)(2)(A); *id.* § 7412(c)(9)(B)(i). EPA relied on the Mercury Risk TSD in reaffirming its prior finding that it is "appropriate" to regulate EGUs under section 112. *See* 77 Fed. Reg. at

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[15] 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, EPA-452/R-11-009 (Dec. 2011) ("Mercury Risk TSD").

9363. In so doing, the Agency noted that it had expanded coverage of watersheds from a previous, similar analysis conducted for the 2000 "appropriate and necessary" finding. *Id.* Yet 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." See Mercury Risk TSD at 110-11. Thus, the Mercury Risk TSD appears to have been conservative.

In 2012, EPA also relied on an updated Non-Mercury Inhalation Case Study to reaffirm the prior finding. *See* 77 Fed. Reg., at 9363. In that study, the Agency estimated the chronic inhalation risk from HAPs other than mercury emitted by a small subset of potentially regulated facilities (n = 16).[16] 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). Case Study at 12-13 & Tbl. 9. In the final rule, the Agency noted that "a total of six facilities exceed the criterion for EGUs to be regulated under CAA section 112," 77 Fed. Reg. at 9363, apparently referring to the delisting provisions, 42 U.S.C. § 7412(c)(9)(B)(i). 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 captures only a small fraction of the full risk from EGU HAP emissions, it provides further support for EPA's proposed determination that it is appropriate to regulate.

It is clear from the 2011 RIA, the Mercury Risk TSD, and the Non-Mercury Inhalation Case Study—even acknowledging gaps in data and methodology which led to a conservative and incomplete calculation of monetized benefits, a conservative estimate of the percentage of watersheds in which high-fish-consuming subsistence fishers were expected to be at risk, and a partial view of the risks posed by non-mercury HAP emissions from EGUs—that the benefits of reducing HAP were and continue to be meaningful. In its 2022 Proposal, EPA rightly continues to rely on the well-documented health benefits of reducing HAP captured in the 2011 RIA and augments its understanding with important updates to science and data, discussed below.

[16] 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) (Case Study).

Information developed since 2011

It is eminently reasonable for EPA to consider new information on the advantages and disadvantages of regulating EGUs under section 112 in reaffirming its finding. We agree with EPA that it is important for the Agency to consider the best currently available evidence in determining whether regulating EGUs under section 112 is "appropriate" in light of the statutory factors. 87 Fed. Reg. at 7650. This determination, as directed by Congress, is highly factual and must be based at least in part on the conclusions in EPA's report on hazards from HAP emissions from EGUs. 42 U.S.C. § 7412(n)(1)(A). Yet, although Congress required the Agency to complete this study within three years of the enactment of the Clean Air Act Amendments of 1990, Congress did not place a time limit on EPA's finding, suggesting that consideration of additional information that became available in the ensuing years could be relevant and properly considered, *see id.*; *see also Michigan*, 576 U.S. at 750 (deeming EPA's cost estimates at the time of regulation, over ten years from the time of the initial finding, relevant to the determination whether regulating EGUs under section 112 is "appropriate" on remand). Moreover, in this situation, where the Agency has determined that it must revisit its prior determinations whether it is appropriate to regulate EGUs under section 112, it is reasonable for EPA to consider subsequent evidence, particularly if current data are available that directly relate to projections in EPA's previous assessments or that provide additional information on the costs and benefits of regulation.

We discuss several sources of relevant new information below.

<u>Mercury - EPA's risk screening analyses</u>

EPA's three new risk screening analyses further demonstrate the risks of EGU HAP emissions and provide additional support for EPA's finding that it is appropriate to regulate EGU HAP emissions. Each screening analysis represents a valid exercise demonstrating the possible scale of certain health impacts that these emissions would inflict without implementation of MATS. As detailed below, although the analyses are intended to provide an illustrative upper bound of the risks assessed, they are in fact conservative in many ways and thus may still understate the potential benefits gained by regulating EGUs under section 112.

EPA's risk screening analyses conducted for this rulemaking confirm that the benefits of regulating EGUs under section 112 are worthwhile (*i.e.*, "appropriate"), considering costs and other factors. As an initial matter, it is fitting for the Agency to assume, in these risk screening analyses, emissions of 29 tons of mercury per year in a baseline scenario without MATS in place.[17] The Supreme Court in *Michigan v. EPA* focused on costs that EPA had estimated at the time of regulation, *see* 576 U.S. at 750, and it would be logical to consider the benefits that EPA then estimated could have been achieved by eliminating the risks that EGUs' emissions of HAPs posed as well. Congress directed EPA to weigh "the hazards to public health reasonably anticipated to occur as a result of emissions by" EGUs in making a finding under section 112(n)(1)(A). 42 U.S.C. § 7412(n)(1)(A). This language plainly requires EPA to take into account the full risks posed by EGU HAP emissions; it does not suggest that EPA should only account for the potential benefits of issuing its original standards. Furthermore, the risk screening analyses evaluate the potential harms of only one HAP emitted by EGUs (mercury) and are thus inherently conservative in their scope.

Moving beyond the quantity and type of emissions assessed, we agree that EPA's approach, which attributes a fraction of incremental harms from population-wide exposure to methylmercury in fish to EGUs and, for cardiovascular impacts, applies multiple cutpoints for health effects, is sufficient for purposes of reassessing the finding. *See* 2022 Risk TSD at 2-3. EPA's assumptions about the relationship between EGU emissions and exposure to methylmercury, as well as its use of multiple cutpoints for cardiovascular effects, are reasonable given statutory directives to decide whether to regulate based on imperfect information, and considering upper bounds for health impacts. Congress described the study required by section 112(n)(1)(A) in protective terms. *See* 42 U.S.C. § 7412(n)(1)(A) (instructing EPA to evaluate the "hazards to public health reasonably anticipated to occur as a result of" EGU HAP emissions in determining whether it is appropriate to regulate). Congress also expected that EPA would not be able to quantify many HAP risks or estimate them within any narrow confidence range; indeed, for most source categories, it replaced EPA's risk-based approach to regulation under section 112 with a mandatory regulatory scheme for congressionally listed HAPs. *See U.S. Sugar Corp. v. EPA*, 830 F.3d 579, 593 (D.C. Cir. 2016) (citing legislative history). These statutory directives are broad enough to allow for EPA's current approach of validating its previous finding with analyses that assume a connection between EGU mercury emissions and exposures to methylmercury, and that apply multiple cutpoints to assess a range of potential cardiovascular impacts.

Nonetheless, scientific understanding of human exposures to methylmercury attributable to EGUs has advanced beyond an approach that looks only at EGUs' fraction of overall mercury emissions or deposition as a proxy for exposures. A refined, more accurate methodology would produce more reliable results and likely show significantly greater health impacts attributable to

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[17] *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) (2022 Risk TSD).

EGU emissions, as exemplified by the analysis[18] conducted by researchers at Harvard University and Syracuse University, described in greater detail in the comments being submitted to this docket by the Emmett Environmental Law & Policy Clinic at Harvard Law School. We recommend that EPA adopt a similar methodology to quantify the expected benefits of future regulations limiting emissions of mercury from EGUs and other sources, and in any retrospective analysis of the health benefits of regulations that have already been implemented.

We offer specific comments on each of EPA's risk screening analyses below.

Risk of fatal heart attacks to the general population

EPA's approach to estimating fatal heart attacks within the general population attributable to EGUs' mercury emissions is justified and conservative. The Agency reasonably employed a methodology that applies EGUs' fractions of global emissions or domestic deposition to the total incremental incidences of fatal heart attacks attributable to methylmercury exposure. *See* 2022 Risk TSD at 2. This methodology is conservative insofar as EPA's estimate of EGUs' share of domestic mercury deposition has been shown to be an underestimate.[19] Further, for the reasons discussed above, this aspect of EPA's methodology also comports with congressional instructions in section 112 to take a protective approach and regulate even where the Agency has not precisely quantified HAP risks.

These statutory instructions also support EPA's decision to apply two cutpoints for the levels of methylmercury exposure at which cardiovascular impacts begin to occur. EPA based this decision on the recommendation of the expert panel that the Agency convened in 2010 to model cardiovascular impacts from methylmercury only above the exposure levels identified in two studies, as well as studies that suggest diminishing protective effects of polyunsaturated fatty acids at higher levels of fish intake corresponding to methylmercury exposures at and above the cutpoints. *See* 2022 Risk TSD at 2-3; *see also id.* at 4-6 & n.4.[20] The approach reflects the

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[18] 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 (Apr. 2022) (Mercury Benefits Template).
[19] *See id.* at 5-6.
[20] EPA relies on the recommendations of the expert panel to include in future benefits analyses a "link between [methylmercury] and acute myocardial infarction." 87 Fed. Reg. at 7641. EPA's previous conclusion that "available evidence does not support a clear characterization of the potential relationship between mercury exposure and cardiovascular effects at this time," 85 Fed. Reg. at 31,309, is unsupported, is at odds with the best available science, and demands an unprecedented and unrealistic degree of certainty before a health endpoint may be used in regulatory analysis. *See* Commonwealth of Massachusetts *et al.*, Petition for Reconsideration of EPA's Final Rule: "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – Reconsideration of Supplemental Finding and

recommendations of experts on this topic, and it is also conservative, insofar as it does not attempt to remove the confounding effect of cardio-protective agents even at high levels of exposure and fish intake, or to quantify any impacts of methylmercury exposure at lower levels.[21] Moreover, for the reasons discussed in the next section, the choice not to quantify incidences of mortality from other modes of action within cardiovascular disease—deaths that are just as well linked to exposure to methylmercury as acute myocardial infarction—results in a dramatic underestimate of benefits.[22] Thus, EPA's quantification of cardiovascular impacts from exposure to methylmercury for this proposal is an excellent first step, and EPA should build upon it by including additional mortality estimates in the final rule and in future relevant rulemakings.

EPA's other assumptions in assessing cardiovascular risks posed by mercury emissions from EGUs are also conservative. It is reasonable to assume that exposure data for women of child-bearing age from the National Health and Nutrition Examination Survey (NHANES) reflect exposures in the general adult population in the U.S., *see* 2022 Risk TSD at 3-4; indeed, to the extent that individuals within this cohort avoid or reduce fish consumption to protect developing fetuses from the impacts of mercury, the assumption could have led to an underestimate of cardiovascular impacts.[23] In addition, EPA's decision not to account for higher levels of exposure among recreational fishers—who comprise more than 10% of the general population—represents a substantial understatement of overall exposure.[24] EPA does properly assume, however, that the hair mercury levels in the NHANES dataset resulted primarily from the consumption of fish containing methylmercury, *see id.*; if other sources such as agricultural

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Residual Risk and Technology Review," 85 Fed. Reg. 31,286 (May 22, 2020), EPA-HQ-OAR-2018-0794-4573, at 9-12 (submitted July 21, 2020). Because EPA did not base its previous conclusion on the best available scientific evidence and disregarded the recommendations of its expert panel, EPA has provided sufficient explanation to overcome its prior conclusion and consider quantifiable cardiovascular benefits of reducing mercury emissions from EGUs in this rulemaking. *See FCC v. Fox*, 556 U.S. at 515.

[21] EPA does include a "no cutpoint" estimate that illustrates the degree to which its upper and lower bound estimates are conservative in this regard. *See* 2022 Risk TSD at 6; *id.* at 8; *see also id.* at 10-11, Tbl. 1 (showing 91 excess annual deaths from EGU mercury emissions with no cutpoint assumed, compared to an upper-bound estimate of 32 excess annual deaths (under a scenario in which U.S. fish consumption is sourced solely from U.S. continental and near-source fisheries)).

[22] *See* Mercury Benefits Template at 10-12 & Tbl. 1.

[23] *See* U.S. Food & Drug Admin., *Advice about Eating Fish For Those Who Might Become or Are Pregnant or Breastfeeding and Children Ages 1 - 11 Years*, https://www.fda.gov/food/consumers/advice-about-eating-fish (recommending that people who might become or are pregnant or breastfeeding avoid or reduce servings of some types of fishes, and avoid or reduce servings of all self-caught fish); *see also* 2022 Risk TSD at 12 (noting that the data indicate that men tend to have higher blood mercury levels than women).

[24] *See* Mercury Benefits Template at 9.

food also contributed to these levels of exposure, then EGUs' emissions of mercury could be expected to contribute proportionately to many of those exposures as well, which would support EPA's assumption that the fraction of mercury exposures attributable to EGUs relates to EGUs' share of mercury emissions or deposition, including exposures through multiple ingestion pathways. In terms of the levels of exposure actually modeled, EPA acknowledges that they are highly conservative because EPA applies the *cutpoint* level to the percentage of the population at *or above* that level, given data limitations as to the relationship between higher levels of mercury exposures and increased health impacts. *See id.* at 8.

These benefits identified by EPA are significant: assuming consumption of fish solely from U.S. continental and near coastal fisheries, EPA estimates that EGUs' mercury emissions are responsible for 32 excess annual deaths from heart attacks (using a low cutpoint for effects from exposure), 17 deaths (using a high cutpoint), or 91 deaths (using no cutpoint). *Id.* at 10-11, Tbl. 1. Assuming consumption from global fisheries, EPA estimates 8 excess annual deaths from heart attacks (using a low cutpoint for effects from exposure), 5 deaths (using a high cutpoint), or 24 deaths (using no cutpoint). *Id.* at 10-11, Tbl. 1. Given that Congress expressed concern about relatively low risks of developing cancer from HAP exposures, *see* 42 U.S.C. § 7412(c)(9)(B)(i); *id.* § 7412(f)(2)(A), these estimates of actual deaths should receive great weight in EPA's consideration of the advantages and disadvantages of regulating EGUs under section 112. And, again, these estimates exclude the vast majority of cardiovascular deaths attributable to EGU emissions of mercury, through modes of action other than acute myocardial infarction.[25]

Risk of IQ loss to the general population

EPA's approach to estimating IQ loss in children within the general population that is attributable to EGUs' mercury emission is also well supported. The Agency follows the same approach to apportioning total incidences (*i.e.*, IQ points lost) resulting from exposure to methylmercury from fish consumption to EGU mercury emissions as it does in estimating fatal heart attacks attributable to EGU mercury emissions. *See* 2022 Risk TSD at 13. Accordingly, for the reasons discussed above, this aspect of EPA's methodology is reasonable and comports with congressional instructions in section 112 to take a protective approach and regulate even where the Agency has not precisely quantified HAP risks.

EPA's other assumptions in assessing IQ loss within the general population attributable to mercury emissions from EGUs are also conservative and provide what should be viewed as a lower bound of these impacts. The Agency has not attempted to account for the confounding beneficial effects of polyunsaturated fatty acids on fetal brain development, despite examples in the scientific literature of adjustment factors that could compensate for this low bias in the concentration-response relationship, which likely leads to underestimating IQ loss attributable to

[25] Mercury Benefits Template at 10-12 & Tbl. 1.

mercury emissions. *See id.* at 14; *id.* at 15; *id.* at 17; MATS RIA at 4-36 to 4-37. In addition, EPA has not quantified the benefits of avoided neurodevelopmental impacts other than IQ loss, 2022 Risk TSD at 14 n.9; *id.* at 16, even though the Agency's Science Advisory Board in 2011 noted that the exclusive focus on this health effect likely underestimates the impacts of EGUs' emissions of mercury, *see* MATS RIA at 4-30; *see also* 77 Fed. Reg. at 9373 (acknowledging that, because IQ is "not the most sensitive neurodevelopmental endpoint affected by [methylmercury] exposure," reliance on it "underestimates the impact of reducing methylmercury in waterbodies").

Regarding exposure levels, as noted above, EPA's decision not to account for higher levels of exposure among recreational fishers—who comprise more than 10% of the general population—represents a substantial understatement of overall exposure.[26] EPA does properly assume, however, that the hair mercury levels in the NHANES dataset resulted primarily from the consumption of fish containing methylmercury, *see* 2022 Risk TSD at 14; if other sources such as agricultural food also contributed to these levels of exposure, then EGUs' emissions of mercury could be expected to contribute proportionately to many of those exposures as well, which would support EPA's assumption that the fraction of mercury exposures attributable to EGUs relates to EGUs' share of mercury emissions or deposition, including exposures through multiple ingestion pathways.

These benefits, although they are likely underestimates, are significant as well: assuming consumption of fish solely from U.S. continental and near coastal fisheries, EPA estimates that EGUs' mercury emissions are responsible for 6,000 lost IQ points. *Id.* at 16, Tbl. 2; *see also id.* at 16 n.10 ("[I]t is likely that modeled IQ loss may not be uniformly distributed across the population of exposed children and may display considerable heterogeneity."). Assuming consumption from global fisheries, EPA estimates 1,600 lost IQ points. *Id.* at 16, Tbl. 2. The Agency observes that, in 2011, it calculated benefits from saving 697 IQ points among children of recreational freshwater fishers from zeroing out EGU emissions of mercury in 2016. *Id.* at 16. Although MATS did not in fact eliminate EGUs' mercury emissions, these emissions declined markedly following implementation of the rule, as discussed below. And, as noted, the study required in section 112(n)(1)(A) that serves as one predicate of an "appropriate" finding must consider all of the public health hazards posed by EGU emissions of HAPs—not just the benefits that would be achieved through regulation. 42 U.S.C. § 7412(n)(1)(A). Thus, the results of EPA's risk screening analysis on lost IQ points should receive considerable weight in a determination whether to reaffirm the finding.

[26] *See* Mercury Benefits Template at 9.

Risk of fatal heart attacks to subsistence fishers

EPA's extension of the 2011 risk assessment (discussed in the Mercury Risk TSD), in which the Agency estimated the number of watersheds where subsistence fishers would be at risk for having children with lost IQ points attributable to EGU emissions of mercury, to the risk of fatal heart attacks is well supported and conservative. In 2011, EPA identified at-risk watersheds by calculating total mercury-related risk from fish-tissue samples and attributed a portion of that risk to EGUs based on the fraction of total modeled (using air quality modeling[27]) mercury deposition in the watershed associated with EGU emissions. *See* 2022 Risk TSD at 18; 2011 Mercury Risk TSD at 47. Watersheds in which female subsistence fish consumers at the 90th, 95th, or 99th percentile for consumption ingested more than the daily reference dose for their bodyweight were considered to be at-risk. *See* 2022 Risk TSD at 18 & n.12. EPA acknowledges that these percentiles lie at the upper end of exposure, as the 2011 analysis (like the present analysis) is intended to screen for risk. *See id.* This approach is consistent with Congress's concern that EPA reduce risks to the "individual most exposed" to emissions. 42 U.S.C. § 7412(f)(2).[28] Furthermore, the present analysis is conservative insofar as it only considers the cardiovascular risks to subsistence fishers posed *by EGU emissions*—unlike the 2011 analysis, which also designated a watershed as at-risk if intake of mercury from *all sources* exceeded the reference dose for IQ loss. *See* 2022 Risk TSD at 18 & n.13; *see also id.* at 20; 87 Fed. Reg. at 7643 (citing legal authority for considering risk that results from cumulative exposures).

To estimate cardiovascular risk based on the previously established mercury ingestion rates among subsistence fishers at the upper end of fish consumption, EPA converted the various levels of EGU-attributable mercury intake to hair-mercury exposures. 2022 Risk TSD at 18; *id.* at 19. A watershed is then designated as "at increased risk for [heart attack] mortality" related to EGU mercury emissions if those hair-mercury exposures exceed the two cutpoints at which fatal

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[27] EPA acknowledges that there is uncertainty involved in "estimating . . . chemistry associated with [mercury] fate and transport, [and] prediction of wet and dry deposition" using the Community Multi-scale Air Quality model version available in 2011. *See* 2022 Risk TSD at 24; *see also* 2011 Mercury Risk TSD at 47. As discussed in the next section, there have been updates to this model that could improve the present analysis and would likely show greater amounts of mercury deposition attributable to EGUs. Nonetheless, the modeling of mercury transport and fate conducted in 2011 suffices for purposes of the extension of the risk screening analysis, which is intended to estimate the degree of risk at the upper ends of exposure and not precisely quantify risks.

[28] In fact, these upper-end fish-consumption scenarios do not necessarily capture the highest levels of exposure, given that EPA limited its analysis to watersheds for which it had fish-tissue data—which might not include the watersheds with the greatest EGU-attributable methylmercury concentrations. *See* 2022 Risk TSD at 18; 2011 Mercury Risk TSD at 79 ("[T]he majority of areas with elevated U.S. EGU-attributable deposition are not covered in the risk assessment. Therefore, we believe that the number of watersheds with elevated U.S. EGU-attributable exposure and/or risk could be substantially larger."); *see also id.* at 96, Tbl. 2-15.

cardiovascular impacts emerge, discussed previously. As noted above, EPA bases this decision on the recommendation of the expert panel that the Agency convened in 2010 to model cardiovascular impacts from methylmercury only above the exposure levels identified in two studies, as well as studies that suggest cardiovascular benefits at low levels of exposure together with cardio-protective agents, and diminishing protective effects of polyunsaturated fatty acids at higher levels of fish intake corresponding to methylmercury exposures at and above the cutpoints. *See* 2022 Risk TSD at 2-3; *see also id.* at 4-6 & n.4. The approach follows the recommendations of the experts on this topic. It is also conservative because it does not attempt to remove the confounding effect of cardio-protective agents, and if EPA had corrected for this confounding effect it would have lowered the cutpoints to more-accurate exposure levels.

The results of the extension of the 2011 risk assessment show that, in upwards of 10% of the watersheds modeled, high-fish-consuming subsistence fishers are at risk of fatal heart attacks from exposures to methylmercury attributable to EGUs. 87 Fed. Reg. at 7643. That percentage is comparable to the 10% of watersheds "at risk" for IQ loss among children of subsistence fishers in the 99^{th} percentile of fish consumption, considering only exposures attributable to EGU emissions of mercury. *See* Mercury Risk TSD at 85, Tbl. 2-8. The extended risk screening analysis to assess watersheds in which high-fish-consuming subsistence fishers are at risk of fatal heart attacks based on methylmercury exposures attributable to EGU emissions confirms that it is appropriate to regulate EGUs under section 112. And, as discussed below, the percentage of watersheds "at risk" for heart attack deaths is much higher—25%—for low-income Black subsistence fishers in the Southeast, 87 Fed. Reg. at 7643, which further supports EPA's proposed reaffirmation of the finding because of congressional concern with health impacts on sensitive populations and highly exposed individuals.

Monetized benefits

EPA made reasonable methodological choices to monetize the quantified benefits of avoided fatal heart attacks and lost IQ points among the general population that could result from eliminating EGUs' emissions of mercury in 2016. The Agency reasonably assumes a ten-year ecological lag time, producing avoided incidences in 2026 and a corresponding monetized value, discounted to 2016. *See* 2022 Risk TSD at 24-25, 26. We note, however, that "[p]rior to 2011, after signaling from EPA that regulations would be promulgated, 11 states had implemented mercury emissions standards for power plants—thus even some of the pre-2011 reductions in mercury emissions are indirectly attributable to EPA's decision to regulate."[29] Therefore, some of the benefits of regulating EGUs under section 112 could have been accruing before 2026,

[29] Elsie M. Sunderland *et al.*, Mercury Science and the Benefits of Mercury Regulation, at 8 (Dec. 2021), https://www.hsph.harvard.edu/c-change/news/mercury-science-and-the-benefits-of-mercury-regulation/ (White Paper on Mercury Science and the Benefits of Mercury Regulation).

even assuming a 10-year ecological lag and some delay in health benefits from reduced exposures to methylmercury.

In addition, we observe that EPA's monetized benefits are likely underestimates of the value of avoided health impacts because they reflect additional future income (for IQ points), rather than willingness to pay (WTP) to avoid this health effect. 2022 Risk TSD at 25; *id.* at 26. EPA acknowledged in 2011 that its valuation of lost IQ points likely omitted some benefits, such as nonwage/nonsalary earnings (*i.e.*, fringe benefits) and household (nonmarket) production. MATS RIA at 4-64. Presumably, people would be willing to pay to avoid the impacts of lost IQ points on other areas of their lives as well, including personal relationships, recreation, and leisure. Indeed, efforts are underway to quantify the full value of avoided IQ loss.[30] If WTP values had been available for use in the risk screening analyses, those analyses likely would have shown even greater monetized benefits. Setting aside WTP values, even a less complete estimate of the value of preserving IQ points should produce greater benefits than a figure that accounts only for lost earnings, as a shift of society's IQ distribution curve toward the lower end would likely result in additional costs that are not reflected in lost earnings.[31]

Nonetheless, the monetized benefits that EPA has calculated are significant. Avoiding 91 excess deaths from heart attacks, the upper end of the range of benefits noted above, translates to $720 million in 2016 at a 3% discount rate. 2022 Risk TSD at 25, Tbl. 4. Saving 6,000 IQ points leads to economic gains of upwards of $53 million in 2016 at a 3% discount rate for both the future earnings stream and for the ecological time lag. *Id.* at 26, Tbl. 5. These monetized benefits alone would account for nearly half of the actual compliance cost of MATS, according to one retrospective estimate. *See* 87 Fed. Reg. at 7651 (citing a 2015 analysis by Andover Technology Partners that estimated compliance cost of approximately $2 billion per year).

Yet the true benefits of reductions of emissions of HAPs from EGUs are unquestionably orders of magnitude higher, given the unquantified and unmonetized benefits of many health impacts from methylmercury exposure and from all other HAPs. *See id.* at 7646 ("The nature and severity of effects associated with HAP exposure, ranging from lifelong cognitive impairment to cancer to adverse reproductive effects, implies that the economic value of reducing these impacts would be substantial if they were to be quantified completely. By extension, it is reasonable to expect both that reducing HAP-related incidence affecting

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[30] *See* OECD, *The costs and benefits of regulating chemicals*, https://www.oecd.org/environment/costs-benefits-chemicals-regulation.htm; *see also* 87 Fed. Reg. at 7646 ("[F]or many HAP-related health endpoints, the Agency lacks economic data that would support monetizing HAP impacts, such as willingness to pay studies that can be used to estimate the social value of avoided outcomes like heart attacks, IQ loss, and renal or reproductive failure.").

[31] *See* Mercury Benefits Template at 13.

individual endpoints would yield substantial benefits if fully quantified, and moreover that the total societal impact of reducing HAP would be quite large when evaluated across the full range of endpoints."). We reiterate that EPA does not need to weigh the monetized benefits of HAP reductions against monetized costs in its preferred framework for making an "appropriate" determination. Instead, the Agency should place great weight on the health benefits of HAP reductions—both quantified and unquantified—consistent with clear congressional intent to maximize HAP emission reductions and provide an ample margin of safety to protect public health. *See* 42 U.S.C. § 7412(d)(2), (f)(2)(A); *see also* 87 Fed. Reg. at 7646 (discussing legislative history indicating that Congress in 1990 understood that the monetizable benefits of HAP reductions were small compared to monetizable costs and nonetheless required swift, maximal reductions of HAP emissions).

Mercury - refined analysis of health impacts

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.[32] We encourage the Agency to support its own expanded estimates of the benefits of reducing mercury emissions from EGUs by referencing this highly credible, state-of-the-science analysis as an additional source of evidence pointing toward much greater EGU HAP risks—and benefits of regulating those emissions under section 112—than were previously quantified. We recommend that, in future rulemakings, the Agency adopt this refined approach to estimating the benefits of reductions in mercury and other water-mediated air pollutants.

EPA's risk screening analyses examining the impacts of EGU mercury emissions on the general population, while a valid exercise demonstrating the possible scale of certain health impacts that these emissions inflicted before implementation of MATS, represent only one possible approach to quantifying these harmful effects. To evaluate more precisely the reductions in health impacts of mercury emitted by EGUs before and after implementation of MATS,[33] researchers at Harvard University and Syracuse University have conducted a step-by-

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[32] *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 being submitted to this docket by the Emmett Environmental Law & Policy Clinic at Harvard Law School.

[33] This approach to quantifying some of the likely benefits of regulating EGUs under section 112 differs from the approach in EPA's risk screening analyses, which assess the total health impacts of projected EGU emissions of mercury in 2016 without regulation. Comparing health impacts from measured EGU emissions of mercury before implementation of MATS (in 2010) to health impacts from measured EGU emissions of mercury after implementation of MATS (in 2020) presents a useful picture of the reduction in mercury-related health impacts over time that could have been achieved from real-world emission reductions under MATS. Because of this

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 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.[34] 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.[35] 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.[36]

- **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.[37] 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.[38] 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.[39] A more granular analysis of the spatial variability in EGU deposition (examining five regions) was conducted for recreationally caught fish.[40] This approach to measuring exposure to mercury

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difference in approach, however, the results of the Harvard-Syracuse Analysis are not directly comparable to (and would be expected to be less than, all other things being equal) EPA's benefits estimates assuming a full 29 tons of unabated mercury pollution from EGUs in 2016.

[34] Mercury Benefits Template at 4-5 & Fig. 1.

[35] *Id.* at 5.

[36] *Id.*

[37] *Id.* at 7.

[38] *Id.*

[39] *Id.* at 9.

[40] *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,[41] 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,[42] 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.[43] 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.[44]

- **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.[45] 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).[46]

- **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.[47] It then converts the lost IQ points to monetized value by applying an economic valuation of lost IQ points.[48] Further, the analysis observes that monetized benefits associated with preserved IQ points from avoided societal impacts beyond lost earnings would likely be greater.[49]

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[41] Rui Li *et al.*, *Mercury pollution in vegetables, grains and soils from areas surrounding coal-fired 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.
[42] Barbara Gworek *et al.*, *Mercury in the terrestrial environment: a review*, 32 Env't Sci. Europe 128 (2020).
[43] White Paper on Mercury Science and the Benefits of Mercury Regulation at 21.
[44] *Id.*
[45] Mercury Benefits Template at 10-11.
[46] *See id.* at 10-12 & Tbl. 1.
[47] *See id.* at 10.
[48] *Id.* at 13.
[49] *See id.*

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.[50] 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.[51] These results confirm that EPA's assumptions in the risk screening analyses were conservative, and they provide independent support for the conclusion that regulating EGUs under section 112 is appropriate.

Each step of this enhanced analysis of the health impacts of EGU emissions of mercury reflects considerations that Congress plainly assigned to EPA in making the "appropriate" determination:

- **Emissions.** Congress directed EPA to consider the results of a study of the EGU emissions of HAPs before making a finding that regulating EGUs is "appropriate." 42 U.S.C. § 7412(n)(1)(A). Further, the considerations required in the mercury study—which include the rate and mass of mercury emissions from EGUs—are relevant to the finding as well. 42 U.S.C. § 7412(n)(1)(B); *Michigan*, 576 U.S. at 753. The emissions estimates in these studies are not frozen in time, just as the costs of mercury controls also referenced in subparagraph (B) are not. *See Michigan*, 576 U.S. at 750 (noting EPA's 2011 estimate of the costs of complying with MATS at "nearly $10 billion a year"). In a reaffirmation of the finding, it is appropriate for EPA to consider analyses of risk that use the most recent, accurate emissions data.

- **Air quality modeling and deposition.** EPA's understanding of the "hazards to public health reasonably anticipated to occur as a result of" EGU HAP emissions, 42 U.S.C. § 7412(n)(1)(A), benefits greatly from improved air quality modeling and assessments of deposition of EGU HAP emissions in the environment. *See also id.* § 7412(n)(1)(B) (requiring study of "the health and environmental effects of [mercury] emissions," which could mainly be expected to occur through transport, deposition, and biomagnification in the aquatic food web); *see id.* § 7412(n)(1)(C) (requiring study of "a threshold for mercury concentrations in the tissue of fish which may be consumed (including consumption by sensitive populations) without adverse effects to public health"). Congress's concern with protecting the "individual most exposed" to HAP emissions from an individual source, potentially through strengthened regulations or ongoing regulation of the source category, *see id.* § 7412(c)(9)(B)(i); *id.* § 7412(f)(2)(A), also supports the use of up-to-date modeling of the transport and deposition of mercury when

[50] *See id.* at 10, 12 & Tbl. 1.
[51] *See id.* at 13.

EPA is proposing to reaffirm a determination that regulation of EGUs under section 112 is appropriate.

- **Exposure through fish consumption.** The same statutory indicia that favor air quality and deposition modeling of mercury support an analysis that traces increases in mercury in the environment to human exposures—especially for exposure pathways more heavily influenced by EGU emissions, such as consumption of fish caught in U.S. coastal fisheries.

- **Cumulative exposures.** Congress evinced its concern with cumulative exposures to mercury by requiring EPA to study the health effects of mercury emissions from all sources (including area sources that would not be subject to the same maximum achievable emissions limits as major sources, and thus could continue to contribute some background level of mercury even after emissions from major sources had declined to achievable levels). *Id.* § 7412(n)(1)(B). Congress also implicitly directed EPA to consider, in deciding whether to regulate EGUs' emissions of mercury, cumulative exposures from multiple sources in the requirement to study "a threshold for mercury concentrations in the tissue of fish which may be consumed (including consumption by sensitive populations) without adverse effects to public health," *id.* § 7412(n)(1)(C); the potential to reduce concentrations of mercury in fish tissue to that level or below could only be evaluated by considering contributions from all sources of mercury.

- **Cardiovascular impacts.** In making (and reaffirming) the finding that it is appropriate to regulate EGU emissions under section 112, EPA is required to consider "the hazards to public health reasonably anticipated to occur as a result of [those] emissions." *Id.* § 7412(n)(1)(A). This language is broad, without any limitation to a particular type of health impact or any demand for a longstanding consensus in the scientific literature as to the relationship between exposures and health impacts. In contrast to the study required to include a threshold for safe levels of mercury in fish tissue, *id.* § 7412(n)(1)(C), Congress entrusted EPA—not an outside body of experts on health sciences—with the discretion to develop this study and follow the protective approach animating numerous CAA programs, *see, e.g.*, *id.* § 7408(a)(1)(A); *id.* § 7411(b)(1)(A); *id.* § 7412(a)(7); *id.* § 7412(b)(2), (3); *id.* § 7412(r)(3). Such hazards would include risks from intermediary effects such as hypertension that could lead to mortality from cardiovascular disease.

For all these reasons, the approach taken in the enhanced analysis of the health impacts of EGU emissions of mercury is particularly fitting in the context of reaffirming an "appropriate" determination, and EPA should consider its results alongside the results of its risk screening analyses in this rulemaking. These approaches involve different assumptions and uncertainties, and each provides independent support for the finding. The fact that they both identify enormous, previously unquantified risks posed by EGU emissions of mercury—and thus benefits of reducing those emissions—weighs heavily in favor of EPA's proposed reaffirmation.

Mercury - environmental impacts

Qualitative and quantitative assessments of the impacts of EGUs' mercury emissions on the environment illustrate the large potential benefits of reducing these emissions for both human welfare and ecological integrity.

The environmental impacts of EGUs' emissions of HAPs, including mercury, are clearly relevant to EPA's determination whether regulation of these sources is "appropriate." *See* 42 U.S.C. § 7412(f)(2)(A) (requiring EPA to promulgate standards that are necessary, in the Agency's view, to "prevent . . . an adverse environmental effect"); *id.* § 7412(n)(1)(B) (requiring EPA to conduct a study of the "environmental effects" of cumulative mercury emissions from EGUs and other sources). EPA observes that methylmercury is known to harm birds and mammals through fish consumption, resulting in slower growth and development, reduced reproduction, and premature mortality. 87 Fed. Reg. at 7640; *see also id.* at 7666. Recent studies, completed since the 1997 Mercury Study and since EPA's promulgation of MATS, provide additional evidence of the nature and degree of those harms. The impacts extend beyond birds and mammals, to reptiles, amphibians, and fish, among other biota, and they are expected to worsen as temperatures increase in aquatic habitats, forcing predatory fish to consume more prey in order to meet metabolic needs and thereby amplifying biomagnification of methylmercury in the food web.[52]

The harmful effects of mercury on birds and mammals are especially well-established. A 2018 review of the literature on mercury toxicity in birds notes serious physiological effects such as disrupted blood and organ biochemistry and hormone levels, suppression of the immune system, and inhibition of growth, as well as behavioral effects and reproductive impacts.[53] Migratory birds may face special challenges with mercury exposure, such as disruption of navigation, magnetoreception, and flight endurance.[54] Mammals have been shown to suffer harms similar to those experienced by birds, although studies on the reproductive impacts of

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[52] Collin A. Eagles-Smith *et al.*, *Modulators of mercury risk to wildlife and humans in the context of rapid global change*, 47 Ambio 170, 177 (2018).

[53] David Evers, *The Effects of Methylmercury on Wildlife: A Comprehensive Review and Approach for Interpretation*, *in* 5 The Encyclopedia of the Anthropocene 181, 185 (Dominick A. DellaSala & Michael I. Goldstein eds., 2018); *see generally* Margaret C. Whitney & Daniel A. Cristol, *Impacts of Sublethal Mercury Exposure on Birds: A Detailed Review, Reviews of Environmental Contamination and Toxicology*, 244 Revs. of Env't Contamination and Toxicology 113 (2017).

[54] Daniel A. Cristol & David C. Evers, *The impact of mercury on North American songbirds: effects, trends, and predictive factors*, 29 Ecotoxicology 1107, 1113 (2020).

mercury on mammals living in the wild have not been published to date.[55] In turtles, however, elevated mercury concentrations in eggs have been associated with decreased hatching success.[56]

EPA also notes that the detrimental effects of methylmercury on wildlife "can propagate into impacts on human welfare to the extent they influence economies that depend on robust ecosystems (*e.g.*, tourism)." *Id.* at 7641. The tourism industry undoubtedly suffers when populations of charismatic animals decline. Yet other sectors of the economy such as the fishing industry or sportfishing may also see lower yields from the population-level effects of methylmercury on fish species' reproduction and survival.[57] For instance, tissue concentrations of mercury in several species of fish in the Great Lakes region have been found to exceed levels at which significant impacts on reproductive success begin to occur.[58] EPA should consider these significant impacts on human welfare in weighing all the advantages and disadvantages of regulating EGUs under section 112.

The loss of birds, mammals, fish, amphibians, and other organisms from methylmercury exposure likely takes a toll on human welfare that cannot be tied to specific economic metrics. For example, people may value these species and their contributions to ecosystems for their inherent worth or for their roles in providing and sustaining ecosystem services. One way to estimate the scale of those benefits, where willingness to pay to preserve the species is not clear in the economic literature, is by examining the monetary damages imposed in settlements over mercury contamination. These monetary damages represent the cost of restoration that would replace the lost animal individuals through additional new or enhanced habitat. The damages can be large: under a 2017 settlement agreement, DuPont is obligated to pay $42 million for restoration projects that would address the impacts of decades of mercury releases into just one watershed—the South River and South Fork Shenandoah River watershed.[59] Although this example does not necessarily reflect levels of contamination comparable to the amount of mercury that is deposited in ecosystems from EGU emissions,[60] it does offer a sense of the scale of harm that mercury releases can inflict on the environment—and thus human welfare as well.

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[55] Evers, *supra* note 53, at 189.
[56] Brittney C. Hopkins *et al.*, *Mercury exposure is associated with negative effects on turtle reproduction*, 47 Env't Sci. & Tech. 2416 (2013).
[57] *See* Charles T. Driscoll *et al.*, *Mercury as a Global Pollutant: Sources, Pathways, and Effects*, 47 Env't Sci. & Tech. 4967, 4971 (2013).
[58] *See* Biodiversity Rsch. Inst. & New York State Energy & Rsch. Dev. Auth., New York State Mercury Connections: The Extent and Effects of Mercury Pollution in the State, at 8-19 & Tbl. 3 (2019), https://briwildlife.org/wp-content/cache/mendeley-file-cache/ee317226-2b81-3e86-98cc-9601435f32ba.pdf.
[59] Va. Dep't of Nat. & Historic Res., *DuPont NRDAR Settlement* (2017), https://www.naturalresources.virginia.gov/initiatives/dupont-nrdar-settlement/.
[60] To give a sense of the scale of the ecological impacts at the South River site, as compared to the ecological impacts of power plants, it is possible to compare fish-tissue mercury

Moreover, natural communities have distinctive cultural importance to Tribes, Indigenous peoples, and other groups—factors that deserve independent, significant weight in EPA's assessment. As discussed in greater depth in these communities' own comments on previous proposed findings under section 112(n), Tribal communities value species that are vulnerable to mercury exposures for unique cultural reasons that may also affect Tribal community members' health.[61]

HAP metals - health impacts

Recent studies on the health impacts of non-mercury metals that are emitted by EGUs provide a more concrete understanding of the severe health outcomes that may result from several exposure pathways and may disproportionately harm communities of color, Indigenous communities, and low-income communities.

The health risks posed by non-mercury metals emitted by coal-fired power plants are now better understood than they were when EPA made its appropriate and necessary finding in 2000 and reaffirmed it in 2012 and 2016. In those actions, 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

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concentrations at the contaminated site to similar concentrations in watersheds affected by EGU emissions of mercury. An ecological study of the South River site found average concentrations of mercury in the tissue of some species of fish ranging from 0.73 μg/g to 2.94 μg/g, depending on the sampling location. *See* URS Corp., *Final Report: Ecological Study of the South River and a Segment of the South Fork Shenandoah River, Virginia* at 66 (Sept. 28, 2012), https://southriverscienceteam.org/wp-content/uploads/2018/08/SR_EcoStudy_Final_Report_REV-01-08102018-complete.pdf. EPA in 2011 estimated that EGU emissions of mercury were responsible for 0.008 ppm (= μg/g) of mercury in fish tissue across all sampled watersheds. *See* Mercury Risk TSD at 73. The concentration of fish tissue attributable to EGUs is thus much lower than the concentrations observed at the South River site, and it would not be reasonable to expect similar wildlife restoration costs deriving from EGU mercury emissions in every watershed affected by those emissions. Nonetheless, even if the true restoration costs from EGU emissions are a small fraction of those ultimately agreed upon in this settlement, the sheer number of watersheds affected indicates that ecological damages from EGU emissions of mercury are sizable.

[61] National Congress of American Indians *et al.*, Comments on Environmental Protection Agency Docket No. EPA-HQ-OAR-2009-0234 – "Supplemental Finding That It Is Appropriate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generated Units," EPA-HQ-OAR-2009-0234-20537 (submitted Jan. 15, 2016) (attached to these comments); *see also* Joanna Burger & Michael Gochfeld, *Conceptual Environmental Justice Model for Evaluating Pathways of Exposure in Low-Income, Minority, Native American, and Other Unique Exposure Populations*, 101 Am. J. Pub. Health S64 (2011) (describing unique pathways of exposure such as sweat baths, medicinal uses, and other Native American cultural practices).

risks, of the metals that it did consider, or of mixtures of metals.[62] Specifically, EPA did not examine the risks of the full set of metals emitted by coal-fired EGUs;[63] did not consider the chemical toxicity of certain radioisotopes;[64] did not investigate the risks of specific compounds of arsenic;[65] and lacked scientific information that is now emerging on the risks posed by exposures to multiple metals.[66] New findings on the health hazards posed by metals individually and in combination, as summarized below, provide critical support for EPA's appropriate and necessary finding because coal-fired EGUs were responsible for large proportions of total domestic anthropogenic emissions of these metals before EPA promulgated MATS.[67]

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. [68] 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.[69] Uranium or vanadium in solution increases vascular contraction and decreases vascular relaxation, thereby increasing the likelihood of hypertension.[70]

Specific compounds of arsenic are now associated with potentially severe health impacts.[71] For instance, 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.[72] 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

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[62] *See* Raina M. Maier, Johnnye Lewis, Priyanka Kushwaha, Thomas A. De Pree, & Debra A. MacKenzie, National Institute of Environmental 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 10-11 (Mar. 2022) (Metals Toxicity Review).
[63] *Id.* at 10.
[64] *Id.* at 10-11.
[65] *Id.* at 11.
[66] *Id.* at 10.
[67] *See id.* at 15 & Tbl. 3.
[68] *See id.* at 31.
[69] *See id.* at 31-32.
[70] *See id.* at 32.
[71] *Id.* at 11.
[72] *Id.* at 30-31.

and function, dermal effects, gastrointestinal effects, anemia, peripheral neuropathy, and liver and kidney damage.[73]

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 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.[74] 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).[75] 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.[76] 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.[77] 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.[78]

Beyond exposures to single metals and their compounds, several studies published after EPA reaffirmed the appropriate and necessary finding in 2012—and indeed, since EPA again reaffirmed the finding in 2016 and conducted its risk review in 2018—reveal 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."[79]

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[73] *Id.* at 29.
[74] 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).
[75] 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).
[76] 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).
[77] 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).
[78] Karen Clay *et al.*, *Toxic Truth: Lead and Fertility*, 8 J. Ass'n Env't & Res. Economists 975, 976, 993 (2021).
[79] Metals Toxicity Review at 10.

Evidence suggests that metals mixtures may increase the risk of hypertension, immune dysfunction and autoimmunity, preterm birth, oxidative stress, and retention of DNA damage.[80] 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 metals.[81] 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.[82] 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. *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).

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."[83] 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.[84] Risks from ingestion of arsenic may be more pronounced for children, who have higher soil contact and thus more exposure through this pathway.[85] 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.[86] 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-

[80] *Id.* at 34-36.
[81] *Id.* at 22-23 & Tbl. 7.
[82] *Id.* at 33-34.
[83] *Id.* at 16; *see also id.* at 25; *id.* at 36-37.
[84] *See id.* at 29-30.
[85] *Id.* at 30.
[86] *Id.* at 36-37.

located, frequently exist in proximity to Indigenous communities," potentially leading to cumulative impacts.[87]

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 portions of plants and soil concentrations for most of the vegetable families examined.[88] 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.[89] 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.[90] EPA should weigh the cumulative health risks of exposures to HAP metals and mixtures of metals from multiple sources and multiple exposure pathways in reaffirming the finding that it is appropriate to regulate HAP emissions from EGUs under section 112. *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)(B) (requiring EPA to study the health and environmental impacts of mercury from *all sources*); *id.* § 7412(n)(1)(C) (requiring a study to determine a threshold level of mercury exposure below which health impacts would not be expected to occur, including exposure through fish consumption as *one* likely pathway).

Acid gases - health impacts

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.[91] 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;[92] pulmonary injury from exposure to

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[87] *Id.* at 26-27.
[88] 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).
[89] 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).
[90] *Id.* §§ 4.3, 4.4.
[91] 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).
[92] *Id.* ¶¶ 12-13.

hydrogen fluoride;[93] and lethality from acute exposures to hydrogen cyanide.[94] Below, we discuss two additional articles presenting recent findings on of 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.[95] 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.[96] EPA should consider these findings—including the potential for the ongoing COVID-19 pandemic and future epidemics to exacerbate the health impacts of exposure to acid gases—in making the determination whether it is "appropriate" to regulate emissions of chlorine gas and other HAPs from coal- and oil-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.[97] The authors conclude that their "initial data support the further investigation for HCl toxicity in children and the development of potential countermeasures."[98] These findings are relevant to the statutory direction to protect sensitive populations from HAP exposures, *see* 42 U.S.C. § 7412(n)(1)(C), and EPA should give special weight to evidence of more-severe health effects from children's exposure to HCl.

<u>Unexpected reductions in EGU HAP emissions</u>

Dramatic, unexpected declines in HAP emissions have resulted in greater reductions in HAP risks than EPA anticipated in 2011. The most recent data suggest that EGU HAP emissions have declined even more following implementation of MATS than EPA projected in 2011. 87 Fed. Reg. at 7632.[99] To the extent that these reductions are attributable to MATS, the

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[93] *Id.* ¶¶ 16-17.
[94] *Id.* ¶¶ 18-19.
[95] 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).
[96] *Id.*
[97] 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).
[98] *Id.*
[99] *Compare* 84 Fed. Reg. at 2689, Tbl. 4 (showing emissions of 4 tons of mercury from MATS EGUs in 2017), *with* MATS RIA at 3-10, Tbl. 3-4 (showing projected emissions of 6.6 tons of mercury from MATS EGUs in 2015). *Compare* EPA, Residual Risk Assessment for the Coal- and Oil-Fired EGU Source Category in Support of the 2019 Risk and Technology Review

rule's reduction of risks over time from exposure to EGU HAPs has proven to be greater than would have been expected in 2011, including through quantifiable reductions in neurological and cardiovascular impacts from methylmercury exposures.[100]

Environmental justice impacts of EGU HAP emissions

EPA must continue to give significant weight to the benefits of regulating EGUs under section 112 specifically for communities of color, Indigenous communities, and low-income communities. *See* 87 Fed. Reg. at 7646-47 (citing Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994); Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021)). 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." Exec. Order No. 12,898, § 1-101, 59 Fed. Reg. at 7629. 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, discussed below.

First, EPA must continue to regulate sources based on risk, and evaluate residual cancer risk remaining after the imposition of MATS, to the "individual in the population who is most exposed to emissions of [carcinogenic HAPs] from the source." 42 U.S.C. § 7412(c)(9)(B)(i); *see id.* § 7412(f)(2)(A). Although these provisions are phrased in terms of the risks from the emissions of a single source within the source category, it is impossible to understand the danger posed by a source's HAP emissions without also considering background exposures to toxic pollutants affecting the same health outcomes. It is well established that communities of color and economically disadvantaged communities frequently are home to the individuals most exposed to toxic emissions from various industrial sources.[101] Given the statutory goal of reducing the risks posed by regulated sources' emissions to these individuals, it is especially appropriate to regulate EGUs under section 112 because communities of color and low-income communities have historically comprised a significant share of the population living near EGUs, and of populations otherwise highly exposed to risks from EGUs' emissions of HAPs.

Proposed Rule, at 38, Tbl. 3.1-1 (Dec. 2018) (showing emissions of 2,797 tons of HCl from MATS EGUs in 2017), *with* MATS RIA at 3-10, Tbl. 3-4 (showing projected emissions of 5,500 tons HCl from MATS EGUs in 2015).

[100] *See* Mercury Benefits Template at 12 & Tbl. 1 (showing a drop in the annual incidence of cardiovascular disease mortality attributable to EGU mercury emissions from 204 in 2010 to 58 in 2020); *id.* at 10 (noting a drop in the annual number of lost IQ points attributable to EGU mercury emissions from 2,600 in 2010 to 700 in 2020).

[101] *See* Emma Rutkowski, Alfredo Rivera & Eric G. O'Rear, Justice40 Initiative: Mapping Race and Ethnicity (Feb. 2022), https://rhg.com/research/justice40-initiative-mapping-race-and-ethnicity/.

Furthermore, certain 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.[102]

Along these lines, new information from EPA's extension of the 2011 Mercury Risk Assessment shows that a disproportionately high percentage of watersheds used by low-income Black subsistence fishers in the Southeast—25%—put fishers "at risk" for heart attack deaths based on methylmercury exposures attributable to EGU emissions. 87 Fed. Reg. at 7643; *id.* at 7647. EPA notes that the hair-mercury levels for low-income Black subsistence fishers active in the 99th percentile of watersheds contaminated by methylmercury attributable to EGU emissions, based on the 95th percentile of fish consumption rates, is more than three times larger than the comparable value for all other groups, except for Laotian-American subsistence fishers. *See* 2022 Risk TSD at 20-21. Although the survey examining fish consumption levels among low-income Black fishers in the Southeast has a small sample size and thus is subject to uncertainty, EPA notes that the more important finding is that fish-tissue concentrations in the Southeast and particularly in South Carolina are much higher than in other regions, which would suggest disproportionate impacts on subsistence fishers in this population regardless of any outlier effect on fish-consumption levels from the small sample size. *Id.* at 21. EPA also observes 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 active in those areas, such as low-income Whites and Blacks in the Southeast. *Id.* at 23. The extended risk assessment provides a useful bounding exercise, and reasonable assumptions about high levels of fish consumption among a number of demographic groups—combined with modeled levels of fish-tissue methylmercury attributable to EGU emissions—indicate disproportionate risk. These conclusions support EPA's reaffirmation of the finding that it is appropriate to regulate EGUs under section 112.

A second statutory indication that EPA's determination whether it is "appropriate" to regulate EGUs under section 112 must take into account environmental justice impacts appears in 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. Congress does not define the term "sensitive populations," but it would be 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. It would also be 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

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[102] *See* Mercury Benefits Template at 13-14 & Fig. 8.

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.[103]

With this understanding, it is important to consider 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.[104] As noted, the Navajo Nation experiences 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.[105] Further, zinc deficiencies may have an additive effect on oxidative stress and inflammation response, which calls for consideration of nutritional deficits among some groups when evaluating the impacts of EGU HAP emissions.[106] It would be proper for EPA to take these compounding effects into account when affirming a finding that it is "appropriate" to regulate EGUs under section 112, in light of the evidence of congressional concern for sensitive populations.

As another example of cumulative exposures, 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. In marginalized communities such as those classified as "environmental justice" communities by EPA, the potential risks of legacy and ongoing pollution lead to disproportionate risk for vulnerable populations. For example, the Appalachian Mountain Club is working with schools and community partners in Lowell and Lawrence, Massachusetts, two such communities. The U.S. Census counts more than two dozen languages spoken by residents of Lowell; the local high school estimates that twice that number are spoken by families at home. An immigrant-rich city, Lawrence is a textbook environmental justice community—the majority of residents (82%) are people of color, with over 40% being foreign-born. English is a second language in 76% of Lawrence households. Median per-capita income in Lowell and Lawrence is lower, and economic poverty is higher, than the regional and national averages. Decades of atmospheric pollution in the northeastern U.S. (including from the formerly coal-fired Merrimack Station, located 40 miles upstream of Lowell on the Merrimack) combined with the legacy of point-source pollution from industries in the watershed, have led to widespread fish consumption

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[103] *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).
[104] Metals Toxicity Review at 11.
[105] *Id.* at 22-23 & Tbl. 7; *id.* at 32-34.
[106] *See id.* at 30-31.

advisories. Data from fish sampling by the Commonwealth of Massachusetts[107] and sampling in the watershed as part of the national-scale Dragonfly Mercury Project[108] have documented concentrations of mercury in biota in this watershed that are high or severe enough to warrant fish consumption advisories for humans and that are of concern for wildlife.

Urban rivers are often important food sources for lower-income urban populations; thus, urban anglers are at higher risk of exposure to contaminants via fish consumption,[109] 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.

Finally, EPA observes 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. *See* 87 Fed. Reg. at 7646. This altruistic benefit "is particularly important as exposure to HAP is often disproportionately borne by underserved and underrepresented communities." *Id.* Crucially, the study that EPA cites for the finding that focus group participants prefer equality in health risks over equality in income also finds that respondents were willing to accept *greater additional risk overall* in exchange for equality, revealing the worth of improvements in equality.[110] 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. Thus, those improvements would serve congressional purposes under section 112 and would therefore be important to consider in determining whether it is appropriate to regulate EGUs under this provision.

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[107] Commonwealth of Massachusetts, *Mercury Studies and Reports*, https://www.mass.gov/lists/massachusetts-mercury-research-data#mercury-studies-&-reports- (last visited Apr. 7, 2022).

[108] Collin A. Eagles-Smith *et al.*, *A National-Scale Assessment of Mercury Bioaccumulation in United States National Parks Using Dragonfly Larvae As Biosentinels Through a Citizen-Science Framework,* 54 Env't Sci. & Tech. 8779 (2020). With partners at Dartmouth College and coordination with the Dragonfly Mercury Project (DMP), a national-scale mercury biosentinel program, the Merrimack River project has affirmed these findings, and has engaged over 100 youth and community members through schools and partners in the active participation and sampling of mercury biosentinels (dragonfly larvae), and in spreading awareness of the corresponding issues with mercury fish consumption risk in the Lowell and Lawrence communities.

[109] T. Bruce Lauber *et al.*, *Urban anglers' adherence to fish consumption advisories in the Great Lakes region*, 43 J. Great Lakes Rsch. 180 (2017).

[110] *See* Maureen Cropper *et al.*, *Preferences for Equality in Environmental Outcomes* 32 (Nat'l Bureau of Econ. Rsch., Working Paper No. 22644, 2016).

Non-HAP benefits of reductions in EGU HAP emissions

The significant benefits of reducing non-HAP air pollutants further, through control of HAPs, support EPA's "appropriate" finding, particularly in light of recent studies more closely linking 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.

In summarizing the benefits from $PM_{2.5}$ and ozone reductions achieved under MATS, EPA observes 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, non-fatal 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." 87 Fed. Reg. at 7699. We note that the Agency, in the 2019 Integrated Science Assessment for Particulate Matter cited in the 2022 Proposal, 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.[111] 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.[112]

New research also indicates that $PM_{2.5}$ exposures from coal-fired power plants disproportionately harm Black populations.[113] 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. MATS RIA at 7-37 to 7-38. 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 decline.[114] 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 the inequities. EPA should consider this advantage of regulating EGUs under section 112 in reaffirming the finding.

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[111] *See* EPA, Integrated Science Assessment for Particulate Matter, at ES-10, Tbl. ES-1 (Dec. 2019); *id.* at ES-15.
[112] *See* EPA, Integrated Science Assessment for Ozone, at ES-6, Tbl. ES-1 (Apr. 2020); *id.* at ES-8.
[113] *See* Christopher W. Tessum *et al.*, *$PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States*, 7 Sci. Advances, 2021, at 1-2.
[114] *See* Abdulrahman Jbaily *et al.*, *Inequalities in air pollution exposure are increasing in the United States* 6 (Jul. 15, 2020) (preprint manuscript) (on file with medRxiv).

Visibility benefits of $PM_{2.5}$ reductions under the interim policy scenario,[115] which EPA estimated at $1.1 billion in 2011, were not included in the final benefits estimate because EPA did not model air quality changes for the final policy. MATS RIA at 5-93. In the MATS RIA, EPA projected that MATS would reduce SO_2 by about 1.3 million tons from the power sector in 2015, from 3.4 million tons to 2.1 million tons. *Id.* at 3-10, Tbl. 3-4; *id.* at 5-15. In actuality, power plants emitted about 2 million tons of SO_2 in 2016, the year of full implementation of MATS.[116]

In 2011, EPA also properly applied the social cost of carbon (SCC) when estimating the climate benefits of CO_2 reductions under MATS. *Id.* at 5-88 to 5-92. Using an SCC value of $24.3 per metric ton of CO_2 under a three percent discount rate, as developed by the Interagency Working Group and published in 2010, EPA estimated that the benefits of CO_2 emission reductions in 2016 were $360 million. *Id.* at 5-89 to 5-90 & Tbl. 5-16; *id.* at 5-91, Tbl. 5-17. These benefits are advantages of regulating EGUs under section 112 that EPA appropriately weighed when making an appropriate and necessary determination under section 112(n). *See Michigan*, 576 U.S. at 752 ("'[A]ppropriate' is 'the classic broad and all-encompassing term that naturally and traditionally includes consideration of all the relevant factors.'") (citation omitted). Nonetheless, they accounted for a small portion of the monetized benefits in 2011, and EPA's determination that the advantages of regulating EGUs under section 112 outweighed the disadvantages would not change even disregarding the benefits of reducing CO_2 emissions.

The substantial health and welfare benefits of reducing $PM_{2.5}$, ozone, and CO_2 under MATS should be weighed as part of EPA's preferred approach to considering all the advantages and disadvantages of regulating EGUs under section 112. *See* 87 Fed. Reg. at 7668-69 (soliciting comment on this issue). Ultimately, however, even setting aside these non-HAP benefits (including the climate benefits), EPA is correct that regulation of EGUs under section 112 is appropriate, in light of the HAP benefits discussed above. *See id*. ("[W]hile we conclude that the benefits associated with regulating HAP alone outweigh the costs without consideration of non-HAP benefits, we also propose that, to the extent we consider benefits attributable to

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[115] Projected reductions of SO_2 under MATS as proposed (the "interim policy scenario") were greater than projected reductions of SO_2 under MATS as finalized (the final policy scenario). *Compare* EPA, Regulatory Impact Analysis of the Proposed Toxics Rule: Final Report, at 3-25, Tbl. 3-12 (Mar. 2011) (showing about 2.4 million tons of SO_2 reduced from all EGUs in 2016), *with* MATS RIA at 3-10, Tbl. 3-4 (Dec. 2011) (showing about 1.3 million tons of SO_2 reduced from all EGUs in 2015). EPA used emission reductions from the interim policy scenario for purposes of air quality modeling, and thus to calculate visibility benefits of the proposed rule. MATS RIA at 5-93. EPA did not rerun the air quality model for the final rule and so could not calculate a comparable value reflecting visibility benefits of the final rule. *Id.*; *see also id.* at 5-13.

[116] EIA, *Emissions by plant and by region* (Nov. 1, 2021), https://www.eia.gov/electricity/data/emissions/.

reductions in co-emitted pollutants as a concomitant advantage, these benefits act to confirm that regulation is appropriate under a totality-of-the-circumstances approach.").

2. The costs of regulating EGUs under section 112 were well documented when EPA promulgated MATS and have proven to be lower than expected, and they are far outweighed by the public health and environmental benefits of regulating EGUs under section 112.

The 2011 RIA described in detail the costs of the standards, reasonably considering all of the projected costs.

EPA's reported compliance costs in the 2011 RIA appropriately included all of the projected costs of meeting the standards based on modeling of the power sector's responses to the rule. MATS RIA at 3-13. The Integrated Planning Model (IPM) solves for the least-cost responses to achieve the standards, taking into account "amortized cost of capital investment . . . and the ongoing costs of operating additional pollution controls, investments in new generating sources, shifts between or amongst various fuels, and other actions associated with compliance." *Id.* This accounting of compliance costs provides a robust and expansive assessment of costs as it considers not just expenditures incurred by EGUs directly regulated by MATS but rather represents the incremental costs to the entire power sector to generate electricity with MATS in place. *See* 87 Fed. Reg. at 7649. It also parallels EPA's methodology for calculating emissions reductions, *see* MATS RIA at 3-10, and therefore provides consistency in evaluating the economic costs and emission-reduction opportunities of regulation.

Using this approach, EPA in the 2011 MATS RIA estimated compliance costs at $9.6 billion. This figure, however, is overinclusive of or overestimates costs in several ways. To arrive at total costs, EPA forced oil units in the model to continue burning oil at historical rates—and controlling their HAP emissions through various means—then added this cost to the projected, system costs from IPM. *See* MATS RIA at 3-30 to 3-31. This approach may reflect a valid assumption that uneconomic oil units would continue to operate post-MATS implementation; however, it does not account for the fact that some of the changes that occur in the modeled IPM scenario would not be needed if oil units complied through other means. Otherwise put, EPA's treatment of oil-fired units double-counts compliance costs for up to 23 units, or 6,690 MW of capacity. Furthermore, to model compliance with the PM standard (as a surrogate for non-mercury metal HAPs), EPA assumed that some units would need to retrofit with fabric filters or upgrade their electrostatic precipitators (ESPs). The model did not capture potentially lower cost abatement options, which real-world compliance data has shown exist. *See id.* at 3-32. EPA acknowledges that it did not anticipate advances that led to lower ultimate compliance costs such as alternative compliance techniques (*e.g.*, some units assumed to install fabric filters could have instead upgraded their ESPs) and declines in the costs of controls. *See* *id.* at 3-32 to 3-33. All of these assumptions are conservative and would have led to overestimates of compliance costs in 2011.

> *New information indicates that the estimated compliance costs that EPA projected in 2011 far exceeded actual compliance costs, which the power sector absorbed without any reliability issues.*

The Supreme Court has recognized that "[i]t will be up to the Agency to decide (as always, within the limits of reasonable interpretation) how to account for cost." *Michigan*, 576 U.S. at 759. We agree with EPA's expert judgment that it would be exceedingly difficult to construct a retrospective, counterfactual scenario in which MATS does not apply, which could establish a baseline by which to determine the actual incremental costs of the rule to the power sector. *See* 87 Fed. Reg. at 7650-51. Such precision is neither required by the statute nor could have been expected by Congress, when the prospective modeling of regulatory scenarios and the baseline expenditures for the industry were themselves subject to significant assumptions and uncertainties. Those uncertainties have diminished with hindsight, and we support EPA's reliance on several *post hoc* analyses that indicate that the *ex ante* estimates of compliance costs were several times higher than the costs that the industry actually incurred. *See id.* at 7651. We have discussed these studies in previous comments on previous iterations of the finding, and we specifically refer to those discussions here.[117]

We note that an additional *ex post* analysis from 2019 cited therein suggests that the capacities on which controls were actually installed following MATS are even lower than EPA's estimates in the present rulemaking.[118] As EPA notes in the 2022 Cost TSD, EPA's current analysis may overestimate the amount of fabric filter installations between 2013 and 2016, since the database the Agency relied on includes fabric filters that were planned by the end of 2016 but could have been brought online after 2016. *See* 2022 Cost TSD at 8 n.4. In addition, EPA notes

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[117] *See* 2019 NGO Comments at 77-78; Comments of Public Health and Environmental Groups on U.S. EPA's "Proposed Supplemental Finding That It Is Appropriate and Necessary to Regulate Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units," 80 Fed. Reg. 75,025, EPA-HQ-OAR-2009-0234-20558, at 19-21 (Dec. 1, 2015) (submitted Jan. 15, 2016) (attached to these comments).

[118] *Compare* 2019 NGO Comments at 77 (citing a report based on data from EPA's Clean Air Markets database indicating installations of 22 GW of fabric filters, 14 GW of dry sorbent injection (DSI), and 14 GW of scrubbers from 2010 to 2017), *and* Ranajit Sahu, Review of EPA Compliance Data: Estimated Capital Costs for MATS Compliance - Acid Gas and Non-Mercury Metals (Apr. 2019), *with* 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 7, Tbl. A-1 (indicating installations of 31.4 GW of fabric filters, 15.8 GW of DSI, and 18 GW of scrubbers from 2013 to 2016) (2022 Cost TSD).

that observed installations of controls in the Agency's current analysis could have been driven by other regulatory requirements outside of MATS, which would also result in an overestimate of costs to comply with MATS. *See id.* at 8. In contrast, the 2019 analysis removed controls that were clearly attributable to other regulatory drivers. It also corrected for mischaracterized installations of certain controls based on a close review of operating permits. For instance, some plant operators categorized dry sorbent injection systems as scrubbers, leading to an overestimate of newly installed scrubbers. Thus, in some respects, the 2019 analysis likely presents more-accurate estimates of the scale of the pollution controls installed following MATS than those estimates in the 2022 Cost TSD. And, unlike the 2022 Cost TSD, the 2019 analysis accounts for some of the effects of other regulations. While the analyses are based on different datasets and are not directly comparable, both serve to confirm the finding that post-MATS installations of pollution controls were much lower than EPA anticipated in 2011.

Regarding EPA's new retrospective analysis of the costs of MATS, presented in the notice, 87 Fed. Reg. at 7651-56, and in the 2022 Cost TSD, we generally support the approach and offer two additional observations below.

First, EPA notes that lower natural gas prices in the early years of MATS implementation likely drove closures of covered units independently of any MATS compliance obligations. This reduced compliance costs with respect to those units projected to install pollution controls. *See* 87 Fed. Reg. at 7653. Furthermore, lower natural gas prices reduced the compliance costs as fewer units retired as a direct result of the rule (*i.e.*, lower natural gas prices removed them from the fleet independently) and since the cost of replacement generation was cheaper for units that did retire as a direct result of the rule (*i.e.*, cheaper gas-fired generation was available than in the model). *See* MATS RIA at 3-16 & Tbl. 3-6 (showing 25 fewer TWh of coal generation and 22 more TWh of natural gas generation in 2015 under the MATS scenario compared to the base case); *id.* at 3-19, Tbl. 3-8 (showing that about 1.6% of coal capacity retires under the MATS scenario).

Similarly, lower costs of renewable energy resources than EPA assumed in 2011 led to lower compliance costs. This is in part due to the extensions of federal tax incentives for wind and solar that were finalized after 2011. As with cheaper natural gas, lower-cost renewables likely independently displaced some MATS-covered units, thus reducing the scale of pollution controls needed to comply with the rule and the amount of retirements directly attributable to the rule. These lower-cost renewables also reduced the cost of alternative generation when units did retire because of MATS. *See* 2022 Cost TSD at 3.[119]

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[119] *Compare* EPA, Documentation for EPA Base Case v.4.10 Using the Integrated Planning Model at 8-2 (Aug. 2010) (discussing updates to the assumptions about the production tax credit (PTC) and investment tax credit (ITC) for IPM modeling ending with the American Recovery and Reinvestment Act of 2009), *with* Congressional Research Service, The Energy Credit or

Thus, the costs of any shifts in generation away from coal-fired units were lower than those included in EPA's 2011 RIA.

Second, EPA notes that emissions controls had better performance or lower capital costs than the Agency assumed in the 2011 modeling. This resulted in significant overestimates of the projected costs, compared to real-world costs. 87 Fed. Reg. at 7655. Specifically, the Agency points to the fact that EGUs needed less sorbent in DSI or incurred lower-than-expected capital costs of ESPs to comply with the rule. *Id.* Along these lines, we note the following developments in control technologies and/or techniques identified in two recent reports by Andover Technology Partners, attached to these comments[120]:

- Activated carbon injection (ACI) for mercury removal has benefited from advanced, third-generation carbons that have improved porosity and surface chemistry designed to perform in conditions with other pollutants and lower treatment rates. At the same time, the costs of these compounds have declined significantly.[121] These next-generation carbons allow for lower treatment rates needed to achieve the same mercury capture percentage and improve fly ash marketability.[122] Both of these improvements would lower the costs of control.

- Excellent performance of PM control configurations such as ESPs suggests that maintenance and better operation of existing controls have improved their efficiency at capturing mercury and non-mercury metal HAP emissions, lowering compliance costs.[123] Similarly, improved maintenance and better management of bag cleaning has enhanced the performance of fabric filters and likely avoided bag replacements over time.[124]

- Wet flue gas desulfurization (FGD) systems have removed acid gases more efficiently by balancing and improving flow through the absorption vessel, improving liquid/gas contact through enhanced absorber spray patterns, and adopting engineering that reflects

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Energy Investment Tax Credit (ITC) at 2 (Apr. 2021) (discussing subsequent extensions of the ITC for solar relevant to the MATS compliance timeframe), *and* Congressional Research Service, The Renewable Electricity Production Tax Credit: In Brief at 5-6 (Apr. 2020) (same for the PTC for wind).

[120] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants (Aug. 2021); Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants (Apr. 2022).

[121] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, at 51.

[122] *Id.* at 52-53.

[123] *See id.* at 42.

[124] *See id.* at 6, 28.

computational fluid dynamics allowing for better capture of pollutants.[125] Emissions of acid gases specifically associated with already installed wet FGD systems decreased overall between 2011 and 2019.[126] Costs of upgrading wet FGD systems, estimated at $38/kW, are well below the $100/kW that EPA assumed in its 2011 modeling.[127] Additionally, since 2011, industry has developed catalysts for use in other pollution controls that are more efficient at mercury oxidation and therefore improve capture of mercury by wet FGD systems.[128]

- Dry FGD systems have removed acid gases more efficiently 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.[129] Emissions of acid gases specifically associated with already installed dry FGD systems decreased overall between 2011 and 2019.[130] Costs of upgrading dry FGD systems, estimated to be as low as $17/kW, are well below the $100/kW that EPA assumed in its 2011 modeling.[131] 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.[132] Halogen injections have improved mercury capture as well.[133]

- DSI systems now need less reagent or sorbent to achieve the same levels of acid-gas reduction, partly because of advances in reagents and advances in equipment and design of injectors that improve performance by better dispersing the reagent.[134] Costs are lower than anticipated because fabric filters are not always needed.[135]

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[125] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants, at 16-20.
[126] *Id*. at 13-16 & Figs. 7, 9.
[127] *Id.* at 22; 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).
[128] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants, at 47-48.
[129] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 23, 30.
[130] *Id.* at 27-29 & Figs. 16, 18.
[131] *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).
[132] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 23.
[133] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 49.
[134] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 38-40.
[135] *See id.* at 38.

These improvements in controls have resulted in lower operating or capital costs compared to the costs that EPA assumed in its 2011 projections. Therefore, they indicate further overestimates in the costs of compliance associated with units that deployed controls to continue operating after the implementation of MATS.

Finally, we support EPA's approach of placing compliance costs in context by comparing them to power sector sales and annual expenditures and by assessing impacts on retail electricity prices, and we agree that it is a fitting way to evaluate costs under section 112(n)(1)(A), for the reasons discussed above. *See* 87 Fed. Reg. at 7657-58. We reiterate here that compliance costs were likely lower than EPA projected in 2011 not only because market factors (including lower natural gas prices and renewable energy costs) drove many retirements (rather than MATS), eliminating compliance costs associated with installing controls or finding replacement generation, but also because these trends reduced the costs of replacement generation needed due to compliance with the rule. Lower costs of controls and less of a need for additional controls to meet the standards, discussed above, have also improved the industry-level comparisons.

III. EPA'S BENEFIT-COST ANALYSIS APPROACH AND THE RESULTING CONCLUSION THAT IT IS "APPROPRIATE" TO REGULATE EGUs UNDER SECTION 112 ARE CONSISTENT WITH THE STATUTE AND ARE AMPLY SUPPORTED BY RECORD EVIDENCE.

A. EPA's alternative benefit-cost analysis approach to determining whether it is "appropriate" to regulate EGUs under section 112 comports with the statute and sound economic principles.

In addition to its preferred totality-of-the-circumstances approach in the 2022 Proposal, EPA also alternatively performed a BCA following standard practices. EPA requested comment "on whether a BCA, on its own, is an appropriate tool to make a determination of whether to regulate under CAA section 112(n)(1)(A), given that it may not meaningfully capture all the societal interests the statute intends the EPA to consider." 87 Fed. Reg. at 7671.

A formal BCA can be a useful tool to inform EPA and the public about the overall societal costs and benefits of a regulation. As EPA recognizes, there are a number of important, statutorily relevant benefits that could not be captured in the bottom line (*i.e.*, the net dollar figure of costs and benefits) of a BCA performed at this time, including distributional effects and benefits that cannot be precisely monetized. For that reason, reliance on the net benefits figure from a BCA alone, which would exclude all consideration of unquantified and unmonetized benefits (tantamount to the approach used for the 2020 Final Action, which essentially ignored unquantified benefits) is not an appropriate way to determine whether to regulate HAPs from EGUs. However, an analysis, whether a BCA or EPA's preferred totality-of-the-circumstances approach, that does give due weight to all unquantified and unmonetized benefits would be an appropriate way to make the "appropriate and necessary" determination. Furthermore, to the extent that certain statutory factors, such as protection of sensitive populations and highly exposed individuals, are not amenable to consideration as part of a BCA, a BCA may nonetheless provide a sufficient basis for an "appropriate and necessary" determination where the outcome of that test would serve those statutory goals (*i.e.*, where BCA indicates that regulation is appropriate).

Importantly, the BCA approach included in the 2022 Proposal, unlike the approach in the 2020 Final Action, follows the Office of Management and Budget guidance, which directs agencies to count both direct and indirect benefits. EPA was correct to include in its BCA all of the monetizable benefits of regulation, including those that accrue from reduction of non-HAP emissions due to the installation of HAP controls required by MATS.

1. <u>EPA's alternative cost-benefit approach is permissible, so long as EPA's analysis comports with the legislative scheme inherent in section 112.</u>

Section 112(n)(1)(A)'s broad language—whether "regulation is appropriate"—gives EPA substantial latitude in selecting its method of assessing costs. *Michigan*, 576 U.S. at 759. For the reasons noted in Part II.A.1, *supra*, the 2022 Proposal's preferred approach reflects the best reading of the statute. But the formal cost-benefit analysis provided as EPA's alternative rationale, 87 Fed. Reg. at 7669, remains statutorily permissible, so long as EPA conducts that analysis in a manner that adheres to section 112's central objectives and structure. *See Teva Pharms. v. Sebelius*, 595 F.3d 1303, 1315 (D.C. Cir. 2010) (*Chevron* permits agencies to adopt plausible readings of statutory text, so long as interpretation is consistent with statutory structure).

Such adherence, first, requires acknowledging and giving weight to the immense non-monetizable benefits of regulation—especially the reductions in public health hazards produced by reductions of mercury and other HAPs that are not captured in the 2011 RIA's dollar figures. *See* 87 Fed. Reg. at 7670 (noting that "the analytical framework for the appropriate and necessary determination should first and foremost be one that is focused on 'Congress' particular concern about risks associated with HAP'" (citation omitted)). Even if it pursues a quantitative approach, EPA cannot entirely ignore substantial and extant benefits merely because it lacks the tools to rigorously quantify them and determine their dollar value. Second, the legislative plan requires that EPA address the impact of regulation on the distributive goals embedded in section 112's text, *e.g.*, 42 U.S.C. § 7412(f)(2) (requiring attention to those "most exposed to emissions").

Third, however EPA chooses to translate the benefits of regulation into a dollar sum, it cannot contradict Congress's statutory determination that protecting vulnerable and highly exposed populations from the harms of exposure to mercury and other air toxics is a worthwhile enterprise. Section 112's text, structure, and context reveal the value Congress placed on protecting the public from toxic emissions. EPA cannot use its own benefit calculation to assign small or *de minimis* value to the HAP reductions that are section 112's central aim. *See Genus Med. Techs. v. FDA*, 994 F.3d 631, 641 (D.C. Cir. 2021) ("It would make little sense . . . for Congress to create such elaborate regulatory regimes…only for [the agency] to possess the authority to upend the statutory scheme . . . ."). While the Supreme Court established in *Michigan* that the statute "treats power plants differently," 576 U.S. at 751, it did not suggest that the general term "appropriate" authorizes EPA to overlook section 112's core structural objectives.

Fourth and finally, any reasonable cost-benefit analysis should include *all* the consequences of regulation; EPA cannot gerrymander its analysis to exclude positive consequences (particularly those resulting from reductions in co-emitted pollutants like sulfur dioxide and particulate matter), while including negative consequences (such as the expense associated with improved pollution control). *See City of Portland v. EPA*, 507 F.3d 706, 712-13 (D.C. Cir. 2007) (noting that courts will not "tolerate rules based on arbitrary and capricious cost-benefit analyses").

Unlike the 2020 Final Action, the 2022 Proposal's alternative approach remains consistent with each of those governing principles, insofar as EPA acknowledges the important non-monetized benefits associated with regulation. 87 Fed. Reg. at 7669. Furthermore, the alternative approach points toward protecting—through regulation—highly exposed individuals and sensitive populations, in line with statutory factors that are not readily incorporated into BCA. 87 Fed. Reg. at 7671. The Agency's decision does not depend on any claim (which would be untenable) that the massive reductions in mercury and other HAP emissions accomplished by MATS are of *de minimis* value; in fact, the benefits of these reductions are enormous, even if not all of the benefits are quantified or monetized, or are readily quantifiable or monetizable. *Id.* And it takes appropriate account of both positive and negative consequences of regulation, by including the improvements in public health that result from reductions in particulate matter, sulfur dioxide, and other co-emitted pollutants. *Id.* at 7670. EPA should consequently retain the alternative approach in its final action; at a minimum, that alternative confirms that a properly conducted formal BCA would not alter EPA's conclusion that regulation is appropriate.

2. <u>Including and considering ancillary benefits in benefit-cost analysis is a longstanding principle of economic best practices and is supported by Agency guidance and administrative precedent.</u>

EPA's proposed alternative approach, which like the 2016 Supplemental Finding's alternative BCA methodology considers all benefits including those that may be considered ancillary, reasonably follows longstanding formal BCA practice. While the Supreme Court declined to require a formal BCA for the appropriateness determination, if the Agency chooses to rely on a BCA approach it must at least follow reasonable principles for its analysis. Inclusion and consideration of all benefits—direct or ancillary, quantified or unquantified, and monetized or unmonetized—in any BCA is consistent with economic best practices for federal agencies.

In 1981, President Reagan signed Executive Order 12,291, which required agencies to choose regulatory objectives to "maximize the net benefits to society."[136] This language suggests an inclusive approach to considering regulatory impacts. Although President Clinton rescinded Executive Order 12,291, he issued Executive Order 12,866, which created the foundation for the current regulatory review process and has remained in effect since 1993.[137] Executive Order 12,866 states that "agencies should assess all costs and benefits of available regulatory alternatives," which also supports a broad and inclusive approach to considering benefits in BCA.[138] A 1996 guidance document from OMB also instructed agencies that they should attempt "to quantify all potential real incremental benefits to society in monetary terms to the maximum extent possible."[139]

In 2003, OMB—during the George W. Bush Administration—issued Circular A-4, which provides guidance for implementing Executive Order 12,866 and continues to govern to this day. Circular A-4 instructs agencies on how to perform regulatory cost-benefit analysis, and was intended to standardize measurement and reporting of benefits and costs of federal regulatory actions. OMB provided particularly clear instructions to agencies that they should "look beyond the direct benefits and direct costs of [a] rulemaking and consider any important ancillary benefits and countervailing risks."[140] Circular A-4 states that "[t]he same standards of information and analysis quality that apply to direct benefits and costs should be applied to ancillary benefits and countervailing risks."[141] These benefits should be given analytic priority when they "are important enough to potentially change the rank ordering of the main alternatives in the analysis."[142] The $90 billion of ancillary benefits in the MATS RIA would be adequate on their own to create large net benefits that could justify regulation of EGUs under section 112, and therefore should at least be included and considered as part of a BCA approach to the appropriateness determination.

Under the alternative approach, in which EPA is relying on a 2011 RIA that the Agency asserts was conducted using the OMB Circular A-4 guidance, it is particularly important that

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[136] Exec. Order No. 12,291, 46 Fed. Reg. 13,193 (Feb. 17, 1981).
[137] Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Sept. 30, 1993).
[138] *Id.*
[139] Office of Management and Budget, "Economic Analysis of Federal Regulations under Executive Order 12866," at III (B) (Jan. 1996).
[140] OMB Circular A-4 at 26.
[141] *Id.*
[142] *Id.*

EPA not depart from OMB's methodology by ignoring the ancillary benefits of MATS, which are clearly significant.

EPA's Guidelines for Preparing Economic Analyses provide further support for following the instructions of Circular A-4 by including ancillary benefits in any BCA approach to the appropriateness determination. The guidelines state that "[a]n economic analysis of regulatory or policy options should present all identifiable costs and benefits that are incremental to the regulation or policy under consideration. These should include directly intended effects and associated costs, as well as ancillary (or co-) benefits and costs."[143]

In its January 6, 2021, peer review of revised guidelines, EPA's Science Advisory Board (SAB) made clear that ancillary benefits should be included in any benefit-cost analysis.[144] The SAB suggested that EPA add a new section titled "Comprehensiveness" to the guidelines "to emphasize that the overarching guidance is, whenever feasible, to include all significant costs and benefits in an unbiased manner."[145] The SAB's report also makes clear that "[c]hanges in other environmental contaminants – and changes in other, ancillary outcomes (e.g., fuel economy benefits) – should be fully accounted for in a BCA."[146] The SAB's recommended language also warns that "[t]he intentional omission of impacts has the potential to change the sign of aggregate net benefits and thus potentially lead a decision-maker acting on benefit-cost principles to an incorrect decision based on those principles."[147] Therefore, it is clear that the experts on the panel whose work informed the SAB's final recommendations supported the inclusion of ancillary benefits in BCA.

EPA's own history includes numerous examples in which EPA has taken ancillary benefits into account in rulemaking for decades under administrations of both parties.[148] Even

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[143] EPA, Guidelines for Preparing Economic Analyses, at 11-2 (Dec. 2010).
[144] EPA SAB, SAB Peer Review of the EPA's Revised Guidelines for Preparing Economic Analysis, (Jan. 6, 2021).
[145] *Id.* at 22.
[146] *Id.*
[147] *Id.* at 24.
[148] *See, e.g.*, 52 Fed. Reg. 25,399, 25,406 (July 7, 1987) (in proposing new NSPS for municipal waste combustors, EPA noting intent to "consider the full spectrum of the potential impacts of regulation," including "indirect benefits accruing from concomitant reductions in other regulated pollutants"); 56 Fed. Reg. 24,468, 24,469 (May 30, 1991) (in proposing performance standards for landfill gases, justifying the regulation partly on "the ancillary benefit of reducing global loadings of methane"); 63 Fed. Reg. 18,504, 18,585-86 (Apr. 15, 1998) (analyzing the indirect benefits of reducing co-pollutants like volatile organic compounds, particulate matter, and carbon monoxide from emissions standards addressing hazardous pollutants from pulp and paper producers); 72 Fed. Reg. 8428, 8430 (Feb. 26, 2007) ("Although ozone and $PM_{2.5}$ are considered criteria pollutants rather than 'air toxics,' reductions in ozone and $PM_{2.5}$ are nevertheless important co-benefits of this proposal."); 75 Fed. Reg. 51,570, 51,578 (Aug. 20, 2010) (considering indirect benefits of regulating HAP from combustion engines).

the Trump Administration relied on ancillary benefits in its Safe Affordable Fuel-Efficient Vehicles rule. That rule relied on claimed safety benefits from avoiding delayed turnover of the vehicle fleet due to higher vehicle prices, which were not the objective of greenhouse gas emission standards for vehicles under section 202(a) of the CAA, and were therefore clearly ancillary benefits.[149] Including and considering ancillary benefits should not only be done when politically advantageous, but instead should be considered longstanding practice underpinning reasonable economic analysis.

As EPA acknowledges, "[c]onsistent with scientific principles underlying BCA, both OMB Circular A-4 and the EPA's Guidelines for Preparation of Economic Analyses direct the Agency to include all benefits in a BCA." 87 Fed. Reg. at 7670. To the extent that EPA relies on a BCA approach to reaffirm the appropriateness determination, the Agency should follow the practices prescribed in those guidance documents, which describe key longstanding principles for BCA. As required by economic best practices, ancillary benefits should be treated similarly to benefits from HAP reductions in any appropriateness determination that relies on a BCA approach—even where ancillary benefits are not ultimately determinative and are not needed to identify net benefits of regulation under section 112.

B. Ample record evidence supports EPA's determination that it is "appropriate" to regulate EGUs under section 112, using a benefit-cost analysis.

1. <u>The benefits of regulating EGUs under section 112 are well documented in record evidence, both available when EPA promulgated MATS and developed since.</u>

The 2011 RIA identified massive benefits of regulating EGU HAP emissions under section 112, including non-HAP benefits, based on information available at the time.

The 2011 RIA monetized only a small subset of the benefits of reducing HAP emissions from EGUs under section 112. Specifically, the 2011 RIA monetized the impacts of EGU mercury emissions on children of recreational fishers, in terms of lost earning associated with lowered IQ, based on information available to the Agency at the time. *See* MATS RIA at 4-56 (presenting results). Among other things, this analysis left out other important exposure pathways, exposed populations, and health endpoints. EPA also acknowledged that IQ loss is not the most sensitive indicator of methylmercury's neurotoxicity and that "its use likely underestimates the impact of reducing methylmercury in water bodies." *Id.* at 4-30.

The RIA was not intended to quantify all HAP benefits. Instead, EPA discussed the health and environmental impacts of other HAPs qualitatively, as they also deserve significant

[149] 85 Fed. Reg. 24,174 (Apr. 30, 2020).

weight due to the well-established, irreversible health impacts of some HAPs. MATS RIA at 4-73 to 4-79.[150] EPA observed that quantification of health and environmental effects beyond IQ loss in children exposed to mercury from recreationally caught freshwater fish "would likely increase the net benefits of the rule"—a dramatic understatement. MATS RIA at 8-1.

The 2011 RIA further documented the enormous monetized non-HAP benefits of regulating EGU HAP emissions under section 112, although these benefits were limited to the avoided impacts of $PM_{2.5}$ and CO_2. *See id.* at 5-93 to 5-97, Tbl. 5-19. Even setting aside these non-HAP benefits, however, EPA should readily conclude that regulation of EGUs under section 112 was and is appropriate, in light of the quantified and unquantified HAP benefits.

New information on benefits supports EPA's conclusion that a benefit-cost analysis independently confirms EPA's finding that it is "appropriate" to regulate EGUs under section 112.

All of the additional benefits of regulating EGUs under section 112 that EPA and outside researchers have identified since 2011—both HAP benefits and non-HAP benefits, quantified and unquantified—would further tilt the balance of costs and benefits in favor of EPA's "appropriate" finding. *See supra* Part II.B.1. Regarding non-HAP benefits in particular, we believe that the substantial health and welfare benefits of reducing $PM_{2.5}$, ozone, and CO_2 under MATS should be weighed as part of EPA's alternative approach of benefit-cost analysis.[151] Ultimately, however, even setting aside these non-HAP benefits, EPA should readily conclude based on its alternative approach that regulation of EGUs under section 112 is appropriate, in light of the HAP benefits discussed above.

2. <u>The costs of regulating EGUs under section 112 are well documented in record evidence, both available when EPA promulgated MATS and developed since.</u>

The 2011 RIA's estimate of the costs of regulating EGU HAP emissions under section 112 was appropriate based on the information available at the time.

As noted above, EPA's approach to modeling incremental costs to the power sector in the 2011 RIA remains reasonable and appropriate. *See supra* Part II.B.2.

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[150] *See also* OMB Circular A-4 at 27 ("[P]lease include a summary table that lists all the unquantified benefits and costs, and use your professional judgment to highlight (e.g., with categories or rank ordering) those that you believe are most important (e.g., by considering factors such as the degree of certainty, expected magnitude, and reversibility of effects).").
[151] *See* OMB Circular A-4 at 27; *see also* 87 Fed. Reg. at 7668-69 (soliciting comment on this issue).

New information on costs supports EPA's conclusion that it is "appropriate" to regulate EGUs under section 112 using benefit-cost analysis.

For all the reasons discussed above, EPA's approach in 2011 to estimating the costs of regulating EGUs under section 112 remains valid, and subsequent events and developments strongly indicate that the actual costs of compliance were dramatically lower than EPA projected. Both in 2011, and even more so now, there is ample evidence in the record that the benefits (both quantified and unquantified) of regulating EGUs under section 112 vastly outweigh the costs (both quantified and unquantified) of doing so. Accordingly, under EPA's independent alternative approach of benefit-cost analysis, it is plainly "appropriate" to limit EGU HAP emissions under this provision.

IV. EPA SHOULD PROMPTLY INITIATE A SEPARATE RULEMAKING TO RECONSIDER ITS RESIDUAL RISK AND TECHNOLOGY REVIEW AND STRENGTHEN MATS.

In the notice of the 2022 Proposal, EPA also requests information to inform its ongoing review of the 2020 Residual Risk and Technology Review (2020 RTR). 87 Fed. Reg. at 7672. Specifically, EPA solicits: input on how EGUs' large HAP reductions under MATS and still-significant emissions of HAPs should factor into its review; risk-related information; and information on the cost or performance of pollution-control techniques, including emissions monitoring and controls used during startup. *Id.* We discuss each of these topics below and provide more-detailed information in the attachments to these comments. We strongly urge EPA to initiate a separate rulemaking to reconsider its 2020 determinations that MATS provides an ample margin of safety to protect public health and that there have been no pertinent developments in practices, processes, and control technologies since MATS was promulgated, and to strengthen the standards in accordance with that review and other statutory requirements.

A. EPA's appropriate and necessary determination is independent of its risk and technology review.

EPA's determination that it is appropriate to regulate power plants under section 112(n)(1)(A), 42 U.S.C. § 7412(n)(1)(A), is independent of its decision to amend MATS pursuant to the risk and technology reviews required by section 112(f) and 112(d)(6), 42 U.S.C. § 7412(f) & (d)(6). EPA can and should therefore expeditiously finalize its conclusion that regulation is appropriate, and promptly take the additional action required by those sections.

Section 112(n)(1)(A) cannot be understood to require the Agency to consider the consequences of standards promulgated under section 112(f) or any revisions required by section 112(d)(6). Both provisions, by their terms, demand information that EPA could not have 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. 42 U.S.C. § 7412(f). That assessment requires accurate knowledge, not just of the initial technology-based standards set under section 112(d)(2) and (3), but 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)]." 42 U.S.C. § 7412(f)(2)(C). 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" that EPA did not address within its initial standards. 42 U.S.C. § 7412(d)(6). Congress cannot have instructed EPA to assess the costs of responding to such developments within section 112(n)(1)(A)'s threshold determination—which, as a matter of statutory structure, precedes even the development of section 112(d)'s initial technology-based standards, let alone further developments outside those standards. For those reasons, section 112(n)(1)(A)'s requirement that EPA decide whether regulation is "appropriate" should not here be understood to require assessment of actions taken pursuant to either section 112(f) or section 112(d)(6).

That conclusion is bolstered by EPA's consideration of costs during its risk and technology review process. *See* 42 U.S.C. § 7412(d)(6) & (f)(2)(A); *Ass'n of Battery Recyclers v. EPA*, 716 F.3d 667, 673-74 (D.C. Cir. 2013) (upholding EPA's practice of considering costs when setting standards under section 112(d)(6)). While the word "appropriate" may be broad, it does not require unnecessary duplication. Section 112(d)(6) and section 112(f) themselves ensure that EPA will not "ignore cost." *Michigan*, 576 U.S. at 753. (And to the extent that any such residual risks remain requiring further regulation under section 112(f), or developments in control techniques have occurred that would necessitate revisions under section 112(d)(6), that could only underscore both the appropriateness and necessity of regulation.) Section 112(f) and (d)(6) present no risk that regulation will do "significantly more harm than good," or alter MATS' costs in a manner that might prove inappropriate. *Id.* at 752. EPA should, therefore, treat its reviews under section 112(d)(6) and (f)(2)—and any regulations that emerge from them—as independent of the appropriateness inquiry presented by section 112(n)(1)(A).

B. EPA must promptly strengthen MATS under section 112(d)(6).

EPA would be well justified in strengthening the standards through the authority granted under CAA section 112(d)(6), which commands EPA to review the standards and revise them "as necessary," taking into account developments in practices, processes, and control technologies, no less often than every 8 years. 42 U.S.C. § 7412(d)(6). Similar factors would govern a decision to revise the standards to reflect maximum achievable reductions beyond the level that EPA set as a "floor" in 2012 as were relevant to the decision at that time. *See id.* § 7412(d)(2); *Ass'n of Battery Recyclers*, 716 F.3d at 673-74 (connecting section 112(d)(6) and (d)(2) in terms of EPA's consideration of costs). EPA could undertake the revisions upon granting reconsideration of the 2012 rule and/or by applying the relevant statutory provisions in a new rulemaking following the ongoing review of the RTR. Finally, a reconsidered section 112(f)(2) risk review could inform the section 112(d)(6) strengthening effort, but is not a prerequisite to it. Under section 112(f)(2), if EPA were to determine that the remaining risk is unacceptable or that MATS does not provide an ample margin of safety to protect public health (a determination that would not be necessary for strengthening under any other provision of section 112), then the Agency could concurrently or separately strengthen the standards through this authority. *See* 42 U.S.C. § 7412(f)(2).

In seeking comment on the ongoing review of the RTR and the need for a separate rulemaking to evaluate strengthening the standards, EPA notes that EGUs' emissions of mercury and other HAPs and contribution to total mercury in the environment are lower than before the implementation of MATS. 87 Fed. Reg. at 7672. Indeed, reductions in emissions of HAPs from EGUs have surpassed the Agency's 2011 expectations. *See* 87 Fed. Reg. at 7632.[152] Further, as described below, the majority of MATS-covered units are emitting well below the current emission standards for mercury, non-mercury metals, and acid gases. That EGUs have greatly reduced their HAP emissions does not excuse EPA from complying with its statutory mandate under section 112(d)(6) to revise the MATS standards "as necessary" or from complying with the other requirements in section 112. The outperformance of the standards has resulted not only from wider deployment of control techniques known at the time EPA promulgated MATS, but also from advances in knowledge and experience gained since that time. All of these facts strongly support strengthening the standards to reflect currently achievable levels.

1. <u>EPA must strengthen MATS in light of developments in practices, processes, and technologies for controlling HAPs emitted by EGUs.</u>

Focusing on the considerations that inform EPA's decision whether to revise standards under section 112(d)(6), there have been "developments" in "practices, processes, and control technologies" indicating that strengthening is required to secure the maximum achievable

[152] *Compare* 84 Fed. Reg. at 2689, Tbl. 4 (showing emissions of 4 tons of mercury from MATS EGUs in 2017), *with* MATS RIA at 3-10, Tbl. 3-4 (showing projected emissions of 6.6 tons of mercury from MATS EGUs in 2015). *Compare* EPA, Residual Risk Assessment for the Coal- and Oil-Fired EGU Source Category in Support of the 2019 Risk and Technology Review Proposed Rule, at 38, Tbl. 3.1-1 (Dec. 2018) (showing emissions of 2,797 tons of HCl from MATS EGUs in 2017), *with* MATS RIA at 3-10, Tbl. 3-4 (showing projected emissions of 5,500 tons HCl from MATS EGUs in 2015).

pollution reduction, including lower emissions rates,[153] improvements in the components and inputs to controls,[154] lower costs of controls,[155] and gained experience with monitoring.[156]

*Information on the performance and cost of controls for **non-mercury metal HAPs** indicates that EPA must strengthen those standards based on these developments.*

- Ninety-nine percent of the 370 MATS-covered coal-fired EGUs that reported emissions in 2019 had emissions of filterable PM (as a surrogate for non-mercury metal HAPs) below the current standard of 0.030 lb/MMBtu, with many well below that standard.[157] Of these EGUs, 50% had a PM emissions rate of 0.006 lb/MMBtu or below; 25% had a

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[153] *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.").
[154] *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.").
[155] *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.").
[156] *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).").
[157] *See* NRDC, MATS Data Analysis, at 4-5 (Aug. 2021), https://www.nrdc.org/sites/default/files/mats-data-analysis-202108.pdf (MATS Emissions Data Analysis).

PM emissions rate of 0.003 lb/MMBtu or below; 20% had a PM emissions rate of 0.0026 lb/MMBtu or below; and 10% had a PM emissions rate of 0.002 lb/MMBtu or below.[158]

- Costs of electrostatic precipitator (ESP) upgrades are now lower and performance of ESPs, whether upgraded or not, is better than EPA understood them to be in 2011.[159] According to Andover Technology Partners' analysis, installing high frequency transformer rectifiers costs about $10/kW or less (compared to $55/kW in EPA's 2011 modeling assumptions), rebuilding the ESP within its existing casing costs about $50/kW (compared to $80/kW in EPA's 2011 modeling assumptions), and increasing the casing volume to increase treatment time costs about $50/kW to $80/kW (compared to $100/kW in EPA's 2011 modeling assumptions).[160] Many units could achieve PM emissions rates of 0.003 lb/MMBtu with these upgrades. Some units with ESPs are already performing at emissions rates as low as 0.0015 lb/MMBtu.[161] As of early 2021, 59% (134 GW) of operating coal-fired EGUs had an ESP installed with no fabric filter.[162]

- Excellent performance of PM control configurations such as ESPs suggests that maintenance and better operation of existing controls have improved their efficiency at capturing emissions, potentially lowering costs.[163] Similarly, improved maintenance and better management of bag cleaning has enhanced the performance of fabric filters and likely avoided bag replacements over time.[164]

- Improved fabric materials in fabric filters are more durable, require less cleaning, and are more reliable, resulting in greater PM capture.[165] Modest upgrades to baghouses, at costs of $5/kW, could lower PM emissions to a rate of 0.0015 lb/MMBtu or below.[166] As of early 2021, 40% (91 GW) of operating coal-fired EGUs had fabric filters installed.[167]

- The use of bag leak detectors and continuous monitoring of PM emissions (PM CEMS) has enabled operators to promptly address problems with PM controls, including

[158] *See id.* at 5.
[159] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 16.
[160] *Id.* at 17-21.
[161] *See id.* at 45-46, Tbl. 7.
[162] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.
[163] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 42.
[164] *See id.* at 6, 28.
[165] *Id.* at 29-31.
[166] *See id.* at 45-46, Tbl. 7.
[167] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.

ductwork and casing leaks, failure of filter bags, blinding of bags, and leakage of plenum seals, resulting in low-cost emissions reductions.[168]

Information on the performance and cost of controls for ***mercury*** *indicates that EPA must strengthen those standards based on these developments.*

- Ninety-nine percent of the 396 MATS-covered not low-rank coal-fired EGUs that reported emissions in the Clean Air Markets Program Data for 2020 had emissions of mercury in 2020 below the current standard of 1.2 lbs/TBtu, with many well below that standard.[169] Of these EGUs burning not low-rank coal, 50% had a mercury emissions rate of 0.49 lb/TBtu or below; 25% had a mercury emissions rate of 0.33 lb/TBtu or below; 20% had a mercury emissions rate of 0.27 lb/TBtu or below; and 10% had a mercury emissions rate of 0.17 lb/TBtu or below.[170] All low-rank units in the dataset emitted below the current standard of 4 lbs/TBtu.[171] Of these EGUs burning low-rank coal, the majority had average mercury emissions rates of about 2.5 lbs/TBtu or below.[172]

- Activated Carbon Injection (ACI) has benefited from advanced, third-generation carbons that were specifically engineered for mercury capture in flue gas. Third-generation carbons have improved porosity and surface chemistry designed to perform in conditions with other pollutants and lower treatment rates.[173] Next-generation carbons cost less, require lower treatment rates to achieve the same capture percentage, and help improve fly ash marketability.[174] For units burning not low-rank coal, increasing ACI treatment could lower mercury emissions rates to 0.3 lb/TBtu or below without installing new controls.[175] As of early 2021, roughly 60% (142 GW) of operating coal-fired EGUs were using ACI as a strategy to reduce mercury emissions.[176]

- Wet FGDs are now better equipped to capture mercury through use of chemicals for oxidizing mercury and management techniques for re-emission of the mercury, as well as

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[168] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 29, 31.
[169] *See* MATS Emissions Data Analysis at 8-9.
[170] *See id.* at 9.
[171] *Id.* at 10.
[172] *See id.* at 10.
[173] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 51.
[174] *Id.* at 52-55.
[175] *See id.* at 67, Tbl. 15.
[176] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.

absorber systems.[177] As of early 2021, roughly 60% (~141 GW) of operating coal-fired EGUs had wet FGDs installed.[178]

- Dry FGDs have seen improved performance and lower cost in capturing mercury through enhanced halogens and methods for delivery of halogens.[179] As of early 2021, 17% (39 GW) of operating coal-fired EGUs had dry FGDs installed.[180]

- Improvements in continuous mercury monitoring have enabled operators to identify and correct problems quickly.[181]

Information on the performance and cost of controls for ***acid gases*** *indicates that EPA must strengthen those standards based on these developments.*

- Ninety-seven percent of MATS-covered coal-fired EGUs that reported HCl emissions in 2019 had emissions below the current standard of 0.002 lb/MMBtu, with many well below that standard.[182] Of these EGUs, 50% had an HCl emissions rate of 0.0006 lb/MMBtu or below; 25% had an HCl emissions rate of 0.00025 lb/MMBtu or below; 20% had an HCl emissions rate of 0.00020 lb/MMBtu or below; and 10% had an HCl emissions rate of 0.0001 lb/MMBtu or below.[183] The majority of units are complying with the acid gas limit using SO_2 as a surrogate. Of the units reporting SO_2 emissions to EPA's Clean Air Markets Division, 20% had an SO_2 emissions rate of 0.07 lb/MMBtu or below, well below the current limit of 0.2 lb/MMBtu.

- 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.[184] Emissions of acid gases specifically associated with already installed wet FGD systems decreased overall between 2011 and 2019.[185] Costs of upgrading wet FGD

[177] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 48-49.
[178] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.
[179] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 49.
[180] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.
[181] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 9.
[182] *See* MATS Emissions Data Analysis at 13-14.
[183] *See id.* at 14.
[184] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 16-20.
[185] *Id.* at 13-16 & Figs. 7, 9.

systems, estimated at $38/kW, are well below the $100/kW that EPA assumed in its 2011 modeling.[186, 187] 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.[188] 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.[189] As of early 2021, about 141 GW, or 62% of coal capacity, were equipped with wet FGD.[190]

- 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.[191] Emissions of acid gases specifically associated with already installed dry FGD systems decreased overall between 2011 and 2019.[192] Costs of upgrading dry FGD systems, estimated to be as low as $17/kW, are well below the $100/kW that EPA assumed in its 2011 modeling.[193, 194] 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.[195] These upgrades could lower HCl emissions to a rate of 0.0006 lb/MMBtu with no further changes.[196] As of early 2021, 39 GW, or 17% of coal capacity, were equipped with dry FGD.[197]

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[186] *Id.* at 22; 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).
[187] 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.
[188] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 54, Tbl. 6.
[189] *Id.*
[190] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.
[191] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 23, 30.
[192] *Id.* at 27-29 & Figs. 16, 18.
[193] *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).
[194] 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.
[195] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 23.
[196] *See id.* at 54, Tbl. 6.
[197] EPA, MATS Units Operating as of Early 2021 (Sept. 2021), https://www.regulations.gov/document/EPA-HQ-OAR-2018-0794-4618.

- 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.[198] Costs are lower than anticipated because fabric filters are not always needed.[199] These upgrades, on the order of $10/kW, could lower HCl emissions to a rate of 0.0006 lb/MMBtu.[200] As of 2019, about 30 GW, or 11% of coal capacity, were equipped with DSI.[201]

We emphasize the conclusions in these reports that even the lowest emissions rates assessed for non-mercury metal HAPs, mercury, and acid gases could be achieved at modest cost to the current fleet of coal-fired units.[202] Achieving the lowest level of acid gases control examined would entail installing fabric filters on many units,[203] thus greatly reducing the overall cost of achieving a lower non-mercury metal emissions limit. Based on these reports, total annualized costs of achieving significantly lower emissions rates—indeed, some of the lowest rates achieved by well-performing units for which data are available—would be expected to be well below $4 billion, which, when added to the already incurred costs of complying with MATS discussed in Part II.B.2, would remain below the total costs projected in the 2011 MATS RIA. These costs would therefore be reasonable and would not alter EPA's proposed finding that regulating EGUs under section 112 is "appropriate," even if the costs of subsequently strengthening the standards were relevant to that determination—which, as discussed in Part IV.A, they are not.

2. <u>EPA must replace the weak work practice standard for toxic organic HAPs with health-protective numeric standards.</u>

EPA must establish numeric limits for toxic organic HAPs from coal- and oil-burning power plants. 42 U.S.C. § 7412(d)(6) (requiring EPA to revise standards "as necessary"). EPA has a statutory obligation to set numeric standards for HAP "whenever . . . feasible." *U.S. Sugar Corp. v. EPA*, 830 F.3d 579, 594 (D.C. Cir. 2016) (citing 42 U.S.C. § 7412(h)(2), (h)(4)). Doing so is feasible here—and necessary—because EPA has established such numeric limits for many other similar sources of air pollution, and has no lawful reason to maintain a contrary approach in MATS. Indeed, EPA has recognized that its failure to establish numeric limits for toxic

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[198] Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 38-40.
[199] *See id.* at 38.
[200] *See id.* at 50-51; *id.* at 54, Tbl. 6.
[201] *Id.* at 2.
[202] *See* Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 45-46, Tbl. 7; *id.* at 67, Tbl. 15; Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 54, Tbl. 6.
[203] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants at 54, Tbl. 6.

organic HAPs from power plants is "not consistent with the approach taken in all other NESHAP rules."[204] In addition, the weak work practice standard that currently governs toxic organic HAP emissions from power plants fails to require the maximum achievable reduction in emissions or reduce risk to protect human health and the environment with an ample margin of safety, in violation of the statute. 42 U.S.C. § 7412(d)(2), (f)(2), (h)(1).

Toxic organic HAPs consist of a large number of especially toxic hazardous air pollutants containing carbon atoms. They are known to cause cancer, reproductive toxicity, neurological problems, birth defects, and many other health harms. Airborne emissions of toxic organic HAPs from power plants pose grave risks to human health.

The following is a summary of the health impacts of just a few of the toxic organic HAPs emitted by power plants. A more comprehensive discussion of the health risks posed by power plant HAP emissions can be found in comments that many of our groups submitted on the residual risk and technology review conducted in 2019.[205]

- **Benzene** has been associated with a range of acute and long-term adverse health effects and diseases in humans, including cancer and adverse hematological, reproductive and developmental effects.[206] Benzene is a known carcinogen; long-term exposure can cause leukemia.[207] Inhalation of high doses of benzene may impact the central nervous system leading to drowsiness, dizziness, irregular heartbeat, nausea, headaches, and depression.[208] Female workers experiencing high exposure levels over the course of many months experienced reproductive impacts, such as a decrease in the size of their ovaries.[209] In animal studies, breathing benzene was associated with developmental effects such as low birth weight, delayed bone formation, and bone marrow damage.[210]

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[204] EPA's Responses to Public Comments on EPA's *National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units*, Vol. 1, at 476 (Dec. 2011).

[205] Comments of Chesapeake Climate Action Network *et al.* on Proposed Residual Risk and Technology Review, EPA-HQ-OAR-2018-0794-1264, at 59-69 (submitted Apr. 17, 2019) (NGO RTR Comments) (attached to these comments).

[206] California Air Resources Board, Report to the Scientific Review Panel on Benzene, Prepared by the Staffs of The Air Resources Board and The Department of Health Services (Nov. 27, 1984), http://www.arb.ca.gov/toxics/id/summary/benzene.pdf.

[207] U.S. Department of Health and Human Services, Toxicological Profile for Benzene (Aug. 2007), https://www.epa.gov/sites/default/files/2014-03/documents/benzene_toxicological_profile_tp3_3v.pdf.

[208] *Id.*; World Health Organization, Exposure to Benzene: A Major Public Health Concern (May 2019), https://www.who.int/publications/i/item/WHO-CED-PHE-EPE-19.4.2.

[209] Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Benzene*, at 6 (Aug. 2007), https://www.atsdr.cdc.gov/toxprofiles/tp3.pdf.

[210] *Id.*

- **Dioxins** are highly toxic and can cause cancer, reproductive and developmental problems, and damage to the immune system, and they can interfere with hormones.[211]

- **Toluene** is included as a developmental toxicant on California's list of chemicals known to cause cancer or reproductive toxicity.[212] Similar to many organic solvents, toluene acts as a respiratory tract irritant, particularly at high air concentrations.[213] For this reason, it can be especially harmful to people with asthma. A ubiquitous air pollutant, exposure to toluene constitutes a serious health concern as it has negative impacts on the central nervous system. Exposure to toluene can cause headaches, impaired reasoning, memory loss, nausea, impaired speech, hearing, and vision, amongst other health effects.[214] Long-term exposure may damage the liver and kidneys.[215]

- **Ethylbenzene** has been classified as a possible human carcinogen by the International Agency for Research on Cancer,[216] and has been associated with a number of adverse health outcomes. Breathing high levels can cause dizziness as well as throat and eye irritation; chronic, low-level exposure over several months to years can result in kidney damage as well as hearing loss.[217]

- **Xylene**[218] may result in a number of adverse human health effects following short-term exposures, including irritation of the skin, eyes, nose and throat; difficulty breathing; damage to the lungs; impaired memory; and possible damage to the liver and kidneys.[219] Long-term exposure may affect the nervous system presenting symptoms such as

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[211] EPA, Learn about Dioxin, https://www.epa.gov/dioxin/learn-about-dioxin.
[212] California EPA Office of Environmental Health Hazard Assessment, Chemicals Known to the State to Cause Cancer or Reproductive Toxicity (Feb. 25, 2022), https://oehha.ca.gov/media/downloads/proposition-65//p65chemicalslistsinglelisttable2021p.pdf.
[213] Agency for Toxic Substances and Disease Registry, *Toluene Toxicity*: *Case Studies in Environmental Medicine*, at 11(Feb. 2001), http://www.atsdr.cdc.gov/hec/csem/toluene/docs/toluene.pdf.
[214] *Id.* at 7, 13-14; EPA, Toluene Summary, https://www.epa.gov/sites/default/files/2016-09/documents/toluene.pdf.
[215] National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards: Toluene* (2010), http://www.cdc.gov/niosh/npg/npgd0619.html.
[216] Leigh Henderson, David Brusick, Flora Ratpan, & Gauke Veenstra, *A Review of the Genotoxicity of Ethylbenzene*, 635 Mutation Research/Reviews in Mutation Research 81-89 (May-June 2007) <doi:10.1016/j.mrrev.2007.03.001>.
[217] Agency of Toxic Substances and Disease Registry, *ToxFAQs for Ethylbenzene* (2010), http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=382&tid=66.
[218] Also known as dimethyl benzene.
[219] Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Xylene*, at 5 (Aug. 2007), https://www.atsdr.cdc.gov/toxprofiles/tp71.pdf.

headaches, lack of muscle coordination, dizziness, confusion, and loss of balance.[220] More-serious long-term health effects include memory impairment, red and white blood cell abnormalities, abnormal heartbeat (in laboratory workers), liver damage, mutagenesis (mutations of genes), reproductive system effects, and death due to respiratory failure.[221]

- **Polycyclic aromatic hydrocarbons (PAHs also described as Polycyclic Organic Matter, or POM)** are a group of over 100 different chemicals that are formed during incomplete combustion.[222, 223, 224] Infants and children are *especially* susceptible to the hazards of PAHs, a class of known human mutagens, carcinogens, and developmental toxicants found in diesel exhaust.[225] Greater lifetime cancer risks result from exposure to carcinogens at a young age. These substances are known to cross the placenta to harm the unborn fetus, contributing to fetal mortality, increased cancer risk, and birth defects.[226] Prenatal exposure to PAHs may also be a risk factor for the early development of asthma-related symptoms and can adversely affect children's cognitive development, with implications for diminished school performance.[227] Exposure of

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[220] *Id.*

[221] M. Zoveidavianpoor, A. Samsuri, & S. R. Shadizadeh, *The Clean Up of Asphaltene Deposits in Oil Wells*, 35 Energy Sources, Part A: Recovery, Utilization, and Environmental Effects 22 (2013).

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

[223] Agency for Toxic Substances and Disease Registry, *Public Health Statement for Polycyclic Aromatic Hydrocarbons (PAHs)* (Aug. 1995), https://www.atsdr.cdc.gov/ToxProfiles/tp69-c1-b.pdf.

[224] Frederica Perera *et al.*, *DNA Damage from Polycyclic Aromatic Hydrocarbons Measured by Benzo[a]pyrene-DNA Adducts in Mothers and Newborns from Northern Manhattan, The World Trade Center Area, Poland, and China*, 14 Cancer Epidemiology, Biomarkers, & Prev. 709 (2005).

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

[226] Perera *et al.*, *supra* note 224.

[227] Frederica P. Perera *et al.*, *Effects of Transplacental Exposure to Environmental Pollutants on Birth Outcomes in a Multiethnic Population*, 111 Environmental Health Perspectives 201 (2003); Frederica Perera *et al.*, *Effect of Prenatal Exposure to Airborne Polycyclic Aromatic Hydrocarbons on Neurodevelopment in the First 3 Years of Life among Inner-City Children*, 114 Env't Health Perspectives 1287 (2006).

children to PAHs at levels measured in polluted areas can also adversely affect IQ.[228] Low-molecular-weight PAHs can form quinones, which exert pulmonary oxidative stress and have a potent negative effect on the immune system.[229]

- **Cyanide** exposure at high levels swiftly harms the brain and heart, beginning with rapid breathing, followed by convulsions, and loss of consciousness, and can even cause coma and death.[230] More commonly, even low-level exposure to hydrogen cyanide is associated with breathing difficulties, chest pain, vomiting, headaches, and enlargement of the thyroid gland.[231]

- **Naphthalene**, a known carcinogen, also has respiratory impacts, ocular effects such as cataracts and retinal damage, and impacts to the hematological systems.[232]

- **1,3-butadiene** causes inflammation of nasal tissues, changes to lung, heart, and reproductive tissues, neurological effects, and blood changes; it is a known carcinogen associated with cancers of the blood and lymphatic system, and it may also cause birth defects according to animal studies.[233]

- **Formaldehyde** is a known carcinogen that can cause asthma or asthma-like symptoms, neurological effects, and increased risk of allergies at exposure levels of 0.1 to 0.5 ppm, and eczema and changes in lung function at exposure levels from 0.6 to 1.9 ppm.[234]

- **Acetaldehyde** is carcinogenic and may cause reproductive and developmental harm, based on animal studies.[235]

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[228] Frederica Perera *et al.*, *Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years*, 124 Pediatrics e195 (2009).
[229] Judy L. Bolton *et al.*, *Role of Quinones in Toxicology*, 13 Chemical Rsch. in Toxicology, 135 (2000).
[230] Agency for Toxic Substances and Disease Registry, *ToxFaqs for Cyanide* (July 2006), https://www.atsdr.cdc.gov/toxfaqs/tfacts8.pdf.
[231] *Id.*
[232] California Office of Environmental Health Hazard Assessment, *Long-term Health Effects of Exposure to Naphthalene*, http://www.oehha.ca.gov/air/hot_spots/pdf/naphth080304.pdf.
[233] Agency for Toxic Substances and Disease Registry, *1,3-Butadiene - ToxFAQs* (Oct. 2012), https://www.atsdr.cdc.gov/toxfaqs/tfacts28.pdf.
[234] Agency for Toxic Substances and Disease Registry, *Formaldehyde - ToxFaqs*, https://www.atsdr.cdc.gov/toxfaqs/tfacts111.pdf.
[235] EPA, Acetaldehyde Hazard Summary (Jan. 2000), https://www.epa.gov/sites/default/files/2016-09/documents/acetaldehyde.pdf.

Even in small quantities, many toxic organic HAPs are highly toxic. Yet power plants subject to MATS emit surprisingly large quantities of toxic organic HAPs. Coal-fired power plants alone emit more than 3,000 tons of toxic organic HAPs each year.[236]

One highly toxic organic pollutant that power plants emit in dangerous amounts is dioxin. According to EPA, U.S. environmental releases of this particularly toxic class of toxic organic HAPs "are dominated by releases to the air from combustion sources" like power plants.[237] EPA's comprehensive dioxin inventory, released in 2006, determined that air pollution from coal-fired power plants accounted for about 5% of total national releases of this extremely toxic pollutant in 2000.[238] While dioxin emissions from most industrial sources declined over the years studied (1987 to 2000), dioxin emissions from coal-fired power plants actually increased.[239]

Despite the toxicity of organic HAPs and the large amounts that power plants emit, the MATS rule does not place any limit on toxic organic HAP emissions. Instead, the MATS rule only requires power plant operators to conduct a periodic tune up. 77 Fed. Reg. at 9371. This weak work practice standard fails to deliver the maximum achievable reduction in emissions or to reduce risk to protect human health with an ample margin of safety and prevent adverse effects to the environment, in violation of the statute. 42 U.S.C. § 7412(d)(2), (f)(2). Indeed, EPA did not project that the tune up requirement would reduce toxic organic HAPs at all; the rule's summary of air pollution benefits does not even mention toxic organic HAP. 77 Fed. Reg. at 9424-25. In the closely related boilers NESHAP, EPA estimated that a similar tune up requirement would reduce hazardous pollution by only 1%.[240] In fact, tune ups and boiler adjustments may not reduce toxic organic HAP emissions, in the aggregate, at all. There is no such thing as universal good combustion; instead, different combustion conditions are more propitious for different pollutants. Boiler adjustments, without more, can actually increase emissions of some toxic organic HAPs.

Establishment of numeric limits for emissions of toxic organic HAPs from power plants is clearly feasible—and thus necessary. 42 U.S.C. § 7412(h)(2), (h)(4), (d)(6). EPA has

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[236] *See* NGO RTR Comments at 5-9; Ranajit Sahu, Underestimation of Organic Emissions from Coal-Fired Boilers by EPA (attached to these comments).

[237] EPA, An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Years 1987, 1995, and 2000 at xlv (Nov. 2006), https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=159286.

[238] *See id.* at xlvi, Tbl. ES-2.

[239] *See id.*

[240] National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers, 76 Fed. Reg. 15,554, 15,579 & Tbl. 3 (Mar. 21, 2011); Revised Methodology for Estimating Impacts from Industrial, Commercial, Institutional Boilers at Area Sources of Hazardous Air Pollutant Emissions, EPA-HQ-OAR-2006-0790-2314, at 17 (Feb. 17, 2011).

recognized that test results below the detection limit do not render pollution measurement infeasible, a finding that has been upheld by the D.C. Circuit. *U.S. Sugar*, 830 F.3d at 622-23 ("[T]he Agency reasonably explained that non-detects are present in many of its datasets because they are inherent to the imprecision associated with measuring boiler emissions."). EPA has never rationally explained why some data in the MATS record showing pollution measurements below the detection limit indicate that pollution cannot be measured, rather than simply showing that units have low emissions, used high detection limits, or both. Moreover, EPA has established numeric limits for many other similar sources of air pollution, confirming that measurement is feasible. One such category is industrial boilers at major sources of air pollution, which are materially identical to the power plants covered by MATS. Since adoption of the MATS rule, EPA has established numeric limits for toxic organic HAPs from boilers, using carbon monoxide emissions as a surrogate.[241] Also in 2013, EPA adopted numeric standards for emissions of toxic organic HAPs from cement kilns.[242] EPA established a numeric limit on dioxins and furans, a standard for non-dioxin hydrocarbons in the form of a numeric limit on toxic organic HAP, and an alternative non-dioxin standard in the form of a numeric limit on total hydrocarbons.[243] In 2015, EPA adopted numeric standards for emissions of dioxins and furans from multiple types of brick and clay kilns.[244] Many pulp and paper mills have long been subject to EPA-issued numeric standards for gaseous toxic organic HAPs, which use methanol as a surrogate.[245]

The years since EPA adopted the MATS rule have witnessed marked improvements in the performance and cost of control technologies that are known to reduce emissions of toxic organic HAPs. These control technologies are more widely used, more effective, and cheaper than at the time of adoption of the MATS rule. They include the use of fabric filtration with activated carbon injection, which is known to reduce dioxins, and is already in use at many power plants. Power plants can also achieve reductions in non-dioxin toxic organic HAPs with selective catalytic reduction technology, which is already used on most power plants, and is projected to be installed on virtually all large coal-fired power plants in the next few years to control the nitrogen oxides (NO_x) emissions that cause the formation of ground-level ozone. While EPA's statutory obligation to establish numeric emission limits is independent of any

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[241] National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters, 78 Fed. Reg. 7138 (Jan. 31, 2013).
[242] National Emission Standards for Hazardous Air Pollutants for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants, 78 Fed. Reg. 10,006 (Feb. 12, 2013).
[243] *Id.* at 10,010 & Tbl. 3, 10,038 & Tbl.1.
[244] NESHAP for Brick and Structural Clay Products Manufacturing; and NESHAP for Clay Ceramics Manufacturing, 80 Fed. Reg. 65,470, 65,471 (Oct. 26, 2015).
[245] National Emission Standards for Hazardous Air Pollutants for Chemical Recovery Combustion Sources at Kraft, Soda, Sulfite, and Stand-Alone Semichemical Pulp Mills, 66 Fed. Reg. 3180, 3184 (Jan. 12, 2001).

developments in methods of control for these pollutants, as a practical matter they strongly support the establishment of protective numeric standards both for toxic organic HAPs of low molecular weight, including formaldehyde, and higher molecular weight, like dioxins and POM.

3. EPA must remove the extended startup period of work practice standards.

As environmental groups explained in comments on the 2019 proposed RTR rule and in a July 2020 petition for administrative reconsideration, EPA must amend MATS to remove EGUs' option to use an extended startup period during which only work practice standards apply.[246] EPA must correct this deficiency as part of a reconsidered section 112(d)(6) review because EPA has no valid statutory basis for retaining work practice standards in lieu of numeric standards during this period.

In 2014, EPA revised MATS 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. 79 Fed. Reg. 68,777, 68,792 (Nov. 19, 2014) (40 C.F.R. § 63.10042). During those four hours for EGUs that choose the second definition, only work practice standards—and no numeric standards—apply. 40 C.F.R. Part 63, Subpart UUUUU, Tbl. 3. EPA based its 2014 revisions on its assertion that EGUs cannot measure their emissions—one of two limited circumstances in which Clean Air Act section 112(h) allows EPA to promulgate work practice standards, 42 U.S.C. § 7412(h)(1)-(2)—during the first four hours they generate electricity. 79 Fed. Reg. at 68,782.

Yet the notifications and reports that EGUs have since filed with EPA make clear that EGU emissions can be measured in the first four hours of electricity generation. As shown in the table below, 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—and thus have chosen to comply with numeric standards beginning at electricity generation, confirming that they can measure emissions during the extended startup period. Specifically, 97% of the coal-fired EGUs that we could discern choices for, representing at least 92% of coal-fired EGUs overall, chose the shorter definition.

[246] *See* NGO RTR Comments at 59-69; Air Alliance Houston *et al.*, Petition for Reconsideration of the Final RTR, EPA-HQ-OAR-2018-0794-4565, at 14-22 (submitted July 21, 2020) (NGO RTR Reconsideration Petition) (attached to these comments).

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

For more details, see the accompanying attachment, which details these choices by EGUs.[247] At least some of the units that chose the second startup definition have since ceased operation.[248]

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 the "best-performing" 12% of coal-fired EGUs (in terms of the ability to measure emissions) could purportedly begin to measure emissions.[249] That the vast majority of coal-fired EGUs—far more than 12% (seven to eight

[247] Environmental groups submitted similar data with their comments on the 2019 proposed RTR rule. *See* NGO RTR Comments at 66, Att. 3. We updated that data to better reflect coal-fired EGUs' current choices of startup definition. *See* MATS Startup Definition Choices for Coal-Fired EGUs – 2021 Update (attached to these comments).

[248] For example, Dallman (Illinois) Unit 33 shut down permanently in 2021. *See* Jakob Emerson, Channel 20 News, *Springfield to shutter Dallman Unit 33, leaving city with single coal-fired power plant* (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* (Oct. 28, 2021), https://www.theadvocate.com/baton_rouge/news/business/article_190562bc-3824-11ec-bcfa-239aa1f91d40.htm.

[249] *See* 79 Fed. Reg. at 68,779-80; *id.* at 68,782 (citing 42 U.S.C. § 7412(h)(1)'s requirement that work practice standards be "consistent with" section 7412(d)(3)'s stringency requirements and stating that EPA's final-rule technical analysis "more appropriately track[ed] this statutory directive"); EPA, Assessment of startup period at coal-fired electric generating units - Revised, EPA-HQ-OAR-2009-0234-20451, at 21 (Nov. 2014) (arriving at four-hour extended startup period by identifying when "best performing 12 percent" of coal-fired EGUs could purportedly begin to measure emissions) (Measurability Analysis). 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).

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. If EPA were to now 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 measure their emissions during the four hours in question,[250] then the Agency must still remove the second definition. That the vast majority of coal-fired units has chosen the first definition shows that the category of EGUs as a whole can measure emissions during these four hours. And continuous emission monitoring systems (CEMS) for PM, SO_2, HCl, and mercury and sorbent trap monitors for mercury can measure emissions from the point of electricity generation forward.[251] Even if EPA were to still allow parametric monitoring for PM but remove EGUs' option to perform quarterly stack tests, parametric monitoring can and should be used to determine compliance with the non-mercury metal standards from the point of generation forward.

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." 42 U.S.C. § 7412(h)(2)(B). 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 small remainder of EGUs that have chosen the second definition (possibly as low as 3% of coal-fired EGUs but, at most, 8%) 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,

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[250] 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.

[251] As discussed in Part IV.C below, 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.

including the first four hours of electricity generation, and count those emissions for compliance purposes.[252] EPA has attested to the accuracy of that Acid Rain emissions data.[253] And 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."[254] 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."[255]

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[252] 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 . . . .").

[253] 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. 3590, 3636 (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.

[254] 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.

[255] 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.

Because EGUs can measure their emissions during the extended startup period, as shown by EGUs' choices of startup definition and the Acid Rain Program requirements, EPA has no valid statutory basis under section 112(h) to retain work practice standards in lieu of numeric standards during the first four hours of electricity generation. The CAA only allows work practice standards in two specific, very limited situations, only one of which EPA relied upon for 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." 42 U.S.C. § 7412(h)(2)(B). 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," *id.* § 7412(h)(2)(A)—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, it is "necessary" under CAA section 112(d)(6) to remove the extended startup period and impose numeric standards during these four hours. The statute plainly states that EPA "shall . . . revise" previously-promulgated standards when "necessary." *Id.* § 7412(d)(6). And 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 . . . ." *La. Env't Action Network v. EPA*, 955 F.3d 1088, 1098 (D.C. Cir. 2020). 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. *See* NGO RTR Comments at 60-61. 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)."[256] More recently, the National Association of Regulatory Utility Commissioners

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[256] Measurability Analysis at 4.

(NARUC) found that the average coal-fired EGU had 10.64 startups in 2018.[257] As also explained in environmental groups' 2019 comments, emissions from EGUs that choose the second startup definition can be elevated 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).[258] Electrostatic precipitators typically are designed to remove 90 to 99.9% of particulate matter released during coal combustion.[259] 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.[260]

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.[261] 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 EGUs can purportedly begin to measure emissions, *see id.* at 64) in exactly

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[257] NARUC, Recent Changes to U.S. Coal Plant Operations and Current Compensation Practices, at 9 (Jan. 2020), https://pubs.naruc.org/pub/7B762FE1-A71B-E947-04FB-D2154DE77D45.
[258] *See* NGO RTR Comments at 62-63; *see also id.* at 61 (discussing elevated EGU emissions during startup in general).
[259] *See* EPA, Air Pollution Control Technology Fact Sheet: Dry Electrostatic Precipitator (ESP) - Wire-Pipe Type, at 1, https://www3.epa.gov/ttncatc1/dir1/fdespwpi.pdf.
[260] *See, e.g.*, NARUC, Recent Changes to U.S. Coal Plant Operations and Current Compensation Practices, at 7-10 (Jan. 2020), https://pubs.naruc.org/pub/7B762FE1-A71B-E947-04FB-D2154DE77D45. 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, Ex. 7.
[261] *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. at 68,786.

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 opt for the shorter startup period and succeed in complying with it, EPA assures us that it will consider further refining and tightening these standards. Resp't's Br. 40.

Sierra Club v. EPA, 884 F.3d 1185, 1200 (D.C. Cir. 2018) (emphasis added). EGUs can clearly comply with MATS beginning at electricity generation: as discussed above (*supra* Part IV.B.1), 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. 40 C.F.R. Part 63, Subpart UUUUU, Tbl. 7. 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 EPA is currently separately required 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. *See Chesapeake Climate Action Network v. EPA*, 952 F.3d 310 (D.C. Cir. 2020) (vacating EPA's denial of environmental groups' reconsideration petition and remanding extended startup period to EPA for reconsideration).[262] If EPA were to simply

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[262] In their petition for reconsideration of the 2014 startup rule, environmental groups—using EPA's reasoning and methodology from the 2014 rule—showed that power plants can measure emissions during the first four hours of electricity generation. *See* Chesapeake Climate Action Network *et al.*, Petition for Reconsideration of Final Action on Startup and Shutdown Provisions in Final National Emissions Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units (Mercury and Air Toxics Standards), EPA-HQ-OAR-2009-0234-20461, at 4, 9, 21-22, Ex. 15 (submitted Jan. 20, 2015); *see also Chesapeake Climate Action Network*, 952 F.3d at 322 ("Both of Petitioners' objections . . . go to the very legality of the Final Rule's § 7412(h) work practice standards for the extended startup period."). EGUs' choices of startup definition and the Acid Rain Program requirements discussed above make clear that EPA's convoluted 2014 approach for determining the length of startup—examining when the best performers purportedly engage their SO_2 and NO_x controls—was fundamentally flawed.

remove the extended startup period, as environmental groups' reconsideration petition requested, there would be no need to conduct separate reconsideration proceedings.[263]

Although EPA often considers cost in its section 112(d)(6) reviews, cost is irrelevant here 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. But even if EPA were, under section 112(d)(6), to consider costs associated with removing the extended startup period,[264] the fact that at least 92%—and possibly as much as 97%—of all coal-fired EGUs have chosen the first definition makes clear that measuring emissions during the extended startup period is not cost-prohibitive. In fact, EGUs that choose the second startup definition presumably incur more costs because they are required to monitor and report more data than those units that comply with the first definition. *See* 40 C.F.R. §§ 63.10020(e), 63.10031(c)(5), 63.10030(e)(8). Similarly, complying with numeric standards beginning at electricity generation is cost-reasonable, as shown by the fact that the overwhelming majority of coal-fired 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 the best-performing 12% of EGUs would reach. *See* 76 Fed. Reg. at 25,041 ("[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."). 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." 79 Fed. Reg. at 68,778 n.1.

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 maintains 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. *See* *Transactive Corp. v. United States*, 91 F.3d 232, 237 (D.C. Cir. 1996) ("A long line of precedent

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[263] Only removal of the startup work practice period during the RTR or reconsideration proceedings on the extended startup period "provid[ing] the same procedural rights" required under section 307(d)(2)-(6), 42 U.S.C. § 7607(d)(7)(B), could satisfy EPA's obligation under section 307(d)(7)(B).

[264] Consideration of any costs associated with removing the extended startup period under section 112(d)(6) would be arbitrary, capricious, and contrary to the statute. Even if the Agency were to consider costs under section 112(d)(6), EPA would not have to account for any (minimal) costs associated with removing the extended startup period in determining that it is appropriate and necessary to regulate EGUs under CAA section 112: as discussed above (*supra* Part IV.A), section 112(n)(1)(A) cannot be understood to require EPA to consider the consequences of revisions under section 112(d)(6).

has established that an agency action is arbitrary when the agency offered insufficient reasons for treating similar situations differently.").

4. Persistent patterns in the demographic makeup of the populations living near regulated EGUs and in the demographic makeup of populations otherwise highly exposed to EGU HAPs support the conclusion the MATS rule should be strengthened under section 112(d)(6).

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 methylmercury attributable to these EGUs, also compel the conclusion that it is necessary to strengthen the standards. Communities of color and low-income communities bear significant impacts of EGU HAP emissions based on proximity to MATS-regulated sources.[265] Furthermore, certain subpopulations continue to face higher exposure to methylmercury attributable to EGU emissions through consumption of fish.[266]

These impacts on overburdened communities support the conclusion that it is appropriate to regulate this source category, in light of multiple statutory indicia of Congress's concern with protecting the most exposed individuals and sensitive populations—which have been shown largely to overlap with environmental justice communities because of historical and ongoing discrimination and other chemical, environmental, physical, and social stressors and extrinsic vulnerabilities.[267] Because these considerations are important to the threshold decision whether to regulate—and conduct subsequent rounds of regulation for—this source category, *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), they are also relevant to the subsequent decision whether revisions to the standards are necessary.

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[265] *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 (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).

[266] *See* Mercury Benefits Template at 13.

[267] *See* Emma Rutkowski, Alfredo Rivera & 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).

Impacts on environmental justice communities are highly relevant in any review of standards under section 112(d)(6), which is a recurring regulatory requirement that Congress intended to achieve maximal reductions in HAP emissions regardless of known HAP risks. *See* 87 Fed. Reg. at 7634, 7635. 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. Thus, for any source category, EPA must weigh the potential improvements in equity from strengthening standards together with the other statutory factors to determine whether it is "necessary" to revise the original standards. In essentially all cases, the distribution of the burdens and benefits of the source category's HAP emissions will have changed since promulgation of the original standards, warranting a fresh look at the level of the standards achievable regardless of any improvements in control techniques. Moreover, consideration of disproportionate impacts is critical to the Agency's continual reviews under section 112(d)(6) because certain "developments," such as improvements in pollution monitors that could benefit fenceline communities,[268] may be particularly relevant to the potential to enhance equitable outcomes under the standards. Accordingly, EPA should revise the standards to address persistent impacts on environmental justice communities from EGUs' HAP emissions as well.

C. EPA must require Continuous Emission Monitoring Systems (CEMS) for PM and HCl.

As part of its section 112(d)(6) review, EPA must require EGUs to monitor their non-mercury metal HAP emissions using CEMS for PM and, for those units that use HCl as a surrogate for acid gas HAPs, monitor their acid gas emissions using CEMS for HCl. PM and HCl CEMS are now more widely deployed than when MATS was first promulgated, and experience with these 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 for PM and HCl and parametric monitoring for PM), thereby lowering HAP emissions. For the same reasons and other reasons discussed above, EPA must likewise revise the emission standards for both non-mercury metal HAPs (where PM is used as a surrogate) and HCl to reflect these developments in monitoring techniques.

Employing PM and HCl CEMS as the only monitoring options for non-mercury metal HAPs and HCl—and complying with the revised emissions standards reflecting these improvements in monitoring—would be "achievable" because these monitoring methods are both cost-reasonable and readily available. Regarding PM CEMS, Andover Technology Partners' report observes:

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[268] *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)

- 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.[269]

HCl CEMS are well demonstrated and cost-reasonable as well, allowing operators to achieve lower HCl emissions rates.[270] 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.[271] Even given this range of cost estimates, it is clear that total costs of installing CEMS for the set of plants that do not currently have PM CEMS or 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 CEMS is also "necessary" under section 112(d)(6) because CEMS would better ensure that EGUs are meeting current emissions standards. Currently, in addition to PM and HCl CEMS, MATS allows EGUs to demonstrate compliance with the PM and HCl standards using quarterly stack testing and to demonstrate compliance with the PM standard using parametric monitoring. 40 C.F.R. § 63.10021; 40 C.F.R. Part 63, Subpart UUUUU, Tbl. 7. 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. Likewise, 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 test.

CEMS for these pollutants should also be required—and EPA would act well within its authority in requiring PM and 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." 42 U.S.C. § 7412(b)(5). 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." *Id.* § 7414(a)(1)(C), (G). And section 114(a)(3) provides: "The Administrator shall in the case of any . . . owner or operator of a major stationary source . . . require enhanced

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[269] Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 6.
[270] *See* Andover Technology Partners, Opportunities for Reducing Acid Gas Emissions on Coal-Fired Power Plants, at 6 & n.7.
[271] *See id.* at 49.

monitoring . . . ." *Id.* § 7414(a)(3). None of these provisions explicitly requires EPA to consider cost in requiring the installation or use of monitoring equipment. *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). Nonetheless, as noted above, requirements to deploy both PM CEMS and HCl 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.

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 through 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.)

77 Fed. Reg. at 9370. EPA did not, however, depart from its position in the proposal that PM CEMS were 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.[272]

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.[273]

Regarding HCl CEMS, the 2011 proposed MATS rule presents lower initial costs and annual costs than for PM CEMS. *See* 76 Fed. Reg. at 25,052 & Tbl. 14. In finalizing the rule, EPA responded to comments about HCl CEMSs' 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. . . .[274]
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> 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

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[272] EPA, MATS Response to Comments Document, Vol. 2, at 155-56; *see also id.* at 158, 159, 160-61 (similar).
[273] *See* Andover Technology Partners, Analysis of PM and Hg Emissions and Controls from Coal-Fired Power Plants at 6.
[274] 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).

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.[275]

In light of EPA's conclusion in the 2011 proposal that PM and HCl CEMS are reasonable monitoring options, the presentation of low and reasonable costs for both PM and HCl CEMS, and EGU operators' experience with both PM CEMS and HCl CEMS gained since 2011 (which has likely led to lower non-mercury metal and acid gas emissions), it would be more than "reasonabl[e]" within the meaning of section 114(a)(1)(C) for EPA to require these monitoring techniques as part of a strengthened rule. In addition, it is well within EPA's authority to require CEMS for these 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 PM CEMS and HCl CEMS (for those units measuring HCl as a surrogate for acid gas HAPs) 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 reconsider its incorrect 2020 determination that no residual risks remain after implementation of MATS.

The 2020 RTR failed to adequately analyze the residual risks remaining after the imposition of MATS, and EPA must reconsider its 2020 determination that the 2012 MATS rule reduces risks to an acceptable level providing an ample margin of safety.

EPA seeks information to inform its review of the 2020 determination, under section 112(f)(2), that MATS provided public health protection with an "ample margin of safety." 87 Fed. Reg. at 7672. Commenters offer legal background on the independent and separate requirements for the residual risk review under section 112(f)(2), and the review under section 112(d)(6). We strongly urge the Agency to propose to reconsider the 2020 determination that MATS provides an ample margin of safety to protect public health. *See* 85 Fed. Reg. at 31,314 (summarizing EPA's 2020 determinations). Upon reconsideration, and for the reasons detailed below and in the related pending petition for reconsideration on these issues, EPA must find that there is an inadequate basis to conclude that the current standards provide an ample margin of safety. In turn, that finding would support a strengthening of the standards under section 112(d)(6), which would necessarily address the remaining risk to some degree. For the reasons discussed below, however, a definitive finding of unacceptable risk or less-than-ample margin of

[275] EPA, MATS Response to Comments Document, Vol. 2, at 193, 199.

safety is not a prerequisite to strengthening the standards under section 112(d)(6), and EPA should proceed to do so based on the extensive evidence that revisions are "necessary" presented in Part IV.B, regardless of its conclusions upon reconsideration of its residual risk assessment.

1. The section 112(f)(2) residual risk review is independent of the section 112(d)(6) review.

The statute requires EPA "within 8 years after promulgation of standards . . . pursuant to [section 112(d) (here, MATS)]" to issue stronger standards if that is "required in order to provide an ample margin of safety to protect public health . . . or to prevent, taking into consideration costs, energy, safety, and other relevant factors, an adverse environmental effect." 42 U.S.C. § 7412(f)(2)(A). As part of that review, EPA must assess whether the emissions of probable or possible human carcinogens are reduced sufficiently to lower the risk of lifetime excess cancer to the individual most exposed to emission from a source in the category to less than one in one million. *Id.* Section 112(f) directs the Administrator to promulgate the additional standards "under this subsection," if required to provide an ample margin of safety or to prevent adverse environmental effects. *Id.*; *NRDC v. EPA*, 529 F.3d 1077, 1081-82 (D.C. Cir. 2008).

This residual risk review requirement is distinct from and parallel to the mandate in section 112(d)(6), 42 U.S.C. § 7412(d)(6), that EPA must at least every eight years "review, and revise as necessary (taking into account developments in practices, processes, and control technologies) emission standards promulgated under [section 112]." *See Nat'l Ass'n for Surface Finishing v. EPA*, 795 F.3d 1, 5 (D.C. Cir. 2015) (noting two "distinct, parallel analyses" required by sections 112(d)(6) and 112(f)(2)). When determining whether more stringent standards are necessary to provide an ample margin of safety to protect public health or prevent an adverse environmental effect, the risk review can take into account information about costs, 42 U.S.C. § 7412(f)(2), and therefore could arguably be influenced by information and analysis in a section 112(d)(6) review. *See id.* EPA's review under section 112(d)(6), however, requires strengthening standards "as necessary," including to "conform them to the basic requisites of 'emission standards' under section 112." *La. Env't Action Network*, 955 F.3d at 1097-98 (holding that the statutory phrase "as necessary (taking into account developments in practices, processes, and control technologies)" does not require that only those factors are to be considered in determining whether regulation is "necessary"). Section 112(d)(6) in no way requires EPA to take information learned in the section 112(f)(2) risk review into account in the section 112(d)(6) review, *Ass'n of Battery Recyclers v. EPA*, 716 F.3d 667, 672 (D.C. Cir. 2013), nor does it 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 tighten standards as a result of the review under 112(d)(6). Indeed, such a prerequisite would essentially replace section 112(d)(6) with section 112(f)(2) (recognizing that the balance of statutory factors under section 112(d)(6) could lead to more-stringent standards where both are relied upon), even though the two provisions focus on different statutory objectives (*e.g.*, maximally reducing HAP emissions to levels achievable with current technology under section 112(d)(6), and eliminating unacceptable risk and providing an ample margin of safety under section 112(f)(2)). EPA would act well within its authority, and consistent with its own precedent, and as upheld by the Court of Appeals, in strengthening standards on the basis of the section 112(d)(6) review alone, even if there were no residual risk remaining at all after the implementation of the 2012 MATS. For EPA to take the opposite position (that residual risk is required before EPA can strengthen standards under section 112(d)(6)) would be contrary to the unambiguous statutory language and arbitrary and capricious.

EPA has strengthened standards as a result of the section 112(d)(6) review at the same time as it found the residual risks under the prior standards to be "acceptable" and providing an ample margin of safety under section 112(f)(2) at least seven times in the past.[276] Such an outcome is supported by the context and legislative history of section 112(f) and 112(d)(6). In the 1990 revisions to the air toxics section of the Act, Congress for the most part shifted from a risk-based to a technology-based approach to regulating HAPs, listing the pollutants of concern in the statute and directing EPA to regulate based on maximum available controls. The residual risk analysis is a legacy of the prior framework, and a check on its new approach, requiring EPA to assess the effectiveness of its technology-based standards after they are implemented. *See* 42 U.S.C. § 7412(f)(2)(A) & (B) (retaining the understanding of providing an ample margin of safety to protect public health as in effect prior to November 15, 1990); *see also NRDC v. EPA*, 529 F.3d at 1079-80 (describing same). At the same time, and additionally, Congress added the separate periodic review and update-as-necessary requirement in section 112(d)(6).

2. <u>EPA must propose to reconsider its 2020 determination that the risks remaining after the imposition of MATS are acceptable and that MATS provides an ample margin of safety.</u>

Commenters on the 2019 proposal, including several commenters here, argued that EPA's final decision in 2020 that risk due to remaining air toxic emissions from power plants after the implementation of MATS is acceptable and that MATS provides an ample margin of safety to protect public health and prevent adverse environmental effects was based on data and analysis that were fundamentally flawed, arbitrary, and capricious.[277] Several groups also filed a petition for reconsideration describing that the flawed analyses were of central relevance to the outcome of the rule, and that the rationales EPA provided were advanced for the first time only

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[276] Site Remediation, 85 Fed. Reg. 41,680 (July 10, 2020); Organic Liquids Distribution, 85 Fed. Reg. 40,740 (July 7, 2020); Ethylene Production, 85 Fed. Reg. 40,386 (July 6, 2020); Pulp Mills, 82 Fed. Reg. 47,328 (Oct. 11, 2017); Acrylic and Modacrylic Fibers Production, Amino/Phenolic Resins Production; Polycarbonate Production, 79 Fed. Reg. 60,898 (Oct. 8, 2014); Natural Gas Processing Plants, 77 Fed. Reg. 49,490 (Aug. 16, 2012); Wood Furniture Manufacturing Operations, 76 Fed. Reg. 72,052 (Nov. 21, 2011).
[277] *See generally* NGO RTR Comments.

after the comment period ended.[278] Certain groups also filed suit challenging the residual risk and technology review, and that lawsuit is on hold pending the Agency's evaluation of the reconsideration petition.[279]

The previously submitted petition for reconsideration provides EPA ample evidence to support a decision to reconsider its 2020 Residual Risk Determination.

The Air Alliance Houston, *et al*., petition for reconsideration lays out the statutory basis for reconsideration due to EPA's failure to provide opportunity to comment on new rationales relied on by the Agency in finalizing its residual risk review. CAA section 307(d)(7)(B) states that if grounds for an objection to a final rule arise after the period for public comment, or it was otherwise not practicable to raise the objection during the comment period, and the objection is of central relevance to the outcome of the rulemaking, the Administrator *shall* convene a proceeding to reconsider the rule. 42 U.S.C. § 7607(d)(7)(B). The petition describes such objections to the 2020 residual risk determination, concerning the multiple deficiencies in EPA's 2020 residual risk review that are centrally relevant to the determination and therefore can and should be addressed in a reconsideration proceeding.

Specifically, EPA's 2019 proposed rule assumed that power plants emit only 3 tons per year of toxic organic HAPs, although the data it claimed to have used in preparing the risk analysis show that annual amount to be underestimated by a factor of 1,000.[280] In response to comments pointing out that EPA's data source actually shows that 3,000 tons of toxic organic HAP per year are emitted from the regulated industry after MATS, EPA offered new rationales not presented in the proposed rule, in an attempt to justify its choice of the 3 tons per year amount.[281] EPA also ignored toxic organic HAPs other than formaldehyde, many of which individually were shown in a report by the Electric Power Research Institute to be emitted from power plants before the imposition of MATS in amounts greater than 50 tons per year.[282] EPA did not prepare a residual risk assessment for these HAPs. Failing to consider the risks posed by any remaining emissions of these HAPs is centrally relevant to a determination that no risks are posed or that MATS provides an ample margin of safety. And, as EPA offered no rationale for this failure, until the final rule stage, this issue must be reconsidered.

Additionally, the 2020 risk assessment failed to account at all for the risks associated with additional emissions that occur during periods of startup, shutdown, or malfunction (SSM)

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[278] *See generally* NGO RTR Reconsideration Petition.
[279] *See* Status Report filed by EPA, *Air Alliance Houston v. EPA*, D.C. Cir. No. 20-1268 (Mar. 10, 2022).
[280] *See* NGO RTR Reconsideration Petition at 22-23.
[281] *See id.* at 23-25.
[282] *See id.* at 24.

of regulated EGUs.[283] In response to comments received on that issue, showing that these HAP emissions are likely significant, particularly for the individual most exposed to them, EPA offered in its final rule entirely new justifications for its decision not to consider those risks – that it had no data suggesting that SSM emissions were higher than at any other time, and that it was commenters' responsibility to offer data on the amount of SSM emissions at issue.[284] That new rationale contradicted earlier statements by the Agency, in its SSM SIP call, that it is concerned about excess emissions during periods of startup, shutdown and malfunction.[285] The Agency's own earlier statements that SSM can "have real-world consequences that adversely affect public health," 80 Fed. Reg. at 33,850, demonstrate that this issue is of central relevance to the risk analysis, and justify reconsideration.

EPA further determined in 2020 that it did not need to assess the residual risks associated with lead emissions where modeled emissions were at concentrations lower than the National Ambient Air Quality Standard (NAAQS) for lead. EPA asserted in the final rule simply that the lead NAAQS is sufficiently protective to provide an ample margin of safety, an argument it had not advanced in the proposal, and on which there was no opportunity to comment.[286] EPA did not explain why the NAAQS, which are national ambient standards set based on providing an "adequate margin of safety," could stand in for the section 112(f) risk assessment which requires an "ample margin of safety," and an emphasis on the most exposed, most vulnerable individuals.[287] In fact, commenters had shown that the lead emissions remaining after imposition of MATS are at health-consequential levels, and therefore the decision not to consider them is of central relevance to the question whether MATS provides an ample margin of safety.[288] Nor did EPA provide any rationale for its decision. Reconsideration is thus required.

EPA failed to consider risks from or provide any multipathway risk assessments for several persistent and bioaccumulative HAP, thereby understating the risks remaining from these HAP after the implementation of MATS.[289] While conceding that it did not consider multipathway risks for these HAPs, EPA in its final rule advanced several new rationales for its actions, including that its failure to include these pollutants in its multipathway risk analysis did not matter because EPA viewed the limited, incomplete list of persistent and bioaccumulative HAP that it did use to be "reasonable," a rationale not presented for public comment in the proposed rule.[290] Because EPA did not undertake a multipathway risk assessment for these

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[283] *See id.* at 7-8.
[284] *See id.*
[285] *Id.* at 27 (citing 80 Fed. Reg. 33,840, 33,850 n.22 (June 12, 2015)).
[286] *See* NGO RTR Reconsideration Petition at 28.
[287] *See id.* at 30-31.
[288] *See id.* at 28-30.
[289] *Id.* at 34-35.
[290] *See id.*

HAPs, it is impossible to say whether any residual risk after imposition of MATS is acceptable with an ample margin of safety, an issue centrally relevant to the outcome of the rule.

EPA excluded from the mercury residual risk assessment the risks faced by those who fish in and eat fish from waterbodies greater than 100,000 acres, thereby underestimating the risks posed by residual emissions of mercury after the implementation of MATS.[291] EPA's rationales for that exclusion were not offered for comment in the proposal, and because no risk assessment was undertaken it is impossible to accurately assess whether imposition of MATS provided acceptable risks with an ample margin of safety, an issue centrally relevant to the outcome of the rule.

Petitioners pointed out to EPA that it had understated the cancer risk associated with residual amounts of HAP emitted after MATS implementation, by failing to do basic math—adding inhalation risk and risks associated with other pathways of exposure—in contravention of EPA's own risk assessment guidelines.[292] These cancer risks were significant: the Agency stated that, for the most exposed individual, the multipathway risk is 50-in-1 million and the inhalation risk is 10-in-1 million.[293] EPA's refusal to acknowledge that the cancer risks from inhalation and other pathways are additive was of central relevance to EPA's finding that the cancer risk for the most exposed individual is acceptable.

EPA's final 2020 risk analysis also assigns zero risk to pollutants for which EPA lacks dose-response information, including several toxic organic HAPs, such as polycyclic organic matter.[294] EPA's assumption that these highly toxic pollutants pose zero risk is scientifically unsupported and irrational, as the health risk from exposure to these pollutants does not depend on whether EPA has information on such risks.

The 2019 Science Advisory Board (SAB) Draft Report notes that EPA conservatively estimated levels of fish consumption by subsistence fishers because the modeling included only fish consumed from small to midsize lakes by fishermen and their families, which is only a small fraction of fish consumed in the United States.[295] The model left out estuarine and marine fish and shellfish, which comprise over 90% of the market share of commercial fish.[296] Further, EPA's model failed to include the size of the fish as a variable,[297] which underestimated actual

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[291] *Id*. at 35-36.
[292] *See id.* at 37-39.
[293] *See id.* at 37-38.
[294] *See* NGO RTR Comments at 20-26.
[295] SAB, Science Advisory Board (SAB) Consideration of the Scientific and Technical Basis of EPA's Proposed Mercury and Air Toxics Standards for Power Plants Residual Risk and Technology Review and Cost Review, at 2 (2019).
[296] *Id.*
[297] *Id.* at 9.

exposure, as larger fish tend to have higher levels of mercury than smaller fish. The model also incorrectly assumed a linear relationship between mercury exposure and harm, and there tend to be higher levels of mercury in fish in the Atlantic versus those in the Pacific.[298] All of these assumptions and categorizations understate the amount of mercury harm experienced.

Additionally, the SAB noted a number of uncertainties present in EPA's analysis—uncertainties that could have resulted in further underestimation of HAP benefits.[299] It is not known how mercury interacts with other toxic emissions and HAP from power plants and how these chemical reactions and combinations may affect the health of those coming into contact with the cocktail of pollutants being emitted from power plants.[300] The cardiovascular effects of reducing mercury consumption also requires additional attention. EPA should include a net effects risk assessment following the FDA model, in its reopened, reconsidered risk assessment.[301] It should include all relevant health outcomes for neonates, children and adults.[302] Not only are these analyses essential to a full examination of the residual risks after implementation of MATS, they could be useful to the Agency more generally in regulating air toxics, and in working with other agencies to provide advice to consumers on fish consumption.

Commenters raised other problems with the MATS residual risk assessment proposed by EPA in 2019, including failing to assess the residual risks associated with the allowable emissions under MATS, failing to use the best science concerning effects of toxics exposures on children and other vulnerable populations, and relying on census centroid data rather than assessing the risks at EGU fence lines to ascertain the risks to the individual most exposed to residual toxic pollution.[303]

For all the reasons laid out in the NGO RTR Comments and in the NGO RTR Reconsideration Petition, the Agency should revisit and reassess the residual risks associated with the MATS rule. That work can be undertaken simultaneously with the section 112(d)(6) review discussed above.

EPA can rely on new information in reconsidering its 2020 Residual Risk Determination.

EPA also would be well within its authority to change its 2020 residual risk determination based on new information it receives as a result of a new rulemaking proposal to

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[298] *See id.* at 2-3.
[299] *Id*. at 9.
[300] *Id*.
[301] *Id*.
[302] *Id*.
[303] *See* NGO RTR Comments at 12-14; *id.* at 18-20. *See generally id.* (laying out these and other problems with the 2019 proposed RTR).

reconsider the 2020 decision. Even if the residual risk determination were a "one-time" requirement, *Surface Finishers*, 795 F.3d at 5, that does not prohibit reconsideration where the Agency recognizes that flaws in its methodology, or new public health, technological, cost, or other non-health information, shows that a more stringent standard is required in order to provide an ample margin of safety, *id.* at 16-17.

All of the new information on the hazards to public health and the environment posed by EGU HAP emissions discussed above, which the Agency did not consider in its 2020 RTR, calls into question the conclusion in the 2020 final rule that the current standards reduce risks to an acceptable level and provide an ample margin of safety. This information includes an assessment of the risks posed by EGU emissions of mercury post-MATS-implementation, which remain significant despite substantial emission reductions and disproportionately impact certain environmental justice communities.

> *That MATS has reduced significant amounts and percentages of HAP emissions from EGUs is not evidence that there are no residual risks following the rule's imposition, or that such risks have been reduced to a level that protects public health with an ample margin of safety.*

While EGUs have significantly reduced their HAP emissions as a result of MATS, they remain the largest emitters of many HAPs, and, as pointed out above, some of EPA's estimates of the amounts emitted—on which it based its 2020 RTR—are factually incorrect. The declines in emissions of HAPs have also not been distributed evenly across all units subject to MATS, with some continuing to emit extraordinarily large quantities of toxic air pollution. Moreover, EPA must reconsider the risks to human health and the environment from residual EGU HAP emissions not only in isolation, but cumulatively with other sources' emissions. This is particularly true given the statute's focus on the health risks experienced by the individual who is most exposed to residual toxic emissions, after the initial implementation of a technology-based standard.

CONCLUSION

EPA should finalize the current proposal and promptly initiate a separate rulemaking to reconsider its Residual Risk and Technology Review and strengthen MATS.

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LIST OF ATTACHMENTS

1. Comments of Environmental, Public Health, and Civil Rights Organizations on "National Emissions Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 84 Fed. Reg. 2670, EPA-HQ-OAR-2018-0794-1191 (Feb. 7, 2019) (submitted Apr. 17, 2019).

2. Comments of the Attorneys General of Massachusetts *et al.* on "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 84 Fed. Reg. 2670, EPA-HQ-OAR-2018-0794-1175 (Feb. 7, 2019) (submitted Apr. 17, 2019).

3. 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 (2016).

4. Amanda Giang & Noelle E. Selin, *Benefits of mercury controls for the United States*, 113 Proc. Nat'l Acad. Sci. 286 (2016).

5. 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 (2010).

6. 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 (Apr. 2022).

7. Commonwealth of Massachusetts *et al.*, Petition for Reconsideration of EPA's Final Rule: "National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units – Reconsideration of Supplemental Finding and Residual Risk and Technology Review," 85 Fed. Reg. 31,286 (May 22, 2020), EPA-HQ-OAR-2018-0794-4573 (submitted July 21, 2020).

8. Elsie M. Sunderland *et al.*, Mercury Science and the Benefits of Mercury Regulation (Dec. 2021).

9. Rui Li *et al.*, *Mercury pollution in vegetables, grains and soils from areas surrounding coal-fired power plants*, 7 Sci. Rep. 46,545 (2017).

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