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**By Email and First Class Mail**

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Designated Federal Officer (DFO)
EPA Science Advisory Board (1400R)
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
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**RE: Written Statement for Science Advisory Board ("SAB") Public Teleconference on the 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***

Dear Dr. Armitage,

The Emmett Environmental Law & Policy Clinic (the "Clinic") at Harvard Law School respectfully submits the following comments on the SAB's draft report on the 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) ("Proposed Finding"). Last spring, the Clinic submitted a comment letter to the Environmental Protection Agency ("EPA") on the Proposed Finding on behalf of Elsie M. Sunderland, Charles T. Driscoll, Jr., Kathy Fallon Lambert, Joel Blum, Celia Y. Chen, David C. Evers, Philippe Grandjean, Robert P. Mason, and Noelle Eckley Selin, scientists with expertise in the fields of atmospheric transport, ecosystem fate and effects, bioaccumulation, human exposures, and health outcomes associated with environmental mercury contamination. This written statement is in part based on that comment letter, a copy of which is attached.

Our comments relate to EPA's conclusion in the Proposed Finding that the mercury-related benefits of regulating power plant hazardous air pollutant emissions are not even "moderately commensurate" with the costs of such regulation. Specifically, we make three categories of observations:

1. **The draft report correctly identifies several shortcomings with EPA's analysis of the mercury-related benefits**. In particular:

- EPA's analysis monetizes the benefits associated with reducing methylmercury intake only with respect to children born to a limited population of recreational fishers who consume freshwater fish, even though marine fish account for more than 80% of methylmercury intake in the United States.[1]

- EPA's analysis uses full-scale IQ as the neurodevelopmental endpoint for its analysis, even though recent epidemiological data have revealed a suite of more sensitive neurodevelopmental endpoints. Even in 2000, the National Research Council recognized that full-scale IQ was not the most sensitive indicator of neurodevelopmental impacts.[2]

- EPA's analysis of neurodevelopmental impacts assumes no harm from exposures below a reference dose (RfD), even though there does not appear to be a safe level of methylmercury exposure for humans. Recent studies have shown adverse effects on brain development in children with prenatal methylmercury exposures similar to or below the RfD.[3] Neonatal studies conducted in the United States,[4] Canada,[5] Europe,[6] China,[7] and Japan[8] have consistently found such low-level exposure to be associated with adverse neurobehavioral development. A study conducted in New Bedford,

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[1] Elsie M. Sunderland et al., *Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States*, 126 Envtl. Health Persp. 017006 (2018).

[2] NRC, *Toxicological Effects of Methylmercury* (2000), *available at* https://www.nap.edu/read/9899/chapter/1.

[3] Margaret Karagas et al., *Evidence on the Human Health Effects of Low-level Methylmercury Exposure*, 120 Envtl. Health Persp. 799, 806 (2012).

[4] Sally Ann Lederman et al., *Relation between Cord Blood Mercury Levels and Early Child Development in a World Trade Center Cohort*, 116 Envtl. Health Persp. 1085, 1090 (2008); Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury levels, and Child Cognition at Age 3 Years in a US Cohort*, 168 Am. J. Epidemiology 1171 (2008).

[5] Joseph L. Jacobson et al., *Relation of Prenatal Methylmercury Exposure from Environmental Sources to Childhood IQ*, 123 Envtl. Health Persp. 827 (2015); Olivier Boucher et al., *Prenatal Methylmercury, Postnatal Lead Exposure, and Evidence of Attention Deficit/Hyperactivity Disorder among Inuit Children in Arctic Québec*, 120 Envtl. Health Persp. 1456 (2012).

[6] Kristine Vejrup et al., *Prenatal Mercury Exposure, Maternal Seafood Consumption and Associations with Child Language at Five Years*, 110 Env't Int'l 71 (2018); Wieslaw Jedrychowski et al., *Effects of Prenatal Exposure to Mercury on Cognitive and Psychomotor Function in One-Year-Old Infants: Epidemiologic Cohort Study in Poland*, 16 Annals Epidemiology 439 (2006).

[7] *See* Jinhua Wu et al., *Effect of Low-Level Prenatal Mercury Exposure on Neonate Neurobehavioral Development in China*, 51 Pediatric Neurology 93 (2014); Yu Gao et al., *Prenatal Exposure to Mercury and Neurobehavioral Development of Neonates in Zhoushan City*, China, 105 Envtl. Res. 390 (2007).

[8] Keita Suzuki et al. *Neurobehavioral Effects of Prenatal Exposure to Methylmercury and PCBs, and Seafood Intake: Neonatal Behavioral Assessment Scale Results of Tohoku Study of Child Development*, 110 Envtl. Res. 699 (2010).

Massachusetts, reached similar conclusions regarding memory and learning, especially visual memory, in children.[9]

- EPA's analysis ignores potential health endpoints from non-neurodevelopmental effects, even though there is strong evidence for a variety of other health impacts from methylmercury exposure. In particular, an expert panel in 2011 concluded that there was sufficient scientific evidence to incorporate cardiovascular health benefits in EPA's regulatory assessments.[10] According to the panel, methylmercury is both directly linked to acute myocardial infarction and intermediary to impacts that contribute to myocardial infarction risk.[11] The intermediary impacts include oxidative stress, atherosclerosis, decreased heart rate variability, and to a certain degree, blood pressure and hypertension. A 2017 systematic review of the association between methylmercury exposure and heart diseases showed that methylmercury enhances production of free radicals resulting in a long-lasting range of effects on cardiac parasympathetic activity, such as myocardial infarction, hypertension, blood pressure, and death.[12] A 2018 meta-analysis of 29 studies found significant positive associations between methylmercury and both elevated blood pressure and hypertension.[13]

- A number of recent analyses suggest that the mercury-related benefits of the MATS rule are actually orders of magnitude larger than those monetized by EPA in the regulatory impact analysis. For example, a 2016 study indicated that when policymakers account for lost wages, medical costs from IQ deficits and nonfatal heart attacks, and premature fatalities quantified into a value of statistical life (VSL) model, the benefits of the Rule exceed $43 billion.[14] Another study estimated an annual benefit of $860 million associated with a 10% reduction in methylmercury exposure in the U.S. population.[15] A 2017 study estimated that the total economic costs from methylmercury exposure in the United States are $4.8 billion per year.[16]

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[9] Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*. 122 Envtl. Health Persp. 1253 (2014).

[10] Henry A. Roman et al., *Evaluation of the Cardiovascular Effects of Methylmercury Exposures: Current Evidence Supports Development of a Dose–Response Function for Regulatory Benefits Analysis*, 119 Envtl. Health Persp. 607, 607 (2011).

[11] *Id.*

[12] Giuseppe Genchi et al., *Mercury Exposure and Heart Diseases*, 14 Int'l J. Envtl. Res. & Pub. Health 74 (2017).

[13] Xue Feng Hu, Kavita Singh & Hing Man Chan, *Mercury Exposure, Blood Pressure, and Hypertension: A Systematic Review and Dose–response Meta-analysis*, 126 Envtl. Health Persp. 076002 (2018).

[14] Amanda Giang & Noelle E. Selin, *Benefits of Mercury Controls for the United States*, 113 Proc. Nat'l Acad. of Sci. 286 (2016).

[15] Glenn E. Rice et al., *A Probabilistic Characterization of the Health Benefits of Reducing Methyl Mercury Intake in the United States*, 44 Envtl. Sci. & Tech. 5216 (2010).

[16] Philippe Grandjean & Martine Bellanger, *Calculation of the Disease Burden Associated with Environmental Chemical Exposures: Application of Toxicological Information in Health Economic Estimation*, 16 Envtl. Health 123 (2017).

EPA's Proposed Finding continues to rely on the 2011 analysis and does not take into account this new information.

2. **Nevertheless, the draft report fails to reach the logical conclusion dictated by these findings**. EPA concludes in the Proposed Finding that the mercury-related benefits of regulating power plant hazardous air pollutant emissions are not even "moderately commensurate" with the costs of such regulation. Based on that conclusion, the agency proposes to find that it is not "appropriate" to regulate such emissions under section 112 of the Clean Air Act. As summarized above, the SAB draft report demonstrates that there are multiple gaps and flaws in the outdated analysis upon which EPA relies to reach this conclusion. As explained more fully in the comment letter that we submitted to EPA on the Proposed Finding (which we have attached to this letter), it is therefore arbitrary and irrational for EPA to make the Proposed Finding. We urge the SAB to recommend that EPA withdraw the Proposed Finding and update its analysis to reflect the best available scientific information.

3. **Finally, we are troubled by several confusing or unsupported statements in the draft report. We request that the SAB either remove these statements or better explain them in the final report**. For example:

- The draft report states that "[i]t is also possible that there is a hormetic dose" of methylmercury exposure, i.e. a low dose at which there are beneficial effects of exposure. We are unaware of any evidence for such an effect. Indeed, as stated above, there does not appear to be a safe level of methylmercury exposure for humans, given that studies have shown adverse effects on brain development in children with prenatal methylmercury exposures below the existing RfD.

- The draft report states that: "The exposure models need to account for the fact that methylmercury has been found in prehistoric fish from 2,000 years ago at levels at or above current levels." It is not clear to us what the basis for this statement is and what significance it is supposed to have. The paper cited in support of this assertion provides data on mercury concentrations in fish sampled from sites in northern Canada between the 1970s and 2000s;[17] it does not address mercury levels in prehistoric fish. To the extent that this statement is intended to undermine the conclusion that mercury emissions from coal-fired power plants contribute to elevated mercury levels in fish, that assertion is contradicted by multiple lines of evidence. For example, studies have demonstrated that a substantial fraction of mercury from power plant emissions is deposited locally.[18] In addition, several U.S. studies have

[17] W.L. Lockhart, et al., *A History of Total Mercury in Edible Muscle of Fish from Lakes in Northern Canada*, 351-52 Sci. Total Env't 427 (2005).

[18] Emily M. White et al., *Spatial Variability of Mercury Wet Deposition in Eastern Ohio: Summertime Meteorological Case Study Analysis of Local Source Influences*, 43 Envtl. Sci. & Tech. 4946, 4952 (2009); David C. Evers et al., *Biological Mercury Hotspots in the Northeastern United States and Southeastern Canada*, 57 BioScience 29, 41 (2007).

measured substantial declines in domestic atmospheric and ecologic mercury concentrations attributable to reductions in mercury emissions from power plants.[19]

- The draft report states that "given that women would have to increase consumption of fish, all fish, four to six-fold more to even get to 8-12 ounces per week, which is still half of the maximum required for net benefits, additional neurological benefits to neonates from exposure to less fish seems implausible." We are confused by this statement. It ignores that both the absolute levels of methylmercury and the ratio of methylmercury to n-3 polyunsaturated fatty acids vary in different types of fish.[20] As Grandjean et al. pointed out in a recent letter, the goals of lowering methylmercury exposure and increasing fish intake can both be achieved "if advice stresses choosing low-mercury seafood varieties."[21] In addition, it misapprehends the nature of the benefits to be achieved by reducing power plant mercury emissions: the benefits derive not from reduced fish consumption but from reduced methylmercury intake because a given quantity of fish will contain a lower concentration of methylmercury.

  More generally, there is ample evidence of neurodevelopmental harm even at exposure levels below the existing RfD.[22] Neonatal studies conducted in the United

[19] Mark S. Castro & John Sherwell, *Effectiveness of Emission Controls to Reduce the Atmospheric Concentrations of Mercury*, 49 Envtl. Sci. & Tech. 14000 (2015); Michael S. Hutcheson et al., *Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions*, 48 Envtl. Sci. & Tech. 2193 (2014); Paul E. Drevnick et al., *Spatial and Temporal Patterns of Mercury Accumulation in Lacustrine Sediments across the Laurentian Great Lakes Region*, 161 Envtl. Pollution 252 (2012).

[20] *See, e.g.*, Kathryn R. Mahaffey et al., *Balancing the Benefits of n-3 Polyunsaturated Fatty Acids and the Risks of Methylmercury Exposure from Fish Consumption*, 69 Nutrition Revs. 493 (2011).

[21] Philippe Grandjean, Sally Ann Lederman & Ellen K. Silbergeld, *Fish Consumption During Pregnancy*, 173 JAMA Pediatrics 292 (2019).

[22] Margaret Karagas et al., *Evidence on the Human Health Effects of Low-level Methylmercury Exposure*, 120 Envtl. Health Persp. 799, 806 (2012).

States,[23] Canada,[24] Europe,[25] China,[26] and Japan[27] have consistently found such low-level exposure to be associated with adverse neurobehavioral development. A study conducted in New Bedford, Massachusetts, reached similar conclusions regarding memory and learning, especially visual memory, in children.[28]

While we fully recognize the importance of fish consumption for neurocognitive development, we emphasize that exposure to methylmercury from fish is significant and can in some cases offset the health benefits of fish consumption.[29] Although fatty acids in fish oil are recommended for cardiovascular health and neurocognitive development,[30] the consumption of methylmercury in fish counteracts the health benefits associated with consumption of seafood,[31] a finding confirmed by studies conducted in Boston[32] and New York City.[33] Since 2005, more than a dozen epidemiologic studies have associated adverse effects as large as or larger than beneficial effects of fish nutrients with greater-than-average methylmercury exposure

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[23] Sally Ann Lederman et al., *Relation between Cord Blood Mercury Levels and Early Child Development in a World Trade Center Cohort*, 116 Envtl. Health Persp. 1085, 1090 (2008); Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury levels, and Child Cognition at Age 3 Years in a US Cohort*, 168 Am. J. Epidemiology 1171 (2008).

[24] Joseph L. Jacobson et al., *Relation of Prenatal Methylmercury Exposure from Environmental Sources to Childhood IQ*, 123 Envtl. Health Persp. 827 (2015); Olivier Boucher et al., *Prenatal Methylmercury, Postnatal Lead Exposure, and Evidence of Attention Deficit/Hyperactivity Disorder among Inuit Children in Arctic Québec*, 120 Envtl. Health Persp. 1456 (2012).

[25] Kristine Vejrup et al., *Prenatal Mercury Exposure, Maternal Seafood Consumption and Associations with Child Language at Five Years*, 110 Env't Int'l 71 (2018); Wieslaw Jedrychowski et al., *Effects of Prenatal Exposure to Mercury on Cognitive and Psychomotor Function in One-Year-Old Infants: Epidemiologic Cohort Study in Poland*, 16 Annals Epidemiology 439 (2006).

[26] *See* Jinhua Wu et al., *Effect of Low-Level Prenatal Mercury Exposure on Neonate Neurobehavioral Development in China*, 51 Pediatric Neurology 93 (2014); Yu Gao et al., *Prenatal Exposure to Mercury and Neurobehavioral Development of Neonates in Zhoushan City*, China, 105 Envtl. Res. 390 (2007).

[27] Keita Suzuki et al. *Neurobehavioral Effects of Prenatal Exposure to Methylmercury and PCBs, and Seafood Intake: Neonatal Behavioral Assessment Scale Results of Tohoku Study of Child Development*, 110 Envtl. Res. 699 (2010).

[28] Sara T.C. Orenstein et al., *Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts*. 122 Envtl. Health Persp. 1253 (2014).

[29] Anna L. Choi et al., *Negative Confounding in the Evaluation of Toxicity: The Case of Methylmercury in Fish and Seafood*, 38 Critical Revs. Toxicology 877 (2008).

[30] Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury levels, and Child Cognition at Age 3 Years in a US Cohort*, 168 Am. J. Epidemiology 1171 (2008).

[31] Anna L. Choi et al., *Negative Confounding in the Evaluation of Toxicity: The Case of Methylmercury in Fish and Seafood*, 38 Critical Revs. Toxicology 877 (2008).

[32] Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury levels, and Child Cognition at Age 3 Years in a US Cohort*, 168 Am. J. Epidemiology 1171, 1177–79 (2008).

[33] Sally Ann Lederman et al., *Relation between Cord Blood Mercury Levels and Early Child Development in a World Trade Center Cohort*, 116 Envtl. Health Persp. 1085, 1090 (2008).

from fish consumption.[34] In fact, past studies analyzing the effects of methylmercury in the human body have underestimated the dangers because nutrients in fish can at least partially mask the true adverse effects of methylmercury.[35] Although the mercury-related damage may be masked, the result is that the benefits that consumers would otherwise obtain from a healthy diet are diminished, thus counteracting the purpose of including fish in the diet.

Thank you for your attention to these comments.

Sincerely,

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[34] *See generally* Edward Groth III, *Scientific Foundations of Fish-Consumption Advice for Pregnant Women: Epidemiological Evidence, Benefit-Risk Modeling, and an Integrated Approach*, 152 Envtl. Res. 386 (2017).

[35] Esben Budtz-Jorgensen et al., *Separation of Risks and Benefits of Seafood Intake*, 115 Envtl. Health Persp. 323, 325–26 (2007); Anna L. Choi et al., *Selenium as a Potential Protective Factor Against Mercury Developmental Neurotoxicity*, 107 Envtl. Res. 45, 51 (2008).

EXHIBIT

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April 17, 2019

**By Electronic Submission to www.regulations.gov**

Administrator Andrew Wheeler
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

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

**Re: COMMENTS ON NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: COAL-OIL-FIRED ELECTRIC UTILITY STEAM GENERATING UNITS—RECONSIDERATION OF SUPPLEMENTAL FINDING AND RESIDUAL RISK AND TECHNOLOGY REVIEW, 84 FED. REG. 2670 (FEB. 07, 2019)**

On behalf Elsie M. Sunderland, Charles T. Driscoll, Jr., Kathy Fallon Lambert, Joel Blum, Celia Y. Chen, David C. Evers, Philippe Grandjean, Robert P. Mason, and Noelle Eckley Selin, as well as itself, the Emmett Environmental Law & Policy Clinic at Harvard Law School respectfully submits these comments on the 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) ("Proposed Finding"). The Emmett Environmental Law and Policy Clinic works on a variety of local, national, and international projects covering the spectrum of environmental law and policy issues under the direction of Professor Wendy B. Jacobs. The other signatories are scientists with considerable expertise in the fields of atmospheric transport, ecosystem fate and effects, bioaccumulation, human exposures, and health outcomes associated with environmental mercury contamination.

The signatories urge the Environmental Protection Agency ("EPA") to withdraw the Proposed Finding, which is based on outdated and inaccurate estimates of both the public health benefits achievable through the Mercury and Air Toxics Standards ("MATS") and the compliance costs. Regardless of the methodology of cost analysis that EPA chooses to adopt, scientific research on the public health consequences of mercury emissions and data on actual compliance costs compel the conclusion that it is appropriate and necessary to regulate hazardous air pollutant ("HAP") emissions from coal-fired electric utility steam generating units ("EGUs" or "coal-fired power plants") under section 112 of the Clean Air Act ("CAA"). To fulfill its duty of reasoned decision-making, EPA must account for up-to-date information when reconsidering the appropriate and necessary finding.

Our comments focus on the following issues:

- Since EPA completed the MATS Regulatory Impact Analysis ("RIA") in 2011, the scientific literature has developed significant new evidence demonstrating the benefits of regulating power plant mercury emissions. This literature includes attempts to quantify the benefits that are orders of magnitude greater than the calculation of monetized mercury-related benefits in the RIA.

- In addition, it is now clear that reductions in mercury emissions from power plants result in localized and regional reductions in atmospheric mercury deposition, which amplifies the benefits of decreasing domestic emissions.

- The entire industry has by now come into compliance with the MATS rule. It is therefore no longer necessary to rely on *ex ante* predictions of the compliance costs. Multiple analyses have estimated that the actual costs of compliance are less than a billion dollars per year compared to the $9.6 billion per year EPA predicted in 2011.

- The 2011 RIA contains flawed analysis and has been made obsolete. In making the Proposed Finding, EPA should not rely solely on the RIA but must consider the updated information on the benefits of regulation and the compliance costs. Without considering this updated information, it is arbitrary and capricious for the Proposed Finding to conclude that the costs of MATS grossly outweigh the HAP benefits.

- The Proposed Finding misinterprets *Michigan v. EPA* to elevate cost above other considerations.

- In light of the regulatory focus of section 112(n)(1) on public health harm, the Proposed Finding's heavy reliance on cost-effectiveness is irrational.

- Even if EPA were to base its Finding on a cost-benefit analysis using the 2011 RIA, the agency should assign more weight to the unquantified, HAP-related benefits and to the co-benefits.

- Regardless of whether EPA could reverse its appropriate and necessary finding, the plain text of section 112 and the D.C. Circuit's binding decision in *New Jersey v. EPA* prohibit EPA from either delisting EGUs or repealing the emissions standards without going through the section 112(c)(9) delisting process.

## I. THE PROPOSED FINDING IGNORES SIGNIFICANT NEW INFORMATION REGARDING BOTH THE BENEFITS AND COSTS OF REGULATING POWER PLANT MERCURY EMISSIONS

Although coal-fired power plants release a variety of HAPs, our comments focus specifically on the benefits associated with reducing emissions of mercury and exposures to its organic form, methylmercury, which is formed in aquatic and terrestrial ecosystems and bioaccumulates in food webs. The peer-reviewed scientific literature demonstrates that the monetized benefits for EGU mercury emissions reductions identified by EPA in the 2011 RIA vastly understate the

benefits associated with reductions of those emissions. In addition, the actual costs of compliance have proven to be much lower than EPA predicted. It is unreasonable for EPA to claim that MATS is not appropriate in the face of this updated evidence that strongly points to the contrary conclusion.

### A. Coal-fired Power Plants are the Largest Domestic Source of Mercury, a Potent Neurotoxicant

Methylmercury is a highly toxic, bioaccumulative, and persistent pollutant. Over the last century and a half, anthropogenic mercury emissions have dramatically increased mercury levels in the environment. Cumulatively, anthropogenic inputs of mercury since 1850 have been 78 times as large as natural inputs.[1] Coal-fired power plants are the largest source of mercury emissions in the United States, accounting for 42% of emissions in 2014.[2]

Once mercury is deposited in the environment, it can be transformed by microbial processes into methylmercury and in this form is taken up by organisms at the base of the food chain. These organisms are subsequently consumed by other organisms—and then passed to predators such as piscivorous fish, brook trout, bald eagle, mink, river otter, insectivorous songbirds, and other mammals and birds.[3] Methylmercury biomagnifies, that is, increases with each level of the food chain, and attains its highest concentrations in predatory species at the top of the food chain.[4] This process of biomagnification occurs in both freshwater and marine ecosystems and extends to terrestrial food-webs that are linked to an aquatic ecosystem. Species with a longer life span are at a greater risk of having elevated methylmercury concentrations due to accumulation of this toxicant as they age; human exposure to methylmercury occurs primarily through consuming fish in which methylmercury has bioaccumulated.[5]

### B. Mercury Harms Human Health and the Environment in a Variety of Ways

#### *1. Methylmercury is a Neurotoxicant*

Methylmercury is a highly toxic substance that targets the nervous system. Infants and fetuses are at the highest risk, both because the developing central nervous system is particularly sensitive to methylmercury and because methylmercury can cross the placental and blood-brain barriers. At the highest levels of exposure, the result might be indistinguishable from cerebral

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[1] David G. Streets, et al., *Total Mercury Released to the Environment by Human Activities*, 51 Envtl. Sci. & Tech. 5969, 5973 (2017).

[2] Emissions Inventory and Analysis Group, Air Quality Assessment Div., Office of Air Quality Planning and Standard, EPA, *2014 National Emissions Inventory, Version 1: Technical Support Document*, 2-25 (2016).

[3] James G. Wiener et al., *Toxicological Significance of Mercury in Yellow Perch in the Laurentian Great Lakes Region*, 161 Envtl. Pollution 350 (2012); Reed C. Harris et al., *Whole-Ecosystem Study Shows Rapid Fish-Mercury Response to Changes in Mercury Deposition*, 104 Proc. Nat'l Acad. of Sci. 16,586 (2007); David C. Evers et al., *Biological Mercury Hotspots in the Northeastern United States and Southeastern Canada*, 57 BioScience 29 (2007).

[4] Wiener et al., *supra* note 3, at 354-55.

[5] *Mercury and Health: Key Facts*, World Health Org., https://www.who.int/news-room/fact-sheets/detail/mercury-and-health (last visited Apr. 15, 2019).

palsy and may lead to "microcephaly, hyperreflexia, and gross motor and mental impairment, sometimes associated with blindness or deafness."[6]

Even at lower levels, prenatal exposure to methylmercury can cause neurological harm. One traditional, well-attested measure is reductions in cognitive test performance,[7] including reductions in IQ.[8] Studies also show a connection to changes in brainstem response to auditory signals,[9] decreased performance on motor speed, attention, and language tests,[10] impeded memory functions,[11] and the likelihood of developing Attention Deficit Hyperactivity Disorder ("ADHD").[12] A series of studies of children in the Faroe Islands, where inhabitants were exposed to methylmercury from the meat of pilot whales, showed that children exposed *in utero* exhibited adverse neurological effects at ages 7, 14, and 22.[13] Cumulatively, these studies demonstrate that the effects of prenatal methylmercury exposure results in life-long neurocognitive deficits.

Methylmercury also causes neurological harm to older children and adults. The effects include symptoms such as "paresthesia, malaise, and blurred vision," and at higher levels can lead to "concentric constriction of the visual field, deafness, dysarthria, ataxia, and ultimately coma and death."[14] The negative effects of methylmercury on adult cognitive functions are so large that they can outweigh the benefits of omega-3 fatty acid intake from fish consumption among individuals who consume large amounts of some species of fish.[15] Methylmercury can also

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[6] United Nations Env't Programme, *Global Mercury Assessment* 38 (2002), *available at* http://www.unep.org/gc/gc22/Document/UNEP-GC22-INF3.pdf.

[7] Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury Levels, and Child Cognition at Age 3 Years in a US Cohort*, 167 Am. J. Epidemiology 1171, 1177–79 (2008).

[8] Margaret R. Karagas et al., *Evidence on the Human Health Effects of Low-Level Methylmercury Exposure*, 120 Envtl. Health Persp., 799 (2012); Philippe Grandjean et al., *Calculation of Mercury's Effects on Neurodevelopment*, 120 Envtl. Health Persp., a452, a452 (2012).

[9] Katsuyuki Murata, et al., *Delayed Brainstem Auditory Evoked Potential Latencies in 14-year-old Children Exposed to Methylmercury*, 144 J. Pediatrics 177 (2004).

[10] Frodi Debes et al., *Impact of Prenatal Methylmercury Exposure on Neurobehavioral Function at Age 14 Years*, 28 Neurotoxicology & Teratology 536, 544–46 (2006).

[11] Nat'l Research Council, *Toxicological Effects of Methylmercury* 4 (2000), *available at* https://www.nap.edu/read/9899/chapter/1.

[12] D. K. L. Cheuk & Virginia Wong, *Attention-Deficit Hyperactivity Disorder and Blood Mercury Level: A Case-Control Study in Chinese Children*, 37 Neuropediatrics 234, 236–39 (2006); Olivier Boucher et al., *Prenatal Methylmercury, Postnatal Lead Exposure, and Evidence of Attention Deficit/Hyperactivity Disorder among Inuit Children in Arctic Québec*, 120 Envtl. Health Persp. 1456, 1459–60 (2012).

[13] Philippe Grandjean et al., *Cognitive Deficit in 7-Year-Old Children with Prenatal Exposure to Methylmercury*, 19 Neurotoxicology & Teratology 417, 417 (1997); Debes et al., *supra* note 10, at 536; Youssef Oulhote et al., *Aerobic Fitness and Neurocognitive Function Scores in Young Faroese Adults and Potential Modification by Prenatal Methylmercury Exposure*, 125 Envtl. Health Persp. 677, 680 (2017).

[14] United Nations Env't Programme, *supra* note 6, at 38.

[15] Steven C. Masley, et al., *Effect of Mercury Levels and Seafood Intake on Cognitive Function in Middle-aged Adults*, 11 Integrative Med. 32, 32 (2012).

decrease several visual and motor functions, such as visual contrast sensitivity, restricted visual fields, hand-eye coordination, manual dexterity, and muscular fatigue.[16]

Methylmercury's neurological impacts might be even greater than revealed by these studies. New research demonstrates that some people are more genetically predisposed to the neurotoxic effects of methylmercury,[17] which means that studies with null findings might mask significant impacts among genetically susceptible subpopulations of the study group.[18]

### *2. Methylmercury Compromises Cardiovascular Health*

High concentrations of methylmercury in blood and tissue samples have been strongly associated with acute coronary events, coronary heart disease, and cardiovascular disease.[19] A 2000 National Research Council report stated that it was reasonable to conclude that methylmercury accumulates in the heart and leads to blood pressure alterations and abnormal cardiac functions.[20] Subsequent research has strengthened these findings. An expert panel convened in 2011 to study the health effects of methylmercury concluded that there was sufficient scientific evidence to incorporate cardiovascular health benefits in EPA's regulatory assessments.[21] According to the panel, methylmercury is both directly linked to acute myocardial infarction and intermediary impacts that contribute to myocardial infarction risk.[22] These intermediary impacts include oxidative stress, atherosclerosis, heart rate variability, and to a certain degree, blood pressure and hypertension. A 2017 systematic review of the association between methylmercury exposure and heart diseases shows that it enhances production of free radicals resulting in a long-lasting range of effects on cardiac parasympathetic activity, such as myocardial infarction, hypertension, blood pressure, and death.[23]

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[16] Jean Lebel et al., *Neurotoxic Effects of Low-Level Methylmercury Contamination in the Amazonian Basin*, 79 Envtl. Res. 20, 28 (1998).

[17] Jordi Julvez et al., *Prenatal Methylmercury Exposure and Genetic Predisposition to Cognitive Deficit at Age 8 Years*, 24 Epidemiology 643, 643 (2013).

[18] Jordi Julvez & Philippe Grandjean, *Genetic Susceptibility to Methylmercury Developmental Neurotoxicity Matters*, 4 Frontiers Genetics 1, 2 (2013).

[19] *See* Jyrki K. Virtanen et al., *Mercury, Fish Oils, and Risk of Acute Coronary Events and Cardiovascular Disease, Coronary Heart Disease, and All-Cause Mortality in Men in Eastern Finland*, 25 Arteriosclerosis, Thrombosis, & Vascular Biology 228, 232 (2004).

[20] Nat'l Research Council, *supra* note 11, at 168–69.

[21] Henry A. Roman et al., *Evaluation of the Cardiovascular Effects of Methylmercury Exposures: Current Evidence Supports Development of a Dose–Response Function for Regulatory Benefits Analysis*, 119 Envtl. Health Persp. 607, 607 (2011).

[22] *Id.*

[23] Giuseppe Genchi et al., *Mercury Exposure and Heart Diseases*, 14 Int'l J. Envtl. Res. & Pub. Health 74 (2017).

### *3. Methylmercury has Additional Impacts on Human Health*

Methylmercury also causes a variety of other adverse health impacts. Both animal studies and human epidemiological observations establish methylmercury as a possible carcinogen,[24] especially with regard to leukemia and liver cancer.[25] Methylmercury can have toxic effects on the renal, reproductive, and hematological systems.[26] There are also potential risks of chromosomal damage[27] and weakening of the immune system.[28] Finally, some studies indicate that methylmercury is associated with endocrine disruption[29] and diabetes.[30]

The consumption of methylmercury in fish also counteracts the health benefits associated with consumption of seafood.[31] While fatty acids in seafood are recommended for cardiovascular health and neurocognitive development,[32] the mercury accumulated in the fish can offset the health benefits,[33] a finding confirmed by studies conducted in Boston[34] and New York City.[35] In fact, it is difficult to consume the amount of fish recommended by the American Heart Association while simultaneously remaining below EPA's mercury reference dose because of the high levels of mercury present in most fish.[36]

The inverse is also true: past studies analyzing the effects of methylmercury in the human body have underestimated the dangers because nutrients in fish mask the true adverse effects of

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[24] Int'l Agency for Research on Cancer, *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 58 Beryllium, Cadmium, Mercury, and Exposures in the Glass Manufacturing Industry* 277–83 (1993), *available at* https://monographs.iarc.fr/wp-content/uploads/2018/06/mono58.pdf.

[25] Nat'l Research Council, *supra* note 11, at 150–51.

[26] *Id.* at 153–54, 161–63, 173–74.

[27] Marúcia I. M. Amorim et al., *Cytogenetic Damage Related to Low Levels of Methyl Mercury Contamination in the Brazilian Amazon*, 72 Anais da Academia Brasileira de Ciências 497, 497 (2000), *available at* http://www.scielo.br/pdf/aabc/v72n4/0048.pdf.

[28] Nat'l Research Council, *supra* note 11, at 156–61; Jennifer F. Nyland et al., *Biomarkers of Methylmercury Exposure Immunotoxicity among Fish Consumers in Amazonian Brazil*, 119 Envtl. Health Persp. 1733, 1736–38 (2011).

[29] Shirlee W. Tan et al., *The Endocrine Effects of Mercury in Humans and Wildlife*, 39 Critical Rev. Toxicology 228, 228 (2009).

[30] Ka He et al., *Mercury Exposure in Young Adulthood and Incidence of Diabetes Later in Life: The CARDIA Trace Element Study*, 36 Diabetes Care 1584, 1587–89 (2013).

[31] Eliseo Guallar et al., *Mercury, Fish Oils, and the Risk of Myocardial Infarction*, 347 New England J. Med. 1747, 1753 (2002).

[32] Emily Oken et al., *Maternal Fish Intake during Pregnancy, Blood Mercury Levels, and Child Cognition at Age 3 Years in a US Cohort*, 167 Am. J. Epidemiology 1171–81 (2008).

[33] Anna L. Choi et al., *Negative Confounding in the Evaluation of Toxicity: The Case of Methylmercury in Fish and Seafood*, 38 Critical Reviews in Toxicology, 877, 877 (2008).

[34] Oken et al., *supra* note 7, at 1177–79.

[35] Sally Ann Lederman et al., *Relation between Cord Blood Mercury Levels and Early Child Development in a World Trade Center Cohort*, 116 Envtl. Health Persp. 1085, 1090 (2008).

[36] *See* Rune Dietz et al., *Anthropogenic Contributions to Mercury Levels in Present-Day Arctic Animals—A Review*, 407 Sci. Total Env't 6120, 6125–26 (2009).

methylmercury.[37] Although the mercury-related damage may be masked, the result is that the benefits that consumers would otherwise obtain from a healthy diet are diminished, thus counteracting the purpose of including fish in the diet.

### *4. Methylmercury Causes Multiple Environmental Harms*

Even at low levels, methylmercury threatens numerous aquatic and terrestrial species of birds and mammals.[38] For example, studies report that mercury has severe reproductive effects on fish such as trout, bass, and salmon.[39] Predatory species that consume fish, such as birds and freshwater and marine mammals, suffer more severe impacts. For example, there are well-documented effects of mercury on loons, including behavioral, physiological, and reproductive impairments.[40] Other piscivorous birds have exhibited decreased foraging efficiency,[41] decreased reproductive success,[42] and liver and kidney damage.[43] Insectivorous birds have likewise shown reduced reproductive capacity,[44] survival rate,[45] immune function,[46] and singing

[37] Esben Budtz-Jorgensen et al., *Separation of Risks and Benefits of Seafood Intake*, 115 Envtl. Health Persp. 323, 325–26 (2007); Anna L. Choi et al., *Selenium as a Potential Protective Factor Against Mercury Developmental Neurotoxicity*, 107 Envtl. Res. 45, 51 (2008).

[38] David C. Depew et al., *Toxicity of Dietary Methylmercury to Fish: Derivation of Ecologically Meaningful Threshold Concentrations*, 31 Envtl. Toxicology & Chemistry 1536, 1538–45 (2012).

[39] Kate L. Crump et al., *Mercury-Induced Reproductive Impairment in Fish*, 28 Envtl. Toxicology & Chemistry 895, 902–04 (2009).

[40] David C. Evers et al., *Adverse Effects from Environmental Mercury Loads on Breeding Common Loons*, 17 Ecotoxicology 69, 69 (2008); Matthew G. Mitro et al., *Common Loon Survival Rates and Mercury in New England and Wisconsin*, 72 J. Wildlife Mgmt. 665, 665–66 (2008).

[41] Evan M. Adams & Peter C. Frederick, *Effects of Methylmercury and Spatial Complexity on Foraging Behavior and Foraging Efficiency in Juvenile White Ibises (Eudocimus Albus)*, 27 Envtl. Toxicology & Chemistry 1708, 1708 (2008).

[42] Peter Frederick & Nilmini Jayasena, *Altered Pairing Behaviour and Reproductive Success in White Ibises Exposed to Environmentally Relevant Concentrations of Methylmercury*, 278 Proc. Royal Soc'y B: Biological Sci. 1851 (2010).

[43] David J. Hoffman et al., *Mercury and Drought Along the Lower Carson River, Nevada: III. Effects on Blood and Organ Biochemistry and Histopathology of Snowy Egrets and Black-Crowned Night-Herons on Lahontan Reservoir, 2002-2006*, 72 J. Toxicology & Envtl. Health, Part A 1223, 1223 (2009).

[44] Rebecka L. Brasso & Daniel A. Cristol, *Effects of Mercury Exposure on the Reproductive Success of Tree Swallows (Tachycineta Bicolor)*, 17 Ecotoxicology 133, 133 (2008).

[45] Kelly K. Hallinger et al., *Mercury Exposure and Survival in Free-Living Tree Swallows (Tachycineta Bicolor)*, 20 Ecotoxicology 39, 39 (2011).

[46] Dana M. Hawley et al., *Compromised Immune Competence in Free-Living Tree Swallows Exposed to Mercury*, 18 Ecotoxicology 499, 499 (2009).

behavior.[47] Mammals that also heavily depend on fish as a food source, such as river otters, suffer from reduced mobility, abnormal reflexes, and impaired escape behavior.[48]

### C. The 2011 RIA Monetized Only a Small Subset of the Benefits of Regulating Power Plant Mercury Emissions

In the Proposed Finding, EPA concludes that it is not "appropriate and necessary" to regulate power plant mercury emissions under section 112 "because the costs of such regulation grossly outweigh the HAP benefits." 84 Fed. Reg. at 2676. In reaching this conclusion, the Proposed Finding relies on the analysis in the RIA that the agency completed in 2011. As we will discuss below, this analysis is outdated and EPA must consider more current information on both the costs and benefits. However, even on its own terms the analysis of quantified HAP-related benefits in the 2011 RIA was incomplete and incorporated multiple conservative assumptions and methods that resulted in an underestimation of the benefits. EPA cannot reasonably rely on the RIA to reverse the appropriate-and-necessary finding.

First, the RIA only quantified the impacts to a tiny fraction of the U.S. population. Specifically, it only accounted for children born to a limited population of recreational fishers who consume freshwater fish during pregnancy from watersheds where EPA had fish tissue data.[49]

Second, even among this small population, the RIA did not consider all pathways of exposure. Instead it considered only exposure from non-commercially-caught freshwater fish, even though marine fish account for more than 80% of methylmercury intake in the United States.[50] Recent research suggests the regulation of domestic U.S. mercury emissions will have a substantial effect on mercury inputs to coastal waters. For example, recent studies reported marked decreases in mercury concentrations in Atlantic bluefin tuna and bluefish attributed to decreases in U.S. mercury emissions.[51]

Third, even for this limited population and limited set of exposure pathways, the RIA did not quantify all of the health benefits described above. It monetized only neurological benefits and even within these considered only impacts on IQ. 77 Fed. Reg. 9304, 9428 (Feb.16, 2012). Therefore, even at the time it was completed, it failed to consider other neurological impacts such as ADHD and non-neurological impacts such as cardiovascular harms. In addition, when translating IQ's benefits to society, the RIA only examined the relationship between lost IQ and

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[47] Leen Gorissen et al., *Heavy Metal Pollution Affects Dawn Singing Behaviour in a Small Passerine Bird*, 145 Oecologia 504, 504 (2005).

[48] Anton M. Scheuhammer et al., *Effects of Environmental Methylmercury on the Health of Wild Birds, Mammals, and Fish*, 36 Ambio 12, 12 (2007).

[49] Health & Envtl. Impacts Div., Office of Air Quality Planning & Standards, EPA, *EPA-452/R-11-011*, *Regulatory Impact Analysis for Final Mercury and Air Toxics Standards* at 4-49 [hereinafter "*Regulatory Impact Analysis*"].

[50] Elsie M. Sunderland et al., *Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States*, 126 Envtl. Health Persp. 017006 (2018).

[51] Ford A Cross et al., *Decadal Declines of Mercury in Adult Bluefish (1972–2011) from the Mid-Atlantic Coast of the U.S.A.*, 49 Envtl. Sci. & Tech. 9064 (2015); Cheng-Shiuan Lee et al., *Declining Mercury Concentrations in Bluefin Tuna Reflect Reduced Emissions to the North Atlantic Ocean*, 50 Envtl. Sci. & Tech. 12825 (2016).

an individual's earning potential. *Id.* This approach omitted lost IQ's other societal impacts, such as costs of requiring medical care or additional special education programs.

Furthermore, recent epidemiological data have revealed a suite of more sensitive neurodevelopmental effects than full-IQ, the impact valued in the EPA's 2011 RIA. Even in 2000, the National Research Council panel on the *Toxicological Effects of Methylmercury* had conceded that full-IQ was not the most sensitive indicator of neurodevelopment.[52] In addition, neurodevelopmental impacts of methylmercury have more recently been documented at exposure levels below the reference dose established by the panel in 2000.[53] As a result, a full quantification of the neurodevelopmental impacts of EGU mercury emissions would take into account both other kinds of fish consumption and effects other than reductions in IQ.

Even within its analysis of this subset of impacts to this one small group, the RIA adopted several assumptions that erred on the side of underestimating the benefits. For example, in deciding which watersheds to include in the analysis, EPA included only those in which either (1) the total potential exposures exceeded the reference dose, *and* in which power plants contributed more than 5% of the mercury deposition, or (2) the power plant emissions alone would result in an exposure in excess of the reference dose. 77 Fed. Reg. at 7311. As EPA explained, "[r]equiring at least a 5 percent EGU contribution is a conservative approach given the increasing risks associated with incremental exposures above the" reference dose. *Id.* at 9311 n.15. EPA also excluded watersheds near coastal areas and the Great Lakes due to modeling uncertainty.[54] EPA omitted these areas even though they "may have elevated U.S. [power plant] deposition relative to the average levels in the continental U.S."[55] Both of these assumptions mean that the RIA underestimated the benefits, even on its own terms.

In addition, when assessing the public health risk of exposure to methylmercury, EPA assumed the existence of a reference dose, which is "a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime."[56] As a result, only watersheds with female subsistence fish consumer exposures above the reference dose were "considered to have the potential for consumers of self-caught fish from that watershed to experience a public health hazard due to [methylmercury] exposure."[57] In other words, exposures below the reference dose were not included as part of the risk assessment. However, there is no evidence from epidemiological studies for a health effects

[52] Nat'l Research Council, *supra* note 11.

[53] Martine Bellanger et al., *Economic Benefits of Methylmercury Exposure Control in Europe: Monetary Value of Neurotoxicity Prevention*, 12 Envtl. Health 3 (2013).

[54] EPA, *EPA-452/R-11-009, Revised Technical Support Document: National-Scale Assessment of Mercury Risk to Populations with High Consumption of Self-caught Freshwater Fish* 7 n.10, (2011) [hereinafter "*Revised Technical Support Document*"].

[55] *Id.*

[56] *Regulatory Impact Analysis*, *supra* note 49, at 4-31.

[57] *Revised Technical Support Document*, *supra* note 54, at 43.

threshold below which neurodevelopmental effects from methylmercury exposure do not occur.[58]

Furthermore, the reference dose that EPA relied on in conducting its risk assessment is outdated: The calculation was published by EPA in the Integrated Risk Information System in 2001, based on a study conducted by the National Research Council in 2000.[59] EPA itself recognizes the need to update the reference dose: the agency recently published a document calling for a reassessment "in light of recent epidemiological studies that analyzed effects at lower methylmercury exposure levels than those in studies used to derive the existing [reference dose]."[60] For example, one recent study suggests an association between methylmercury exposure and anxiety even at very low levels of prenatal exposure where the mean blood mercury concentration was 0.67 μg/L,[61] which is below the geometric mean for women in every year of National Health and Nutrition Examination Survey data.[62]

The final quantification of the benefits was also undervalued for another two reasons. First, when EPA estimated the sensitivity of IQ to cord blood methylmercury, it relied on dose-response information from a 2007 study by Axelrad et al.[63] This study is outdated and results in a severe underestimation of the actual harms. Estimates that rely on more recent information present a much greater magnitude of harm.[64]

Second, when translating the relationship between mercury and IQ, EPA applied a linear model that underestimated the true effect of the exposure.[65] In reality, the relationship between daily intake and brain mercury is a power function with a coefficient greater than 1.0. Therefore, "a decrease in [mercury] intake will produce a greater-than-linear decrease in brain concentration."[66] However, EPA decided on a linear model because the calculation would be much simpler. As the Science Advisory Board explained, this approach would underestimate the benefits of mercury reduction not only because of the modeling procedure but also its inputs.[67]

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[58] Karagas et al., *supra* note 8.

[59] *Id.*

[60] EPA, *Integrated Risk Information System (IRIS) Assessment Plan for Methylmercury (Scoping and Problem Formulation Materials)* at 6:16 (2019).

[61] Nimesh B. Patel et al., *Very Low-Level Prenatal Mercury Exposure and Behaviors in Children: The HOME Study*, 18 Envtl. Health 4 (2019).

[62] Ctrs. Disease Control & Prevention, U.S. Dep't of Health & Human Servs., *Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables, January 2019, Volume One*, at 321-22 (2019), *available at* https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Jan2019-508.pdf.

[63] *Regulatory Impact Analysis*, *supra* note 49, at 4-31.

[64] Grandjean et al., *supra* note 8.

[65] Science Advisory Board Mercury Panel, *EPA-SAB-11-017, Review of EPA's Draft National-Scale Mercury Risk Assessment* 20 (2011).

[66] *Id.*

[67] *Id.*

Although EPA may have appropriately adopted assumptions that minimized the benefits of regulating EGU mercury emissions in 2012, now that the agency is proposing to reverse course, it is no longer logically supportable to retain them. The effect of the assumptions in the 2012 rulemaking was to discount information that would have only strengthened the agency's conclusion, whereas the effect now is to ignore information that undermines it. As the Supreme Court has stated, "[s]o long as they are supported by a body of reputable scientific thought, the Agency is free to use conservative assumptions . . . *risking error on the side of overprotection rather than underprotection*."[68] The Proposed Finding would do the reverse.

### D. The RIA Substantially Underestimated the Contribution of Coal-fired Power Plants to Local Mercury Deposition

The RIA also underestimated the significance of U.S. power plant mercury emissions to atmospheric mercury deposition to land and waters in the United States. It calculated the benefits of MATS based on atmospheric modeling that suggested that only approximately 2% of total mercury deposition in the United States is derived from U.S. power plant emissions.[69] However, more recent scientific studies demonstrate that the contribution of U.S. coal-fired power plants to local deposition is much higher than previously understood. Accordingly, the RIA underestimated the domestic benefits of reducing those emissions.

Mercury emissions from power plants occur in three forms: (1) gaseous elemental mercury, (2) gaseous oxidized mercury (also called "reactive gaseous mercury"), and (3) mercury bound to particles. In general, oxidized mercury and particle-bound mercury travel shorter distances than elemental mercury before falling to the Earth because they are more water-soluble and chemically reactive. A substantial portion of the mercury emitted by coal-fired power plants is in the oxidized and particle-bound forms.

A substantial fraction of mercury from power plant emissions has been demonstrated to be deposited locally. For example, one study of mercury deposition in Ohio concluded that forty-two percent of the average atmospheric mercury wet deposition was traceable to a nearby coal-fired power plant.[70] Another study identified biological mercury hotspots in the northeastern United States driven mainly by domestic emissions.[71]

For the past two decades, mercury researchers have noted slow and steady declines in atmospheric mercury concentrations in the Northern Hemisphere. Initial attempts to rationalize these observations from a scientific perspective were confounded by a commonly held (but incorrect) assumption among researchers that global mercury emission trends from anthropogenic sources were steady or increasing over this same time period. Zhang et al. recently corrected an error in previous emissions inventories on the form of mercury released by power plants over time. In particular, they demonstrated that as utilities implemented selective

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[68] *Indus. Union Dep't AFL-CIO v. API*, 448 U.S. 607, 656 (1980) (emphasis added).

[69] *Revised Technical Support Document*, *supra* note 54, at 65.

[70] Emily M. White et al., *Spatial Variability of Mercury Wet Deposition in Eastern Ohio: Summertime Meteorological Case Study Analysis of Local Source Influences*, 43 Envtl. Sci. & Tech. 4946, 4952 (2009).

[71] Evers et al., *supra* note 3, at 41.

catalytic reduction, the fraction of mercury emissions released as oxidized or particle-bound mercury decreased—reducing local impacts by more than the reduction in overall emissions. This correction helps enable global models to reproduce the observed declining atmospheric mercury trends.[72] This analysis shows spatial patterns and temporal trends in atmospheric mercury concentrations and deposition are much more influenced by local and regional actions than previously assumed. The Proposed Finding is arbitrary for not taking this updated information on mercury emissions, atmospheric transformations, and deposition into account.

### E. The Quantifiable Benefits of Reducing Mercury Emissions are Much Larger than Estimated in the RIA

It is not surprising—given the significant gaps in the 2011 RIA's analysis of the monetized benefits of regulating mercury emissions from coal-fired power plants described above—that recent studies suggest that the mercury-related benefits of the MATS Rule are actually orders of magnitude larger than those monetized in the RIA. For example, a 2016 study indicated that when policymakers account for lost wages, medical costs from IQ deficits and nonfatal heart attacks, and premature fatalities quantified into a value of statistical life (VSL) model, the benefits of the Rule exceed $43 billion.[73] Another study estimated an annual benefit of $860 million associated with a 10% reduction in methylmercury exposure in the U.S. population.[74] A 2017 study estimated that the total economic costs from methylmercury exposure in the United States are $4.8 billion per year.[75] Even an earlier study had concluded that, factoring in the impact of lower IQ on schooling, probability of workforce participation, and lifetime earnings, U.S. power plant mercury emissions cost the economy about $1.3 billion every year.[76]

### F. As U.S. Power Plant Mercury Emissions Have Declined, Health Has Improved

Given that the MATS Rule has been in effect since 2012, the benefits of the rule are no longer hypothetical. Domestic mercury emissions have declined dramatically: according to Toxics Release Inventory ("TRI") data, mercury emissions from U.S. coal-fired power plants decreased

[72] Yanxu Zhang et al., *Observed Decrease in Atmospheric Mercury Explained by Global Decline in Anthropogenic Emissions*, 113 Proc. Nat'l Acad. of Sci. 526 (2016).

[73] Amanda Giang & Noelle E. Selin, *Benefits of Mercury Controls for the United States*, 113 Proc. Nat'l Acad. of Sci. 286 (2016).

[74] Glenn E. Rice et al., *A Probabilistic Characterization of the Health Benefits of Reducing Methyl Mercury Intake in the United States*, 44 Envtl. Sci. & Tech. 5216 (2010).

[75] Philippe Grandjean & Martine Bellanger, *Calculation of the Disease Burden Associated with Environmental Chemical Exposures: Application of Toxicological Information in Health Economic Estimation*, 16 Envtl. Health 123 (2017).

[76] Leonardo Trasande et al., *Public Health and Economic Consequences of Methyl Mercury Toxicity to the Developing Brain*, 113 Envtl. Health Persp. 590 (2005).

by 86% (79,000 pounds) between 2006 and 2016,[77] and by 89% (83,000 pounds) between 2007 and 2017.[78]

These declines have been correlated with reductions in environmental mercury levels, fish advisories, adult blood mercury levels, and prenatal methylmercury exposures. For example, several U.S. studies have measured substantial declines in domestic atmospheric and ecologic mercury concentrations attributable to reductions in mercury emissions from power plants. Castro and Sherwell observed declines in atmospheric mercury concentrations at a pristine site in Maryland downwind of power plants in Ohio, Pennsylvania, and West Virginia.[79] Drevnick et al. observed a mean ~20% decline in mercury accumulation in 104 sediment cores from the Great Lakes regions attributable to domestic emissions reductions.[80] Similarly, Hutcheson et al. noted declines in methylmercury concentrations in freshwater fish in the United States concurrent with domestic mercury emissions reduction.[81] It is important to note that even though bioaccumulated methylmercury levels in fish is a good indicator of mercury emission changes, it is estimated that not all of the mercury emitted into the air will be reflected in fish until 10 years later due to the persistent nature of mercury in water.[82] Accordingly, the health benefits from MATS will continue to manifest themselves in the years to decades to come.

### G. Actual MATS Compliance Costs Have Been Much Lower than Predicted in 2011

In the 2011 RIA, EPA estimated that the utility industry's annual compliance costs for the MATS Rule would be approximately $9.6 billion per year. Multiple sources of information have now made it clear that this number dramatically overestimated the actual costs.[83]

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[77] EPA, *TRI National Analysis 2016: Comparing Industry Sectors* 31 (2018), *available at* https://www.epa.gov/sites/production/files/2018-01/documents/comparing_industry_sectors.pdf.

[78] *Mercury Air Releases Trend*, EPA, https://www.epa.gov/trinationalanalysis/mercury-air-releases-trend (last visited Apr. 15, 2019).

[79] Mark S. Castro & John Sherwell, *Effectiveness of Emission Controls to Reduce the Atmospheric Concentrations of Mercury*, 49 Envtl. Sci. & Tech. 14000 (2015).

[80] Paul E. Drevnick et al., *Spatial and Temporal Patterns of Mercury Accumulation in Lacustrine Sediments across the Laurentian Great Lakes Region*, 161 Envtl. Pollution 252 (2012).

[81] Michael S. Hutcheson et al., *Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions*, 48 Envtl. Sci. & Tech. 2193 (2014).

[82] Giang & Selin, *supra* note 73.

[83] This scenario—in which the predicted compliance costs turn out to be much higher than the actual costs—is common with environmental regulations. When a new or more stringent emissions limit is introduced, demand for control technology increases and companies are incentivized to innovate. These changes, combined with more widespread use of and experience with the technology and with the regulatory process results in technological advancements and cost reductions. *See generally* Brief of *Amici Curiae* Technological Innovation Experts Nicholas Ashford, M. Granger Morgan, Edward Rubin, and Margaret Taylor in Support of Respondents, *North Dakota v. EPA*, No. 15-1381 (D.C. Cir. Dec. 21, 2016), *available at* https://www.edf.org/sites/default/files/content/2017.02.06_tech_experts_final_brief.pdf.

A 2015 analysis by Andover Technology Partners showed that the actual cost of compliance in the initial years of implementation was approximately $2 billion per year—more than $7 billion lower than EPA estimated.[84] The analysis attributed the lower costs:

> to the facts that: (1) improvements in dry sorbent injection ("DSI") and activated carbon injection ("ACI") technologies have significantly lowered the costs of those pollution control systems; (2) natural gas prices have been significantly lower than those upon which EPA's estimates were premised; and (3) EPA overestimated the generation capacity that would require installation of fabric filters (also known as baghouses), dry flue gas desulfurization ("FGD") systems and wet FGD upgrades.[85]

This analysis also estimated that the annual costs after 2015 would be less than $1 billion.[86] To complement this "top-down" analysis, a subsequent report by James Staudt of Andover Technology Partners estimated ongoing operating costs using a "bottom-up" methodology; this report concluded that the annual operating costs were roughly $620 million.[87]

Even representatives of the utility industry, in a letter sent to EPA in the summer of 2018, estimated that the total cost to the industry over the six years that MATS had been in effect was approximately $18 billion—also much lower than EPA had predicted.[88]

These estimates are bolstered by reviews of utility company securities filings, which demonstrate a pattern of decreasing cost estimates over time.[89] For example, FirstEnergy initially projected that it would cost the company $2 billion to $3 billion to comply with MATS. By the time of its 2011 Fourth Quarter Earnings Call, this estimate had declined to $1.3 billion to $1.7 billion. By 2014, the company was reporting that its "total capital cost for compliance (over the 2012 to 2018 time period) is currently expected to be approximately $370 million."[90]

Similar declines can be seen at the level of a single plant. In 2014, the Southwestern Electric Power Company (SWEPCo), a subsidiary of American Electric Power predicted that the cost of installing mercury controls for units 1 and 3 of its J. Robert Welsh Power Plant in Texas was

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[84] Declaration of James E. Staudt, Ph.D., CFA, at 3, *White Stallion Energy Center v. EPA*, No. 12-1100 (D.C. Cir. Dec. 24, 2015).

[85] *Id.*

[86] *Id.* at 7.

[87] James E. Staudt, Ph.D., Update of the Cost of Compliance with MATS—Ongoing Costs of Control (May 25, 2017) (Exhibit 1 to Letter from Brian Leen, President and Chief Executive Officer, ADA Carbon Solutions, LLC, to Peter Tsirigotis, Director, Office of Air Quality Planning and Standards, EPA (June 29, 2018) [hereinafter "Staudt Update"], *available at* https://www.sierraclub.org/sites/www.sierraclub.org/files/blog/ADA%20Carbon%20Solutions%20Letter.pdf.

[88] Letter from Edison Electric Institute, et al., to William L. Wehrum, Assistant Administrator, Office of Air and Radiation, EPA (July 10, 2018) [hereinafter "EEI Letter"].

[89] Staudt Update, *supra* note 87, at 6 & Ex. 3; Envtl. Defense Fund, *Power Companies' Declining Estimates of the Compliance Costs of the Mercury & Air Toxics Standards (MATS)* (2014), *available at* http://blogs.edf.org/climate411/files/2014/05/Declining-costs-of-MATS-compliance.pdf.

[90] Staudt Update, *supra* note 87, Ex. 3 at 1.

approximately $410 million.[91] By 2015, the cost estimated had declined to approximately $400 million.[92] After completing the control projects for MATS compliance in 2016, SWEPCo reported that the actual cost was approximately $370 million.[93]

All of these sources of information demonstrate that the actual MATS compliance costs for the utility industry were much lower than EPA predicted in 2011. It is irrational for the Proposed Funding to conclude that the benefits of regulating power plant HAP emissions are not "moderately commensurate" with the costs when the cost number used for that comparison is inflated by many billions of dollars per year.

## II. EPA HAS THE AUTHORITY AND THE OBLIGATION TO RE-EVALUATE ITS COST-BENEFIT ANALYSIS IN LIGHT OF THE NEW INFORMATION

Instead of conducting an original analysis of the impacts of regulating power plant HAP emissions, the Proposing Finding uses data from the 2011 RIA. Continuing to rely on eight-year-old data when significant new information regarding both benefits and the costs is available is arbitrary and capricious. Moreover, the Proposed Finding does not provide a reasoned explanation for its failure to update the analysis, which is also a violation of the rulemaking procedures mandated by the CAA.

### A. As a Matter of Rational Decision-making, EPA Should Rely on Up-to-Date Information

"Federal administrative agencies are required to engage in reasoned decision-making. Not only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational." *Michigan v. EPA*, 135 S. Ct. 2699, 2706 (2015). An agency violates this duty when, for example, it "entirely fail[s] to consider an important aspect of [a] problem" or "offer[s] an explanation for its decision that runs counter to the evidence before the agency." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 44 (1983). In addition, "when an agency decides to rely on a cost-benefit analysis as part of its rulemaking, a serious flaw undermining that analysis can render the rule unreasonable." *Nat'l Ass'n of Home Builders v. EPA*, 682 F.3d 1032, 1040 (D.C. Cir. 2012).

If EPA finalizes the Proposed Finding without considering new evidence regarding the costs and benefits of regulating power plant HAP emissions, it will be committing both of these errors.

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[91] Am. Elec. Power, *American Electric Power 2014 Annual Report: Audited Consolidated Financial Statements and Management's Discussion and Analysis of Financial Condition and Results of Operations* at 91 (2014), *available at* https://aep.com/assets/docs/investors/AnnualReportsProxies/docs/14annrep/2015_Official_Appendix_A.pdf.

[92] Am. Elec. Power, *American Electric Power 2015 Annual Report: Audited Consolidated Financial Statements and Management's Discussion and Analysis of Financial Condition and Results of Operations* at 107 (2015), *available at* https://aep.com/assets/docs/investors/AnnualReportsProxies/docs/15annrep/2015AnnualReportAppendixAtoProxy.pdf.

[93] Am. Elec. Power, *American Electric Power 2016 Annual Report: Audited Consolidated Financial Statements and Management's Discussion and Analysis of Financial Condition and Results of Operations* at 107 (2016), *available at* https://aep.com/assets/docs/investors/AnnualReportsProxies/docs/16annrep/2016AnnualReportAppendixAtoProxy.pdf.

Updated evidence regarding the health impacts and the fate and transport of those emissions, as well as information on the actual costs of compliance for the electric utility industry, are all central aspects of the "problem" before the agency when it decides whether regulating power plant HAP emissions is "appropriate and necessary." Moreover, such a finding would run counter to the evidence before EPA. Unless EPA can explain why the 2011 data reflects reality more accurately than the new evidence or offer other sufficient justifications, its choice to rely on the 2011 RIA "bears no rational relationship to the reality it purports to represent." *Sierra Club v. United States EPA*, 167 F.3d 658, 662 (D.C. Cir. 1999) (quoting *Columbia Falls Aluminum Co. v. EPA*, 139 F.3d 914, 923 (D.C. Cir. 1998)).

Courts have frequently held that an agency action is arbitrary and capricious if it is based on outdated information, particularly when it is clear that more recent data are available. For instance, the Eighth Circuit once held that EPA's consideration of costs when promulgating a new source performance standard under the Clean Water Act was inadequate because the agency "based its cost figures on 1971 prices, even though the Development Document and the regulations were published in March of 1974." The Court further opined that "[m]ore current figures than this are available, and should be used by the EPA in setting forth projected capital and operating costs for new plants." *CPC Int'l, Inc. v. Train*, 515 F.2d 1032, 1051 (8th Cir. 1975). Similarly, in a case involving the Department of Energy's setting of appliance efficiency standards, the D.C. Circuit held that "it would be patently unreasonable for DOE to begin further proceedings in the last half of 1985 based on data half a decade old." *Natural Resources Defense Council, Inc. v. Herrington*, 768 F.2d 1355, 1408 (D.C. Cir. 1985). As the Ninth Circuit recently summed up the principle:

> [W]e should not silently rubber stamp agency action that is arbitrary and capricious in its reliance on old data without meaningful comment on the significance of more current compiled data. We hold that EPA's failure to even consider the new data and to provide an explanation for its choice rooted in the data presented was arbitrary and capricious.

*Sierra Club v. U.S. E.P.A.*, 671 F.3d 955, 968 (9th Cir. 2012); *see also Alvarado Cmty. Hosp. v. Shalala*, 155 F.3d 1115, 1122 (9th Cir. 1998), *amended*, 166 F.3d 950 (9th Cir. 1999) (finding that Medicare reimbursement decision was arbitrary and capricious because it was based on 1981 data when 1984 data were available).

The failure to consider these new data is also inconsistent with EPA's internal policies regarding the role of science in its regulatory decision-making. EPA has long taken the position that all of its decisions must be based on the "best available science." For instance, the agency's 1997 strategic plan provided that one of EPA's overall purposes was to ensure that "efforts to reduce environmental risk are based on the best available scientific information."[94] In 2002, the agency issued Information Quality Guidelines in which it took the position that this standard should apply to all of its risk assessments.[95] As recently as April of last year, EPA reiterated in a notice of proposed rulemaking that "*[t]he best available science must serve as the foundation of EPA's*

[94] EPA, *EPA/190-R-97-002, EPA Strategic Plan* 16 (1997).

[95] EPA, *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency* 22 (2005).

*regulatory actions*."[96] Taking action based on an eight-year-old assessment in the face of significant new scientific information plainly does not constitute using "the best available science."

In fact, EPA previously recognized the importance of using up-to-date science in making the section 112(n) appropriate-and-necessary determination. When promulgating the MATS Rule in 2012 EPA conducted "additional technical analyses" to build on its original finding from 2000. 77 Fed. Reg. at 9301. According to EPA, although the agency was "not required to reevaluate the 2000 finding," it updated the risk assessments "[b]ecause over 10 years had passed since the 2000 finding, and EPA wanted to evaluate HAP emissions from U.S. EGUs based on the most accurate information available." *Id.* at 9337.

Cases decided under the National Environmental Policy Act ("NEPA") also demonstrate this principle, even though the standard of review for NEPA ("hard look") is not precisely the same as the reasoned decision-making requirement that applies to the Proposed Finding. These cases show that, when an agency is developing an Environmental Impact Statement ("EIS"), "reliance on out-of-date or incomplete information may render the analysis of effects speculative and uncertain." *City of Dallas, Tex. v. Hall*, 562 F.3d 712, 720 (5th Cir. 2009). For example, a recent D.C. Circuit decision involved the Federal Energy Regulatory Commission's NEPA review during the licensing of a hydroelectric project. *Am. Rivers & Ala. Rivers Alliance v. FERC*, 895 F.3d 32 (D.C. Cir. 2018). When analyzing the fish mortality that would be caused by the project, "the Commission's only cited evidence for the amount of fish deaths was a more-than-decade-old-survey of fish entrainment studies and estimates provided by the license applicant itself, Alabama Power." *Id.* at 50. The court held that "[t]he Commission's acceptance, hook, line, and sinker, of Alabama Power's outdated estimates, without any interrogation or verification of those numbers is, in a word, fishy. *And it is certainly unreasoned*." *Id.* (emphasis added). Other cases are to the same effect. *See, e.g.*, *Custer Cty. Action Ass'n v. Garvey*, 256 F.3d 1024, 1034 (10th Cir. 2001) (holding that "agencies must take a hard look at the environmental consequence of proposed actions utilizing public comment and the best available scientific information"); *San Juan Citizens Alliance v. United States BLM*, 326 F. Supp. 3d 1227, 1249 (D.N.M. 2018) (rejecting the Bureau of Land Management's "rel[iance] on outdated scientific tools and analyses").

The Proposed Finding's failure to take into account updated information regarding costs is particularly troubling because the distinction is not between relatively older and new predictions, but rather between a prediction and reality. Now that EPA is equipped with knowledge about the actual compliance costs, the outdated prediction from the 2011 RIA has very limited, if any, value. Therefore, EPA is obligated to confront the fact that $9.6 billion per year is a highly

[96] EPA, Strengthening Transparency in Regulatory Science (Proposed Rule), 83 Fed. Reg. 18,768, 18,769 (Apr. 30, 2018) (emphasis added).

inflated cost figure. In fact, the power industry has already absorbed the costs relatively smoothly and would not be better off if the regulations are repealed.[97]

### B. The Proposed Finding Provides no Meaningful Explanation for its Failure to Consider New Information

The Proposed Finding cites no legal authority for the appropriateness of continuing to rely on data from 2011. In fact, it provides no meaningful justification for this decision at all. That failure alone is sufficient reason for EPA to withdraw the Proposed Finding.

The Proposed Finding refers to a memorandum entitled "Compliance Cost, HAP Benefits, and Ancillary Co-Pollutant Benefits for '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. at 2678 & n.16. According to the Proposed Finding,

> *as explained in the memorandum*, given that the CAA section 112(n)(1)(A) finding is a threshold analysis that Congress intended the Agency would complete prior to regulation, the EPA believes it is reasonable for purposes of this reconsideration to rely on the estimates projected prior to the rule's taking effect, *i.e.*, the estimates of costs and benefits calculated in the 2011 RIA.

84 Fed. Reg. at 2678 (emphasis added).

The memorandum,[98] however, contains no such explanation. In fact, the sentence quoted above *is the entire explanation* that the Proposed Finding provides for ignoring eight years of scientific research on the benefits of regulating HAP emissions from power plants, as well as data indicating the actual costs of compliance.

Accordingly, the Proposed Finding violates EPA's duty to set forth "the major legal interpretations . . . underlying the proposed rule." 42 U.S.C. § 7607(d)(3)(C).

> It is not the role of the courts to speculate on reasons that might have supported an agency's decision. We may not supply a reasoned basis for the agency's action that the agency itself has not given. Whatever potential reasons the Department might have given, the agency in fact gave almost no reasons at all. In light of the serious reliance interests at stake, the Department's conclusory statements do not suffice to explain its decision.

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[97] *See* EEI Letter, *supra* note 88 ("It is important to note that all covered plants have implemented the regulation and that pollution controls—where needed—are installed and operating . . . . Therefore, we urge EPA . . . to leave the underlying MATS rule in place and effective."). Similarly, it has now been demonstrated that reducing power plant mercury emissions actually results in lower levels of methylmercury exposure in the United States. *See Mercury Air Releases Trend*, *supra* note 78.

[98] The Memorandum was made available to the public in the docket folder for the Proposal at: https://www.regulations.gov/document?D=EPA-HQ-OAR-2018-0794-0007.

*Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2117, 2127 (2016) (citations and internal quotation marks omitted). EPA should therefore withdraw the Proposed Finding and conduct further analysis in light of the new evidence. If EPA were to provide the missing legal interpretation in a final Finding without first issuing a new proposal, that course of action would be impermissible because it would deprive the public of any opportunity to comment on the legal interpretation.

## III. EVEN IF THE PROPOSED FINDING COULD RELY SOLELY ON DATA FROM THE 2011 RIA, ITS ANALYSIS OF THE DATA IS IRRATIONAL

### A. The Proposed Finding Assigns a Determinative Role to Cost, which is Inconsistent with *Michigan* and the Statutory Text

In the Proposed Finding, EPA rejects its previous "cost-reasonableness" approach, and instead focuses its analysis on the comparison between monetized costs and monetized HAP-specific benefits. Although the agency does not specify exactly what standard it uses to measure costs against benefits, the Proposed Finding concludes that it is not appropriate and necessary to regulate power plants primarily based on the "gross disparity between monetized costs and [quantified] HAP benefit." 84 Fed. Reg. at 2677. In reaching the conclusion, however, EPA is ambiguous regarding the magnitude of benefits relative to costs necessary to make regulation of power plants under section 112 "appropriate," the precise way in which unquantified HAP benefits are accounted for, and the weight, if any, assigned to quantified co-benefits. Because the determinative role the Proposed Finding assigns to costs is inconsistent with the statutory text of section 112(n) as interpreted by the *Michigan* decision, the Proposed Finding is arbitrary and capricious.

To begin with, "appropriate and necessary" is a capacious phrase under which EPA must consider multiple factors—not only costs. In *Michigan*, Justice Scalia explicitly recognized that section 112(n)(1)'s "broad reference to appropriateness encompasses *multiple* relevant factors (which include but are not limited to cost)," and *Michigan* in no way suggested that cost should be the central factor in the Finding. 135 S. Ct. at 2709. Understood properly, the *Michigan* decision, by pointing out that "agencies have long treated cost as a centrally relevant factor when deciding whether to regulate," simply reiterates that cost should be *one* of the factors that EPA considers when making the finding. *Id.* at 2707 (emphasis added). In other words, what *Michigan* requires is that cost play *some* role in the finding, not that cost considerations should dominate the finding. The Proposed Finding, by focusing exclusively on the balance between the compliance costs and the quantified HAP benefits, is inconsistent with this direction from the Court.

Next, the text of section 112(n)(1) more generally makes it clear that Congress intended that public health, not cost, play the main role in the "appropriate and necessary" finding. Congress put health at the forefront of 112(n)(1) by requiring the Administrator to perform "a study of the hazards to public health reasonably anticipated to occur as a result of" power plant HAP emissions. 42 U.S.C. § 7412(n)(1)(A). This study is the only one that Congress explicitly instructed EPA to consider when making the appropriate and necessary finding. *Id.* ("The Administrator shall regulate electric utility steam generating units under this section, if the Administrator finds such regulation is appropriate and necessary *after considering the results of*

*the study required by this subparagraph*.") (emphasis added). Moreover, Congress mandated three studies in section 112(n)(1) and while health impacts are part of all three studies, cost factors into only one of them. *Id.* § 7412(n)(1)(A)-(C). It is telling that while public health was clearly Congress's primary focus in section 112(n)(1)(A), cost comes into consideration only indirectly through "the classic broad and all-encompassing term" "appropriate." *Michigan*, 135 S. Ct. at 2707. Although *Michigan* rejected the argument that this language foreclosed EPA from ignoring costs in the finding, Congress did not intend to make cost the central consideration.

The Proposed Finding's narrow focus on cost-effectiveness also thwarts the purpose of section 112 as a whole. Section 112 addresses HAPs that Congress determined to be "inherently harmful," and—as EPA previously recognized—Congress expressly instructed the agency to "protect the most sensitive populations from those harms."[99] 81 Fed. Reg. at 24,424. The emphasis on public health is also evident in section 112(c)(9), which conditions delisting of any sources upon a finding that emissions from the source category do not "exceed a level which is adequate to protect public health with an ample margin of safety and [pose] no adverse environmental effect." 42 U.S.C. § 7412(c)(9). Similarly, section 112(e)(2) specifically instructs the agency, when setting its priorities to promulgate emission standards for different source categories, to consider "the known or anticipated adverse effects of [pollutants] on public health and the environment" in tandem with "the quantity and location of emissions or reasonably anticipated emissions of [HAPs] that each category . . . will emit." 42 U.S.C. § 7412(e)(2). As explained below, section 112(n)(1) is an integral part of section 112, which Congress enacted explicitly in response to EPA's lack of action in addressing the harmful effects of HAPs, and therefore shares the section's overall focus on harm prevention. In this context, it is impermissible for the agency to allow a cost-benefit analysis that overstates costs and understates benefits to dictate the appropriate-and-necessary finding.

### B. The Proposed Finding's Consideration of Unquantified Benefits is Incoherent and Incomplete

It is a long-standing principle that agencies should carefully consider non-monetized benefits in decision making that requires cost-benefit analysis. Office of Management and Budget ("OMB") Circular A-4 specifically instructs agencies to identify important non-monetary values in any analysis, warns that "the most efficient alternative will not necessarily be the one with the largest quantified and monetized cost-benefit estimate," and instructs agencies to "exercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis." OMB, *Circular A-4: Regulatory Analysis* 26 (2003).

The Proposed Finding "acknowledges the importance of [the non-monetized] benefits and the limitations on the [a]gency's ability to monetize HAP-specific benefits," 84 Fed. Reg. at 2677, and further mentions that "such benefits are relevant to any comparison of the benefits and costs

[99] In the Proposed Finding, EPA contends that to accommodate statutory objectives when interpreting section 112(n)(1)(A) would be to "harmonize" the provision with the rest of the section and the CAA as a whole, 85 Fed. Reg. at 2675, which is it asserts is impermissible under *Michigan*. *See* 135 S. Ct. at 2710. However, nothing in *Michigan* suggests that the differences in treatment automatically make cost the determinative factor in regulatory decisions regarding EGUs; *Michigan* never affirmatively explains the different treatments in terms of the kind of role that cost should play.

of a regulation," *id.* at 2678. Its consideration of these unquantified benefits, however, suffers from two fatal flaws.

First, the Proposed Finding's discussion of non-monetized, HAP-specific benefits does not go further than a mere acknowledgement of their existence. Without providing any further discussion of the nature, seriousness, and magnitude of the unquantified benefits, EPA nevertheless concludes that "the gross disparity between monetized costs and HAP benefits, which [the agency] believe to be the primary focus of the . . . determination in CAA section 112(n)(1)(A), is too large to support an affirmative appropriate and necessary finding." 84 Fed. Reg. at 2678. In fact, EPA asserts that "even assuming that actual costs and benefits differed from projections made in 2011, given the large difference between target HAP benefits and estimated costs, the outcome of the Agency's proposed finding here would likely stay the same." *Id.* But EPA cannot rationally make such a statement before it demonstrates at least a rough sense of the magnitude of the non-monetized benefits, especially when it ignores published scientific developments since 2011 that have allowed some previously unquantifiable benefits to be quantified. Without a reasonable attempt to articulate a general grasp of the non-monetized benefits, it is arbitrary and capricious for EPA to reach this conclusion. After all, section 112(n)(1) imposes on EPA the statutory duty to understand the public health consequences of EGU emissions, a responsibility EPA "cannot shirk . . . simply because it may be difficult." *NetCoalition v. SEC*, 615 F.3d 525, 539 (D.C. Cir. 2010). Considering the critical role that EPA assigns to cost-benefit analysis, the Proposed Finding's cursory treatment of unquantified benefits constitutes a failure "to consider an important aspect of the problem." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

Second, the Proposed Finding reverses EPA's previous approach to non-monetized benefits without explanation. Such an "'unexplained inconsistency' in agency policy" is arbitrary and capricious. *Encino Motorcars, LLC v. Navarro*, 136 S. Ct. 2119, 2125 (2016) (quoting *Nat'l Cable & Telecomms. Ass'n v. Brand X Internet Servs.*, 545 U.S. 967, 981 (2005)). In evaluating the unquantified benefits, the Proposed Finding relies on the same 2011 RIA as did the 2016 Supplemental Finding, yet reaches the opposite conclusion. This reversal signals a changed evaluation of the magnitude of HAP-specific benefits relative to compliance costs: in the 2016 Supplemental Finding, EPA stated that "the final RIA demonstrates that the benefits (monetized *and non-monetized*) of MATS are substantial and far outweigh the costs." 81 Fed. Reg. 24,420, 24,425 (April 25, 2016) (emphasis added). In the Proposed Finding, however, EPA reverses this position by concluding that even taking into account non-monetized HAP benefits and co-benefits, "the gross disparity between monetized costs and HAP benefits . . . is too large to support an affirmative . . . finding." 84 Fed. Reg. at 2677.

A policy change is not arbitrary and capricious if:

> the agency (1) displays awareness that it is changing position, (2) shows that the new policy is permissible under the statute, (3) believes the new policy is better and (4) provides good reasons for the new policy, including 'a reasoned explanation . . . for disregarding facts and circumstances that underlay or were engendered by the prior policy.

*Organized Vill. of Kake v. U.S. Dep't of Agric.*, 795 F.3d 956, 966 (9th Cir. 2015) (quoting *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515-16 (2009) (internal quotation marks omitted)). EPA's treatment of non-monetized HAP-related benefits violates the first and the fourth requirements of this test. As discussed above, the Proposed Finding summarily reaches the conclusion that costs grossly outweigh HAP-related benefits without analyzing the relevant factors in the comparison. In this process, EPA fails to address the fact that the non-monetized benefits were treated differently or were given different weights in the 2016 finding. The lack of analysis demonstrates that EPA does not display awareness that "it is changing position" regarding unquantified HAP benefits. Further, because the Proposed Finding turns on the magnitude of the unquantified HAP benefits, to adequately explain the reversal, EPA is obligated to provide a "reasoned explanation" for rejecting the conclusion it reached in 2016. The agency acts arbitrarily and capriciously when it fails to either confront the significance of the non-monetized benefits "or explain why [they have been] rendered . . . irrelevant." *Nat'l Parks Conservation Ass'n v. Semonite*, 916 F.3d 1075, 1085 (D.C. Cir. 2019).

### C. EPA Should Consider All Benefits, Including Those Related to PM Emission Reductions, under a Cost-Benefit Approach

The Proposed Finding is also irrational because it ignores entirely the significant benefits the 2011 RIA identified from reductions in particulate matter ("PM") emissions. Although PM is not the direct target of section 112, the quantifiable public health benefits of PM reductions are undeniable, and they do not become less real merely because PM is not the regulatory focus. Rather, consideration of co-benefits is consistent with the public health focus of section 112.

Agencies and courts have increasingly recognized that agencies should take into account both indirect costs and co-benefits to provide a more accurate and complete understanding of the net impact of a regulation. OMB Circular A-4 codifies these developments, explicitly requiring agencies to "look beyond direct benefits and direct costs" and to "consider any important ancillary benefits countervailing risks," and stating that "the same standards of information and analysis quality that apply to direct benefits and costs should be applied to ancillary benefits and countervailing risks."[100] EPA itself acknowledges the relevance of co-benefits in its current guidelines for cost-benefit analyses, which require an economic analysis of regulations to include both "directly intended effects . . . as well as ancillary benefits and costs." EPA, *Guidelines for Preparing Economic Analyses* 11-2 (2010).

EPA has recognized that section 112's overarching emphasis on public health makes co-benefits particularly relevant to regulatory decisions under that section. In *Sugar Corp v. EPA*, 830 F.3d 579 (D.C. Cir. 2016), the agency had declined to set a less stringent, health-based standard for hydrogen chloride emissions from industrial boilers, finding that such a standard was not appropriate because—among other things—the more stringent Maximum Achievable Control Technology ("MACT") standard resulted in "potential co-benefits . . . in lowering emissions of other HAP and non-HAP pollutants," *id.* at 625. EPA argued that "its consideration of these co-benefits was not a regulation of other pollutants; rather, it was simply choosing not to ignore the purpose of the CAA—to reduce the negative health and environmental effects of HAP emissions." *Id.* The D.C. Circuit agreed with EPA, holding that the statutory "text does not

[100] OMB, *Circular A-4: Regulatory Analysis* 26 (2003).

foreclose the Agency from considering co-benefits and doing so is consistent with the CAA's purpose—to reduce the health and environmental impacts of hazardous air pollutants." *Id.*

It is clear from *Sugar Corp.* that EPA can consider co-benefits when making regulatory decisions under section 112. Importantly, the D.C. Circuit has also held that agencies are *required* to account for some secondary risks created by their regulations. For example, in *Competitive Enterprise Int. v. Nat'l Highway Traffic Safety Admin.*, 956 F.2d 321, 323-35 (D.C. Cir. 1992), the D.C. Circuit struck down a regulation promulgated by the National Highway Traffic Safety Administration because the agency failed to consider the indirect costs of its fuel efficiency standards, specifically the potential increased safety risks associated with smaller, more fuel efficient cars. In the context of National Ambient Air Quality Standards ("NAAQS"), the same court once deemed an EPA regulation unreasonable because the agency failed to consider the potential health detriments from lowering the ozone and PM NAAQS (which arise because ground-level ozone has an ultraviolet radiation screening function). *See Am. Trucking Ass'ns v. EPA*, 175 F.3d 1027, 1036-37 (D.C. Cir. 1999) (reversed on other grounds); *see also U.S. Telecom Ass'n v. FCC*, 290 F.3d 415, 424-25 (D.C. Cir. 2002) (overturning two Federal Communications Commission rules because of the agency's failure to consider the rules' indirect cost differentials in different competitive markets, and "the relevance of competition in broadband services coming from cable" and satellite companies, another indirect cost).

If agencies cannot ignore major countervailing risks, then logically a balanced cost-benefit analysis calls for inclusion of co-benefits. To account for one while leaving out the other is incoherent and unreasonable. In the Proposed Finding, EPA explains its exclusion of co-benefits by stating that the reduction of HAP emissions is the "explicit focus of regulations to reduce emissions under CAA section 112," while the ancillary co-benefits only occur when the technologies to control for HAPs are deployed "outside the direct regulatory focus of CAA section 112."[101] But this line of reasoning is flawed, as it is clear that agencies are required to take into account "indirect costs" that, by virtue of being "indirect," are never the "direct regulatory focus."

Additionally, the 2011 RIA for the MATS breaks down the estimated compliance costs into three components: capital and operating costs, fuel costs, and value of electricity generated.[102] Among the three, only the costs to implement and operate pollution control technologies *result directly* from the regulation, in the sense that only these technologies are specifically required by the regulations, while changes in both fuel cost and electricity cost are derivative products of the regulations. If EPA advocates a cost-benefit analysis that factors in only the benefits derived from the direct regulatory target, then the agency should analyze costs in a similarly narrow approach and thus could consider only the capital investment and operating costs.

[101] EPA, *Memorandum: Compliance Cost, HAP Benefits, and Ancillary Co-Pollutant Benefits for "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*" at 3 (2018).

[102] *Regulatory Impact Analysis*, supra note 49, at 7-14.

## IV. EVEN IF EPA CONCLUDES THAT IT IS NOT APPROPRIATE AND NECESSARY TO REGULATE EGU HAP EMISSIONS, IT DOES NOT HAVE THE AUTHORITY TO DELIST POWER PLANTS OR TO RESCIND THE EMISSION STANDARDS (*COMMENTS C-4 – C-10)*

In the 2012 MATS Rule, EPA—after making the finding that it was appropriate and necessary to regulate HAP emissions from power plants—added coal- and oil-fired power plants to the source category list under section 112(c)(1) and established emission standards under section 112(d). In the Proposed Finding, EPA states that it does not intend to rescind the section 112(c)(1) listing or remove the section 112(d) emission standards. 84 Fed. Reg. at 2678-79. The Proposed Finding, however, seeks comment on "two alternative interpretations of the impact of reversing the 2016 Supplemental Finding." *Id.* at 2679. As described below, neither of these alternative interpretations is legally supportable and EPA must therefore keep both the listing and the standards in place even if it rescinds the "appropriate and necessary" finding.

### A. EPA Cannot Delist EGUs Without Satisfying the Section 112(c)(9) Criteria Because *New Jersey* is not Distinguishable (*Comment C-7*)

In 2008, the D.C. Circuit held that EPA could not remove the EGU source category from the section 112(c) list unless the agency made the findings required under section 112(c)(9). *New Jersey v. EPA*, 517 F.3d 574, 583 (D.C. Cir. 2008). Under the first proposed alternative interpretation, EPA would conclude that *New Jersey* decision is distinguishable because at the time of the *New Jersey* decision, EPA had not yet finalized section 112(d) standards for power plants and the "appropriate and necessary" was therefore not "final agency action" subject to judicial review. 84 Fed. Reg. at 2679. However, because the *New Jersey* decision did not depend upon the result of the appropriate and necessary finding, it cannot be distinguished from the situation here. EPA is therefore bound by *New Jersey* and cannot remove EGUs from the 112(c) list without satisfying the delisting criteria in section 112(c)(9).

*New Jersey* concerned EPA's authority to remove power plants from the source category list after a previous reversal of an appropriate and necessary finding. EPA had originally issued an appropriate and necessary finding in 2000.[103] In 2005, EPA reversed course; instead of issuing MACT standards under section 112, EPA decided to regulate power plants under section 111, and concurrently removed power plants from the section 112(c)(1) list without going through section 112(c)(9). EPA justified its decision by explaining that section 112(n)(1)(A) provided the agency the authority to remove power plants from section 112(c) list "at any time that it makes a negative appropriate and necessary finding under the section." 70 Fed. Reg. at 16,032.

*New Jersey* struck down EPA's delisting decision on the ground that the delisting requirements in section 112(c)(9) applied to all listed sources, regardless of whether EPA can or did revise its appropriate and necessary finding. Section 112(c)(9) provides that:

> The Administrator may delete any source category from the [section 112(c)(1) list] . . . whenever the Administrator . . . [determines] that emissions from no

[103] EPA, Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units, 65 Fed. Reg. 79,830 (Dec. 20, 2000).

> source in the category or subcategory concerned . . . exceed a level which is adequate to protect public health with an ample margin of safety and no adverse environmental effect will result from emissions from any source.

42 U.S.C. § 7412 (c)(9).

The D.C. Circuit read the plain language of this provision to mean that section 112(c)(9) was the exclusive avenue for delisting. The Court reasoned that:

> [B]ecause section 112(c)(9) governs the removal of 'any source category' (emphasis added) from the section 112(c)(1) list, and nothing in the CAA exempts EGUs from 112(c)(9), the *only* way EPA could remove EGUs from the section 112(c)(1) list was by satisfying section 112(c)(9)'s requirements.

517 F.3d at 582 (emphasis added).

In reaching the conclusion that EPA failed to follow its statutory mandate when making the delisting decision, however, the court did not opine on the reasonableness of the negative finding. Nor did the court analyze the reviewability of the finding. In fact, the court acknowledged EPA's authority to change its determination, stating that "nothing in the CAA would have prevented [EPA] from revising its determination about whether it was 'appropriate and necessary' to [regulate]." *Id.* at 583. However, neither EPA's authority to reverse its finding, nor the reasonableness of such reversal, was factored by the Court into its analysis of the plain meaning of section 112(c)(9). According to the court, EPA's authority to reverse the preliminary finding was irrelevant because when it comes to delisting, Congress "unambiguously limit[ed] EPA's discretion to remove sources, including EGUs, from the section 112(c)(1) list once they have been added to it," which "precludes EPA's inherent authority claim." *Id.* *New Jersey* therefore explicitly rejected the relevance of the appropriate and necessary finding to the mandatory delisting procedure in section 112(c)(9), and as a result, the reviewability of the finding cannot be used to distinguish *New Jersey* from the action at hand.

Therefore, although the initial decision whether to list EGUs is governed by a separate program under section 112(n)(1), the delisting of EGUs is subject to the section 112(c)(9) scheme. The finding became legally irrelevant to EPA's delisting authority once EGUs were listed.

### B. Section 112(d) Requires that EPA Regulate EGUs under Section 112(d) as Long as the Sources are Listed under Section 112(c) (*Comment C-8*)

EPA further suggests under its second alternative interpretation that it could rescind emission standards for power plants without delisting them. According to EPA, even if *New Jersey* is applicable, the decision does not prevent EPA from rescinding emission standards promulgated under section 112(d) since *New Jersey* addressed only delisting but not standard rescission. Furthermore, EPA reasons that 112(n)(1) grants the agency the authority to rescind emission standards for sources listed under this provision even if those sources would remain listed, because "CAA 112(n)(1)(A) plainly establishes that the Administrator must find regulation under CAA section 112 is appropriate and necessary as a prerequisite to undertaking such regulation." 84 Fed. Reg. 2679. The agency's reasoning is mistaken in its reading of the statutory text and understanding of *New Jersey*.

First, as a matter of statutory language, section 112(d) is as clear as 112(c). Section 112(d) states that EPA "*shall* promulgate regulations establishing emission standards for *each* category or subcategory of major sources and area sources of hazardous air pollutants listed for regulation pursuant to subsection (c) of this section." 42 U.S.C. § 7412(d)(1) (emphasis added). The word "shall" establishes a mandatory duty, leaving EPA no discretion to exempt any source categories. *See United States v. Monsanto*, 491 U.S. 600, 607 (1989) (in using the word "shall," "Congress could not have chosen stronger words" to express its intent that [a statutory duty] be mandatory."). The non-discretionary nature of EPA's duty is further supported by the word "each," which unambiguously indicates that this mandatory duty applies to *every* source category listed under section 112(c).[104] The language of 112(d) is unambiguous and mandatory; EPA must establish emission standards for "each" source category listed under 112(c), which means EPA is obligated to regulate EGUs as long as they are listed under 112(c). Because, as explained above, EPA does not have the discretion to delist without going through the section 112(c)(9) process, a reversal of the "appropriate and necessary" finding would have no effect on the existing emission standards for EGUs.

Second, in the context of the clear text of 112(d) and 112(c), *New Jersey* implicitly rejects EPA's assertion that the agency could derive the authority to rescind emission standards from its authority to reverse the appropriate and necessary finding. *New Jersey* stands for the proposition that the separate regime of section 112(n) does not take EGUs out of the general structure of section 112. If section 112(n) does not exempt EGUs from the section 112(c)(9) delisting procedures, then logically this provision does not create an exemption for EGUs under section 112(d) either, given that section 112(d) is automatically triggered upon listing. Because listing is the necessary and sufficient trigger for standard-setting, to rescind any emission standard, EPA must go through the delisting process; section 112(c)(9) is the required mechanism for EPA to retract any standards that are already in place.

In its effort to render *New Jersey* inapplicable to emission standards, EPA effectively asserts its inherent authority to rescind the standards. However, EPA's attempt to revoke emission standards under section 112(n) falls squarely within the ambit of principle that "when Congress has provided a mechanism capable of rectifying mistaken actions . . . it is not reasonable to infer authority to reconsider agency action." *Am. Methyl Corp. v. EPA*, 749 F.2d 826, 835 (D.C. Cir. 1984); *see also Ivy Sports Med., LLC v. Burwell*, 767 F.3d 81 (D.C. Cir. 2014) (ruling that because FDA concededly could have used a statutory provision to reclassify a device, it could not rely on "inherent reconsideration authority" to short-circuit that statutory process and revoke its prior substantial equivalence determination to achieve that same result). To emphasize, once

[104] Courts have consistently interpreted "each" according to its ordinary meaning and equated "each" with "every." For example, in a case involving permits issued under Title V of the CAA, the D.C. Circuit interpreted a provision requiring that "[e]ach permit . . . shall set forth . . . monitoring . . . requirements to assure compliance with the permit terms and conditions." 42 U.S.C. § 7661c(c)) (emphasis added). The court held that: "There can be no doubt about the plain meaning of this phrase. 'Each' means '[e]very one of a group considered individually." AMERICAN HERITAGE DICTIONARY 269 (4th ed. 2001). Title V requires that '[e]very one' of the permits issued by permitting authorities include adequate monitoring requirements." *Sierra Club v. E.P.A.*, 536 F.3d 673, 678 (D.C. Cir. 2008); *see also, e.g., Exelon Wind 1, L.L.C. v. Nelson*, 766 F.3d 380, 403 (5th Cir. 2014) ("The option belongs to each qualifying facility, which means that it belongs to 'every' qualifying facility."); *Dickenson-Russell Coal Co., LLC v. Sec'y of Labor*, 747 F.3d 251, 258 (4th Cir. 2014) (giving "each" its dictionary meaning, which is "every one of two or more people or things considered separately").

a source is triggered into the regulatory program under section 112, the agency's "inherent authority" to reconsider its preliminary appropriate and necessary finding cannot trump the statutory text that establishes the exclusive mechanism to rescind standards.

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For all these reasons, the Proposed Finding is arbitrary and capricious, as it is inconsistent with scientific knowledge and EPA's statutory mandate. It is appropriate and necessary to regulate HAP emissions from power plants; MATS has been proven effective in addressing the public health and environmental threats of power plant mercury emissions. The Proposed Finding should therefore be withdrawn.

Thank you for your attention to these comments.

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