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It Remains "Appropriate and Necessary" to Regulate Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units

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I. Introduction

a. Overview

The Northeast States for Coordinated Air Use Management (NESCAUM)[1] first developed this report[2] in response to the February 7, 2019 U.S. Environmental Protection Agency (EPA) Proposed Rule *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Reconsideration of Supplemental Finding and Residual Risk and Technology Review*[3] (referred to here as the "Reconsideration Proposal"). In that action, which was finalized on May 22, 2020,[4] EPA proposed to withdraw its long-standing and well-documented "appropriate and necessary" finding first made in 2000[5] and subsequently reaffirmed in 2012[6] and 2016.[7] This document has now been updated in response to the EPA's February 9, 2022 *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking* (referred to here as the "Reaffirmation Proposal"),[8] which proposes to withdraw the finding in the 2020 Reconsideration and reaffirm the 2016 finding that the rule remains "appropriate and necessary" after consideration of cost.

The "appropriate and necessary" finding underpins pollution control requirements for mercury and other hazardous air pollutants (HAPs, also referred to as "air toxics") emitted by coal- and oil-fired electric generating units (EGUs). EPA established these requirements in the 2012

[1] NESCAUM is the regional association of the state air pollution control agencies in Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont (www.nescaum.org).
[2] *See* NESCAUM, *It Remains "Appropriate and Necessary" to Regulate Toxic Air Emissions from Coal- and Oil-fired Electric Generating Units*, Boston, MA (April 17, 2019). Available at https://www.nescaum.org/documents/nescaum-it-remains-approp-necess-reg-air-toxics-from-coal-oil-egus-20190417-final.pdf.
[3] 84 Fed. Reg. 2670-2704 (February 7, 2019).
[4] 85 Fed. Reg. 31286-31320 (May 22, 2020).
[5] 65 Fed. Reg. 79,825-79,831 (December 20, 2000).
[6] 77 Fed. Reg. 9304-9513 (February 16, 2012).
[7] 81 Fed. Reg. 24,420-24,452 (April 25, 2016).
[8] 87 Fed. Reg. 7624-7672 (February 9, 2022).

Utility Mercury and Air Toxics Standards (MATS)[9] and the affected EGUs have now complied with the emission limits. MATS continued existence, however, has been put at legal risk because of EPA's 2020 withdrawal of the rule's "appropriate and necessary" basis.

Prior to MATS, the states in the NESCAUM region, as well as a number of other states, developed their own state programs to control mercury, an important air toxic emitted by coal-fired EGUs. The state rulemakings often took a "multi-pollutant" approach that also included requirements to reduce emissions of acid- and ozone-forming precursor pollutants (e.g., nitrogen oxides, sulfur dioxide). During the development of their rules, the states used a number of approaches in assessing the costs, benefits, and feasibility of controlling multiple pollutants within a single program. Because the state rules pre-dated the original federal promulgation of MATS, they served as early examples of the practicality of the later MATS requirements.

Mercury has received special attention because of its elevated presence in commercially and recreationally important fish consumed by the public, as well as its adverse environmental impacts on loons and other wildlife. Due to elevated fish mercury levels, all the NESCAUM states have issued fish consumption advisories for fish caught in most or all the waters within each state.[10] To address this problem, New York and the New England states successfully petitioned EPA in 2007 to establish a Northeast Regional Mercury Total Maximum Daily Load (TMDL) under section 303(d) of the Clean Water Act.[11] The Northeast Regional Mercury TMDL established a mercury budget at a reduced level that the states project will allow for safe fish consumption and the lifting of state fish consumption advisories.

In setting their regional TMDL, the Northeast states considered multiple cross-media mercury sources. These encompassed out-of-region and in-region combustion sources emitting mercury to the air that subsequently deposited to the surface, municipal wastewater treatment plants directly discharging to water, non-municipal wastewater discharges, and stormwater. Based on 1998 emissions, modeled atmospheric deposition contributed 97.9 percent of the total mercury load to the region's waters, with the majority share coming from out-of-region sources. In order to achieve the target fish tissue mercury concentrations, the states determined it will require an at least 98 percent reduction in atmospheric mercury deposition arising from anthropogenic sources relative to 1998 levels.[12]

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[9] 77 Fed. Reg. 9304-9513 (February 16, 2012).
[10] *See* U.S. EPA, *State, Territory and Tribe Fish Advisory Contacts*, https://fishadvisoryonline.epa.gov/Contacts.aspx (accessed March 24, 2022).
[11] US EPA Region 1 letter to CT DEP, *Notification of Approval of Northeast Mercury TMDL* (December 20, 2007). New Jersey followed with its own successful mercury TMDL petition in 2009 [EPA Region 2 Decision Letter, *Review of Total Maximum Daily Load (TMDL) for Mercury Impairments Caused Mainly by Air Deposition in 122 HUC 14s Statewide, New Jersey (NJ)* (September 29, 2009)].
[12] New England Interstate Water Pollution Control Commission, *et al., Northeast Regional Mercury Total Maximum*

To address mercury released within their own borders, the Northeast states have been implementing multiple rules limiting mercury emissions from in-state emission sources. These measures have included limits on coal-fired power plants, medical waste incinerators, municipal waste combustors, and sewage sludge incinerators.[13] Initial measures reduced the modeled in-region mercury deposition contribution attributable to Northeast state sources from 43 percent in 1998 to 19 percent in 2002. Conversely, the modeled relative in-region contribution from out-of-region sources (upwind states and international) rose from 57 percent in 1998 to 81 percent in 2002.[14]

While the Northeast states have made significant progress in reducing in-region mercury releases, these reductions will not be sufficient to ensure that fish are safe to eat unless comparable out-of-region national and international measures occur. According to the Northeast Regional Mercury TMDL analysis:

> The Northeast region's ability to achieve the calculated TMDL allocations is dependent on the adoption and effective implementation of national and international programs to achieve necessary reductions in mercury emissions. Given the magnitude of the reductions required to implement the TMDL, the Northeast cannot reduce in-region sources further to compensate for insufficient reductions from out-of-region sources. . . . Specifically, it is Northeast States' position that the data and analyses in this TMDL demonstrate that: . . . (B.) EPA must implement significant reductions from upwind out-of-region sources, primarily coal-fired power plants; and (C.) MACT provisions of section 112(d) of the CAA should be adopted as the mechanism for implementing this TMDL.[15]

In the 2020 Reconsideration, however, EPA reversed course by adopting a new and highly restrictive view of the value of the health and environmental benefits achieved by MATS. The analysis that supported that finding dismissed the majority of the benefits associated with reducing EGU air toxics, and as a result, the Agency asserted that the remaining benefits no longer justified the "appropriate and necessary" finding that forms the legal basis for MATS.

Although the Agency did not revoke the MATS emission standards when withdrawing the "appropriate and necessary" finding, EPA's 2020 action exposed MATS to new legal jeopardy.

Daily Load (October 24, 2007). Available at http://click.neiwpcc.org/mercury/mercury-docs/FINAL%20Northeast%20Regional%20Mercury%20TMDL.pdf (accessed March 24, 2022).

[13] NESCAUM, *Tracking Progress in Reducing Mercury Air Emissions*, Boston, MA (September 2007). Available at http://www.nescaum.org/documents/northeast-states-succeed-in-reducing-mercury-in-the-environment/final-nescaum-mercury-success-story.pdf/ (accessed March 24, 2022).

[14] New England Interstate Water Pollution Control Commission, *et al.*, *Northeast Regional Mercury Total Maximum Daily Load* (October 24, 2007), at p. 7.

[15] *Ibid.* at p. 44.

A challenger to MATS has asserted the rule's emission limits for air toxics are no longer legally justified without an affirmative finding in place as a prerequisite.[16] The absence of an affirmative "appropriate and necessary" finding could result in a court striking down the standards, and put the Northeast states' public health and environment at increased risk. Vacating MATS would create economic incentives for coal- and oil-fired EGUs not to operate, or operate at diminished effectiveness, their installed pollution controls where not required for other purposes. As noted in this document, there is historical precedent for EGUs dialing back or turning off installed pollution controls when not required to operate them. Because the Northeast states are downwind from states with large coal- and oil-fired EGUs that lack their own state standards that could backup the loss of MATS, increased air toxic emissions from those states will result in increased deposition within the Northeast region.

This document provides a broad overview of the extent of the numerous impacts that HAPs emitted by coal- and oil-fired EGUs have on public health and the environment. Rather than fully accounting for these in its 2019 Reconsideration Proposal, EPA selectively ignored or overly discounted multiple other exposure pathways (e.g., most fish consumption pathways for mercury exposure) and multiple other benefits from reducing the public's exposure through those pathways (e.g., decreased risk of fatal heart attacks and diabetes). EPA also discounted to zero the impacts of air toxics to the environment, such as known impacts of mercury on wildlife. The analysis in the 2022 Reaffirmation Proposal monetized one additional exposure pathway, exposure of the general U.S. population to methylmercury from the consumption of commercially-sourced fish, and one additional health endpoint, myocardial infarction mortality (MI-mortality), but did not monetize other health and environmental impacts.

In the 2019 Reconsideration Proposal, EPA applied a new and diminished approach to cost-benefit analysis that was ill-suited for assessing the full benefits of reducing HAPs from coal- and oil-fired EGUs. EPA used a cost-benefit approach that was overly narrow and heavily discounted or ignored hard to monetize benefits. This approach is incomplete and potentially misleading when applied to air toxics where many of the adverse impacts, hence benefits, occur over long time periods or are widely disbursed and difficult to directly link to a unique causal factor at a specific point in time. States that previously adopted their own multipollutant pollution control programs recognized that the full benefits of their rules were not always amenable to monetization,[17] and therefore considered the multiple health and environmental

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[16] Westmoreland Mining Holdings LLC v. U.S. EPA, *Westmoreland Mining Holdings LLC's Nonbinding Statement of Issues to Be Raised*, D.C. Circuit, Case No. 20-1160 (filed August 21, 2020).
[17] *See, e.g.,* Delaware Department of Natural Resources & Environmental Control, Division of Air & Waste Management, Air Quality Management Section, *Technical Support Document for Proposed Regulation No. 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation*, September 2006 (p. 62). Available at:

benefits using a broader set of considerations. The 2022 Reaffirmation Proposal reverts to a "totality-of-the-circumstances" methodology that is similar to that used in the 2016 finding and, like the state approaches, allows for the consideration of both monetized and non-monetized benefits.

Also in the 2019 Reconsideration Proposal, EPA, in a reversal of long-standing regulatory practice and at odds with the federal government's own guidelines, dismissed the co-benefits from reductions in fine particulate matter that it asserted are not the "target pollutants" under MATS. Most non-mercury metal air toxics, however, are physically bound within primary particulate matter emitted by coal- and oil-fired EGUs and are reduced by using particulate matter pollution controls. Therefore, reductions in particulate matter are a natural and unavoidable consequence of the MATS requirements to reduce non-mercury metal air toxics. EPA's revised approach in the 2019 Proposed Reconsideration ignored this direct relationship and assigned it no benefit. The 2022 Reaffirmation Proposal restores the importance of co-benefits, and presents benefits associated with HAP emissions reductions alone and well as benefits associated with reduction of all pollutants, including non-HAPs.

Based on a fuller accounting of the health and environmental benefits as well as historical control costs of the MATS requirements, and consistent with long standing regulatory analysis prior to the narrow approach EPA adopted in the Reconsideration Proposal, we conclude that it remains appropriate and necessary to regulate toxic air emissions from coal- and oil-fired EGUs.

b. NESCAUM background

NESCAUM was established in 1967 as a forum among its northeastern state members to exchange technical information, promote cooperation in regard to air pollution control issues of regional concern, and assist the states in implementing national environmental programs required under the Clean Air Act and other federal legislation. To accomplish these objectives, NESCAUM facilitates technical committees and workgroups, sponsors frequent air quality trainings, participates in national discussions, and organizes a variety of research initiatives. Many of NESCAUM's activities culminate in technical analyses, published reports, and informational workshops designed to provide support to our member states or disseminate state-of-the-art information concerning air pollution control issues.

With respect to air toxics, NESCAUM has been deeply involved over a number of years in the evaluation of their impacts on public health and the environment within the Northeast. These activities include:

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https://documents.dnrec.delaware.gov/Air/Documents/Regs%20SIPS%20Under%20Develop/Appendix%208-6%20Multi_p_TechSptDoc1.pdf.

- Analyzing the trace metal and sulfur content in wood fuels and heating oil sold in the Northeast;
- Reviewing control technologies to reduce conventional and hazardous air pollutants from coal-fired EGUs;
- Characterizing organic HAPs and other air pollutants from wood burning appliances;
- Evaluating relative cancer risks from conventional and reformulated gasolines;
- Quantifying the comparative contributions of different mercury pollution sources and source regions to mercury deposited from the air to land and water in the Northeast;
- Conducting state-level monitoring and modeling analyses of air toxics; and
- Improving source-specific estimates in mercury air emission inventories within the NESCAUM states.

A more complete listing of these and other NESCAUM activities with links to individual documents is available at www.nescaum.org.

c. Mercury and other hazardous air pollutants in the Northeast

In 2011, the EPA presented a summary of the cancer and non-cancer impacts for mercury, the non-mercury toxic metals, acid gases, and organic HAPs, including dioxins/furans that the MATs rule addresses.[18] That summary is now supplemented in the Technical Support Document[19] of the 2022 Proposed Affirmation by a quantitative analysis of an additional exposure pathway and toxic endpoint for methylmercury.

Mercury has received special attention as a health and environmental problem among the NESCAUM states. Mercury deposition from upwind sources has significantly affected aquatic and terrestrial environments in the Northeast, resulting in states having to issue fish consumption advisories to protect human health. Over 15,000 fish samples collected in the Northeast confirm widespread mercury contamination of aquatic ecosystems, threatening human health and wildlife without broad regional efforts to reduce significant local and upwind sources of mercury emissions. Mercury contamination also threatens the tourist and recreational fishing industries, which contribute $3 billion a year to the Northeast's regional economy.

In a 1997 study, the EPA modeled the transport and deposition of mercury emissions associated with selected categories of major combustion and manufacturing sources, including coal- and

[18] US EPA, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards*, EPA-452/R-11-011 (December 2011).
[19] US EPA, *National-Scale Mercury Risk Estimates for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking*, Memo to Docket ID No. EPA-HQ-OAR-2018-0794 (September 2, 2021).

oil-fired EGU boilers. The study showed that the Northeast had one of the highest annual mercury deposition rates in the country and that in areas with flat terrain, at least 75 percent of the mercury emitted by the modeled facilities was transported more than 50 km downwind from the facility. Monitoring data corroborated the modeling results.[20]

In 2007, NESCAUM conducted a modeling study to apportion contributions, by geographical area and by source category, to mercury deposition in the NESCAUM region. The analysis used an emissions inventory developed by NESCAUM for 2002,[21] after controls were implemented in the region for three mercury emission source categories: municipal waste combustors; medical waste incinerators; and sewage sludge incinerators. The modeling study calculated that in 2002, upwind sources in states outside of the NESCAUM region were responsible for nearly 60% of the domestic U.S. contribution to deposition in the NESCAUM states; upwind EGUs alone were responsible for 36% of those impacts.[22] As an outgrowth of this work, all the NESCAUM states, collectively or individually, petitioned EPA under the Clean Water Act to establish total maximum daily loads (TMDLs) for mercury entering the waters of the Northeast, which EPA approved.[23]

Working with the New England Interstate Water Pollution Control Commission (NEIWPCC), NESCAUM in 2008 used an EPA-sponsored modeling analysis[24] to further refine its previous results showing that much of the mercury entering the Northeast's aquatic ecosystems is deposited from the air, and a significant portion of this mercury comes from emission sources outside the region. That analysis concluded that nearly half of the mercury associated with U.S. sources that is deposited across New York and the New England states comes from within these states and another 40 percent is attributable to sources in states immediately upwind, including Pennsylvania, New Jersey, Ohio, West Virginia, and Maryland.[25] As part of a Clean Water Act

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[20] US EPA, *Mercury Study Report to Congress, Volume III: Fate and Transport of Mercury in the Environment*, EPA-452/R-97-005 (1997).

[21] NESCAUM, *Inventory of Anthropogenic Mercury Emissions in the Northeast*, Boston, MA (2005). Available at http://www.nescaum.org/documents/inventory-of-anthropogenic-mercury-emissions-in-the-northeast/.

[22] NESCAUM, *Modeling Mercury in the Northeast United States*, Boston, MA (2007). Available at http://www.nescaum.org/documents/mercury-modeling-report_2007-1005b_final.pdf/.

[23] US EPA Region 1 letter to CT DEP, *Notification of Approval of Northeast Mercury TMDL* (December 20, 2007) (this is a regional mercury TMDL covering the states of CT, ME, MA, NH, NY, RI and VT); EPA Region 2 letter to NJ DEP, *Review of Total Maximum Daily Load (TMDL) for Mercury Impairments Caused Mainly by Air Deposition in 122 HUC 14s Statewide, New Jersey (NJ)* (September 25, 2009).

[24] US EPA, *Model-based Analysis and Tracking of Airborne Mercury Emissions to Assist in Watershed Planning*, Final Report, U.S. EPA Office of Wetlands, Oceans, and Watersheds, Washington, DC (August 2008). Available at https://www.epa.gov/sites/default/files/2015-09/documents/2008_10_28_tmdl_pdf_final300report_10072008.pdf (accessed March 30, 2022).

[25] NESCAUM, *Sources of Mercury Deposition in the Northeast United States*, Boston, MA (2008). Available at http://www.nescaum.org/documents/nescaum-sources-of-hg-depo-in-northeast_2008-final.pdf/. The modeling results are consistent with NESCAUM's earlier 2007 assessment, with the differences between in-region and out-of-region source contributions to Northeast deposition attributable to differences in each model's mercury emissions

sec. 319(g) conference that focused on mercury TMDL water quality impairment issues in New York and the six New England states, EPA reviewed NESCAUM's analysis and found its results virtually identical with EPA's own results.[26]

While mercury receives a large share of the attention, other non-mercury air toxic emissions from coal- and oil-fired EGUs affect the Northeast. For example, researchers have implicated nickel emissions from oil combustion with an increased risk of cognitive impairment,[27] lung cancer,[28] and daily mortality.[29] In the Northeast, EGUs burning No. 6 residual oil are a large source of these emissions.

d. NESCAUM state efforts to reduce mercury released into the environment

In light of the dangers posed by mercury contamination, the Northeast states have been aggressively regulating in-region mercury releases to the air for a number of years. These efforts have been aimed at reducing mercury in products entering into waste streams in addition to direct releases into air and water. A summary of efforts in 2007 noted:

> Since 2000, the Northeast states have enacted major legislation to address mercury use in products and ultimately in solid and hazardous waste. […] Mercury collection and recycling efforts by the Northeast States led to an estimated 7.5 tons of mercury recovered from homes, schools, hospitals, and other locations throughout the region. Some of the actions that have contributed to these reductions include the recycling of 41,764 mercury-containing thermostats, the collection of 120,973 mercury automobile switches and 213,322 mercury thermometers, and the removal of 4,696 lb of mercury from 456 schools.[30]

Additional efforts among the Northeast states include adopting laws or regulations requiring the installation of dental amalgam separators in dental offices to reduce the amount of mercury going to wastewater treatment facilities. Strict emission limits on municipal waste combustors

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inventories, emitted mercury species profiles by source type, meteorological years, and boundary conditions (*see* p. 12).

[26] US EPA, *Determination of Mercury Deposition Contributions from States Outside the Northeast*, Presentation by Dwight Atkinson, U.S. EPA, at Clean Water Act Section 319(g) Mercury Conference, Philadelphia, PA, June 22-23, 2010.

[27] Wurth, R., M.A. Kioumourtzoglou, K.L. Tucker, J. Griffith, J. Manjourides, and H. Suh. Fine Particle Sources and Cognitive Function in An Older Puerto Rican Cohort in Greater Boston, 2 *Environ. Epidemiol.* e022 (2018), DOI: 10.1097/EE9.0000000000000022.

[28] Turner, M.C., Z.J. Andersen, A. Baccarelli, W.R. Diver, S.M. Gapstur, C.A. Pope, III, D. Prada, J. Samet, G. Thurston, and A. Cohen. Outdoor Air Pollution and Cancer: An Overview of the Current Evidence and Public Health Recommendations, 70 *CA Cancer J. Clin.* 460–479 (2020).

[29] Lippmann, M., K. Ito, J.S. Hwang, P. Maciejczyk, and L.C. Chen. Cardiovascular Effects of Nickel in Ambient Air, 114 *Environ. Health Perspect.* 1662-1669 (2006).

[30] King, S., P. Miller, T. Goldberg, J. Graham, S. Hochbrunn, A. Wienert, and M. Wilcox. Reducing Mercury in the Northeast United States. *EM*, Air & Waste Management Association (Pittsburgh, PA), pp. 9-13 (May 2008).

reduced their mercury air emissions in the Northeast states by 85% since the late 1990s, from more than 14,000 lb to approximately 2,000 lb of emitted mercury. Additional deep reductions have occurred from medical waste incinerators within the region, where state limits resulted in mercury decreases of greater than 95% from these sources, falling from almost 1,600 lb in 1998 to 58 lb in 2002.[31]

Prior to the federal MATS rule in 2011, the NESCAUM states had already begun imposing by rule or legislation stringent mercury limits on coal-fired EGUs, and these were largely in place by the mid-2000s. Emissions requirements for coal-fired EGUs adopted in the Northeast include the following:

- Connecticut enacted legislation in June 2003 requiring coal-fired units in the state to meet emissions requirements by July 1, 2008.[32]
- Massachusetts promulgated regulations in May 2004 to limit mercury emissions from four large coal-fired EGUs in the state relative to 2000-2001 levels.[33] The deadline for compliance with Phase 1 (minimum 85% mercury capture) of those requirements was January 1, 2008. Compliance with more stringent Phase II requirements (minimum of 95 percent mercury capture) was required by October 1, 2012.
- New Hampshire adopted state legislation calling for a state-wide 80 percent reduction in coal-fired EGU mercury emissions no later than July 1, 2013.[34]
- New Jersey adopted rules in August 2005 limiting mercury emissions from coal-fired boilers by December 15, 2007.[35]
- New York State adopted rules in 2007 capping mercury emissions from coal-fired EGUs in the years 2010-2014 and limiting those emissions by 2015.[36]

Many of these state emission limits are well below that required by the federal MATS rule.

e. State rules did not impose significant burdens on costs of reliability

Prior to EPA's final promulgation of MATS, a number of states had already adopted stringent limitations on mercury emissions from new and existing fossil fuel EGUs, often as part of multi-pollutant programs that included control cost considerations for sulfur dioxide (SO_2) and

[31] *Ibid.*
[32] Connecticut General Statute section 22a-199 (2003).
[33] 310 CMR 7 (2004).
[34] RSA 125-O:11-18 (2006).
[35] N.J.A.C. 7:27-27.1 *et seq.* (2004).
[36] 6 NYCRR Part 246 (2007).

nitrogen oxides (NO_X). Rules covering EGUs in Delaware,[37] Maryland,[38] Massachusetts,[39] New Jersey,[40] New York,[41] and Wisconsin[42] are illustrative of the cost considerations taken by these states.

In their rulemakings, the states recognized a broader range of public health and environmental benefits and put these considerations within an overall cost context affecting the electric generation industry as well as consumers. For example, Delaware and New York estimated the impact of their rules on retail electricity prices. While they projected an increase in cost of electricity generation for the affected EGUs, they concluded that it was not of sufficient magnitude to expect increased rates for consumers.[43,44]

With state rules now having been in place for over a decade, the historical experience in the states that adopted mercury standards show that the control costs did not impose an unreasonable burden on the covered EGUs, did not cause a drastic rise in electricity rates, and did not undermine electric grid reliability. As discussed below, retrospective analyses of the MATS implementation, which has comparable requirements to those in the state rules, showed that actual costs were lower than projected costs and did not adversely affect the reliability of the

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[37] Delaware Department of Natural Resources & Environmental Control, Division of Air & Waste Management, Air Quality Management Section, *Technical Support Document for Proposed Regulation No. 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation*, September 2006 (pp. 47-56). Available at: https://documents.dnrec.delaware.gov/Air/Documents/Regs%20SIPS%20Under%20Develop/Appendix%208-6%20Multi_p_TechSptDoc1.pdf.

[38] Maryland Department of the Environment, *Technical Support Document for Proposed COMAR 26.11.27, Emission Limitations for Power Plants,* December 26, 2006 (pp. 36-41).

[39] Massachusetts Department of Environmental Protection, Bureau of Waste Prevention, Division of Planning and Evaluation, *Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions from the Combustion of Solid Fossil Fuel*, December 2002. Available at: https://www.mass.gov/files/documents/2016/08/pp/mercfeas.pdf.

[40] New Jersey Register, *Air Pollution Control: Control and Prohibition of Mercury Emissions,* Vol. 36, No. 1, 123(a), January 5, 2004. Available at: https://www.nj.gov/dep/aqm/hgprop.pdf.

[41] New York State Department of Environmental Conservation, 6 NYCRR Part 246, *Mercury Reduction Program for Coal-Fired Electric Utility Steam Generating Units*, 6 NYCRR Part 200.9, *Referenced Material Revised Regulatory Impact Statement*, 2006.

[42] Wisconsin Department of Natural Resources, Bureau of Air Management, *Factsheet on Rule to Control Mercury Emissions from Coal-Fired Power Plants*, revised August 2008.

[43] Delaware Department of Natural Resources & Environmental Control, Division of Air & Waste Management, Air Quality Management Section, *Technical Support Document for Proposed Regulation No. 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation*, September 2006 (p. 50). Available at: https://documents.dnrec.delaware.gov/Air/Documents/Regs%20SIPS%20Under%20Develop/Appendix%208-6%20Multi_p_TechSptDoc1.pdf.

[44] New York State Department of Environmental Conservation, 6 NYCRR Part 246, *Mercury Reduction Program for Coal-Fired Electric Utility Steam Generating Units*, 6 NYCRR Part 200.9, *Referenced Material Revised Regulatory Impact Statement*, 2006 (p. 24).

grid.[45,46,47]

II. Control Costs

Actual control costs for EGUs to comply with MATS have been less than originally estimated by EPA. A retrospective analysis of MATS compliance costs by industry representatives estimated those costs to be about $2 billion annually, which is less than one-quarter of EPA's prospective annual cost estimate of $9.6 billion in the 2012 MATS rule.[48] A number of factors contributed to the substantially lower actual compliance costs. These factors include:[49]

1) Improved dry sorbent injection and activated carbon injection technologies at significantly lower costs;
2) Significantly lower natural gas prices than EPA estimated; and
3) Less generation capacity installing fabric filters, dry flue gas desulfurization (FGD) systems, and wet FGD upgrades than EPA estimated.

It is not unusual for the actual costs of complying with air pollution regulations to be substantially lower than pre-compliance estimates. NESCAUM's 2000 retrospective review of several air pollution programs found a repeated pattern of high EPA cost estimates and much higher industry cost projections (often by a factor of two or more) as rules were promulgated, with lower actual compliance costs once the programs were implemented. Examples of programs for which costs were prospectively overestimated include the California Low Emissions Vehicle program and requirements for SO_2 controls pursuant to Title IV of the Clean Air Act.[50]

EPA conducted a retrospective cost analysis for the 2022 Reaffirmation Proposal and concluded that "the available *ex post* evidence points to a power sector that incurred significantly lower costs of compliance obligations under MATS than anticipated based on the *ex ante* projections when the rule was finalized in 2012. This overestimate was significant" [87 Fed. Reg. 7656].

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[45] *White Stallion Energy Center, LLC v. EPA*, D.C. Circuit Case No. 12-1100, Motion of Industry Respondent Intervenors to Govern Future Proceedings, filed September 24, 2015 (*see* Declaration of James E. Staudt and accompanying exhibits).
[46] M.J. Bradley & Associates, *Status of the MATS Rule*, November 16, 2017. Available at: https://www.mjbradley.com/sites/default/files/MJBA_IssueBrief_MATS_2017-11-16.pdf. Accessed March 24, 2022.
[47] Edison Electric Institute, Comment letter submitted to EPA Docket No. EPA-HQ-OAR-2018-0794. April 19, 2019. Available at: https://www.regulations.gov/comment/EPA-HQ-OAR-2018-0794-2267.
[48] *White Stallion Energy Center, LLC v. EPA*, D.C. Circuit Case No. 12-1100, Motion of Industry Respondent Intervenors to Govern Future Proceedings, filed September 24, 2015 (*see* Declaration of James E. Staudt and accompanying exhibits).
[49] *Ibid.* Staudt Declaration.
[50] NESCAUM, *Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers*, September 2000. Available at: http://www.nescaum.org/documents/rpt000906mercury_innovative-technology.pdf.

"With respect to just pollution control installation and operation, we project that we overestimated annual compliance costs by at least $2.2 to 4.4 billion per year, simply as a result of fewer pollution controls being installed than were estimated in the 2011 RIA[.] We additionally find that the controls that were installed at MATS-regulated EGUs were likely both less expensive and more effective in reducing pollution than originally projected, resulting in our estimate likely being too high for these reasons as well" [87 Fed. Reg. 7649].

III. Northeast states will be adversely impacted if MATS requirements are rescinded

a. Withdrawing the "appropriate and necessary" finding puts the MATS requirements at legal risk

The EPA's Reconsideration Proposal did not propose to revoke the MATS standards (although it did invite comment on that option); EPA proposed only to withdraw the "appropriate and necessary" finding. Withdrawing the finding—which, under the Clean Air Act obligates EPA to regulate EGU HAPs—has opened the MATS standards to additional legal challenge.[51] Should the MATS standards be vacated or rescinded by future legal or administrative action, it creates the threat that EGUs now in full compliance with MATS would stop operating their installed controls. This is not entirely speculation, as the following historical context shows. Ceasing operations of those controls would cause adverse impacts in downwind Northeast states.

b. Operation of installed controls

The initial MATS compliance deadline was April 16, 2015. According to the U.S. Energy Information Administration (EIA), coal-fired plants with a total capacity of 87 GW installed pollution-control equipment and nearly 20 GW of coal capacity was retired by that date. The EPA granted one-year extensions to coal plants with a total capacity of 142 GW, which allowed those facilities to operate until April 2016 while finalizing compliance strategies.[52]

An additional one-year extension, to April 2017, was granted to five plants with a combined capacity of 2.3 GW to ensure electric reliability. Two of those five plants were retired, one converted to natural gas, and one installed MATS-compliant controls by that date. The remaining plant, Oklahoma's Grand River Energy Center, was given another emergency extension to July 2017 for reliability issues,[53] and complied with MATS requirements in 2017.[54]

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[51] Westmoreland Mining Holdings LLC v. U.S. EPA, *Westmoreland Mining Holdings LLC's Nonbinding Statement of Issues to Be Raised*, D.C. Circuit, Case No. 20-1160 (filed August 21, 2020).
[52] US EIA, Coal Plants Installed Mercury Controls to Meet Compliance Deadlines, *Today in Energy*, (September 18, 2017), https://www.eia.gov/todayinenergy/detail.php?id=32952#.
[53] *Ibid.*
[54] US EIA, *2017 Form EIA-860 Data – Schedule 6B, Emission Standards and Control Strategies*, (September 13, 2018) https://www.eia.gov/electricity/data/eia860/.

There typically is a financial cost associated with operation of the controls used to remove regulated pollutants from EGU emissions.[55] As a result, there is an economic incentive for EGUs to discontinue operating pollution controls absent an enforceable obligation to do so under a permit, regulation, or court order.[56] A specific example is the coal-fired Montour Power Plant in Pennsylvania, where a company spokesperson stated that in 2015, it was much cheaper to buy allowances than run its already installed NO_X controls.[57] The EPA identified another instance in which the NO_X emission rate at Miami Fort Unit 7 in Ohio "*substantially increased* in 2019 compared to previous years" (emphasis in original) and that this was "likely due to the erosion of the existing incentive to optimize controls (*i.e.*, the ozone-season NO_X allowance price has fallen so low that unit operators find it more economic to surrender additional allowances instead of continuing to operate pollution controls at an optimized level).[58] The EPA has more recently noted an instance of a power plant owner and operator shutting down selective catalytic reduction (SCR) controls for NO_X on several coal-fired steam units in Missouri after having purchased a large reserve of NO_X allowance credits.[59]

Thus, there is precedent to expect that the coal-fired EGUs located in states without their own state rules requiring controls will not operate or will limit operation of the controls that they installed to comply with MATS requirements if that rule is no longer in effect. This is particularly likely for controls specific to mercury reduction, such as activated carbon injection and halogen (e.g., bromine) addition, that cost money to operate and that can be readily turned off without affecting compliance with other non-mercury pollution control obligations.

Given that the majority of the nation's coal-fired EGU capacity is located in states without state-based mercury controls—such as Indiana, Pennsylvania, Ohio, West Virginia, and Texas—uncontrolled mercury emissions in the event of full or partial vacatur or repeal of MATS could be substantial. Several studies at a downwind monitoring site in western Maryland in relatively close proximity to coal-fired power plants in Ohio, Pennsylvania, and West Virginia have linked ambient mercury concentrations measured at the site with power plant emissions in upwind

[55] Examples of these costs are for the purchase of control reagents, parasitic energy load to run the controls, and additional operation and maintenance of the control equipment.
[56] McNevin, T.F. Recent increases in nitrogen oxide (NO_X) emissions from coal-fired electric generating units equipped with selective catalytic reduction, 66 *JAWMA* 66-75 (2016), DOI: 10.1080/10962247.2015.1112317.
[57] O'Neill, J.M., *N.J. Air Quality Takes a Hit*, The Record (Bergen County, NJ), May 17, 2015 (quoting a company spokesperson, "[t]oday, the cost of using installed controls far exceeds the cost of obtaining allowances in the trading market.").
[58] 86 Fed. Reg. 23054 (April 30, 2021), at 23089.
[59] 87 Fed. Reg. 20036 (April 6, 2022), at 20122-20123.

states.[60,61,62] Uncontrolled mercury emissions from Pennsylvania's coal-fired EGUs are of particular concern to the NESCAUM states because Pennsylvania has numerous coal-fired EGUs and contributes significantly to mercury deposition in the NESCAUM states, due to its proximity to the region and prevailing weather patterns.[63]

c. Impacts of mercury deposition on natural resources

As documented in recent studies, reductions in mercury emissions associated with implementation of state and federal rules have resulted in decreased mercury levels in waterbodies and in freshwater and saltwater fish. Examples of studies documenting those reductions include:

- Core sediment samples taken from the Great Lakes and nearby lakes showed a 20% mean decline in mercury accumulation attributable to domestic emissions reductions.[64]
- Mercury concentrations in largemouth bass and yellow perch in lakes in a mercury hotspot area of Massachusetts showed declines of 44% and 43%, respectively, between 1999 and 2011, a period in which major reductions in mercury air emissions from combustion sources occurred in the region.[65]
- Concentration of mercury in bluefish collected off the North Carolina coast in 2011 was 43% lower than the concentration measured in 1972. The study noted that this reduction, approximately 10% per decade, "is similar to estimated reductions of mercury observed in atmospheric deposition, riverine input, seawater, freshwater lakes, and freshwater fish across northern North America." The study also cited eight additional studies conducted between 1973 and 2007 that confirm the decrease in mercury levels in bluefish captured in the Mid-Atlantic Bight (defined as the continental shelf waters from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina) with decreasing U.S. mercury air

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[60] Castro, M. S. and J. Sherwell. Effectiveness of Emission Controls to Reduce the Atmospheric Concentrations of Mercury, 49 *Environ. Sci. Technol.* 14000-14007 (2015).
[61] Cheng, I., L.M. Zhang, M. Castro, and H.T. Mao. Identifying Changes in Source Regions Impacting Speciated Atmospheric Mercury at a Rural Site in the Eastern United States, 74 *J. Atmos. Sciences* 2937-2947 (2017).
[62] Luippold, A., M. Sexauer Gustin, S.M. Dunham-Cheatham, M. Castro, W. Luke, S. Lyman, and L. Zhang. Use of Multiple Lines of Evidence to Understand Reactive Mercury Concentrations and Chemistry in Hawai'i, Nevada, Maryland, and Utah, USA, 54 *Environ. Sci. Technol.* 7922-7931 (2020), DOI: 10.1021/acs.est.0c02283.
[63] NESCAUM, *Sources of Mercury Deposition in the Northeast United States*, Boston, MA (2008), at 18 (showing that Pennsylvania contributed approximately 22 percent of all U.S. domestic mercury deposition in New York and the six New England states, even prior to when the NESCAUM states began to reduce their own power plant mercury emissions). Available at http://www.nescaum.org/documents/nescaum-sources-of-hg-depo-in-northeast_2008-final.pdf/.
[64] Drevnick, P.E., *et al*., Spatial and Temporal Patterns of Mercury Accumulation in Lacustrine Sediments across the Laurentian Great Lakes Region, 161 *Environ. Pollut.* 252-260 (2012), DOI: 10.1016/j.envpol.2011.05.025.
[65] Hutcheson, M.S., C.M. Smith, J. Rose, C. Batdorf, O. Pancorbo, C.R. West, J. Strube, and C. Francis. Temporal and Spatial Trends in Freshwater Fish Tissue Mercury Concentrations Associated with Mercury Emissions Reductions, 48 *Environ. Sci. Technol.* 2193-2202 (2014), DOI: 10.1021/es404302m.

emissions.[66]

- Long term research at an experimental lake in northwestern Ontario clearly demonstrated that reductions in mercury loadings resulted in rapid decreases in methylmercury concentrations in large-bodied fish populations within 8 years.[67] Therefore, mercury emission controls can have relatively near-term benefits for fish consumers, whether the loading reduction comes from reduced direct atmospheric deposition or from runoff. A modeling study of projected mercury concentration reductions in fish tissue in a New Hampshire freshwater lake resulting from reduced atmospheric mercury deposition reached a similar conclusion.[68]

Decreases in mercury contamination of fish are associated with human health benefits, as discussed in the following subsection. In addition, a reduction in mercury contamination will decrease the detrimental impacts on fish and fish-eating wildlife, including:

- Impacts on insectivorous terrestrial species such as songbirds,[69] bats, spiders, and amphibians;
- Reproductive effects, including deficits in sperm and egg formation, histopathological changes in testes and ovaries, and disruption of reproductive hormone synthesis in several fish species, including trout, bass (large and smallmouth), northern pike, carp, walleye and salmon;[70]
- Significant adverse effects in breeding loons,[71] including behavioral (reduced nest-sitting), physiological (flight feather asymmetry), and reproductive (chicks fledged/territorial pair) effects and reduced survival; and

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[66] Cross, F.A., D.W. Evans, and R.T. Barber. Decadal Declines of Mercury in Adult Bluefish (1972–2011) from the Mid-Atlantic Coast of the U.S.A., 49 *Environ. Sci. Technol.* 9064–9072 (2015), DOI: 10.1021/acs.est.5b01953.
[67] Blanchfield, P.J., *et al.* Experimental evidence for recovery of mercury-contaminated fish populations, 601 *Nature* 74-78 (2022), DOI: 10.1038/s41586-021-04222-7.
[68] Vijayaraghavan, K., L. Levin, L. Parker, G. Yarwood, and D. Streets. Response to Fish Tissue Mercury in a Freshwater Lake to Local, Regional, and Global Changes in Mercury Emissions, 33 *Environ. Toxicology and Chemistry* 1238–1247 (2014).
[69] Jackson, A.K., D.C. Evers, E.M. Adams, D.A. Cristol, C. Eagles-Smith, S.T. Edmonds, C.E. Gray, B. Hoskins, O.P. Lane, A. Sauer, and T. Tear. Songbirds as sentinels of mercury in terrestrial habitats of eastern North America, 24 *Ecotoxicology* 453-467 (2015), DOI: 10.1007/s10646-014-1394-4.
[70] Depew, D.C., N. Basu, N.M. Burgess, L.M. Campbell, E.W. Devlin, P.E. Drevnick, C.R. Hammerschmidt, C.A. Murphy, M.B. Sandheinrich, and J.G. Wiener. Toxicity Of Dietary Methylmercury To Fish: Derivation Of Ecologically Meaningful Threshold Concentrations, 31 *Environmental Toxicology and Chemistry* 1536–1547 (2012).
[71] Depew, D.C., N. Basu, N.M. Burgess, L.M. Campbell, D.C. Evers, K.A. Grasman, and A.M. Scheuhammer. Derivation of Screening Benchmarks for Dietary Methylmercury Exposure for the Common Loon (*Gavia Immer*): Rationale for Use in Ecological Risk Assessment, 31 *Environmental Toxicology and Chemistry* 2399–2407 (2012).

- Effects on the white ibis and other piscivorous bird species, including decreased foraging efficiency, decreased reproductive success and altered pair behavior, resulting in a reduction in fledglings.[72]

Mercury contamination of fishing areas, largely due to atmospheric mercury deposition, has led many states, including the NESCAUM member states, to issue widespread fish consumption advisories. Advisories warn residents, particularly women of child bearing age, to avoid or severely curtail fish consumption. Wildlife are not able to choose to avoid these exposures. For example, a study of lake-nesting bald eagles in Maine found that their nestlings had mercury concentrations exceeding levels associated with adverse health effects in other bird species, and the primary source of mercury to the lakes was from atmospheric deposition.[73] Without MATS to limit these mercury emissions, the Northeast states will have little chance to address these persistent harms to the region's natural resources caused by EGUs located upwind and outside the region.

d. Impacts of mercury deposition on human health

As discussed above, emitted mercury, when deposited in or carried into waterbodies, is readily converted to methylmercury (MeHg), a particularly toxic and persistent form of mercury. MeHg bioconcentrates in the food chain, and, as a result, mercury levels in fish tissue can be as much as 10 to 100 million times greater than concentrations in water.[74] Therefore, consumption of fish, including freshwater fish and saltwater fish and shellfish, are the major route of human exposure to mercury.

Human health effects linked to mercury exposure include the following:

- Children exposed to MeHg during a mother's pregnancy can experience persistent and lifelong IQ and motor function deficits. There is no known threshold below which these effects do not occur.[75]
- In adults, high levels of MeHg exposure have been associated with adverse

[72] For additional information on identified environmental impacts of mercury in the environment, *see* US EPA, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards*, EPA-452/R-11-011 (December 2011), Chapter 4.
[73] DeSorbo, C.R., N.M. Burgess, C.S. Todd, D.C. Evers, R.A. Bodaly, B.H. Massey, S.E. Mierzykowski, C.P. Persico, R.B. Gray, W.E. Hanson, D.E. Meattey, and K.J. Regan. Mercury concentrations in bald eagles across an impacted watershed in Maine, USA, 627 *Science of the Total Environment* 1515-1527 (2018), DOI: 10.1016/j.scitotenv.2018.01.023.
[74] Driscoll, C.T., Y.-J. Han, C. Chen, D. Evers, K.F. Lambert, T. Holsen, N. Kamman, and R. Munson. Mercury Contamination on Remote Forest and Aquatic Ecosystems in the Northeastern U.S.: Sources, Transformations, and Management Options, 57 *BioScience* 17-28 (2007).
[75] Grandjean, P. and M. Bellanger. Calculation of the Disease Burden Associated with Environmental Chemical Exposures: Application of Toxicological Information in Health Economic Estimation, 16 *Environ. Health*, 123 (2017), DOI: 10.1186/s12940-017-0340-3.

cardiovascular and hypertensive effects, including increased risk of fatal heart attacks.[76,77,78]

- Other adverse health effects of MeHg exposure that have been identified in the scientific literature include neurological effects,[79,80] endocrine disruption,[81] diabetes risk,[82] and compromised immune function.[83]

EPA's Regulatory Impact Analysis (RIA) in support of the 2011 MATS rule only monetized the effect of loss of IQ points for a certain subset of the exposed U.S. population. However, it is important that all of the health impacts listed above be carefully evaluated in any regulatory action that may increase mercury exposures.[84,85] The TSD for the 2022 Reaffirmation monetized an additional methylmercury health endpoint, myocardial infarction (MI) mortality. Consideration of cardiovascular effects is particularly critical. In 2011, a group of experts convened by EPA found "the body of evidence exploring the link between MeHg and acute myocardial infarction (MI) to be sufficiently strong to support its inclusion in future benefits analyses, based both on direct epidemiological evidence of an MeHg–MI link and on MeHg's association with intermediary impacts that contribute to MI risk."[86]

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[76] Genchi G., M.S. Sinicropi, A. Carocci, G. Lauria, and A. Catalano. Mercury Exposure and Heart Diseases, 14 *Int. J. Environ. Res. Public Health* 74 (2017), DOI:10.3390/ijerph14010074.
[77] Hu, X.F., K. Singh, and H.M. Chan. Mercury Exposure, Blood Pressure, and Hypertension: A Systematic Review and Dose-Response Meta-analysis, 126 *Environmental. Health Perspecti*ves 076002 (2018).
[78] Nedellec, V. and A. Rabl. Costs of Health Damage from Atmospheric Emissions of Toxic Metals: Part 2—Analysis for Mercury and Lead, 36 *Risk Analysis* 2096-2104 (2016), DOI: 10.1111/risa.
[79] Orenstein, S.T., S.W. Thurston, D.C. Bellinger, J.D. Schwartz, C.J. Amarasiriwardena, L.M. Altshul, and S.A. Korrick. Prenatal Organochlorine and Methylmercury Exposure and Memory and Learning in School-Age Children in Communities Near the New Bedford Harbor Superfund Site, Massachusetts, 122 *Environ. Health Perspectives* 1253-1259 (2014).
[80] Dickerson, A.S., M.H. Rahbar, A.V. Bakian, D.A. Bilder, R.A. Harrington, S. Pettygrove, R.S. Kirby, M.S. Durkin, I. Han, L.A. Moyé 3rd, D.A. Pearson, M.S. Wingate, and W.M. Zahorodny. Autism spectrum disorder prevalence and associations with air concentrations of lead, mercury, and arsenic, 188 *Environ. Monit. Assess*. 407 (2016), DOI: 10.1007/s10661-016-5405-1.
[81] Tan, S.W., J.C. Meiller, and K.R. Mahaffey. The endocrine effects of mercury in humans and wildlife, *Crit. Rev. Toxicol.* 39 (3), 228−269 (2009).
[82] He, K., P. Xun, K. Liu, S. Morris, J. Reis, and E. Guallar. Mercury exposure in young adulthood and incidence of diabetes later in life: the CARDIA trace element study, 36 *Diabetes Care* 1584−1589 (2013).
[83] Nyland, J. F., M. Fillion, R. Barbosa, Jr., D.L. Shirley, C. Chine, M. Lemire, D. Mergler, and E.K. Silbergeld. Biomarkers of methylmercury exposure and immunotoxicity among fish consumers in the Amazonian Brazil, 119 *Environ. Health Perspect*. 1733− 1738 (2011).
[84] Sunderland, E.M., C.T. Driscoll, Jr., J.K. Hammitt, P. Grandjean, J.S. Evans, J.D. Blum, C.Y. Chen, D.C. Evers, D.A. Jaffe, R.P. Mason, S. Goho, and W. Jacobs. Benefits of Regulating Hazardous Air Pollutants from Coal and Oil-Fired Utilities in the United States, 50 *Environ. Sci. Tech*. 2117-2120 (2016).
[85] Giang, A. and N.E. Selin. Benefits of Mercury Controls for the United States, 113 *Proceedings of the Nat'l Acad. of Sci*. 286-291 (2016).
[86] Roman, H.A., T.L. Walsh, B.A. Coull, E. Dewailly, E. Guallar, D. Hattis, K. Mariën, J. Schwartz, A.H. Stern, J.K. Virtanen, and G. Rice. Evaluation of the Cardiovascular Effects of Methylmercury Exposures: Current Evidence Supports Development of a Dose–Response Function for Regulatory Benefits Analysis, 119 *Environ. Health Perspect.* 607–614 (2011).

Note that fish with high MeHg levels also frequently have high levels of heart protective omega-3 fatty acids.[87] That correlation tends to mask the cardiovascular effects of MeHg in epidemiological studies and has made the development of quantitative risk factors for the MeHg-MI link more challenging. However, as discussed below, monetizing MI reductions associated with reduction in MeHg exposures significantly increases the quantified benefits associated with the MATS rule.

As previously noted, a recent study convincingly linked decreased levels decreased mercury air emissions with decreased concentrations of MeHg in bluefish captured in the Mid-Atlantic Bight (the continental shelf waters from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina).[88] The study's authors concluded that, assuming that bluefish are representative of other marine predators, reduced mercury releases will result in lower mercy public mercury exposures associated with eating marine fish. Those reductions in mercury intakes will likely have the largest benefit for women living in Atlantic coastal areas, who have, on average, higher mean mercury blood levels than other U.S. women of child-bearing age, as documented in the National Health and Nutrition Examination Survey.[89]

Consistent with the bluefish findings, another study found declining mercury concentrations in bluefin tuna in the Northwest Atlantic Ocean, and the declines paralleled decreases in North American mercury emissions being exported to the North Atlantic.[90] Because tuna species collectively provide more mercury (~40%) to the U.S. population than any other source,[91] it is clear that there will be significant health and economic benefits associated with saltwater fish consumption that come from reducing U.S. EGU mercury emissions.

The 2022 Reaffirmation Proposal estimated that the MI-mortality benefit associated with implementation of the MATS rule implementation was nearly $720 million per year [87 Fed. Reg. 7646]. The absence of MATS would put at risk public health in the Northeast states from the consumption of mercury-tainted fish, while diminishing the important health benefits of a

[87] Mahaffey, K.R., R.P. Clickner, and R.A. Jeffries. Methylmercury and Omega-3 Fatty Acids: Co-occurrence of Dietary Sources with Emphasis on Fish and Shellfish, 107 *Environ. Res.* 20–29 (2018).
[88] Cross, F.A., D.W. Evans, and R.T. Barber. Decadal Declines of Mercury in Adult Bluefish (1972–2011) from the Mid-Atlantic Coast of the U.S.A., 49 *Environ. Sci. Technol.* 9064–9072 (2015), DOI: 10.1021/acs.est.5b01953.
[89] Cusack, L.K., E. Smit, M.L. Kile, and A.K. Harding. Regional and Temporal Trends in Blood Mercury Concentrations and Fish Consumption in Women of Child Bearing Age in the United States Using NHANES Data from 1999–2010, 16 *Environ. Health* 10-20 (2017), DOI: 10.1186/s12940-017-0218-4.
[90] Lee, C.-S., M.E. Lutcavage, E. Chandler, D.J. Madigan, R.M. Cerrato, and N.S. Fisher. Declining Mercury Concentrations in Bluefin Tuna Reflect Reduced Emissions to the North Atlantic Ocean, 50 *Environ. Sci. Technol.* 12825-12830 (2016), DOI: 10.1021/acs.est.6b04328.
[91] Sunderland, E.M. Mercury exposure from domestic and imported estuarine and marine fish in the U.S. seafood market, 115 *Environ. Health Perspect.* 235−242 (2007); *see also* Sunderland, E.M., M. Li, and K. Ballard. Decadal Changes in the Edible Supply of Seafood and Methylmercury Exposure in the United States, 126:1 *Environ. Health Perspect.* 017006-1 (2018), DOI: 10.1289/EHP2644.

diet that includes fish. In addition, the vitality of the Northeast's marine fisheries is put at risk, threatening the future prospects of an already stressed but economically important component of the Northeast states' economies.[92]

e. Impacts on compliance with other Clean Air Act requirements

The EPA incorporated MATS into its 2011 emissions modeling platform that projects emission baselines into the future.[93] States relied upon these projections in developing pollution control strategies to attain and maintain national ambient air quality standards (NAAQS). For example, Connecticut included EPA's 2017 baseline projections for emissions of NO_X, which include MATS reductions, in an ozone state implementation plan (SIP) submittal.[94] While MATS may not specifically require limitations on NO_X as an ozone precursor, EPA has included the program in its projections because of its impact on reducing ozone precursor emissions in Connecticut and upwind states. Similarly, EPA has previously credited sulfur dioxide and particulate matter reductions from MATS in concluding that these would help eastern states meet the daily and annual fine particulate matter NAAQS with no additional controls needed.[95] Removal of MATS alters those projections and undermines the states' ability to achieve the relied-upon reductions associated with MATS to help attain and maintain compliance with the ozone and particulate matter national ambient air quality standards.

In addition to the national ambient air quality standards, EPA requires states to develop long-term strategies that address visibility-impairing haze in designated federally protected national parks and wilderness areas ("Class I areas"[96]), and these strategies must consider "Emission reductions due to ongoing air pollution control programs[.]"[97] As part of these considerations,

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[92] Unsworth, R.E., H. Balestero, S. Chivukula, M. Flight, E. Horsch, and C. Smith (Industrial Economics, Inc.), *The Economic Benefits of the Mercury and Air Toxics Standards (MATS) Rule to the Commercial and Recreational Fishery Sectors of Northeast and Midwest States* (2019), Doc. ID No. EPA–HQ–OAR–2018–0794–1175. Available at: https://www.regulations.gov/comment/EPA-HQ-OAR-2018-0794-1175.

[93] US EPA, *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*, (August 2015). Available at https://www.epa.gov/sites/production/files/2015-10/documents/2011v6_2_2017_2025_emismod_tsd_aug2015.pdf.

[94] Connecticut Department of Energy and Environmental Protection, *8-Hour Ozone Attainment Demonstration for the Connecticut Portion of the New York-Northern New Jersey-Long Island (NY-NJ-CT) Nonattainment Area, Technical Support Document, Enclosure A, Revision to Connecticut's State Implementation Plan* (August 2017). Available at https://www.ct.gov/deep/lib/deep/air/ozone/ozoneplanningefforts/SouthwestConnecticutAttainmentSIPFINAL.pdf (*see* pp. 56-57).

[95] US EPA, *Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter*, EPA-452/R-12-005 (December 2012). Available at https://www3.epa.gov/ttnecas1/regdata/RIAs/finalria.pdf.

[96] "Class I areas" are national parks larger than 6,000 acres and national wilderness areas larger than 5,000 acres that were in existence when the Clean Air Act was amended in 1977. *See* National Park Service, *Class I Areas*, https://www.nps.gov/subjects/air/class1.htm (accessed March 22, 2019).

[97] 40 CFR 51.308(f)(2).

EPA requires states with Class I areas to include MATS among the federal measures that they use to establish reasonable progress goals in their state haze plans.[98] In the NESCAUM region, four states have Class I areas – Maine, New Hampshire, New Jersey, and Vermont. Removal of MATS will hinder the ability of these and other states with Class I areas to achieve the reasonable progress goals in their haze plans.

IV. Co-benefits and non-monetized benefits of the MATS rule

The EPA's 2019 Reconsideration Proposal adopted for the first time a cost-benefit approach in which benefits that can be monetized were virtually the only factors considered in its "appropriate and necessary" finding. This overly constrained EPA's approach to one narrow slice of the full benefits reasonably attributable to MATS. EPA also for the first time dismissed the substantial "co-benefits" from reductions in other air pollutants, most notably fine particulate matter, based on the assertion that these are not the intended target of MATS, therefore cannot be meaningfully considered. Neither of those drastic changes are consistent with good practice in economic analysis,[99] and both contradict the federal government's own guidance in conducting a regulatory impact analysis. The 2022 Proposed Affirmation reverses EPA's position on both of those issues. The finding uses a totality-of-the-circumstances approach that includes monetized and non-monetized benefits. The benefits of both HAP reductions alone and HAP reductions plus co-benefits are compared with costs in that analysis.

a. Non-monetized benefits of HAP reductions

The EPA's 2011 RIA for the MATS rule monetized only one exposure-health endpoint, loss of IQ points in children who were exposed prenatally to MeHg via maternal ingestion of self-caught freshwater fish. The RIA stated that that endpoint was used because of "the availability of thoroughly-reviewed, high-quality epidemiological studies assessing IQ or related cognitive outcomes suitable for IQ estimation, and the availability of well-established methods and data for economic valuation of avoided IQ deficits."[100]

In the 2011 RIA, EPA did not attempt to monetize the benefits of reducing risks of any of the other health and environmental endpoints associated with exposure to MeHg that are listed above, including the increased risk of myocardial infarction in adults. It also did not monetize the benefits associated with a reduction in MeHg in saltwater fish and in commercially

[98] 82 Fed. Reg. 3078-3129 (January 10, 2017), at 3092.
[99] Aldy, J., M. Kotchen, M. Evans, M. Fowlie, A. Levinson, and K. Palmer. Deep Flaws in a Mercury Regulatory Analysis, 368 *Science* 247-248 (2020), DOI: 10.1126/science.aba7932.
[100] US EPA, *Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards*, EPA-452/R-11-011 (December 2011), Chapter 4.

purchased fish. The RIA states that EPA did not attempt to monetize those pathways for two reasons: "(1) for self-caught saltwater fish, we are unable to estimate the reduction in fish tissue methylmercury that would be associated with reductions in mercury deposition from U.S. EGUs, and (2) for commercially purchased ocean fish, it is nearly impossible to determine the source of the methylmercury in those fish, and thus we could not attribute mercury levels to U.S. EGUs."[101]

The TSD[102] for the 2022 Reaffirmation Proposal monetizes an additional pathway, exposure of the general U.S. population to methylmercury from the consumption of commercially-sourced fish, and an additional health endpoint, myocardial infarction mortality (MI-mortality). While NESCAUM recognizes that there are uncertainties in quantifying these exposures, it is essential that these pathways be included in any benefit analysis, because they are the main MeHg exposure pathways for most of the U.S. population. NESCAUM also encourages EPA to monetize additional exposure pathways and endpoints as sufficient data are available.

b. Expanded quantitative analyses of the benefits of HAP reductions

Several studies have estimated the benefits of reductions in exposures to MeHg associated with lower EGU emissions that yielded benefit estimates considerably higher than those calculated in EPA's 2011 RIA, including:

- A calculation of societal costs associated with exposure to MeHg in the U.S., including costs borne by the health care system, by the individual and the household, and by employers and insurers. Those costs were valued at $4.8 billion per year.[103]
- Using a probabilistic model, researchers calculated that a 10% reduction in the U.S. population's exposure to MeHg would be associated with a savings of $860 million per year, based on reductions in fatal heart attacks and IQ gains.[104]
- A 2005 NESCAUM analysis calculated that the health benefits to the public associated with reduced EGU mercury emissions would be as high as $4.9 billion (2000$) per year. This analysis, which included health endpoints (e.g., cardiovascular effects and premature mortality) and exposure pathways (e.g., ocean-caught fish) that were not

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[101] *Ibid.*
[102] US EPA, *National-Scale Mercury Risk Estimates for Cardiovascular and Neurodevelopmental Outcomes for the National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units—Revocation of the 2020 Reconsideration, and Affirmation of the Appropriate and Necessary Supplemental Finding; Notice of Proposed Rulemaking*, Memo to Docket ID No. EPA-HQ-OAR-2018-0794 (September 2, 2021).
[103] Grandjean, P. and M. Bellanger. Calculation of the Disease Burden Associated with Environmental Chemical Exposures: Application of Toxicological Information in Health Economic Estimation, 16 *Environ. Health* 123 (2017), DOI: 10.1186/s12940-017-0340-3.
[104] Rice, G.E., J.K. Hammitt, and J.S. Evans. A Probabilistic Characterization of the Health Benefits of reducing Methyl Mercury Intake in the United States, 44 *Environ. Sci. Technol.* 5216-5224 (2010), DOI:10.1021/es903359u.

included in the 2011 RIA, assumed an EGU mercury emissions cap of 26 tons per year, based on an earlier EPA proposal. Because EPA's final MATS rule resulted in a four-fold greater decrease in EGU mercury emissions below NESCAUM's assumed 26 tons per year, the full health benefits of MATS would be even larger than suggested by NESCAUM's 2005 estimates.[105]

c. Consideration of benefits of HAP reductions that cannot be monetized

It is essential that EPA also meaningfully account for benefits associated with the MATS rule that cannot be monetized, and do so for both human health and ecological benefits. Frequently, there is more information available to monetize costs than benefits. While the regulated community has incentive and resources to estimate compliance costs (and, as noted earlier, typically overestimates costs), it has no such incentive to monetize public benefits. While government can help fill this information imbalance, it often lacks the resources to do so. Furthermore, benefits that accrue over long time periods or are widely disbursed and difficult to directly link to a unique causal factor at a specific point in time may be overly discounted or completely ignored.

The Office of Management and Budget's (OMB) guidance on best practices in conducting regulatory analyses clearly supports serious consideration of all benefits, including those that cannot be monetized. The OMB's 2003 Circular A-4 notes that "[w]hen important benefits and costs cannot be expressed in monetary units, benefit-cost analysis is less useful, and it can even be misleading, because the calculation of net benefits in such cases does not provide a full evaluation of all relevant benefits and costs.[106]

States that have adopted their own rules limiting mercury emissions from EGUs also identified numerous important benefits associated with their rules that they were not able to fully monetize. Delaware, for example, stated that, "while it is evident that economic benefits will accrue," it "was not able to obtain sources of information that quantify the economic impact of mercury emissions reductions on neurological effects, cardiovascular effects, genotoxic effects, immunotoxic effects, or ecological effects."[107] Consistent with the OMB's guidelines and states' experiences, NESCAUM believes that the presently quantifiable benefits do not capture the full

[105] NESCAUM, *Economic Valuation of Human Health Benefits of Controlling Mercury Emissions from U.S. Coal-Fired Power Plants*, February 2005. Available at: http://www.nescaum.org/documents/rpt050315mercuryhealth.pdf.
[106] Office of Management and Budget (OMB), *Circular A-4: Regulatory Analysis*, 2003, p. 10.
[107] Delaware Department of Natural Resources & Environmental Control, Division of Air & Waste Management, Air Quality Management Section, *Technical Support Document for Proposed Regulation No. 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation*, September 2006 (p. 62). Available at: http://www.dnrec.delaware.gov/dwhs/Info/Regs/Documents/8969c5c8305d44318a38de77339cdf66multi_p_TechSptDoc1.pdf.

value of HAPs reductions associated with the MATS rule. EPA acknowledges this discrepancy in the 2022 Reaffirmation Proposal, stating that, "(t)hese estimates are intended to illustrate the point that the HAP impacts are large and societally meaningful, but not to suggest that they are even close to the full benefits of reducing HAP. There are many other unquantified effects of reducing EGU HAP that would also have substantial value to society" [87 Fed. Reg. 7628]. Therefore, it is essential that an approach that takes into account non-monetized risk be employed in regulatory cost-benefit analyses.

d. Consideration of co-benefits from reduction of criteria pollutant exposures

The EPA's 2016 Supplemental Finding included a formal cost-benefit analysis that found the monetized benefits associated with implementation of the MATS rule far outweighed the costs of compliance. In the Supplemental Finding, EPA stated that while in its preferred approach it was not relying on the rule's monetized co-benefits to reaffirm its "appropriate and necessary" finding, the results of its formal cost-benefit analysis provided further evidence in support of the basis for MATS.

In the 2019 Reconsideration Proposal, EPA proposed to reverse that finding because most of the monetized benefits calculated in the benefit-cost analysis are associated with what it views as ancillary reductions in non-HAP emissions. Specifically, most of the monetized benefits in the Supplemental Finding's formal cost-benefit analysis were associated with reductions in fine particulate matter ($PM_{2.5}$). Those reductions are a co-benefit of the installation of control technology that reduces emissions of $PM_{2.5}$, nitrogen oxides and sulfur dioxide, as well as HAPs. Note that in addition to direct (primary) $PM_{2.5}$ emissions from EGUs, nitrogen oxides and sulfur dioxides emitted by EGUs react in the atmosphere to form secondary $PM_{2.5}$.

The 2022 Reaffirmation Proposal again reversed EPA's position on this issue. By monetizing an additional exposure route and an additional health endpoint, as discussed above, the analysis in that finding demonstrated that HAP emission reductions alone were sufficient to justify costs. Co-benefits are also quantified, and the 2022 finding concludes that, "if we also account for the non-HAP benefits in our preferred totality-of-the-circumstances approach, such as the benefits (including reduced mortality) of coincidental reductions in PM and ozone that flow from the application of controls on HAP, the balance weighs even more heavily in favor of regulating HAP emissions from coal- and oil-fired EGUs" [87 Fed. Reg. 7636].

The EPA's minimization of the importance of co-benefits (also called ancillary benefits) in the 2019 Reconsideration Proposal contradicted guidance on this subject in OMB's Circular A-4, which states the following:

> Your analysis should look beyond the direct benefits and direct costs of your rulemaking

> and consider any important ancillary benefits and countervailing risks. An ancillary benefit is a favorable impact of the rule that is typically unrelated or secondary to the statutory purpose of the rulemaking (e.g., reduced refinery emissions due to more stringent fuel economy standards for light trucks) while a countervailing risk is an adverse economic, health, safety, or environmental consequence that occurs due to a rule and is not already accounted for in the direct cost of the rule (e.g., adverse safety impacts from more stringent fuel-economy standards for light trucks).
>
> You should begin by considering and perhaps listing the possible ancillary benefits and countervailing risks. However, highly speculative or minor consequences may not be worth further formal analysis. Analytic priority should be given to those ancillary benefits and countervailing risks that are important enough to potentially change the rank ordering of the main alternatives in the analysis. In some cases, the mere consideration of these secondary effects may help in the generation of a superior regulatory alternative with strong ancillary benefits and fewer countervailing risks. For instance, a recent study suggested that weight-based, fuel-economy standards could achieve energy savings with fewer safety risks and employment losses than would occur under the current regulatory structure.[108]

OMB reiterated its position in draft guidance issued in 2017, which stated that "[t]he consideration of co-benefits, including the co-benefits associated with reduction of particulate matter, is consistent with standard accounting practices and has long been required under OMB Circular A-4."[109]

In addition, EPA uses filterable particulate matter emitted by coal- and oil-fired EGUs as a surrogate for non-mercury metal air toxics because these metals are closely associated with filterable particulates.[110] Therefore, controls that reduce filterable particulate matter from coal- and oil-fired EGUs are responsible for achieving reductions of these non-mercury metals. As a factual matter, control of filterable particulates emitted from EGUs is integrally linked to control of most metal toxics emitted by the same facilities.

V. Summary

Almost 20 years after EPA first found it "appropriate and necessary" to limit mercury and other air toxics emitted by coal- and oil-fired EGUs (and reaffirmed it twice), the Agency reversed course to withdraw the finding in 2020. In doing so, EPA presented no new scientific assessment

[108] Office of Management and Budget (OMB), *Circular A-4: Regulatory Analysis,* 2003, p. 26.
[109] Office of Management and Budget (OMB), *2017 Draft Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act*, 2017, p. 13.
[110] 77 Fed. Reg. 9304-9513 (February 16, 2012), at 9402.

that air toxics emitted by EGUs no longer threaten public health and the environment. Instead, EPA presented a drastically scaled-back approach to assessing the benefits from reducing EGU air toxic emissions. In doing so, EPA conducted a cost-benefit analysis where the Agency contrasted only one narrow slice of monetized benefits against an outdated and demonstrably wrong monetized set of control costs. As a practical matter and with no prior precedent, EPA dismissed all other benefits of MATS that it did not assign a dollar value to, which by implication was the same as assigning them a value of zero dollars.

Furthermore, in the 2020 withdrawal, EPA inexplicably ignored standard good accounting practice and federal OMB guidance by dismissing MATS co-benefits that it has itself recognized may be relied upon by states in developing strategies to achieve compliance with other Clean Air Act requirements.

By basing its 2020 action to withdraw its previous "appropriate and necessary" finding on a narrowly constrained cost-benefit analysis that was incapable of adequately considering all the impacts of the HAPs covered by MATS, EPA failed to provide an informed analysis. In reviewing a more complete and extensive record of the range of benefits achievable by the MATS rule, and recognizing the actual historical costs of MATS compliance, we concluded that EPA lacked a proper foundation for withdrawing its long-standing "appropriate and necessary" finding.

The 2022 Reaffirmation Proposal appropriately seeks to reverse EPA's 2020 finding withdrawal. By reverting to well-accepted cost-benefit analysis approaches that consider non-monetized benefits, monetize additional HAP-reduction benefits, and include co-benefits of reductions of other pollutants, the full record clearly demonstrates that, after consideration of cost, it is appropriate and necessary to regulate air toxics emitted by coal- and oil-fired EGUs.