April 17, 2019

Comments from Academics, Scientists and Clinicians on the EPA Proposed Action "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"

Submitted online via *Regulations.gov* to docket EPA-HQ-OAR-2018-0794

These comments are submitted on behalf of the undersigned academics, scientists, and clinicians. The co-signers' institutional affiliations are included for identification purposes only and do not imply institutional endorsement or support unless indicated otherwise.

We appreciate the opportunity to provide comments on the U.S. Environmental Protection Agency (EPA) Proposed Action "National Emission Standards for Hazardous Air Pollutants (HAPs): Coal- and Oil-Fired Electric Utility Steam Generating Units-Reconsideration of Supplemental Finding and Residual Risk and Technology Review,"[1] also known as the Mercury and Air Toxics Standards (MATS). Since its implementation in 2012, MATS has driven significant decreases in the releases of mercury and other toxic chemicals from electric utility steam generating units (EGUs),[2] resulting in large benefits to public health, especially for children.[3]

The current proposal is scientifically and technically inadequate in its approaches to considering benefits and costs, as the rule's methodology is a far departure from established, peer-reviewed and validated analytical practices.[4] Because EPA does not utilize the best available science, current scientific principles or data in the rule, its conclusions are unsubstantiated and the policy actions proposed lack a basis in the evidence. This is especially concerning because the proposal could seriously harm public health, with vulnerable populations including infants and children most at risk.

We are strongly opposed to this action and recommend that EPA withdraw the proposal immediately. Our comments address the following main points.

RECOMMENDATION

1. **EPA should withdraw this proposal immediately.**

PROBLEMS WITH THE PROPOSAL

2. **EPA does not quantify major benefits of mercury and HAPs emissions reductions.**

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[1] 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 2019, 84 C.F.R. § 2670 (2019)

[2] US EPA. (2018). Introduction to the Toxics Release Inventory and the 2016 TRI National Analysis Report. Washington, DC: US EPA. Available: https://www.epa.gov/sites/production/files/2018-01/documents/2016_trina_webinar.pdf

[3] Giang, A., & Selin, N. E. (2016). Benefits of mercury controls for the United States. *Proceedings of the National Academy of Sciences*, *113*(2), 286–291. https://doi.org/10.1073/pnas.1514395113

[4] US EPA. (2010). Guidelines for Preparing Economic Analyses. Washington, DC: National Center for Environmental Economics, US EPA. Available: https://www.epa.gov/sites/production/files/2017-08/documents/ee-0568-50.pdf

3. **EPA does not use current scientific approaches to quantify benefits from mercury and HAPs emissions reductions.**
4. **If EPA withdrew or weakened MATS, this would harm public health, with children especially at risk.**

We are appreciative of the opportunity to provide public input. Please do not hesitate to contact us with any questions regarding these comments.

Sincerely,

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RECOMMENDATION

1. EPA should withdraw this proposal immediately.
The proposal is not consistent with the Agency's statutory mandate under the Clean Air Act, which requires EPA to permanently reduce HAP emissions from stationary sources through technology and risk-based standards that will protect human health and the environment.[5] Since the MATS proposed rule was issued in 2011, the science finding that mercury, HAPs and other air pollutants are toxic has only grown stronger. Therefore, EPA's conclusion from 2011 still stands: "The Agency's appropriate and necessary finding was correct in 2000, and it remains correct today."[6] The current rule proposal has many fundamental scientific flaws and EPA does not provide any explanation or evidence for how human or environmental health would benefit from the proposed actions.

As such, EPA should not implement the methods for benefit cost-analysis in this proposal for MATS or for any other Agency action, whether major or minor. EPA is responsible for making numerous decisions that directly impact public and environmental health, and the Agency is legally mandated to make these decisions in a timely manner, based on the full body of credible scientific evidence following established, validated analytical practices.

PROBLEMS WITH THE PROPOSAL

2. EPA does not quantify major benefits of mercury and HAPs emissions reductions.
EPA's proposal to ignore co-benefits of reducing particulate matter and other pollutants like NO_2 and SO_2 is not consistent with established economic analysis and runs counter to government guidelines.[7,8] These co-benefits must be considered as part of any benefit-cost analysis conducted according to current scientific principles. But even aside from these substantial co-benefits, there are significant benefits of reducing mercury and HAPs emissions themselves, acknowledged by EPA but not quantified.[9] EPA must quantify these effects for an accurate benefit-cost analysis, and as detailed in point 3, there are recommended methodological approaches available to do so.

Mercury
First, EPA does not consider all important exposure sources in its calculation of the benefits of mercury emissions reduction for IQ, resulting in significant underestimation of these benefits. EPA's only quantified benefit of mercury reduction is for IQ in populations consuming self-caught freshwater fish, which is a small fraction of the population consuming mercury-contaminated fish. EPA notes it does not quantify benefits from mercury reductions in other fish (self-caught saltwater and commercially

[5] National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial-Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units, 76 C.F.R. § 24975 (2011)
[6] Id.
[7] Office of Management and Budget, (2003). Circular A-4: Regulatory Analysis. Washington D.C.: US Government Publishing Office. Available: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf
[8] US EPA (December 2010) Guidelines for Preparing Economic Analyses. pp.7-3. Washington D.C.: US EPA."Analysts should take care to think through potential secondary or indirect effects of the policy options as well, as these may prove to be important."
[9] 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 2019, 84 C.F.R. § 2670, pp. 2678 (2019)

purchased);[10] these benefits are likely to be substantial, as a majority of the population consumes these kinds of fish. For example, Bellinger, 2012[11] calculated that methylmercury exposures resulted in loss of over 200,000 IQ points for U.S. children and the societal costs of methylmercury-related cognitive deficits were estimated at $4.8 billion in 2017.[12] These and other new data available since 2011 should have informed EPA's analysis, especially evidence that has advanced scientific understanding of the fate, transport and deposition of U.S. mercury emissions.[13, 14, 15] Where data gaps remain, the U.S. National Academy of Sciences (NAS) has recommended using data-informed defaults to account for known factors that influence the outcome in question, as otherwise the effect would be underestimated.[16]

Second, EPA does not quantify the benefits of mercury reductions for numerous other health impacts. These were not included in the 2011 Regulatory Impact Analysis with various rationales including uncertainty in the available evidence and/ or methodological limitations to monetize benefits.[17] EPA's 2011 evaluation relied heavily on a 2000 National Research Council report on mercury,[18] but in the almost 20 years since that report, a substantial new body of evidence for all of the health impacts in question has been established, a selection of which is detailed below. In the current proposal, EPA should have identified and evaluated the new evidence, with likely result of finding that the certainty or strength of the evidence has improved substantially. Indeed, Roman et al, with EPA's support, did exactly that for cardiovascular effects and found the body of evidence to be sufficiently strong to include in benefits analyses.[19] Even if evidence is less certain for other health effects, current scientific approaches are perfectly able to quantify and monetize these benefits (see point 3 below); the limitation here is not in the available methodology but in EPA's willingness to apply it.

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[10] US EPA. (2011). Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards. pp. 4-1. Available: https://www3.epa.gov/ttnecas1/regdata/RIAs/matsriafinal.pdf

[11] Bellinger, D. C. (2012). A strategy for comparing the contributions of environmental chemicals and other risk factors to neurodevelopment of children. *Environmental Health Perspectives*, *120*(4), 501–507. https://doi.org/10.1289/ehp.1104170

[12] Grandjean, P., & Bellanger, M. (2017). Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation. *Environmental Health*, *16*(1), 123. https://doi.org/10.1186/s12940-017-0340-3

[13] Giang, A., & Selin, N. E. (2016). Benefits of mercury controls for the United States. *Proceedings of the National Academy of Sciences*, *113*(2), 286–291. https://doi.org/10.1073/pnas.151439511

[14] Lepak, R. F., Yin, R., Krabbenhoft, D. P., Ogorek, J. M., Dewild, J. F., Holsen, T. M., & Hurley, J. P. (2015). Use of Stable Isotope Signatures to Determine Mercury Sources in the Great Lakes. *Environmental Science and Technology Letters*, *2*(12), 335–341. https://doi.org/10.1021/acs.estlett.5b00277

[15] Zhang, Y., Jacob, D. J., Horowitz, H. M., Chen, L., Amos, H. M., Krabbenhoft, D. P., … Sunderland, E. M. (2016). Observed decrease in atmospheric mercury explained by global decline in anthropogenic emissions. *Proceedings of the National Academy of Sciences*, *113*(3), 526–531. https://doi.org/10.1073/pnas.1516312113

[16] National Research Council. (2009). Science and Decisions: Advancing Risk Assessment. Ch. 4-6. Washington, D.C.: National Academies Press.

[17] US EPA. (2011). Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards. pp. ES-10-ES-13. Washington D.C.: US EPA. Available: https://www3.epa.gov/ttnecas1/regdata/RIAs/matsriafinal.pdf

[18] National Research Council. (2000). *Toxicological Effects of Methylmercury*. Washington, DC: The National Academies Press. https://doi.org/10.17226/9899.

[19] Roman, H. A., Walsh, T. L., Coull, B. A., Dewailly, É., Guallar, E., Hattis, D., … Rice, G. (2011). Evaluation of the cardiovascular effects of methylmercury exposures: Current evidence supports development of a dose-response function for regulatory benefits analysis. *Environmental Health Perspectives*, 119, 607–614. https://doi.org/10.1289/ehp.1003012

A brief selection of evidence on mercury health impacts unquantified by EPA

Health impact	Select recent publications
Other neurodevelopmental impacts	Wang, J., Wu, W., Li, H., Cao, L., Wu, M., Liu, J., … Yan, C. (2019). Relation of prenatal low-level mercury exposure with early child neurobehavioral development and exploration of the effects of sex and DHA on it. *Environment International*, *126*, 14–23. https://doi.org/10.1016/j.envint.2019.02.012 Prpić, I., Milardović, A., Vlašić-Cicvarić, I., Špiric, Z., Radić Nišević, J., Vukelić, P., … Horvat, M. (2017). Prenatal exposure to low-level methylmercury alters the child's fine motor skills at the age of 18 months. *Environmental Research*, *152*, 369–374. https://doi.org/10.1016/j.envres.2016.10.011
Cardiovascular toxicity	Roman, H. A., Walsh, T. L., Coull, B. A., Dewailly, É., Guallar, E., Hattis, D., … Rice, G. (2011, May). Evaluation of the cardiovascular effects of methylmercury exposures: Current evidence supports development of a dose-response function for regulatory benefits analysis. *Environmental Health Perspectives*, Vol. 119, pp. 607–614. https://doi.org/10.1289/ehp.1003012 Genchi, G., Sinicropi, M. S., Carocci, A., Lauria, G., & Catalano, A. (2017). Mercury exposure and heart diseases. *International Journal of Environmental Research and Public Health*, *14*(1). https://doi.org/10.3390/ijerph14010074
Genotoxicity and immunotoxicity	Bjørklund, G., Dadar, M., Mutter, J., & Aaseth, J. (2017, November 1). The toxicology of mercury: Current research and emerging trends. *Environmental Research*, Vol. 159, pp. 545–554. https://doi.org/10.1016/j.envres.2017.08.051

Other Hazardous Air Pollutants (HAPs)

EPA did not quantify the benefits of decreasing HAPs emissions other than mercury. EPA found that MATS would decrease emission of HAPs including arsenic, cadmium, lead, nickel, benzene, formaldehyde, acetaldehyde, chlorine, and chromium.[20] Some of these HAPs are carcinogens, and all are linked to non-cancer effects including neurological, cardiovascular, liver, kidney, respiratory, immune and reproductive effects. EPA states that cancer and noncancer benefits were not quantified due to "methodology and data limitations," but EPA has previously quantified for some HAPs the benefits of reductions in cancer and non-cancer risk using unit risk factors developed in 1995.[21] EPA should update the unit risk factors and fully quantify the cancer and noncancer benefits associated with reductions in those HAPs. For the other HAPs, EPA should use its established methodology to calculate the benefits of cancer risk reduction, and also account for benefits due to reducing noncancer risks as described below.

3. EPA does not use current scientific approaches to quantify benefits from mercury and HAP emissions reductions.

EPA relies on outdated risk assessment practices to justify excluding many health effects that could be quantified and monetized. EPA's methods should incorporate noncancer health effects and health effects that have less certain evidence. In particular, the current approach of threshold doses for noncancer health endpoints, which is not scientifically supported, does not allow for the incorporation

[20] US EPA. (2011). Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards. pp.68-79. Washington D.C.: US EPA. Available: https://www3.epa.gov/ttnecas1/regdata/RIAs/matsriafinal.pdf

[21] Id. pp. 69

of noncancer health endpoints in risk reduction estimates and subsequent related health benefits in a benefit-cost analysis.[22] The NAS recommends not assuming a threshold for a population dose-response assessment unless there is sound science indicating a population threshold for a given contaminant.[23] Probabilistic and regression models can approximate a dose-response function when adequate data is available.[24] Quantification of otherwise omitted noncancer health effects would allow for monetization of beneficial health risk reductions, making benefit-cost analyses consistent with current science and improving accuracy.

In addition, effects with less-certain evidence are often excluded from EPA benefit-cost analyses due to ambiguity of the strength of evidence in the risk assessment,[25] as described above for the MATS Regulatory Impact Analysis. This practice can lead to exclusion of "suggestive" evidence, a common descriptor in noncancer health effects and key determination in risk estimates, in primary quantitative benefits analysis. Adoption of new models or methodology to translate complex uncertainty terms to reflect a range or distribution of values could better characterize risk in benefit-cost analyses.

For example, Rice et al developed a probabilistic model to characterize IQ- and cardiovascular-related benefits of decreases in mercury exposure in the U.S., resulting in a 95th percentile estimate of $3.5 billion in benefits.[26] EPA could build on this approach to fully and accurately quantify all the benefits associated with decreased mercury and HAPs emissions.

4. If EPA withdrew or weakened MATS, this would harm public health, with children especially at risk.

Under Executive Order 13045, each Agency "shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."[27] For pregnant women and children, there is no known "safe" exposure to mercury; like lead, neurodevelopmental impacts occur at any level of exposure.[28] Since implementation of MATS, U.S.

[22] McGartland, A., Revesz, R., Axelrad, DA., Dockins, C., Sutton, P., and Woodruff, TJ. (2017). Estimating the health benefits of environmental regulations. *Science*, *357*(6350), pp.457-458. https://doi.org/10.1126/science.aam8204

[23] National Research Council. (2009). *Science and Decisions: Advancing Risk Assessment*. Washington, DC: The National Academies Press. https://doi.org/10.17226/12209

[24] Chiu, W., Axelrad, D., Dalaijamts, C., Dockins, C., Shao, K., Shapiro, A., & Paoli, G. (2018). Beyond the RfD: Broad Application of a Probabilistic Approach to Improve Chemical Dose–Response Assessments for Noncancer Effects. *Environmental Health Perspectives*, *126*(06). https://doi.org/10.1289/EHP3368

[25] McGartland, A., Revesz, R., Axelrad, DA., Dockins, C., Sutton, P., and Woodruff, TJ. (2017) Estimating the health benefits of environmental regulations. *Science*, *357*(6350), 457-458.

[26] Rice, G. E., Hammitt, J. K., & Evans, J. S. (2010). A probabilistic characterization of the health benefits of reducing methyl mercury intake in the United States. *Environmental Science and Technology*, *44*(13), 5216–5224. https://doi.org/10.1021/es903359u

[27] Protection of Children From Environmental Health Risks and Safety Risks, 62 C.F.R. § 19885 (1997)

[28] Id. and Grandjean, P., & Bellanger, M. (2017). Calculation of the disease burden associated with environmental chemical exposures: application of toxicological information in health economic estimation. *Environmental Health*, *16*(1), 123. https://doi.org/10.1186/s12940-017-0340-3

women's mercury levels have declined, leading to significant reduction of neurodevelopmental risks for children. [29, 30]

If the MATS standards were withdrawn or weakened, mercury emissions could increase, with resultant harm to the health of children. This is inconsistent with EO 13045 and with EPA's statutory mandate under the Clean Air Act to ensure protection of human health from HAPs.

[29] Birch, R. J., Bigler, J., Rogers, J. W., Zhuang, Y., & Clickner, R. P. (2014). Trends in blood mercury concentrations and fish consumption among U.S. women of reproductive age, NHANES, 1999-2010. *Environmental Research*, *133*, 431–438. https://doi.org/10.1016/j.envres.2014.02.001

[30] Rice, G. E., Hammitt, J. K., & Evans, J. S. (2010). A probabilistic characterization of the health benefits of reducing methyl mercury intake in the United States. *Environmental Science and Technology*, *44*(13), 5216–5224. https://doi.org/10.1021/es903359u