Mercury Matters 2020: A Science Brief for Journalists

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MATS and Mercury in Context

Coal-fired power plants are the largest source of mercury in the U.S., accounting for approximately 48% of mercury emissions in 2015[1]. The Mercury and Air Toxics Standards (MATS) were finalized in 2012 to regulate emissions of mercury, acid gases and other hazardous air pollutants (HAPs) from U.S. electric utilities.

The 2012 MATS rule was intended to reduce mercury emissions from regulated power plants by 90%, improve public health, and help meet U.S. commitments under the 2017 Minamata Convention on Mercury.

The Latest from EPA

On April 16, 2020, the Environmental Protection Agency (EPA) overturned the Agency's prior determination and deemed that it is not "appropriate and necessary" to regulate mercury and other hazardous air pollutants (HAPs) from oil- and coal-fired power plants under section 112 of the Clean Air Act. According to legal scholars, this decision undermines the foundation of the MATS rule and invites challenges to the emissions standards themselves.

The EPA also issued a "Residual Risk and Technology Review" in which it concluded that no further emissions reductions will be required from affected power plants to protect human health. The EPA Science Advisory Board recently issued a report urging the Agency to develop a new mercury exposure estimate before finalizing this residual risk assessment.

The Issue

EPA's justification for weakening MATS relies not only on its decision to eliminate "co-benefits" *but also on a flawed underestimation of the benefits of reducing mercury itself*. The 2012 MATS rule has substantially decreased mercury emissions and improved public health at a much lower cost than anticipated. Yet, EPA continues to rely on the outdated cost and health benefit estimates from the 2011 MATS Regulatory Impact Assessment (RIA) to support its determination.

EPA's "appropriate and necessary" and "residual risk" determinations are inconsistent with current science on mercury exposure, the societal impacts of mercury pollution in the U.S.[2,3], and the full benefits of emissions controls. Among other shortcomings, the 2011 MATS RIA that EPA relied on only accounts for the benefits of mercury reductions to children of freshwater recreational anglers in the U.S., a small fraction of the total population affected.

The Impacts of Mercury Emissions on Human Health and the Environment Are Well-Understood

Mercury has been studied intensively for decades and its impacts are well-understood. Important facts about the effects of mercury include the following:

- Mercury in the form of methylmercury is a potent neurotoxin.
- Children exposed to methylmercury during a mother's pregnancy can experience persistent and lifelong IQ and motor function deficits[4].
- In adults, high levels of methylmercury exposure have been associated with adverse cardiovascular effects, including increased risk of fatal heart attacks[5].
- Other adverse health effects of methylmercury exposure that have been identified in the scientific literature include endocrine disruption[6], diabetes risk[7], and compromised immune function[8].
- The societal costs of neurocognitive deficits associated with total methylmercury exposure in the U.S. were estimated in 2017 to be approximately $4.8 billion per year[9].
- No known threshold exists for methylmercury below which neurodevelopmental impacts do not occur[10,11].

Mercury exposure in the U.S. occurs primarily through the consumption of freshwater fish and seafood (fish and shellfish). The consumption of marine fish, often harvested from U.S. coastal waters, accounts for greater than 80% of methylmercury intake by the U.S. population[12]. Dietary supplements cannot counteract methylmercury toxicity in U.S. consumers. A safe and consumable fishery is important to retaining a healthy, low-cost source of protein and other nutrients that are essential for pregnant women, young children, and the general population.

After mercury is emitted from power plants it is deposited back to Earth where it can be converted to methylmercury, a highly toxic form of mercury that magnifies up food chains, reaching concentrations in fish that are 10 to 100 million times greater than concentrations in water[13].

With increasing levels of mercury in the environment due to human activities, virtually all fish from U.S. waters now have detectable levels of methylmercury. Some fish, such as swordfish, large species of tuna, and freshwater game fish, can have levels that exceed consumption guidelines.

States post fish consumption advisories for waterbodies that are known to have elevated contaminants. In 2013, consumption advisories for mercury were in effect in all 50 states, one U.S. territory, and three tribal territories, and accounted for 81% of all U.S. consumption advisories[14]. This represents more advisories for mercury than for all other contaminants combined.

Wildlife that consume fish, such as common loons, bald eagles, otter and mink, and many marine mammals can also experience adverse effects from mercury and are unable to heed advisories[15]. The health of many songbird and bat species is threatened due to methylmercury exposure in wetland habitats. The productivity of economically valuable game fish stocks can also be compromised[16].

As Mercury Emissions in the U.S. Have Declined, Health Has Improved

The outdated science from the 2011 MATS RIA that EPA relied on in its current decision assumed that mercury emissions from coal-fired utilities are mainly transported long distances from the U.S. and that a substantial fraction of mercury in the U.S. comes from international sources. However, scientific understanding of the fate of U.S. mercury emissions has advanced considerably since 2011[17,18]. Recent research shows that the contribution of U.S. coal-fired power plants to local mercury contamination particularly in the eastern U.S. has been markedly underestimated. Accordingly, mercury controls on U.S. electric utilities have contributed to the following emissions reductions and associated environmental and human health improvements in the U.S.

- Mercury emissions from U.S. coal-fired power plants have declined by 85% from 92,000 pounds in 2006 to 14,000 pounds in 2016[19] since states began setting standards and MATS was introduced in 2011. Eleven states had implemented mercury emissions standards for power plants prior to 2011.
- Concurrent with declines in mercury emissions, mercury levels in air, water, sediments, loons, freshwater fisheries, and Atlantic Ocean fisheries[20] have decreased appreciably.
- Mercury levels in the blood of women in the U.S. declined by 34% between 2001 and 2010 as mercury levels in some fish decreased, and fish consumption advisories improved[21].
- The estimated number of children born in the U.S. each year with prenatal exposure to methylmercury levels that exceed the EPA reference dose has decreased by half from 200,000-400,000 to 100,000-200,000, depending on the measure used[22].

The Benefits of Reducing Mercury Are Much Larger Than EPA Has Estimated

The EPA continues to estimate that the annualized mercury-related health benefits of reducing mercury emissions would be less than $10 *million*. Recent studies that account for more pathways of methylmercury exposure and additional health effects suggest that the monetized benefits of reducing power plant mercury emissions in the U.S. are likely in the range of several *billion* dollars per year[23,24,25]. These and other studies support the conclusion that the mercury-related benefits from MATS are orders of magnitude larger than previously estimated in the 2011 MATS RIA on which the EPA's decision is based[26].

In addition to the mercury-related benefits, MATS has also decreased sulfur dioxide and nitrogen oxide emissions, improving air quality and public health by reducing fine particulate matter and ground-level ozone. The EPA estimated that the annualized value of these additional benefits is $24 to $80 billion; bringing the total annual benefits from MATS to tens of billions of dollars. Even with these more complete estimates, substantial benefits of reducing mercury and other air toxics remain unquantified due to data limitations[27].

On the cost side, new information suggests that the EPA's original cost-estimate for MATS of $9.6 billion is much higher than the actual cost due to declines in natural gas prices and lower than expected control equipment and renewable energy costs[28]. Yet, even with the original overestimate, the EPA projected that MATS would increase the monthly electric bill of the average American household by

only $2.71 (or 0.3 cents per kilowatt-hour). This value is well within the price fluctuation consumers experienced between 2000 and 2011[29].

The Bottom Line

The science is clear. Total methylmercury exposure must be taken into account in policy decisions. The health impacts in the U.S. of mercury emissions in the U.S. are large and disproportionately affect children and other vulnerable populations. Mercury emission standards in the U.S. have markedly reduced mercury in the environment and improved public health. The mercury-related benefits alone of the MATS rule are much larger than EPA has estimated, the actual costs appear to be substantially lower than EPA has projected, and the total monetized benefits across all pollutants far outweigh the cost of the standards.

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