**Mercury MACT Under the Clean Air Act:**
**An Assessment of the Mercury Emissions Outcomes**
**of Stakeholder Group Recommendations**
NESCAUM – May 8, 2003

## 1.0 Background

Mercury is a persistent, bioaccumulative, neurotoxic pollutant. When released into the environment and deposited or carried into water bodies, mercury is easily converted to methylmercury, a particularly toxic mercury compound, and accumulates in sediments. Methylmercury is readily transmitted up the food chain and accumulates in the tissues of animals. Exposure to mercury can cause numerous adverse effects in plants, birds, and mammals, including humans.

In humans, methylmercury is transported across the placenta into the brain of the developing fetus. In young children and fetuses, methylmercury inhibits the normal development of the nervous system, an effect that may occur even at low exposure levels. This damage frequently is not apparent until later in the developmental process, when motor and verbal skills are found to be delayed or abnormal. Developmental effects have been found in children exposed in utero, even though their mothers did not experience any symptoms of adult toxicity. States are sufficiently concerned about the public health impacts of mercury exposure that most have posted advisory warnings about fish consumption – the primary exposure route in humans.

In 1998, the U.S. Environmental Protection Agency (EPA) identified mercury as the hazardous air pollutant of "greatest potential concern" associated with coal-fired electricity production.[1] Moreover, coal-fired power plants were identified as the largest remaining source of airborne mercury emissions in the U.S. following the regulation of other important mercury sources, such as municipal and medical waste incinerators, in the late 1990s. Under a legal settlement reached pursuant to the Clean Air Act Amendments of 1990, EPA is required to promulgate mercury emissions standards for electricity generating utility boilers by December 2004. These standards – which according to the explicit language of the Clean Air Act must reflect the utilization of "Maximum Achievable Control Technology" for mercury – are expected to be implemented by December 2007.

To assist in the development of Maximum Achievable Control Technology (MACT) standards for power plant mercury emissions, EPA convened a multi-stakeholder group known as the Utility MACT Working Group (hereafter, Working Group). The Northeast States for Coordinated Air Use Management (NESCAUM) has participated in this group since its inception. NESCAUM is an interstate association of air quality control agencies in the eight Northeast states (the six New England states, New York, and New Jersey). Together with other Working Group participants, NESCAUM worked to develop a set of

[1] U.S. EPA. 1998. *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final Report to Congress.*

specific recommendations to EPA concerning issues related to the setting of MACT standards for mercury emissions, consistent with the requirements of the Clean Air Act.

Ultimately, the stakeholder groups participating in the Working Group could not agree on a single set of recommendations for mercury emissions standards. Instead, the Working Group's deliberations resulted in separate recommendations from a range of stakeholders, including distinct recommendations from four major stakeholder groups: the State and Local Agency Stakeholders,[2] the Environmental Stakeholders,[3] the Clean Energy Group (CEG),[4] and multi-industry stakeholders under the name "Majority Industry Group."[5] The first three of these groups reached significant consensus, however, jointly signing a memorandum to the members of the Clean Air Act Advisory Committee indicating that there were, in fact, broad areas of agreement among them.[6] This memorandum also expressed concern that the final report of the Working Group had obscured the extent to which consensus had been achieved among many of the stakeholders on important issues.

Throughout the Working Group's deliberations, EPA represented its intention to model the impact of stakeholder group recommendations on mercury emissions from the electric power sector using ICF's IPM model. Recently, however, EPA indicated that it will delay – and perhaps forego entirely – any IPM analysis of stakeholder recommendations. In light of this decision, NESCAUM decided to analyze the emissions impacts of the recommendations of these four stakeholder groups participating in the Working Group.

Each of the stakeholder groups submitted recommendations for mercury reductions in terms of a specific rate-based emission standard or an alternative approach allowing sources to meet *either* a specific rate-based emission standard *or* a specific percentage reduction requirement. NESCAUM undertook this analysis in order to translate each group's recommendations into the annual tons of mercury that would be released to the environment. Notwithstanding this analysis, NESCAUM urges EPA to model the stakeholder group recommendations with IPM, consistent with its original

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[2] State and Local Agency Stakeholders included NESCAUM, STAPPA/ALAPCO, the State of New Jersey, and the Regional Air Pollution Control Agency (RAPCA) based in Dayton, Ohio. (The State of Texas also participated in the Working Group, but preferred to offer a separate opinion on several issues.)

[3] Environmental Stakeholders included the Clean Air Task Force, National Wildlife Federation, National Environmental Trust, Natural Resources Defense Council, and Environmental Defense.

[4] The Clean Energy Group was represented in the Working Group by PG&E National Energy Group. Two of its members, Consolidated Edison and Public Service Enterprise Group, also participated in the Working Group. Other Clean Energy Group members include Conectiv, Exelon Corporation, KeySpan, Northeast Utilities, and Sempra Energy.

[5] The Majority Industry Group was represented principally by Cinergy, the Class of 85 Regulatory Response Group, Latham & Watkins, the National Mining Association, Seminole Electric Cooperative, Southern Company Generation, the United Mine Workers, the Utility Air Regulatory Group, West Associates, the American Public Power Association, and the National Rural Electric Cooperative Association.

[6] "Areas of Agreement Among Stakeholders in the Utility MACT Working Group," Memorandum dated October 30, 2002.

representations, in order to provide a more complete picture of the emissions impact of implementing various policy options for regulating mercury from power plants.

## 2.0 Methodology

The total mercury tonnage that would be emitted under each stakeholder group's MACT recommendation was calculated using the underlying fuel consumption data and uncontrolled mercury emissions information reported in EPA's Utility Air Toxics Study database. This analysis does not attempt to project growth in fuel consumption, nor does it model changes in the methods of electricity production. Such a dynamic analysis would require the use of a system dispatch model like IPM. However, we are confident that this analysis provides reasonable estimates of the annual tons of mercury that would be emitted by the electric power sector under each of the scenarios considered.

All of the stakeholder group recommendations were analyzed using a subset of the power plants in the EPA Utility Air Toxics Study database.[7] Plant-by-plant mercury emissions estimates were downloaded from EPA's website.[8] These data were compared with mercury input concentrations in the coal purchased by power plants, which was compiled from first, second, third and fourth quarter 1999 coal data downloaded from the same source.[9] There were 412 power plants for which both coal data and EPA plant emissions estimates existed for mercury. These 412 facilities – emitting an estimated 44.6 tons of mercury in 1999 – were included in the analysis. EPA estimates that the entire universe of facilities in its Utility Air Toxics Study database emitted approximately 48 tons of mercury in 1999.

Because the State and Local Agency Stakeholder group recommendation did not include lignite, coal-fired power plants that reported lignite as their primary coal type were excluded from the analysis of that group's recommendations, eliminating 11 facilities. These 11 facilities generated an estimated 3.1 tons of mercury emissions in 1999. Eliminating these 11 facilities left 401 coal-fired power plants available for the analysis of this stakeholder group's MACT recommendation. In 1999, these 401 power plants emitted an estimated 41.5 tons of mercury.

In converting the stakeholders' recommendations to annual mercury emissions in tons, the analysis assumes that those sources whose emissions are already below the recommended limits will not increase their emissions to the maximum allowable level.

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[7] This was necessary because certain data were not available for a small subset of the facilities in the EPA Utility Air Toxics Study database.

[8] "Plant by Plant Emissions Estimates," Wordperfect file downloaded March 26, 2002 from http://www.epa.gov/ttn/atw/combust/utiltox/utoxpg.html.

[9] Database compiled by Michael Aucott of the New Jersey Department of Environmental Protection.

## 3.0 Analysis of Stakeholder Group Recommendations

Annual emissions in tons of mercury from electric power plants after the MACT standard is implemented are estimated below for each of the recommendations of the four stakeholder groups. The results of this assessment are summarized in Appendix A.

### 3.1 State and Local Agency Stakeholder Group

*Recommendation: The State and Local Agency Stakeholders recommended a plant-by-plant standard equivalent to the less stringent of 0.4-0.6 pounds per trillion British thermal units (lbs/TBtu) or a 90% reduction (from the mercury content in coal). This standard would only apply to bituminous and subbituminous coal. This stakeholder group did not submit a recommendation for plants burning primarily lignite.*

Two approaches were analyzed. The first allowed sources to choose between complying with a rate-based emission standard of **0.6** lbs/TBtu or a 90% reduction from the mercury content in coal. It was assumed that sources would select the less stringent of these two compliance paths. Using this approach, of the 401 facilities included in this stakeholder group's analysis, 47 facilities would continue to emit at current levels (i.e., current emissions are below the proposed standard), 188 would choose to comply with the 90% control efficiency option, and 166 would choose to comply with the emission rate standard of 0.6 lbs/TBtu. Overall, this would result in annual mercury emissions of approximately **6.7** tons.

The second approach allowed sources to choose between a rate-based emission standard of **0.4** lbs/TBtu or a 90% reduction. Using the method applied above, 43 of the 401 facilities included in the analysis would continue to emit at current levels (i.e., current emissions are below the proposed standard), 306 would choose to comply with the 90% control efficiency option, and 52 would choose to comply with the emission rate standard of 0.4 lbs/TBtu. Overall, this would result in annual mercury emissions of **6.3** tons.

### 3.2 Environmental Stakeholder Group

*Recommendation: The Environmental Stakeholders recommended a plant-by-plant standard of 0.19 lbs/TBtu for fluidized bed combustion (FBC) facilities and 0.21 lbs/TBtu for all other facility types. This standard would apply to all coal types.*

The Environmental Stakeholder Group's recommendation applied to all coal types, allowing the 11 lignite-burning plants to be included in this analysis, yielding a total of 412 facilities for which adequate data were available to assess the emissions impact of the recommended standards. Overall, the Environmental Stakeholder Group's recommended standards would result in annual mercury emissions of **1.9** tons.

### 3.3 Clean Energy Group Recommendation

*Recommendation: The Clean Energy Group recommended a plant-by-plant standard of 0.320 lbs/TBtu for FBC facilities burning bituminous or subbituminous coal, 1.223 lbs/TBtu for all other boiler types burning bituminous or subbituminous coal, 11.984 lbs/TBtu for FBC facilities burning lignite, and 9.091 lbs/TBtu for all other boiler types burning lignite. Although CEG has indicated it would support a standard allowing sources to comply with either a specified emission rate or a specified control efficiency, CEG made emission rate recommendations only based on its understanding that IPM cannot model control efficiency standards.*

The Clean Energy Group's recommendation was applied to all 412 facilities for which adequate emissions data were available. Overall, the Clean Energy Group's recommended standards would result in annual mercury emissions of **13.1** tons.

### 3.4 Majority Industry Group Recommendation

*Recommendation: The Majority Industry Group recommended a plant-by-plant standard of 3.7 lbs/TBtu for hot stack facilities burning bituminous coal, 2.2 lbs/TBtu for saturated stack facilities burning bituminous coal, 3.2 lbs/TBtu for wet stack facilities burning bituminous coal, 4.2 lbs/TBtu for facilities burning subbituminous coal, 6.5 lbs/TBtu for facilities burning lignite, and 2.0 lbs/TBtu for FBC facilities.*

NESCAUM did not have access to data regarding the stack characteristics of the facilities burning bituminous coal (i.e., hot, saturated, or wet), and thus was unable to precisely convert the Majority Industry Group's recommendation into total tons of mercury emitted annually. We bracketed the *range* of annual emissions, however, by calculating tons emitted from facilities burning bituminous coal assuming: (1) that for the low (most stringent) end of the range, *all* such facilities would comply with the lowest recommended emission rate of 2.2 lbs/TBtu, and (2) that for the high (least stringent) end of the range, *all* such facilities would comply with the highest recommended emission rate of 3.7 lbs/TBtu. Emission rates for other facilities and fuel types were applied as recommended. Overall, the Majority Industry Group's recommended standards would result in annual mercury emissions between **25.0** and **30.0** tons.

## 4.0 Discussion

Under the federal Clean Air Act, the mercury MACT standard for the electric generating sector is required to be proposed by December 2003, promulgated in final form by December 2004, and is expected to be implemented by December 2007. Thus, under the existing Clean Air Act (i.e., unmodified by any federal multi-pollutant legislation

applicable to the power sector), the public can expect reductions in mercury pollution from power plants to occur by the end of 2007.

It is difficult to predict the level at which EPA will ultimately set the mercury MACT standard. However, it is worth noting that some states have already moved to adopt mercury standards in the range of stringency recommended by the State and Local Agencies Stakeholder Group and on a similar timeline to that expected under the Clean Air Act for implementation of a federal MACT standard. In March 2003, for instance, a coalition[10] of an electric generating company and several environmental groups publicly issued a joint recommendation to the Connecticut General Assembly calling for legislation establishing stringent mercury emission standards for Connecticut's coal-fired power plants. Specifically, their proposal would require coal-fired plants in Connecticut to achieve either a mercury emission rate of 0.6 lbs/TBtu or a 90% control technology efficiency by July 2008. The proposal further directs the Connecticut Department of Environmental Protection to consider new emissions standards for mercury in 2012. Similarly, the Massachusetts Department of Environmental Protection has concluded that the removal of at least 85-90% of mercury in flue gas has been demonstrated to be technologically and economically feasible.[11]

## 5.0 Conclusion

This analysis was conducted to facilitate comparisons among different Stakeholder Group recommendations within the EPA Utility MACT Working Group process and several legislative proposals currently before Congress to reduce multiple types of pollutant emissions from the power sector, including mercury. Most of these legislative proposals would set aside the MACT process authorized under the Clean Air Act and would address power plant mercury emissions directly, in most cases by establishing a national cap on power sector mercury emissions and (in some cases) also establishing facility-specific minimum mercury reduction requirements. An important dimension of all of these proposals is the timeframe over which mercury reductions would be implemented. As noted several times in this discussion, under current law new MACT standards will be implemented by the end of 2007. By comparison, at least one proposal now before Congress delays full action on mercury for more than a decade compared to the mercury MACT process.

The consequences of delay in implementing new mercury control requirements are potentially significant in terms of foregone reductions in the quantities of this persistent, bio-accumulative toxin that will be released to the environment over the next 10 to 15 years. Compared to the MACT recommendations of the State and Local Agency

[10] This coalition included PSEG Power Connecticut, Clean Water Action, the Connecticut Coalition for Clean Air, and the Clean Air Task Force.

[11] "Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions from the Combustion of Fossil Fuel," Massachusetts Department of Environmental Protection, December 2002.

Stakeholder Group, for example, the more delayed legislative proposal noted previously would result in the allowable emission of an additional 258 tons of mercury between 2007 and 2020. Even assuming EPA picks a less stringent MACT standard representing a middle ground between the more centrist Stakeholder Group recommendations summarized in Appendix A, foregone emissions reductions relative to the more delayed legislative proposals now before Congress could be significant. For example, utilizing the same comparison as above, a MACT standard equivalent to an annual cap of 11 tons – if implemented in 2008 – would likely reduce cumulative emissions by more than 180 tons by 2020, compared to a phased approach that delays similar levels of control for another 10 years. This represents approximately four years worth of mercury emissions at current emission rates (44.6-48.0 tons per year). Due to its persistence in the environment, any additional mercury emitted as a result of delaying new control requirements will remain bioavailable for years, needlessly accumulating in the food chain that ultimately reaches humans.

We hope that the results of this analysis will help avoid lost opportunities of this nature by providing useful guidance both to EPA in reaching its final mercury MACT determination for power plants and to policymakers in Congress as they consider multi-pollutant legislation incorporating mercury emission limits.

**Appendix A.**

# SUMMARY OF ANALYSIS RESULTS

| Stakeholder Group | Recommended Mercury Emission Standard | Relevant Annual Baseline (tons) | Post-MACT Annual Emissions (tons) |
|---|---|---|---|
| Environmental Stakeholders | • 0.19 lbs/TBtu for FBC facilities<br>• 0.21 lbs/TBtu for all other facility types for all coal types | 44.6 | 1.9 |
| State and Local Agencies | • 0.4-0.6 lbs/TBtu or a 90% reduction, applied to bituminous and subbituminous coal | 41.5 | 6.3-6.7 |
| Clean Energy Group | • 0.320 lbs/TBtu for FBC facilities burning bituminous or sub-bituminous coal<br>• 1.223 lbs/TBtu for all other boiler types burning bituminous or sub-bituminous coal<br>• 11.984 lbs/TBtu for FBC facilities burning lignite<br>• 9.091 lbs/TBtu for all other boiler types burning lignite | 44.6 | 13.1 |
| Majority Industry Group | • 3.7 lbs/TBtu for hot stack facilities burning bituminous coal<br>• 2.2 lbs/TBtu for saturated stack facilities burning bituminous coal<br>• 3.2 lbs/TBtu for wet stack facilities burning bituminous coal<br>• 4.2 lbs/TBtu for facilities burning subbituminous coal<br>• 6.5 lbs/TBtu for facilities burning lignite<br>• 2.0 lbs/TBtu for FBC facilities | 44.6 | 25.0-30.0 |