

CHAMBER OF COMMERCE
OF THE
UNITED STATES OF AMERICA

WILLIAM L. KOVACS
VICE PRESIDENT
ENVIRONMENT, TECHNOLOGY &
REGULATORY AFFAIRS

1615 H STREET, N.W.
WASHINGTON, D.C. 20062
(202) 463-5457

April 29, 2004

EPA Docket Center (Air Docket)
U.S. EPA West (6102T)
Room B-108
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
Attention Docket ID No. OAR-2002-0056

Re: Comments on EPA's Proposed Rule: *Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units*

Dear Sir or Madam:

These comments are being filed on behalf of the U.S. Chamber of Commerce (Chamber), the world's largest business federation, representing more than three million businesses of every size, sector, and region. The Chamber serves as the principal voice of the American business community. Its members will be significantly affected by the proposed rule¹ because the rule contemplates creation of a regulatory structure that significantly impacts the operation and performance of Electric Utility Steam Generating Units (hereafter power plants). Many of our members own, operate, or derive benefits from these power plants, such as electricity to run their businesses.

The concerns expressed in these comments are presented in two main sections. Section I addresses legal issues pertaining to the proposed regulation and the regulatory options described therein. Section II addresses technical considerations. For the reasons indicated, the Chamber contends that significant human health benefits will not be realized if a regulatory framework is implemented

¹ "Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units," *Federal Register* 60 (January 30, 2004): 4652-4752.

to reduce emissions of mercury from coal-fired power plants. That observation notwithstanding, if the U.S. Environmental Protection Agency (EPA or the Agency) intends to move forward with implementing a regulatory framework to limit such emissions, the Chamber believes that its comments clearly make the case that any regulatory framework must include a cap-and-trade emissions management system, notwithstanding whether EPA decides to regulate under CAA §111 or §112.

Specifically, the Chamber has four main concerns with the EPA's proposal to regulate mercury emissions from power plants:

1. From a review of the overall proceedings leading up to the December 14, 2000, finding by EPA, there appears to be a conflict of interest on the part of a senior decisionmaker at EPA since this individual both filed the initial litigation against EPA and subsequently participated as an EPA official in the settlement of the litigation. This apparent conflict must be investigated since if real, it may so taint the rulemaking as to render it unconstitutional.
2. In addition to considering comments on the proposed options for controlling mercury emissions, EPA should also consider comments on the December 14, 2000, finding that regulation of mercury emissions from power plants was appropriate and necessary since the Agency did not provide an opportunity for public review and comment of that finding.
3. EPA's efforts to regulate mercury do not conform to the clear dictates of Congress. In the compromise that led to passage of the 1990 Clean Air Act (CAA) Amendments Congress spelled out precise limits on EPA's authority to regulate mercury, including that any regulation of mercury by EPA under CAA §112(n)(1)(A) not be contingent upon the use of scrubbers or other command and control technologies.
4. EPA's findings are not supported by science.

I. REGULATORY BACKGROUND

EPA first regulated mercury as an air pollutant in the early 1970s²; however, it lacked any clear jurisdiction to consider regulation of power plant emissions until amendments were made to the CAA in 1990. In the 1990 amendments, Congress directed EPA to undertake a number of studies on the *hazards to public health reasonably anticipated to occur as a result of emissions by electric utilities* including the rate and health effects of mercury emissions and the control technologies required for their reduction³.

In September 1992, following this Congressional guidance, EPA decided not to include certain power plants in its list of Hazardous Air Pollutant sources. Instead, the Agency decided to wait for completion of the studies before making a determination about how it would regulate mercury. Led by attorney David Doniger, the Natural Resources Defense Council (NRDC) and other environmental groups responded by filing a lawsuit seeking review of that decision with the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit) (mercury lawsuit)⁴ (see Exhibit A). EPA initially entered into a settlement agreement with NRDC in October of 1994, but did not fully finalize the terms until approximately April of 1998. From 1993 until the end of 2000, Mr. Doniger served the Clinton administration, first as a senior member of the White House Council on Environmental Quality and then for roughly seven years as Counsel to the Assistant Administrator in EPA's Office of Air and Radiation where he was in a position to influence negotiation of the settlement agreement with NRDC on the regulation of mercury. Under the settlement agreement, the Agency promised to determine whether regulation of mercury from power plants was appropriate and necessary. If it determined that regulation was appropriate, the settlement required the Agency to promulgate regulations under an expedited schedule.

EPA did not make this determination until approximately 36 hours after the Supreme Court's decision in *Bush v. Gore*⁵. Without opportunity for additional public comment on its decision⁶, on December 14, 2000, the

² "Air Pollution and Control: List of Hazardous Air Pollutants," *Federal Register* 36 (March 31, 1971): 5931.

³ Clean Air Act §112(n)(1)(A), (B).

⁴ Petition for Review, *Natural Resources Defense Council, Inc. v. U.S. EPA, et al.* (D.C. Cir. September 14, 1992) (No. 92-1415). A copy is Attached as Exhibit A.

⁵ *George W. Bush and Richard Cheney v. Albert Gore, Jr. et al.*, 531 U.S. 98 (2000).

⁶ As part of the fact finding process, EPA solicited information on the regulation of mercury from the public but did not provide an opportunity for comment on the Agency's ultimate determination.

Agency found that mercury emissions from power plants presented a hazard to human health⁷. This decision ignored EPA's own recommendations that further study and review be undertaken. Both the 1997 mercury report⁸ and the 1998 mercury study⁹ raised doubts about the quality of the data before EPA, focusing in particular on the development of the Agency's reference dose (RfD) for mercury. Noting that various studies before the Agency reported very different results and that limitations and uncertainties existed in then available data sets, EPA stated: *The U.S. EPA and other federal agencies intend to participate in an interagency review of all the human data on methylmercury, including the more comprehensive studies from the Seychelles and Faroe Islands. The purpose of this review is to reduce the level of uncertainty attending current estimates of the level of exposure to mercury associated with subtle neurological endpoints. After this process, the U.S. EPA will re-assess its RfD for methylmercury to determine if change is warranted*¹⁰.

This interagency review has apparently not been completed and EPA has still not reassessed its RfD in light of current scientific knowledge. Rather, in its December 14, 2000, decision the Agency found that fish consumption was the primary pathway for exposure to mercury¹¹, that there are long-term developmental effects in children from mercury consumption¹², and that 85 percent of the adults in the United States are exposed to mercury through fish consumption each month¹³. EPA then declared power plants to be the largest domestic source of mercury emissions¹⁴, that those emissions present a significant hazard to public health and the environment¹⁵, and that reducing emissions from electric utilities is an important step in eliminating what the Agency considers a health hazard¹⁶. The Agency concluded, as a result, that regulation of mercury emissions from electric utilities was both appropriate and necessary¹⁷.

⁷ "Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units," *Federal Register* 65 (December 14, 2000): 79825.

⁸ "Mercury Study Report to Congress," *EPA 452/R-97-0003* (December 1997): Page 3-26.

⁹ "Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units – Final Report to Congress," *EPA-453/R-98-004a* (February 1998): Page ES-16.

¹⁰ *Ibid*, Footnotes 8 and 9.

¹¹ *Ibid*, Footnote 7, 79829.

¹² *Ibid*, Footnote 7, 79830.

¹³ *Ibid*, Footnote 7, 79829.

¹⁴ *Ibid*, Footnote 7, 79830.

¹⁵ *Ibid*, Footnote 7, 79830.

¹⁶ *Ibid*, Footnote 7, 79830.

¹⁷ *Ibid*, Footnote 7, 79829.

A. The Involvement of a Senior EPA Official in Both the Mercury Lawsuit Against the Agency and in EPA's Settlement of the Matter Presents the Appearance of a Conflict of Interest That Must Be Investigated to Preserve the Right to Constitutional Due Process

The potential of a serious conflict of interest overshadows the current rulemaking. The presence of David Doniger as a senior member of EPA's air office during this rulemaking, let alone his participation in the matter at EPA, raises serious questions about the rulemaking's transparency and validity. The possibility that his participation in the rulemaking violates the fundamental constitutional right of due process necessitates that EPA postpone further action on the rule until this apparent conflict has been fully investigated¹⁸.

The American legal system has always endeavored to prevent even the probability of unfairness¹⁹. To avoid the appearance of impropriety that this type of conflict can bring, the District of Columbia Bar Rule of Professional Conduct expressly prohibit advancing two or more adverse positions in the same matter²⁰. As such, David Doniger's role as the original attorney of record and signatory of the pleadings²¹ (see Exhibit A) in the mercury lawsuit that led to this rulemaking should have disqualified him from participating as an EPA official in matters related to the mercury lawsuit. His intimate involvement in the initial litigation against EPA required him to prejudge the involved facts and law in a manner that made service in his role at EPA inappropriate²². However, instead of avoiding this potential conflict, Mr. Doniger assumed the position of Counsel to the Assistant Administrator, the most senior political policy advisor within the office. From that post it appears that he provided day-to-day oversight and input²³ regarding the settlement of the mercury litigation he filed, regarding compliance with the terms

¹⁸ *Amos Treat & Co. v. SEC*, 306 F.2d 260 at 267 (D.C. Cir. 1962). See also *Lead Industries* at 1172 – 1180.

¹⁹ *Amos Treat & Co. v. SEC*, at 267.

²⁰ "Conflict of Interest: General Rule," *D.C. Rules of Professional Conduct* 1.7. Most other jurisdictions across the country include substantially the same prohibition.

²¹ See Exhibit A – Copy of Petition.

²² *Cinderella Career & Finishing Schools, Inc. v. FTC*, 425 F.2d 583 at 591 (D.C. Cir. 1970).

²³ It is possible that Mr. Doniger recused himself from participation or input into this matter. However, a review of both the *Federal Register* and EPA's public docket for the rulemaking failed to identify any such action on Mr. Doniger's part.

of that settlement, and even regarding the calculation of appropriate attorney's fees to be awarded²⁴. It appears that Mr. Doniger's roles in both sides of this litigation are potentially in conflict.

In *Lead Industries v. EPA*, another case involving a potential conflict of interest by a former NRDC attorney within EPA, the D.C. Circuit noted two occasions when a government official possessed a sufficient conflict of interest such that they should not have participated in a rulemaking: 1) if the official or a party to which he was connected possessed a financial interest in the outcome of the controversy; and 2) if the official signed or actively participated in preparing a pleading or a brief, or if they were otherwise actively involved in the prior stages of the case²⁵. In *Lead Industries* the D.C. Circuit never reached a final decision on the matter because industry failed to raise their conflict of interest concerns in its comments on the rulemaking. Nevertheless the D.C. Circuit suggested that no conflict existed when a federal official simply presented his personal viewpoint at a public forum prior to accepting his appointment as Assistant Administrator in EPA's air office. Unlike the situation in *Lead Industries*, Mr. Doniger appears to have been actively involved on both sides of the litigation. This apparent level of participation appears to provide the most compelling proof that [David Doniger was] unable to carry out his duties in a constitutionally permissible manner²⁶, and raises the possibility that EPA might be required to nullify the settlement agreement and the December 14, 2000, finding and recoup any settlement amounts improperly paid to NRDC. The Chamber requests that Administrator Leavitt conduct a full inquiry into the appearance of this conflict of interest.

²⁴ Under the terms of the settlement agreement, the parties resolved to informally settle any claims for costs of litigation, including attorney's fees. Following his service in the Clinton administration, Mr. Doniger returned to the NRDC in a senior management role.

²⁵ *Lead Industries v. EPA*, 647 F.2d 1130 at FN 136 (D.C. Cir. 1980) cert. denied 101 S.Ct. 621 (quoting *Laird v. Tatum*, 409 U.S. 824 at 828 (1972)). The EPA official involved in the *Lead Industries* conflict of interest inquiry was David Hawkins. Following Mr. Doniger's departure from NRDC for his post at EPA, Mr. Hawkins acted as a signatory on pleadings in the mercury lawsuit and settlement negotiations.

²⁶ *Association of National Advertisers v. FTC*, 627 F.2d 1151 (D.C. Cir. 1979), cert denied 447 U.S. 921 (1980).

B. EPA Should Consider Comments it Receives on Both its Proposed Options for Regulating Mercury Emissions and on the Underlying December 14, 2000, Finding That the Regulation of Mercury Emissions is Appropriate and Necessary

EPA's December 14, 2000, finding about the appropriateness and necessity of regulating mercury emissions is not final since EPA never subjected its finding to the minimum appropriate process under the Administrative Procedure Act. In particular, while EPA allowed for some public involvement while collecting the data that underlies the 1997 mercury report and 1998 mercury study, the Agency did not allow for public review or comment of its final December 14, 2000, finding. This is an essential element of the regulatory process²⁷ and it is still well within the discretion of EPA to modify, amend, revise, or retract its December 14, 2000, decision. Since that decision is still subject to court review and is a necessary prerequisite to EPA's regulation of mercury, the Agency should review and consider the comments it receives on both the December 14, 2000 decision to regulate mercury emissions as well as the proposed rule²⁸.

C. EPA's Actions are Beyond the Authority Granted By Congress to Regulate Mercury

As a result of its December 14, 2000, finding, EPA is proposing alternative ways to regulate mercury: under CAA §112(d), or under CAA §111. Regulation under CAA §112(d) involves imposition of federal Maximum Achievable Control Technology (MACT) standards on all mercury sources nationwide. EPA's other proposed regulatory approach under CAA §111 establishes a nationwide cap-and-trade system for mercury emissions that is contingent upon the agreement of individual states to participate. Those states that choose to opt out of the system are required to develop their own controls on emissions. As discussed below, neither alternative conforms to the intent of Congress in CAA §112(n)(1)(A).

²⁷ Administrative Procedure Act §553(b)

²⁸ *Utility Air Regulatory Group v. Environmental Protection Agency*, 2001 U.S. App. LEXIS 18436 (D.C. Cir. 2001).

Congress clearly restricted EPA's authority to regulate mercury emissions from power plants under CAA §112(n)(1)(A). In doing so, Congress sought to limit the regulatory burden on power plants and avoid the imposition of costly command-and-control schemes like the MACT required under CAA §112(d). Instead, Congress limited EPA's authority to regulate mercury emissions to within the narrow terms of CAA §112(n)(1)(A), required the Agency to find that regulation is both appropriate and necessary, and required the use of alternative control strategies. Congress left the exact strategy for regulation open to EPA.

In formulating the 1990 amendments to the CAA, the original House and Senate bills differed significantly in their treatment of power plant emissions under CAA §112. These differences were resolved, and the final bill that was reported from the conference adopted the House language allowing for passage of the current CAA §112(n)(1)(A). Section 112(n)(1)(A) mandates that the administrator shall regulate electric utility steam generating units under this section²⁹. Under the conference agreement, both houses of Congress agreed that if EPA decided to regulate power plant emissions by adopting a standard under CAA §112, it could only do so in compliance with subsection (n)³⁰.

Congressman Oxley (R-OH) described this requirement as restricting the ability of EPA to regulate power plant emissions of mercury unless...*the studies described in section 112(n) clearly establish that emissions of any pollutant, or aggregate of pollutants, from such units cause a significant risk of serious adverse effects on the public health. Thus, if the Administrator regulates any of these units, he may regulate only those units that he determines – after taking into account compliance with all provisions of the act and any other Federal, State, or local regulation and voluntary emission reductions – have been demonstrated to cause a significant threat of serious adverse effects on the public health*³¹.

²⁹ "A Legislative History of the Clean Air Act Amendments of 1990," *1990 CAA Leg. Hist.* 1177 at 1416.

³⁰ *Ibid.*

³¹ "A Legislative History of the Clean Air Act Amendments of 1990," *1990 CAA Leg. Hist.* 10726 at 10762.

In those units that EPA decides are appropriate and necessary to regulate, subsection 112(n) requires EPA to consider the use of alternative control measures. Specifically, Congress did not grant the authority to require scrubbing of utility emissions³². Rather, the Senate adopted the House of Representatives directive that EPA contemplate alternative control strategies³³. Senator Simpson of Wyoming elaborated: “This provision contains the appropriate flexibility so that, in the event EPA finds it appropriate to regulate certain utility emissions, EPA could avoid any scrubbing requirement. In receding the Senate is consistent with the intent of the Senate-passed subparagraph (e)(5)(E) that **prohibited imposition of utility scrubber requirements** [emphasis added]. It is the sense of the conferees that EPA’s ultimate decision avoid any conflict with title V implementation, including the compliance flexibility and cost-effectiveness goals which are central to the acid rain program³⁴.”

It is not insignificant that both Congressman Oxley and Senator Simpson focused their remarks around the regulation of units, as opposed to the regulation of a source category³⁵. In clearly stressing the need to regulate individual units, as opposed to all electric utility sources, Congress directed EPA to focus on reducing emissions from select individual units with the highest, or otherwise most harmful, emissions rates and to avoid mandatory and costly restrictions on all units within the industry. EPA however, in its December 14, 2000, finding ignored Congress’ clear intent and instead listed power plants as a source category under CAA §112(c)³⁶, thus requiring regulation of all emissions sources and not just those units demonstrated to cause a significant threat of serious adverse effects to public health³⁷.

³² *Ibid*, Footnote 29 at 1247.

³³ *Ibid*.

³⁴ “A Legislative History of the Clean Air Act Amendments of 1990,” *1990 CAA Leg. Hist.* 1097 at 1151. The original Senate language, as embodied in S.1603, 101st Congress, required promulgating standards for mercury emissions based upon cost and feasibility if the Administrator of EPA found they were warranted to protect public health or the environment, but did not authorize use of “flue gas steam scrubbing technology.” Congress eventually adopted the language from the House of Representatives bill that permitted the Administrator of EPA to regulate mercury emissions only if “appropriate and necessary” and then only through the use of alternative control strategies.

³⁵ *Ibid*.

³⁶ *Ibid*, Footnote 7, 79830.

³⁷ *Ibid*, Footnote 31.

II. EPA'S PROPOSED RULE IS NOT SUPPORTED BY SCIENCE AND WILL NOT ENHANCE THE PROTECTION OF PUBLIC HEALTH

A. SUMMARY OF THE DEFICIENCIES WITH EPA'S SCIENCE

The Chamber asserts that the proposed rule will not achieve intended objectives. As argued below, fish consumption advisories for mercury—the benchmark indicator that public officials use to signal their judgments of health impacts—are unlikely to be relaxed if the rule is implemented. Therefore, the proposed rule produces no benefit to human health and is unwarranted.

What underlies the proposed regulatory activity is a widespread belief that the amount of methylmercury³⁸ in the fish consumed by Americans is harmful and that limiting mercury emissions from power plants will significantly curtail the buildup of methylmercury in fish.

Neither belief, however, is supported by scientific knowledge: recent findings (see the attached *Reality Check: Straight Talk About Mercury*) based on research funded by the National Institutes of Health, the U.S. Food and Drug Administration, and the United States Department of Health & Human Services indicate that the current levels at which Americans consume fish are not harmful. Public officials have not taken reasonable account of this research, which was published in *The Lancet* in May 2003, where, according to Gary Myers, pediatric neurologist at the University of Rochester, there is presently no good scientific evidence that moderate fish consumption is harmful to the fetus³⁹.

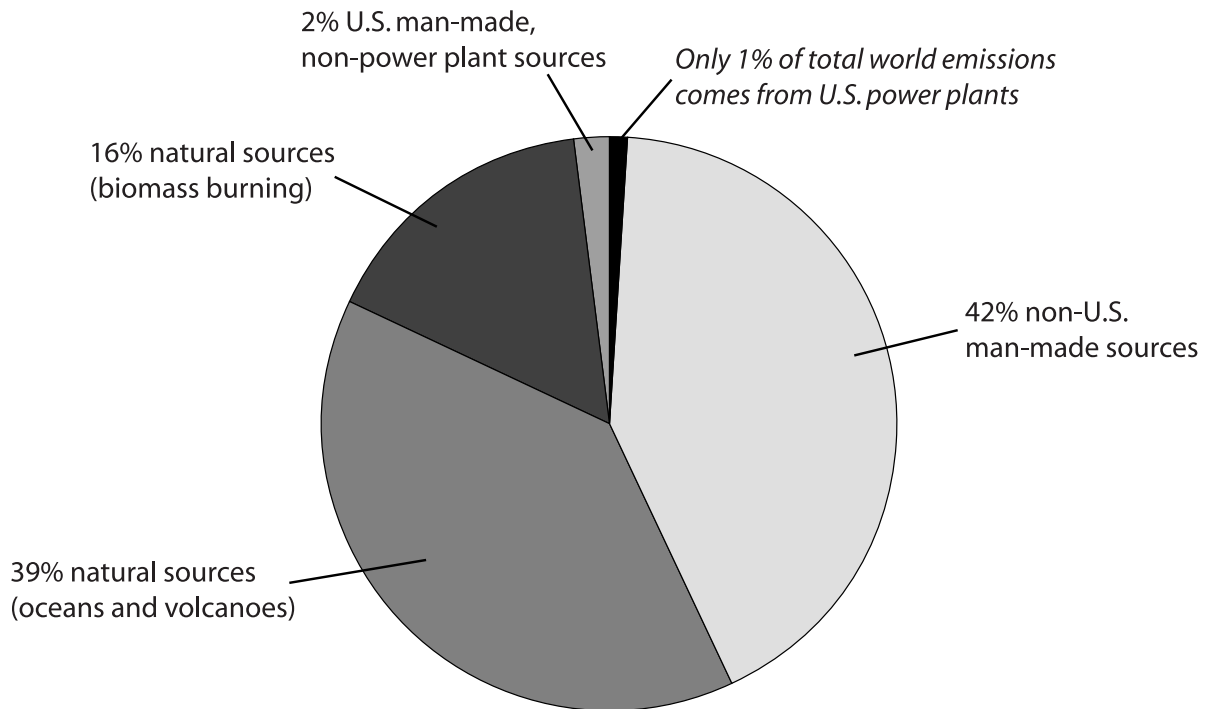
³⁸ Methylmercury can be toxic to humans in certain circumstances, which largely depend on the nature and extent of exposure to the chemical. Methylmercury can be formed from inorganic forms of mercury (such as those that are found in power plant emissions and other sources) through a complex process. Ultimately, the main pathway of human exposure is through ingestion of methylmercury in fish.

³⁹ Professor Gary Myers, University of Rochester, Rochester, NY, Testimony before the Committee on Environment and Public Works, United States Senate, July 29, 2003.

Second (see Figure 1 below) it is well known that U.S. power plants release minimal mercury emissions to the atmosphere compared with the documented, huge **global** emissions of mercury from human activity and natural sources, much of which is external to the United States. Indeed, given this worldwide reservoir of mercury, EPA does not know if limiting mercury emissions from U.S. power plants will curtail the accumulation of methylmercury in fish at levels below that which it asserts are of regulatory concern.

Moreover, no matter what mercury emissions controls are put in place at these power plants, the levels of methylmercury in ocean fish will remain virtually unchanged. Simply put, given the fact that the world's oceans contain millions of tons of mercury, reducing some or even all of the roughly 45–48 tons of mercury emissions from U.S. coal-fired power plants will leave the levels of mercury in the world's oceans unchanged and consequently the levels of methylmercury in the ocean fish that Americans eat every day will remain virtually unchanged.

Emissions of mercury from U.S. coal-fired power plants are small compared to global emissions sources



J.Pacyna, E. Pacyna, F. Steenhuisen, S. Wilson,
Atmospheric Environment, in press, 2003; Friedli et al.,
Atmospheric Environment, vol. 37: 253-267, 2003.

Figure 1

regulatory attempt aimed to limit mercury emissions from U.S. coal-fired power plants, there are very real and as yet unresolved engineering problems. As EPA well understands, there is no one-size-fits-all mercury emissions abatement control technology and there never will be. This absolutely incontrovertible fact must not be ignored, and, as discussed below, should EPA, despite the lack of persuasive evidence of need, decide to go ahead and regulate emissions of mercury from coal-fired power plants, the Chamber asserts that there is no question that there must be a flexible cap-and-trade emissions management scheme that allows for facility-specific

control technology solutions and that takes full account of continuing technology innovations and any unintended consequences of implementing the various technologies that may be implemented.

B. THE STATUS OF FISH ADVISORIES IS THE KEY METRIC OF REGULATORY WORTHINESS

A resulting documented relaxation in the extent and proscriptiveness of fish consumption advisories for mercury contamination is the acid test of whether any benefit is actually realized from the proposed regulatory action because the fish advisories are the benchmark indicator of concerns that public officials have about possible human health impacts. Such advisories are in fact the instruments of choice of federal, state, and local public officials to indicate what is judged to be excessive exposure to methylmercury found in fish.

A significant decrease in the extent or stringency of the fish advisories signals a positive change in the outlook of public officials about possible health impacts. To the contrary, the absence of any relaxation of fish advisories would clearly indicate that a judgment has not been made that there has been a significant change in assessed health impacts.

For reasons discussed below, neither of the proposed regulations are likely to lead to any significant decrease in the advisories. As such, the proposed rule to reduce mercury emissions from power plants is unwarranted.

In fact, EPA reports that the number of lake acres and river miles under advisory continues to **increase**, and despite the many emissions control measures that have already been implemented in the past decade, there is no field evidence that a reversal of this advisories trend is likely to occur⁴⁰.

⁴⁰ See <http://www.epa.gov/waterscience/fish/advisories/factsheet.pdf>

Mercury enters the environment (air, land, and water) from numerous sources, not just from U.S. power plants (see Figure 1 above). Some of this mercury ends up in freshwater (rivers, lakes, and streams) and some in ocean environments. A small fraction of it can be converted into methylmercury that can accumulate in fish. Subsequently, people who consume freshwater and ocean fish are exposed to this accumulated methylmercury. In fact, consumption of fish is the main pathway of human exposure to methylmercury⁴¹.

Specific to power plants, preliminary findings of ongoing research being undertaken in Canada suggest that the primary pathway for introduction of mercury to lakes and rivers, and its subsequent conversion to methylmercury occurs via direct deposition of mercury from the atmosphere.^{42,43}

The objective of the proposed regulation, regardless of whether promulgated under authority of Section 111 or Section 112 of the CAA, is therefore to reduce mercury emissions to the atmosphere from these power plants, which EPA believes ultimately contributes to methylmercury in fish. In fact, despite evidence to the contrary—the **increasing** extent and stringency of fish advisories—EPA believes that accomplishing this objective will significantly reduce the potential for harm to human health.

⁴¹ Most fish consumed by people are taken from oceans, not from rivers and lakes. Therefore local river and lake fish advisories aim to protect a relatively small subset of fish-consuming individuals. Methylmercury can be toxic to humans in certain circumstances, which largely depend on the nature and extent of exposure to the chemical. Methylmercury can be formed from inorganic forms of mercury (such as are found in power plant emissions and other sources) through a complex process.

⁴² John Novak, EPRI, Private communication, February 13, 2004. [NB: The extent of generality of this finding is an unresolved issue.]

⁴³ The METAALICUS (Mercury Experiment to Assess Atmospheric Loading in Canada and the United States) study, now underway in Canada, aims to provide an improved understanding of how mercury emissions from power plants impact surrounding local and regional areas. METAALICUS is a whole-ecosystem experiment in which mercury inputs to a Canadian headwater lake and its watershed are being increased experimentally. To simulate localized power plant impacts, the mercury is being added as stable, non-radioactive isotopes of inorganic reactive mercury (the form of mercury that is most likely to deposit locally). The power of using isotopes lies in the ability to follow the newly deposited mercury separately from the background mercury. Multimillion dollar funding for this project comes from the Canadian Department of Fisheries and Oceans, the EPRI, EPA, U.S. Department of Energy (DOE), the U.S. Geological Survey, the Wisconsin Department of Natural Resources, and the National Sciences Engineering and Research Council of Canada. The different mercury isotopes are being added to the upland, wetland, and the lake surface to determine if the route of entry affects how much is accumulated in the fish. This experiment provides the control necessary to examine the effects of one critical factor: mercury loading. Furthermore, this experiment also makes it possible to distinguish newly deposited mercury from background mercury that has accumulated over hundreds of years.

Assessments of methylmercury health impacts that might occur at typical domestic fish consumption levels have produced conflicting results⁴⁴. For reasons presented elsewhere, the Chamber believes that recent scientific information persuasively indicates that there is no convincing evidence that Americans are harmed when they consume fish at current dietary intake levels⁴⁵.

Nonetheless, EPA, as well as many state and local officials, have concluded that the health of some people is potentially or significantly adversely impacted from consumption of fish containing methylmercury. This has led to the establishment of fish advisories based on reference doses⁴⁶ and fish advisories based on other types of information. Inclusive of the allowance for what is judged an adequate margin of safety⁴⁷, these fish advisories aim to protect people from what public officials judge to be excessive exposure to methylmercury when fish are consumed.

Relevant to whether the proposed rule is necessary, the key question is whether reducing mercury emissions from power plants will reduce methylmercury levels in freshwater fish below the levels of concern expressed by these fish consumption advisories. If the proposed rule succeeds in this respect, one would expect a resulting widespread relaxation of fish advisories. If, however, reducing mercury emissions from power plants does not lead to a significant reduction in the extent and stringency of fish advisories, then a mercury emissions control standard will be a costly but ineffective regulatory measure.

⁴⁴ U.S. Chamber of Commerce, *Reality Check: Straight Talk About Mercury*, Washington, D.C. (2003), and references contained therein.

⁴⁵ *Ibid.*

⁴⁶ The Reference Dose (RfD) is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

⁴⁷ NB: The legal basis for the factor of ten margin-of-safety used by EPA in developing an acceptable methylmercury reference dose is not established by the Clean Air Act.

C. THE PROPOSED REGULATION WILL NOT ACCOMPLISH THIS OBJECTIVE

First, **the proposed rule is clearly irrelevant to reducing potential human health impacts from ocean fish consumption.** This is because reducing mercury emissions from power plants will have absolutely no significant effect on levels of methylmercury in ocean fish. This has been convincingly demonstrated, not through the use of models, which can be unreliable, but instead by performing actual field measurements whose results have been reported by scientists at Princeton University in peer-reviewed scientific journal literature⁴⁸. Moreover, for millions of years, there have been and still are millions of tons of mercury in the world's oceans. This quantity is vastly larger than the 45–48 tons annually emitted from U.S. power plants⁴⁹, which is why power plant emissions are irrelevant to the level of methylmercury in ocean fish.

Second, **it is highly doubtful whether the proposed regulation will, as signaled by the fish advisories, significantly reduce human health impacts from consumption of freshwater fish.** A recent study by Brookhaven National Laboratory finds that only 4–7 percent of mercury emitted from power plants is deposited locally into freshwater⁵⁰. Additionally, the Electric Power Research Institute (EPRI) reports that reducing mercury emissions from power plants will produce only **minimal** benefits—for example, a 47 percent reduction in emissions would yield less than a one percent drop in methylmercury exposure associated with consumption of freshwater fish⁵¹. Moreover, because U.S. power plant emissions

⁴⁸ Kraepiel, A. M. L. et al., “Sources and Variations of Mercury in Tuna,” 37(24) *Environmental Science & Technology* (2003): 5551-5558.

⁴⁹ See for example: Pacyna, J. et al., 37(1) *Atmospheric Environment* (2003): 109-117; and Friedli, R. et al., 37(2) *Atmospheric Environment* (2003): 253–267; Renner, R. 35(21) *Environmental Science & Technology* (2001): 439A-440A; Pelley, J. 35(5) *Environmental Science & Technology* (2001): 97A-98A; Levin, L., EPRI, “New Perspectives on Mercury in the Environment,” Committee on Environment and Public Works, United States Senate, July 29, 2003. Written remarks prepared for the full committee hearing to examine climate history and its implications, and the science underlying fate, transport, and health effects of mercury emissions.; U.S. Chamber of Commerce, *Reality Check: Straight Talk About Mercury*, Washington, D.C. (2003).

⁵⁰ Michael Rossler, Statement of the Edison Electric Institute at public hearings about the Interstate Air Quality Rule and Mercury Proposals (February 25-26, 2004); Sullivan, T. et al. “Assessing the Impacts of Local Deposition of Mercury Associated with Coal-Fired Power Plants” BNL, Presentation at 227th American Chemical Society National Meeting, Anaheim, CA (March 28-April 1, 2004); Lipfert, F., Sullivan, T. and Rennigner, S. “Assessing the Mercury Health Risks Associated with Coal-Fired Power Plants: Issues in Atmospheric Processes” BNL, Presentation at 227th American Chemical Society National Meeting, Anaheim, CA (March 28-April 1, 2004).

⁵¹ *Ibid.*

contribute just one percent of the total global mercury emissions to the atmosphere⁵², much of the mercury that is deposited into lakes and rivers does **not** come from U.S. power plants, but is instead deposited from other emissions sources—most of which are located outside United States borders and are dramatically and rapidly increasing in strength (see Figure 1 above and attached *Reality Check: Straight Talk About Mercury*).

Therefore, it is highly doubtful that federal, state, or local public officials would significantly weaken their fish consumption advisories in response to reductions of mercury emissions to the atmosphere from domestic coal-fired power plants. Freshwater fish advisories established to protect humans from exposure to methylmercury in consumed fish are concerned only with the **total** amount of methylmercury found in fish and not with the individual fractional contributions from the various mercury emissions sources.

In sum, for the reasons noted above, reducing emissions of mercury from U.S. power plants will have a minimal effect on lowering levels of methylmercury in freshwater fish. Thus there is no present justification for a finding that it is necessary to regulate emissions of mercury from U.S. power plants.

If EPA's proposed regulation is to proceed forward, it is absolutely incumbent on EPA to convincingly demonstrate, according to sound science principles, that a net significant human health benefit will in fact ensue as a result of the contemplated regulation, if promulgated under the CAA. EPA must exercise care in making this judgment, for such a standard is a costly option to the affected businesses and industries.

In fact, the necessity to assure that sound science underpins crucial agency decisions is a view that has enjoyed broad bipartisan support. Such sentiment has been expressed not only by representatives of the present Bush administration, but also by the

⁵² *Ibid*, Footnote 49.

Clinton administration, as exemplified in the following remark of former EPA Administrator Carol Browner that: *The Agency has demonstrated a strong commitment to sound science as the basis for our decisions*⁵³.

D. EPA CANNOT DEMONSTRATE REGULATORY EFFECTIVENESS

Contrary to Administrator Browner's assertion regarding the importance of founding regulatory decisions upon sound science, and doubts about human health benefits notwithstanding, many stakeholders believe that moving forward with some form of the proposed rule, regardless of whether it is promulgated via a CAA §112 or a §111 standard, is necessary, notwithstanding inadequate scientific knowledge.

Related to such stakeholder beliefs, a key aspect of this regulation is the question of the extent of its actual, as opposed to hypothetical, regulatory effectiveness. Specifically, if mercury emissions are reduced at power plants, for a significant benefit to ensue, some significant, broad-based reduction of methylmercury in lakes and rivers must in fact occur. EPA must convincingly demonstrate that this is the case by conducting actual **field** measurements at a credible, representative sample of potentially impacted lakes and rivers.

Unfortunately, rather than relying heavily on direct field measurements, EPA has instead largely attempted to demonstrate regulatory effectiveness by modeling hypothetical scenarios of emissions reductions and impacts, with and without various emissions controls. An issue of great concern to many stakeholders is that the source code to these models is treated as proprietary and is, therefore, not publicly available.

In fact, despite requests (for access to the source code) through the years from stakeholders, the Agency has steadfastly refused to release the source code to the public under any circumstances, even though the development of these modeling capabilities has been accomplished through the expenditure of

⁵³ Statement of Carol Browner, Administrator, U.S. Environmental Protection Agency, U.S. House of Representatives. Committee on Science, October 4, 2000.

taxpayer dollars. As a result, no one among the public—not environmental advocates, not business and industry advocates, or anyone else—has any way to directly assess the credibility of these models and adequately gauge the reliability of model outcomes and predictions. Moreover, it is not evident that the power of the proprietary models to make reliable predictions has been adequately retrospectively benchmarked against a credible, representative sample of actual **field** sites. There is no satisfactory reason evident as to why such an undertaking could not be performed in some reasonably transparent manner.

E. THE “HOT SPOTS” ISSUE AND CAP-AND-TRADE VERSUS MACT

Proponents of a uniformly applied MACT approach for limiting emissions of mercury from power plants argue that such strict technology-based controls are needed (and are available) to avoid the formation of geographically localized mercury “hot spots.”

Hot spots are areas of the country in which the level of mercury in the environment is elevated relative to other areas of the country. Mercury hot spots, MACT advocates argue, [**presumably**] form if emissions controls at power plants are not uniformly applied—which, they say, could occur under a flexible cap-and-trade management system. For these reasons, advocates of MACT reject use of the latter cap-and-trade approach. The key aspect of their argument is that they believe uniformity in the application of a MACT standard will lead to consistently better mercury emissions reduction results than would otherwise be achieved through a cap-and-trade standard.

The modifier **presumably** is used above intentionally in this discussion, because while EPA has performed, via the use of proprietary models, some limited studies of hypothetical hot spot formation and the potential effectiveness of various mercury emissions reduction control strategies, the Agency has not, as noted above, extensively benchmarked (retrospectively or otherwise) model predictions with actual field data to establish the extent of consistency between its predictions and reality. Thus, the veracity of the proprietary model predictions is questionable. More generally, the Agency has not adequately assessed the dynamic flux of mercury

in the environment so as to arrive at a full understanding of all the contributory factors that could lead to hot spot formation, some of which likely have nothing whatsoever to do with the presence or absence of power plants.

The above observations notwithstanding, advocates of strict MACT controls argue that **all other things being equal**, in a cap-and-trade scenario, geographically localized mercury hot spots could (hypothetically at least) occur when power plants in these locales opt to avoid implementing mercury emissions controls by purchasing emissions allowance credits. This could occur, they argue, because in purchasing credits, these plants can maintain their status quo mercury emissions levels. It is this situation of supposed differential use of controls that advocates argue leads to the expectation of occurrences of continued mercury buildup in these localized regions compared to other regions of the country where credits are not purchased, and where instead, mercury emissions controls are put in place. Note that this observation has relevance only to that fraction of emitted mercury that can be deposited locally, as compared to that fraction (in most cases larger) of emitted mercury that enters the global atmospheric pool of mercury and is instead transported over long distances.

In contrast to the arguments of MACT advocates, according to Michael Rossler, Manager of Environmental Programs for the Edison Electric Institute, *Based on many years of real-world experience, studies of the acid rain allowance trading program conducted by EPA, and the environmental group Environmental Defense, and others, demonstrate that trading did not significantly change where emission reductions actually occurred. The clear success of the acid rain SO₂ trading program provides evidence to dispel fears about localized efforts*⁵⁴.

EPRI concurs, noting that: *A number of scientists and others have raised the concern that allowing emissions trading in a mercury reduction rule would result in the creation of 'hotspots,' or areas of elevated mercury deposition.*

⁵⁴ Michael Rossler, Statement of the Edison Electric Institute at public hearings about the Interstate Air Quality Rule and Mercury Proposals (February 25-26, 2004).

There is no evidence that 'hotspots' currently exist around coal-fired power plants. There is direct experience from the SO₂ trading program indicating that hotspots will not develop. National trading in sulfur dioxide credits has resulted in a net reduction in SO₂ emissions with the largest reductions at the plants that originally emitted the most SO₂⁵⁵.

EPRI also notes that: *There are no incentives for buyers of credits to actually increase their emissions, and the cost of purchasing credits still motivates them to reduce emissions as much as possible. Thus, if a **national** [emphasis added] cap on mercury emissions is put in place, a movement away from hot spots, rather than their creation, would be expected⁵⁶.*

In comparing the distribution of mercury among, and within, various geographical regions of the country, and in drawing conclusions about the possible occurrence of mercury hot spots, it is important to note that **all other things** are in fact not equal. There are, for instance, wide variations in plant design, existing and likely to be implemented emissions controls, fuel type or mix, the mercury and other chemical content of the fuel consumed, fuel energy content, and numerous other influencing factors⁵⁷. On this basis alone, the determination of where and under what circumstances hot spots might occur in association with power plant proximity is not a simple issue to resolve.

It does not automatically follow that a failure to reduce mercury emissions at some facilities will necessarily result in hot spot formation. It is certainly not possible to arrive at convincing conclusions when they are based primarily on the use of proprietary models that have not been adequately benchmarked against a credible, representative sample of field test sites.

Further complicating this issue, the processes that do affect the flux of mercury in and out of the environment can vary from one region of the country to another, and there can be naturally occurring hot spots—such **baseline** hot spot occurrences are not well documented, nor is the evolution of such naturally occurring hot

⁵⁵ EPRI *Frequently Asked Questions About Mercury* (2004).

⁵⁶ *Ibid.*

⁵⁷ Brown, E., "Overview of the Utility MACT Development and Issues" EPA Office of Air and Radiation (March 7, 2003); Ihle, J., "Mercury Emissions and Fuel Switching: What's in Your Coal?" *Coal Age* (October 1, 2002): <http://www.coalage.com> (article accessed online September 5, 2003).

spots over time well understood. Thus, arriving at sound conclusions about hot spots and what causes them requires access to reliable data and information concerning all the mercury emissions sources in or impacting a geographic region, as well as knowledge about naturally occurring mercury in the environment and factors that affect the mobility, fate, and transport of mercury in all its various forms in the environment. The chemistry of mercury—its speciation—is, after all, a particularly important issue.

The speciation of mercury, in the most generally relevant terms, whether it exists in a reactive versus a non-reactive form, as well as its physical disposition (e.g., gaseous or particle bound), and other factors, such as the amount of mercury emitted from a facility, all influence both its presence and mobility in the environment and the ability of emissions control technologies to capture it.

Depending on the compositional attributes of mercury emitted from power plants, some mercury (primarily the reactive mercury fraction) can deposit locally, and some mercury (primarily the elemental, non-reactive mercury fraction) is mainly transported over long distances and enters the global atmospheric pool of mercury. This latter, so-called non-reactive fraction does not contribute significantly in a preferential manner to geographically localized buildup of mercury hot spots. In addition, a significant amount of the emitted reactive mercury fraction can chemically convert to a non-reactive form that is not locally deposited but rather is also transported over long distances.

At many power plants, most of the mercury that is emitted is present in a non-reactive form. As EPA well knows, much of this non-reactive mercury is difficult to capture. However, for reasons described above, if it is not deposited locally, its likely relevance to reducing human health impacts is minimal, particularly given the huge reservoir of mercury from other sources in both the atmosphere and the world's oceans.

The necessary important distinctions concerning mercury species (from all possible emissions sources) that impact a geographically localized area are not well documented, nor, apparently, are there extensive data on-hand for performing credibly

reliable modeling exercises to assess the subsequent fate and transport of all these emitted species of mercury from all these possible sources. Given all the above noted uncertainties, it is not at all clear that MACT control strategies will necessarily provide an optimum way to address the issue of hot spots to the extent that they may be a legitimate issue of concern.

F. THERE IS NO ONE-SIZE-FITS-ALL EMISSIONS CONTROL TECHNOLOGY

For the reasons stated above, there is in fact no persuasive, weight-of-evidence argument based on sound science that convincingly demonstrates that the requirement and imposition of a MACT standard will prevent hot spot formation to any greater extent than may be realized using a cap-and-trade emissions control approach. To the contrary, a technology lock-in under a MACT standard could prove detrimental to the optimization of mercury emissions reductions possibilities.

This is because the availability of power plant mercury emissions data is limited, but what information is on-hand clearly indicates that there is no one-size-fits-all control technology available that will universally reduce mercury emissions from power plants to achieve some across-the-board, nationally mandated stringent level of control⁵⁸. As EPA, the U.S. Department of Energy, and competent scientists well know, any contention to the contrary is absolutely

⁵⁸ See for example: Brown, E., "Overview of the Utility MACT Development and Issues" EPA Office of Air and Radiation, (March 7, 2003); Levin, L., EPRI, "A Framework for Assessing the Cost-Effectiveness of Electric Power Sector Mercury Control Policies" Final Report #1005224, Palo Alto, CA (May 2003); "DOE Lab Seeks Comment on Mercury Removal Technique" 10(137) *Air Daily* (July 22, 2003): 1-2; "Dramatically Improved Mercury Removal" *Environmental Science & Technology* 37(15) (2003): 238A; Peltier, R., "Mercury Removal Standards are Coming. Where's the Technology?" *Platts Power Magazine* at <http://www.platts.com> (article accessed online July 3, 2003); Betts, K., "Integrated technology targets mercury emissions" *Environmental Science & Technology* 34(17) (2003): 378A-379A; Cooney, C., "Wisconsin Pulls Out Ahead on Mercury Controls" *Environmental Science & Technology* 36(24) (2002): 440A-441A; Hoffman, J. and Ratafia-Brown, J., Science Applications International Corporation, "Preliminary Cost Estimate of Activated Carbon Injection for Controlling Mercury Emissions From an Un-Scrubbed 500 MW Coal-Fired Power Plant" Final Report for DOE (November 2003).

untrue, and EPA is already aware of the numerous reasons for this technology limitation—such as the influences of variations in coal type and composition, plant operating conditions, existing controls, etc. Simply put, it is an absolute fact that some control technologies may work as intended under some conditions, but not under other conditions.

What this means, is that **if any one particular mercury emissions control technology is selected and locked-in through a MACT standard, a non-uniform control of mercury emissions is absolutely certain to result.** Thus, from the perspective of regulatory effectiveness and efficient nationwide reductions of mercury emissions from power plants, a MACT standard would surely fail to accomplish what some stakeholders think it is capable of doing. Clearly, a cap-and-trade management system accompanied by flexibility in the choice of technology options is preferable to a command-and-control MACT approach.

G. FLEXIBILITY IS KEY

If controls are required, there must be flexibility in choosing technology options for achieving specified emissions limits. Permitting such flexibility, which would be possible through a cap-and-trade rulemaking, assures that when and where it is determined necessary to limit mercury emissions, the most optimal facility-specific control technology can be utilized. The Chamber believes that this approach is what Congress mandated in the 1990 amendments to the CAA⁵⁹.

In addition, technology for mercury emissions control is still evolving and undergoing engineering and performance improvements. For the foreseeable future this will be the case⁶⁰. Thus, a lock-in via a MACT standard will fail to capture any future technology innovations. On the other hand, by permitting sufficient flexibility in selecting an appropriate, facility-specific control technology, a cap-and-trade approach can capture future technological innovations, thereby optimizing mercury emissions reduction capabilities.

⁵⁹ Refer to the discussion of legal issues above in these comments.

⁶⁰ *Ibid*, Footnotes 57 and 58.

It should also not go unnoticed that there has not yet been any **long-term** performance testing of even the present menu of mercury emissions control technology options⁶¹, and this too weighs heavily against implementing a mandatory MACT approach. The long-term cost impacts to power plants from the use of mercury emissions control technologies are not well known, nor is there any reliable knowledge about the long-term performance efficiency of these technologies, nor is there much knowledge about the impacts of using these control technologies on the amount of downtime for equipment repair and maintenance. If equipment downtime and outages due to the use of unproven technology turns out to be a significant problem, there could be substantial disruptions in power supply to the American public.

In sum, a flexible menu of options, which may be best achieved through a cap-and-trade rulemaking, must be assured because the state of mercury emissions control technologies, their impacts on operations, and options for use are evolving and because even when any such control technologies are considered **mature**, there still will not be any one-size-fits-all technology.

H. ADDITIONAL ISSUES NOT ADEQUATELY ADDRESSED

Beyond what mercury emissions reductions might be achieved through co-benefits⁶², many stakeholders argue that the use of activated carbon (AC) as a MACT for reducing mercury emissions is preferable for achieving further reductions. For the reasons stated above (and per the footnoted references), AC is not a one-size-fits-all control technology. There are, however, several key considerations concerning the use of AC that EPA has not adequately addressed.

For example, it is not altogether clear that there will, in the future, be a sufficient supply of AC for use in reducing mercury emissions from power plants if this control technology is widely deployed. Such deployment could drastically increase demand for AC. Some projections appear to suggest that there may be an adequate supply available when and where it is needed, however,

⁶¹ *Ibid*, Footnotes 57 and 58.

⁶² Air pollution control technology that captures sulfur oxides (SO_x) and nitrogen oxides (NO_x) also captures some mercury emissions. This coincidental capture of mercury in this manner is referred to as a “co-benefit.”

EPA apparently has not assessed the actual facts of this situation, inclusive of a broad consideration of all competing demand for use of AC (such as for removing pollutants from water supplies or wastewater decontamination), nor has it extensively considered the demand for AC in terms of achieving desired levels of mercury emissions reductions. This latter consideration is significant, as high mercury emissions reductions are extremely demanding of AC supply in some applications.

If it turns out that future demand for AC approaches or exceeds supply (on either a regional or nationwide basis), there could be localized or even national shortfalls of this material. Moreover, if demand exceeds supply, the cost of AC could increase, possibly dramatically, which would significantly affect the economics of this control technology strategy.

Impacts on the commercial sale and reuse of ash that contains spent AC may also be an important issue of concern, particularly if end-market uses such as cement and concrete production and as raw feed for cement clinker and other applications generate concerns about how the presence of AC will affect product integrity, or its actual or perceived hazardousness by stakeholders⁶³. EPA must address this issue or it could fail to take into account these undesirable side effects, which have the potential to be economically disruptive and possibly interfere with power plant operations and the ability of these plants to provide electric power on a reliable basis to the American public.

Further, EPA has not clearly indicated whether spent AC that is destined for disposal that contains captured mercury emissions will be considered a hazardous waste regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA)⁶⁴. Possibly, the AC captured in air pollution control equipment may not fall

⁶³ Utilization of fly ash in concrete production is particularly sensitive to carbon content, and any additional carbon may render fly ash unsuitable for use. Even at low levels of carbon contamination, the association of fly ash with mercury capture may result in loss of markets simply due to a perceived association with the hazards of mercury. Hoffman, J. and Ratafia-Brown, J., Science Applications International Corporation, "Preliminary Cost Estimate of Activated Carbon Injection for Controlling Mercury Emissions From an Un-Scrubbed 500 MW Coal-Fired Power Plant" Final Report for DOE, (November 2003).

⁶⁴ Moreover, if the spent AC waste stream that contains captured mercury emissions is mixed or co-mingled with other solid waste streams from a power plant, it is not clear whether EPA will consider the mixed, or co-mingled, waste stream to also be hazardous and subject to RCRA Subtitle C regulatory requirements.

under the existing Bevill Exemption because it may not fit the description of a listed waste. If so, it is possible that unless EPA determines otherwise, all such captured AC, co-mingled or otherwise, could well have to be managed and disposed of under RCRA Subtitle C.

The RCRA Subtitle C regulations are substantially more stringent than RCRA Subtitle D (non-hazardous waste) regulations, and would result in more expensive waste management requirements. It is not evident that EPA has adequately considered the economic implications of this scenario, although it could have potentially enormous impacts on the cost of operation of coal-fired power plants⁶⁵, possibly seriously compromising the ability of industry to adequately supply electricity to the American public at, or near, current costs.

In view of such potentially large cost impacts, a MACT control standard that locks-in AC use could create disastrous distortions in the price of electricity. This is one more reason why a flexible, nationwide cap-and-trade management system that allows selection from a menu of control technology strategies is preferable.

We thank EPA for the opportunity to comment on this most important issue.

Sincerely,

William L. Kovacs

Attachments

⁶⁵ The American Coal Ash Association estimates that current costs of ash disposal as a non-hazardous material range from about \$3 to \$30 per ton of material but that should fly ash mixed with AC be considered a hazardous waste, management and disposal costs would be significantly higher, likely in excess of \$100 per ton and perhaps greater than \$1000 per ton. Hoffman, J. and Ratafia-Brown, J., *Ibid.* page 16.