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Mercury Emissions from Electric Power Plants: An Analysis of EPA's Cap-and-Trade Regulations

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Summary

EPA studies conclude that at least 7.8% of American women have blood mercury levels sufficient to increase the risk of adverse health effects (especially lower IQs) in children they might bear. Thus, there was great interest in the agency's March 15, 2005, announcement that it was finalizing new regulations to control mercury (Hg) emissions from coal-fired electric power plants — power plants account for 42% of total U.S. mercury emissions, according to EPA.

In announcing the regulations, however, EPA stated that most mercury in the atmosphere comes from non-U.S. global sources. Thus, even if regulations could reduce power plant mercury emissions to zero, the agency concluded, there would be little change in the mercury health effects it has identified. Instead of more stringent requirements, EPA promulgated "cap-and-trade" standards that rely heavily on co-benefits from sulfur dioxide and nitrogen oxide controls installed under a separate agency rule, the Clean Air Interstate Rule (CAIR). This approach minimizes costs for electric utilities: by 2015, less than 1% of coal-fired power plants will have installed equipment specifically designed to control mercury, according to EPA. By 2020, only 4% of plants will have such equipment. Ten states have filed suit to overturn the agency's action, arguing that EPA is required by the Clean Air Act to impose more stringent Maximum Achievable Control Technology standards at each individual plant.

Beginning in 2010, the cap-and-trade standards limit total power plant mercury emissions to 38 tons annually (a 21% reduction vs. 1999 levels). A second phase caps annual emissions at 15 tons, starting in 2018. According to the agency, trading and banking of emission allowances will result in lower than required emissions in the early years, but will delay achievement of the 15-ton cap to at least 2025. Thus, the net effect of the rule appears to be to postpone until the 2020s direct regulation of mercury (except as a co-benefit achieved from regulating other pollutants).

EPA has sent contradictory signals regarding the importance of controlling mercury emissions. Its January 2004 analysis of the proposed rule estimated that the indirect benefits of more stringent regulations ($15 billion annually) would outweigh compliance costs by a factor of at least 16 to 1. Direct benefits (although unquantifiable) were said to be "large enough to justify substantial investment in Hg control." The analysis of the final rule, by contrast, concludes that quantifiable direct and indirect benefits of mercury control are just $43 million per year, with annual costs as high as $896 million. EPA's calculations did not include consideration of an academic study that it had funded, a factor contributing to the calculation of smaller benefits. This decision was one of several irregularities in the regulatory process alleged by the agency's Inspector General, GAO, and critics of the rule.

In addition to EPA's regulatory effort, five bills that would regulate these emissions have been introduced so far in the 109th Congress, with more expected. S. 131, the Clear Skies Act, has many points in common with the EPA regulatory approach. This report will be updated.

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Background

Mercury is a potent neurotoxin that can cause adverse health effects at very low concentrations. Concerns about public exposure to mercury have grown in recent years as research has indicated its presence at significant levels in numerous species of fish, and as analyses of dietary intake and resulting blood levels have pointed to potential health risks from mercury ingestion, particularly for women of child-bearing age and developing fetuses.

According to the Environmental Protection Agency (EPA), as of December 2003, 45 states had issued fish consumption advisories due to mercury. Twenty-one states (primarily in the Midwest and Northeast) have issued statewide advisories for mercury in all their freshwater lakes and/or rivers. In all, these advisories cover more than 13 million acres of lakes and roughly 767,000 river miles.[1] An additional 11 states, primarily in the South, have statewide advisories for mercury in their coastal waters, and Hawaii has a statewide advisory for mercury in marine fish.

Mercury reaches water bodies from naturally occurring sources, from past uses (many of which, such as fungicide application to crops, are now banned), from disposal of mercury-containing products, and from current activities — principally combustion of fuels containing mercury in trace amounts. Mercury released to the atmosphere can circulate for up to a year before being deposited on land or in water. Thus, it is widely dispersed, and often is transported thousands of miles from the emissions source.[2] According to EPA, U.S. sources contributed only 3% of the 5,500 tons of mercury emitted to the atmosphere on a global basis in 1995.[3] Of the mercury deposited in the United States, however, about 60% comes from U.S. sources.[4]

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[1] U.S. EPA, Office of Water, "National Listing of Fish Advisories," Fact Sheet, August 2004, p. 4, available at [http://www.epa.gov/waterscience/fish/advisories/factsheet.pdf].

[2] U.S. EPA, Office of Air Quality Planning and Standards, *1997 Mercury Study Report to Congress: Overview*, December 1997, p. 1, available at [http://www.epa.gov/ttn/atw/112nmerc/mercover.html].

[3] Ibid.

[4] U.S. EPA, Office of Air and Radiation, Mercury White Paper, p. 1, available at [http://www.epa.gov/ttn/oarpg/t3/memoranda/whtpaper.pdf].

This percentage is estimated to be "even higher in certain regions (e.g., northeast U.S.),"[5] because mercury emissions are concentrated in specific areas, and because of variations in precipitation patterns. The highest deposition rates, according to EPA, "occur in the southern Great Lakes, the Ohio Valley, the Northeast, and scattered areas in the Southeast."[6]

Of particular concern for aquatic organisms and human health is mercury in the form of methyl mercury. Nearly all of the mercury that accumulates in fish tissue is methyl mercury, an organic compound formed by a microbial process, often in wetland environments. Once formed, methyl mercury tends to bio-accumulate in aquatic organisms, increasing concentrations at each level of the food chain. "As a result, top predators in a food chain, such as largemouth bass or walleye, may have concentrations of these chemicals in their tissues that may be a million times higher than the concentrations in the water."[7]

Children born to women with fetal cord blood concentrations of mercury above 5.8 parts per billion (ppb) "are at some increased risk of adverse health effects,"[8] according to EPA. These health effects include delayed development, neurological defects, and lower IQ. Recent EPA analyses conclude that at least 7.8% (and possibly as many as 15.7%) of women of child-bearing age had blood-mercury levels high enough that their umbilical cord blood would have been above the 5.8 ppb threshold in 1999-2000.[9]

Sources of Emissions / Status of Regulations

As shown in **Table 1**, U.S. air emissions of mercury come from eight principal sources. Of these, the largest source is coal-fired utility boilers (i.e., coal-fired electric power plants). These accounted for an estimated 52 tons of mercury emissions per year in 1994-1995, about one-third of total U.S. mercury emissions at the time.[10]

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[5] U.S. EPA, "Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units," 65 *Federal Register* 79827, December 20, 2000.

[6] Ibid.

[7] National Listing of Fish Advisories, previously cited, p. 4.

[8] EPA, Office of Children's Health Protection, *America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illnesses*, 2nd edition, February 2003, at [http://www.epa.gov/envirohealth/children/ace_2003.pdf], p. 59.

[9] Kathryn R. Mahaffey, "Methylmercury: Epidemiology Update," presented at U.S. EPA National Forum on Contaminants in Fish, San Diego, CA, January 26, 2004, p. 5. Available at [http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf].

[10] EPA does not have current data for all sources of mercury emissions. Since the mid-1990s, mercury emissions have been reduced substantially from the three waste combustor/incinerator categories, and marginally from electric utilities. In its regulatory impact analysis for the proposed electric utility rule, EPA used 1999 data showing utility emissions of 48 tons as the baseline against which to compare reductions.

Table 1. Mercury Emissions Estimates and Current Regulatory Status

Source	Pre-Regulation Emissions (tons/year)	% of Total	Current Status of Mercury Regulations
Coal-fired Utility Boilers	52	33%	Rule finalized 3/15/05 would set a 38-ton cap on emissions in 2010 and a 15 ton cap by 2018 (69% reduction).
Large (>250 tons per day) Municipal Waste Combustors (MWC)	30	19%	Regulated: current emissions estimated at about 95% below 1990 levels.
Coal-fired Commercial / Industrial Boilers	21	13%	Rule promulgated 9/13/04 would reduce emissions by 1.9 tons by 2007.
Medical Waste Incinerators	16	10%	Regulated: current emissions estimated at about 94% below 1990 levels, mostly through closures.
Oil-fired Commercial/ Industrial Boilers	8	5%	Rule promulgated 9/13/04 would not require reductions.
Mercury Cell Chlor-alkali Plants	7*	4%	Rule promulgated 12/19/03 will reduce emissions 74% by 12/19/06.
Hazardous Waste Combustors	7	4%	Regulated: current emissions estimated at about 50% below 1990 levels.
Portland Cement Plants	5	3%	Rule promulgated 6/14/99 reduces hazardous air pollutant metal emissions 24%; remanded by U.S. Court of Appeals, D.C. Circuit to require specific standard for mercury and 2 other pollutants.
Other (at least 15 categories of minor sources)	12	8%	Generally not regulated
TOTAL	158		

Sources/Notes: Pre-regulation emissions data from U.S. EPA, *Mercury Study: Report to Congress*, Volume II. RPS-452/R-97-004 (December 1997), p. ES-6; current status of mercury regulations from U.S. EPA, *Mercury White Paper* (not dated), with information updated by CRS telephone communications with EPA. Emissions estimates are for 1994-1995. Percentages do not add because of rounding.

* Data for the chlor-alkali sector are subject to considerable uncertainty. Chlor-alkali plants produce chlorine by subjecting liquid mercury and saturated brine to an electric current. The mercury binds with potassium or sodium in the process, but later is separated and reused. In the year 2000, 65 tons of mercury that the plants consumed could not be accounted for.

Regulation of Non-Utility Sources. As of March 2005, EPA had made regulatory promulgations for all major sources of mercury emissions. The authority for most of these regulations is Section 112 of the Clean Air Act (42 U.S.C. 7412), which requires National Emission Standards for Hazardous Air Pollutants. In amending Section 112 in 1990, Congress included a list of 188 hazardous air pollutants to be regulated — mercury among them. EPA was directed to identify sources of these pollutants and impose Maximum Achievable Control Technology (MACT). Section 112 defines MACT for new facilities as an emission standard no less stringent than what is achieved in practice by the best controlled similar source (i.e., the best demonstrated technology). For existing facilities, it allows a somewhat less stringent standard, setting the average emissions of the best performing 12% of units in the category as a minimum in most cases, but giving EPA discretion to set a more stringent standard. Sources of mercury emissions, including coal-fired commercial and industrial boilers, chlor-alkali plants, and Portland cement plants, are subject to regulations promulgated under this authority.

Separately, Section 129 of the Clean Air Act requires emission standards for solid waste incinerator units, including municipal and medical waste incinerators. These standards, which were promulgated in the mid-1990s, limit 11 categories of pollutants, including mercury. Under the standards, municipal and medical waste incinerators, which together accounted for 29% of total U.S. mercury emissions before regulation, have achieved emission reductions of 95%, and together emitted only 2.2 tons of mercury in 2000, according to EPA.[11] As a result, coal-fired utilities — the last major source to be regulated — now account for at least 42% of U.S. mercury emissions.[12]

Electric Utilities and Mercury

Statutory Requirements. Electric utilities were singled out for special consideration by the 1990 Clean Air Act Amendments. Under Section 112(n), EPA was required to undertake two studies of mercury emissions and other hazardous air pollutants from electric utility steam generating units, and to report to Congress before deciding whether to impose MACT standards. One study was to characterize emissions from utilities, municipal waste incinerators, and other sources, determine their health and environmental effects, identify the technologies available to control emissions, and estimate the costs of such technologies. The other study was to determine the hazards to public health anticipated as a result of emissions of all

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[11] "Major Reductions in Toxics, Metals Seen from Controls on Incinerators, EPA Says," *Daily Environment Report*, June 25, 2002, p. A-3.

[12] The 42% estimate comes from Table VI-2 of "Revision of December 2000 Regulatory Finding on the Emissions of Hazardous air Pollutants from Electric Utility Steam Generating Units and the Removal of Coal- and Oil-fired Electric Utility Steam Generating Units from the Section 112(c) List," 70 *Federal Register* 16018, March 29, 2005 (hereafter, "Revision of Regulatory Finding"). It refers to emissions in 2001. In the agency's Toxic Release Inventory (TRI) database [http://www,epa.gov/tri/], electric utilities accounted for 62.9% of total air emissions of mercury and mercury compounds in 2002 (latest available year as of March 2005). The TRI database somewhat overstates the utility share of the total because it excludes waste incineration and all sources that emit less than 10 pounds of mercury.

hazardous air pollutants emitted by electric utilities after imposition of other requirements of the act, and describe "alternative control strategies for emissions which may warrant regulation under this section." After considering the results of this study, "the Administrator shall regulate electric utility steam generating units under this section [Section 112], if the Administrator finds such regulation is appropriate and necessary...."

Having submitted the required reports to Congress under this section in 1997 and 1998,[13] EPA Administrator Carol Browner did find such regulation appropriate and necessary, and issued a formal finding to that effect in December 2000.[14] The finding set in motion the development of MACT standards. The standards were to be proposed by December 15, 2003, and a final MACT rule was to be signed by March 15, 2005. MACT standards require compliance for existing facilities three years after promulgation, with the possibility of one-year extensions.[15]

EPA's Utility Regulations. In the March 15, 2005 final mercury rules, EPA did not promulgate a MACT standard. Instead, it revisited the December 2000 analysis and reversed its regulatory finding. In its revised analysis, regulating mercury from utilities under Section 112 is neither "appropriate" nor "necessary." It is not appropriate, the agency concluded, because the health effects of mercury from utilities remaining after imposition of other controls "do not result in hazards to public health."[16] It is not necessary, in the agency's reasoning, because mercury could be regulated under other sections of the act, specifically Section 111.[17] Thus, the agency proposed a New Source Performance Standard (NSPS) for mercury from utilities under Section 111(b), and a cap-and-trade system to control emissions from existing and new utility sources under Section 111(d).

Of the two Section 111 rules, attention has focused primarily on the cap-and-trade system under Section 111(d), rather than the NSPS. Very few new coal-fired units have been built in recent years, and only a handful of such facilities are currently moving through the permitting process. While some think the rise in natural gas prices will spark construction of a new wave of coal-fired plants, the

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[13] U.S. EPA, Office of Air Quality Planning and Standards, *Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units — Final Report to Congress*, February 1998, 2 vols., available at [http://www.epa.gov/ttn/atw/combust/utiltox/utoxpg.html#TEC]; and U.S. EPA, OAQPS and Office of Research and Development, *Mercury Study Report to Congress*, December 1997, 8 vols., available at [http://www.epa.gov/ttnatw01/112nmerc/mercury.html].

[14] Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units, 65 *Federal Register* 79825, December 20, 2000.

[15] These dates on which regulations were to be proposed and promulgated were fixed in a modified settlement agreement filed November 17, 1998. The case is Natural Resources Defense Council, Inc. v. U.S. EPA, No. 92-1415 (D.C. Cir.). Originally, the deadline for promulgation was December 15, 2004. In late April 2004, NRDC offered to extend the deadline 90 days in order to allow for additional analysis of regulatory options. EPA accepted the offer.

[16] U.S. EPA, Revision of Regulatory Finding, 70 *Federal Register* 16004, March 29, 2005. The full discussion begins on p. 16002.

[17] Ibid., p. 16005.

Department of Energy projects essentially no change in coal-fired electric generation between now and 2015.[18] Thus, it is expected that the NSPS will affect far fewer units than the cap-and-trade rules. Furthermore, under the promulgated cap-and-trade system, new units are not given any emission allowances: for each ounce of mercury that they emit, they would need to purchase an allowance from an existing unit that has controlled emissions more or sooner than required. Thus, in the overall scheme of things, new units would not increase total emissions of mercury above the nationwide cap, no matter how weak or strong the NSPS might be.

The cap-and-trade system, on the other hand, has received significant attention, much of it highly critical. Some of the criticism concerns the choice of Section 111(d) as the legislative authority for mercury regulation. Section 111(d) has rarely been used until now, and has never been used to regulate a hazardous air pollutant listed under Section 112. EPA staff say that it has previously been used to regulate sulfur emissions from pulp and paper mills and fluoride emissions from aluminum smelters, neither of which are controlled elsewhere in the act.[19] EPA's March 29, 2005 *Federal Register* notice contains a long discussion of the legality of the use of Section 111, as opposed to the MACT authority in Section 112. The legality of this approach was immediately challenged in a suit filed by ten states.[20]

The specifics of the cap-and-trade system — its timing and its level of stringency — are also controversial.[21] The system will cap nationwide emissions of mercury from coal-fired electric generating units at 38 tons beginning in 2010 and at 15 tons beginning in 2018. If achieved, the caps would provide a 21% reduction from the 1999 level of emissions in Phase 1, and a 70% reduction in Phase 2.

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[18] See Energy Information Administration, U.S. DOE, *Annual Energy Outlook 2005*, February 2005, Table A9, p. 154, available at [http://www.eia.doe.gov/oiaf/aeo/].

[19] Sulfur and fluoride are not listed as hazardous air pollutants under Section 112(b) and are not criteria pollutants listed under Section 108(a).

[20] The case is New Jersey v. EPA, No.05-1097 (D.C. Cir.) filed Mar.29, 2005. The original plaintiffs were New Jersey, California, Connecticut, Maine, Massachusetts, New Hampshire, New Mexico, New York, and Vermont. Wisconsin joined them, April 11. For a discussion of the legal issues, see CRS Report RL32203, *Legal Analysis and Background on the EPA's Proposed Rules for Regulating Mercury Emissions from Electric Utilities*. Interestingly, neither Section 111 nor Section 112 actually mention cap-and-trade programs. Section 111 requires "standards of performance," defined as a standard that "reflects the degree of emission limitation achievable through the application of the *best system of emission reduction* [emphasis added] which ... the Administrator determines has been adequately demonstrated." EPA states that this language allows a cap-and-trade system. Section 112(d) also uses broad language, referring to "measures, processes, methods, systems, or techniques," but in elaborating on this definition for nearly a page, the statute provides numerous examples and specifics, without mentioning cap-and-trade systems.

[21] A variety of views have been expressed by interested parties regarding EPA's mercury rule. For additional views on the rule, the reader may wish to read Charles River Associates study for the Edison Electric Institute (EEI), *Projected Mercury Emissions and Costs of EPA's Proposed Rules for Controlling Utility Sector Mercury Emissions*, available from EEI. For environmental views, the reader may wish to visit the website of Clear the Air at [http://www.cleartheair.org/mercury/mercuryhurts/] or see the statement of the Natural Resources Defense Council at [http://yubanet.com/artman/publish/article_19309.shtml].

Table 2. Mercury Caps and Projected Emissions Under the Mercury Cap-and-Trade Rule

Year	**2010**	**2015**	**2018**	**2020**
Cap	38 tons	38 tons	15 tons	15 tons
Projected Actual Emissions	31.3 tons	27.9 tons	n.a.	24.3 tons

Source: U.S. EPA.

The caps will be implemented through an allowance system similar to that used in the acid rain program, through which utilities can either control the pollutant directly, or purchase excess allowances from other plants that have controlled more stringently or sooner than required. Early reductions can be banked for later use, if they are not sold. The agency says the banking provision will provide incentives for early reductions. As shown in **Table 2**, it projects emissions of 31.3 tons in 2010, nearly 7 tons less than the cap.[22] If this happens, it will allow utilities to delay full compliance with the 70% reduction until well beyond 2018, as they use up banked allowances rather than install further controls. The agency's analysis projects actual emissions to be 24.3 tons as late as 2020 (less than a 50% reduction compared to baseline 1999 emissions).[23] It appears that full compliance with the 70% reduction might be delayed until 2030.[24]

Costs and Benefits of the Final Rule. While acknowledging that it is unable to estimate or express in dollars at least seven categories of potential benefits, EPA's estimate of the direct benefits of the final cap-and-trade rule is close to zero.[25]

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[22] U.S. EPA, Office of Air Quality Planning and Standards, *Regulatory Impact Analysis of the Clean Air Mercury Rule*, March 2005, Table 7-3, p. 7-5, available at [http://www.epa.gov/ttn/atw/utility/ria_final.pdf].

[23] Ibid.

[24] EPA has not provided an estimate of the year in which the 70% reduction will be attained. The Integrated Planning Model, which the agency uses to calculate regulatory impacts, runs to the year 2030 and assumes that all allowances will be used by the end date. Discussions we held with EPA staff indicate that some think the allowances will be used more quickly (perhaps as early as 2025), while others think use of allowances will be stretched into the 2030s. The level at which the Phase 1 cap is set is a key determinant of when the rule reaches its ultimate stringency. The final rule's 38-ton Phase 1 cap generates 70.5 tons of early reduction allowances by 2018 in EPA's analysis. A cap that matched EPA's estimate of *actual* emissions in 2010 would generate only about 17 tons of allowances by 2018 if the timing of industry compliance was unchanged. In general, the larger the number of allowances generated by early reductions the later full compliance will be achieved.

[25] Potential benefits that were not estimated included cardiovascular effects, ecosystem effects, genotoxic, immunotoxic, reproductive, renal, and hematological effects. While studies have suggested associations between exposure to methylmercury and each of these effects, EPA found the evidence either inconclusive or insufficient to evaluate the impacts.

(continued...)

The one direct benefit for which the agency made an estimate was the benefit from avoided IQ decrements in children prenatally exposed to lower levels of methylmercury, the value of which was estimated at $400,000 to $3.0 million annually. In calculating this amount, the agency looked only at exposures due to the mother's ingestion of fish from fresh water recreational fishing.[26]

In addition, the agency found that the controls installed to reduce mercury would slightly reduce emissions of fine particulate matter ($PM_{2.5}$), saving up to 7 lives annually. These co-benefits were estimated at $1.4 million to $40 million per year.[27]

The costs of the mercury rule were estimated to range from $157 million annually to $896 million, depending on whether a 3% or 7% discount rate was used.[28] Cost factors estimated by EPA included capital investments in pollution control, operating expenses of the pollution controls, and additional fuel expenditures, but not the cost of monitoring, reporting, and recordkeeping.[29]

Several observations can be made regarding these cost and benefit estimates. First, according to the rule's preamble, "EPA modeling assumes no improvements in the cost or effectiveness of Hg [mercury] control technology over time"; in the next sentence, the agency notes, "In reality, by 2020, costs of Hg control are expected to have declined."[30] The costs used in the modeling runs were estimated in mid-2003, according to EPA. Since that time, mercury control costs have declined as much as 75%, according to the Institute of Clean Air Companies (ICAC), the trade

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[25] (...continued)
See U.S. EPA, "Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units," Final Rule, Preamble, pp. 186-187, available at [http://www.epa.gov/ttn/atw/utility/camr_final_preamble.pdf] (hereafter, "Preamble to the Final Rule"). In its analysis of the *proposed* rule, EPA listed 11 health and welfare benefits of controlling mercury: reductions in neurological disorders, learning disabilities, and developmental delays; impacts on birds and mammals, such as reproductive effects; impacts on commercial, subsistence, and recreational fishing; and reduced "existence values" for currently healthy ecosystems. It also listed as potential mercury control benefits reductions in cardiovascular effects, altered blood pressure regulation, and reproductive effects in humans. None of these benefits were quantified, but the agency stated at the time that it believed that they "are large enough to justify substantial investment in Hg emission reductions." U.S. EPA, *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* (hereafter, the Mercury Proposal), Preamble, Table 9, 69 *Federal Register* 4711, 4708, January 30, 2004.

[26] U.S. EPA, Preamble to the Final Rule, previously cited, pp. 182-188.

[27] Ibid., p. 187. A more thorough discussion of the co-benefits of particulate matter control is found in Section 12 of the Regulatory Impact Analysis, at [http://www.epa.gov/ttn/atw/utility/ria_final.pdf].

[28] The higher discount rate would imply greater uncertainty regarding future cost rather than the imposition of additional controls.

[29] EPA estimates these costs elsewhere in its analysis at "less than $76 million" annually. Preamble to the Final Rule, p. 190.

[30] Ibid., pp. 198-199.

association that represents manufacturers of pollution control equipment.[31] If that is the case, mercury control costs could be overestimated by as much as a factor of 4.

The discrepancy between ICAC's estimate and EPA's may be larger than fourfold, however. At a January 2005 congressional briefing, ICAC and one of the technology providers estimated current mercury control costs as low as $2,000 per pound.[32] EPA's modeling runs estimated the marginal cost to be $39,000 per pound in 2020.[33]

Second, while the estimated costs of the rule ($157 million to $896 million annually in 2020) appear substantial in EPA's cost-benefit analysis, there is little additional detail provided as to what these costs represent. The analysis concludes that almost no pollution control equipment would be installed specifically to control mercury. As shown in **Table 3**, in 2010, only 2 gigawatts (less than 1% of coal-fired capacity) is projected to have installed activated carbon injection (ACI) under the rule.[34] An additional 1 gigawatt (Gw) is projected to add selective catalytic reduction (SCR) to control mercury. (Total coal-fired electric capacity is currently 305 Gw, and is expected to remain at that level in 2010.) By 2015, there is little change. By 2020, mercury controls would include 13 gigawatts of ACI (about 4% of coal-fired units), 3 Gw of SCR, and 1 Gw of scrubbers.[35]

The reason that so few units would install ACI in EPA's analysis is that the agency designed the rule to complement its simultaneous promulgation of the Clean Air Interstate Rule (CAIR), a cap-and-trade program for utility emissions of sulfur dioxide (SO_2) and nitrogen oxides (NOx). Controlling SO_2, NOx, and mercury simultaneously reduces costs by allowing utilities to maximize "co-benefits" of emission controls. Controls such as scrubbers and fabric filters, both of which are widely used today to control SO_2 and particulates, have the side effect (or co-benefit) of reducing mercury emissions to some extent. NOx control technology (known as selective catalytic reduction, or SCR) tends to oxidize elemental mercury, making it easier for scrubbers and particulate controls to remove. Under EPA's cap-and-trade regulations, both the 2010 and 2018 mercury emission standards are set to maximize use of these co-benefits. Thus, few controls would be required to specifically address mercury emissions under the rule, and the costs specific to controlling mercury would be low.

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[31] Institute of Clean Air Companies (ICAC), "Advances in Mercury Control Technology to Meet Future Needs," Congressional Briefing, January 31, 2005.

[32] Ibid. Followup discussions with ICAC, one of its member companies, and EPA staff produced a range of estimates regarding cost; but all three sources agreed that the cost of mercury removal has been reduced substantially since EPA's 2003 baseline. Personal communications, week of April 11, 2005

[33] See Regulatory Impact Analysis, previously cited, Table 7-8, p. 7-7. EPA's modeling results are expressed in 1999 dollars.

[34] ACI is the only technology specifically designed for mercury control in EPA's model.

[35] FGD scrubbers and SCR are designed primarily to reduce SO_2 and NOx, but have the co-benefit of reducing mercury.

Table 3. EPA Projections of Installed Pollution Controls at Coal-Fired Electric Generating Units, 2010-2020, in gigawatts (Gw)

	2010			2015			2020		
	FGD	**SCR**	**ACI**	**FGD**	**SCR**	**ACI**	**FGD**	**SCR**	**ACI**
Current level +CAIR	146	125	—	177	151	—	198	153	0.5
Addition due to Hg Rule	—	1	2	2	2	3	1	3	12.5

Source: U.S. EPA, Regulatory Impact Analysis, Table 7-9. Total coal-fired electric generating capacity, according to U.S. DOE, was 305.2 Gw in 2003, and is projected to be 304.6 Gw in 2010, 310.6 Gw in 2015, and 334.6 Gw in 2020.

Notes:
FGD=Flue Gas Desulfurization (scrubbers, principally intended for SO_2 control);
SCR=Selective Catalytic Reduction (principally intended for NOx control);
ACI=Activated Carbon Injection (principally intended for Hg control).
Base Case equals continuation of control programs in place as of March 2004.
CAIR=Clean Air Interstate Rule signed March 10, 2005.
Hg rule=Clean Air Mercury Rule, signed March 15, 2005.

There are also two observations regarding the benefit side of the analysis. One notable feature is the contrast between EPA's final cost-benefit analysis and the agency's analysis of its *proposed* rule, which appeared in the *Federal Register* a year earlier.[36] In the proposed rule, calculations of the overall costs and benefits supported the imposition of a more stringent standard. The proposed MACT rule would have taken effect two years earlier than the cap-and-trade rule, and allowed emissions of 34 tons annually. The agency projected compliance costs of the MACT proposal at $945 million per year. Quantifiable benefits of MACT (essentially longer lives and less illness from the reductions in fine particles achieved as a co-benefit) were estimated at more than $15 billion annually (a 16 to 1 advantage over costs). If costs to other sectors of society were added in, the benefit-cost ratio was still 9 to 1.

As noted earlier, none of the $15 billion in benefits the agency quantified in its proposal was a *direct* benefit of mercury control. They were all benefits that resulted from reduced particulate emissions. In addition to these co-benefits, however, the agency concluded that the *unquantifiable* direct benefits of controlling mercury "are large enough to justify substantial investment in Hg emissions reductions."[37]

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[36] U.S. EPA, Mercury Proposal, Preamble, 69 *Federal Register* 4651, January 30, 2004.

[37] Ibid., p. 4711.

Table 4. EPA Estimates of the Costs and Benefits of MACT vs. Cap and Trade for Utility Mercury Controls

Regulation / Effective Date		Emissions Cap	Annual Compliance Cost	Annual Benefits		Ratio of Benefits to Costs
				Direct	Co-Benefit	
MACT	2008	34 tons	$945 million	n.q.	>$15 billion	16:1
Cap and Trade (phase 1)	2010	38 tons	$160 million	n.q.	n.q.	— -
Cap and Trade (phase 2)	2018	15 tons	$750 million	$0.4-$3.0 million	$1.4 - $40 million	0.0024 - 0.0573:1

Source: U.S. EPA. n.q. = not quantified. For both the MACT and the cap-and-trade rules, there are varying estimates of cost in EPA's Regulatory Impact Analyses and in the Preamble to the rules, depending on whether one chooses the industry's compliance cost or the cost to society at large, and depending on the discount rate used to adjust future costs and benefits. To facilitate comparisons, this table relies on compliance cost rather than social cost. The range of cap-and-trade benefits includes both direct and indirect ($PM_{2.5}$-related) benefits.

As shown in **Table 4**, the analysis accompanying the final rule presents results far different from the earlier analysis: whereas the earlier analysis showed benefits far outweighing costs, the final analysis concludes that the costs of mercury control outweigh the benefits by 17 to 1. The primary change appears to be a reassignment of the $15 billion in particulate matter co-benefits to the CAIR rule.[38] By making implementation of mercury controls simultaneous with CAIR, the co-benefits are attributed to CAIR, instead of to the mercury rule. EPA's analysis of CAIR now shows benefits of $85-100 billion annually by 2015, more than 25 times its cost.

Some of this change is simply a paper exercise: the co-benefits are taken from one rule and given to another. But there is also a real difference in the agency's position regarding direct benefits. Rather than maintaining that the benefits of mercury control — although unquantifiable — are large enough to justify substantial investments in mercury control, the agency now concludes that even a complete elimination of the mercury emissions from U.S. power plants would have little impact on human health.[39]

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[38] If MACT were imposed in 2008, as would have been required by statute had the agency implemented a MACT approach, the co-benefits of installing scrubbers and SCR (reductions of hundreds of thousands of tons of SO_2 and NOx) would be attributed to the MACT rule. By moving implementation to 2010 in the final rule, the co-benefits estimated to result from MACT (reductions of 2,200 premature deaths annually, 2,900 non-fatal heart attacks, thousands of hospital and emergency room visits, and millions of work loss and restricted activity days) are no longer attributed to mercury regulations.

[39] "EPA, in its expert judgment, concludes that utility Hg emissions do not pose hazards to
(continued...)

In assessing this latter conclusion, though, we arrive at a second key observation regarding the benefits analysis: EPA's assessment did not include two peer-reviewed studies that indicated stricter utility mercury rules would have yielded large benefits. One study, by the Mount Sinai Center for Children's Health and the Environment, published in the National Institutes of Health's *Environmental Health Perspectives* February 28, 2005, concluded that between 316,588 and 637,233 newborn children each year have blood mercury levels associated with loss of IQ. The study concluded:

> The resulting loss of intelligence causes diminished economic productivity that persists over the entire lifetime of these children. This lost productivity is the major cost of methylmercury toxicity, and it amounts to $8.7 billion annually (range: $2.2-$43.8 billion, 2000 dollars). Of this total, $1.3 billion (range: $0.1-$6.5 billion) each year is attributable to mercury emissions from American power plants.[40]

This report may not have been available to EPA in time to be considered in developing the final rule, but a second study, funded by EPA and submitted to the agency February 22, 2005, reportedly was available to the agency, at least in preliminary form, before the agency's deadline for inclusion in the final analysis.[41] This study, conducted by the Harvard Center for Risk Analysis, concluded that the benefits of reducing power plant mercury emissions to 15 tons per year range from $119 million annually if persistent IQ deficits from fetal exposures to methylmercury are counted, to as much as $5.2 billion annually if both IQ deficits and cardiovascular effects and premature mortality are estimated.[42] The Harvard report was not referenced in the agency's analysis of the final rule. The agency maintains that since the final report on the study was not submitted until after a January 3, 2005 agency deadline, it was ineligible to be considered.

Availability of Technology. Critics of EPA's mercury rule argue that the regulations should be more stringent or implemented more quickly. To a large extent, these arguments and EPA's counterarguments rest on assumptions concerning

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[39] (...continued)
public health." U.S. EPA, Revision of Regulatory Finding, 70 *Federal Register* 16025, March 29, 2005.

[40] Leonardo Trasande, Philip J. Landrigan, Clyde Schechter, "Public Health and Economic Consequences of Methylmercury Toxicity to the Developing Brain," *Environmental Health Perspectives*, posted online February 28, 2005, p. 6, available at [http://ehp.niehs.nih.gov/members/2005/7743/7743.pdf].

[41] See "EPA Draws Fire for Ignoring Harvard Study of Benefits of Reducing Mercury Pollution," *Daily Environment Report*, March 24, 2005, p. A-9.

[42] Glenn Rice and James K. Hammitt, Harvard Center for Risk Analysis, "Economic Valuation of Human Health Benefits of Controlling Mercury Emissions from U.S. Coal-Fired Power Plants," report for Northeast States for Coordinated Air Use Management, February 2005, [http://bronze.nescaum.org/airtopics/mercury/rpt050315mercuryhealth.pdf], pp. xvi-xix. This report appears to have two key differences from EPA's assessment of benefits. First, it estimated cardiovascular effects and mortality. Second, it looked at impacts of mercury emissions on coastal Atlantic, Gulf of Mexico, and global fish, in addition to non-commercial fresh water fish.

the availability of control technologies. Specifically, EPA maintains that the technology required for mercury control will not be adequately demonstrated until after 2010,[43] and that the technologies for SO_2 and NOx — while available now — cannot be implemented at a faster pace without causing "extremely high" costs and overwhelming the capacity of equipment suppliers.[44]

Analysis by other experts came to a different conclusion. For example, a late 2003 paper co-authored by representatives of two power companies, the Electric Power Research Institute, the U.S. Department of Energy, and ADA-ES, a leading consultant on advanced mercury control technologies, concluded:

> Recent full-scale field tests have proven the effectiveness of activated carbon injection for reducing mercury emissions. This technology is ideally suited for use on existing coal-fired boilers as it provides the following advantages:
>
> - Minimal capital cost of equipment (<$3/kW);
> - Can be retrofit with little or no downtime of the operating unit;
> - Effective for both bituminous and subbituminous coals;
> - Can achieve 90% removal when used with a fabric filter that has been designed properly for carbon injection; and
> - It can be integrated to enhance mercury capture with virtually every configuration of air pollution control equipment including ESPs [electrostatic precipitators], fabric filters, wet and dry scrubbers.[45]

The agency's own Office of Research and Development (ORD), in a white paper posted on the EPA website March 2, 2004, appears to conclude that technology is more available and more effective than is maintained in the agency's rulemaking. ORD found that fabric filters, a relatively simple technology that is currently installed on more than 12% of power plants, achieve a 90% reduction in mercury emissions at bituminous coal plants and a 72% reduction at subbituminous plants. The addition of a scrubber increased the emission reduction to 98% at bituminous plants, according to ORD.[46]

The white paper further stated that, by 2010, activated carbon injection with a fabric filter "has the potential to achieve 90% Hg reduction" on any rank of coal, and

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[43] Mercury Proposal, Section IV.D.2., p. 4698.

[44] Ibid.

[45] Michael Durham, et al., "Full-Scale Results of Mercury Control by Injecting Activated Carbon Upstream of ESPs and Fabric Filters," paper presented at PowerGen 2003, Las Vegas, NV, December 9-11, 2003, p. 19.

[46] U.S. EPA, Office of Research and Development, "Control of Mercury Emissions from Coal-Fired Electric Utility Boilers," undated, posted March 2, 2004, available at [http://www.epa.gov/ttn/atw/utility/hgwhitepaperfinal.pdf].

could be installed within 1-2 years of signing a contract to do so.[47] Since the white paper was written, there have been reports that a European firm, Donau Carbon, has begun offering commercial guarantees for mercury removal from coal-fired power plants using ACI technology.[48]

ACI has also been used successfully, for the past decade, to control mercury emissions from municipal waste incinerators. According to EPA's Office of Air Quality Planning and Standards, emissions of mercury from these sources were reduced from 45.2 tons in 1990 to 2.2 tons in 2000, and, "The performance of the MACT retrofits has been outstanding."[49] While the concentration of mercury in incinerator emissions is higher than that in coal-fired power plants, requiring some adjustments in operating methods, the basic ACI technology has proven itself to be reliable and effective through a decade of experience.

Hot Spots. One of the main criticisms of the cap-and-trade approach is that it would not address "hot spots," areas where mercury emissions and/or concentrations in water bodies are greater than elsewhere. EPA has developed data on such hot spots: Environmental Defense released a report in December 2003 based on EPA's data that concluded: "At hot spots, local sources within a state commonly account for 50% to 80% of the mercury deposition."[50]

That the local contribution to hot spot concentrations is this high is disputed by utility sources, particularly for mercury emitted by power plants. Utility spokespersons maintain that much of the mercury emitted by utilities is in the elemental form, is non-water soluble, and is released from taller stacks. The result, they say, is that it is less available to fish, and disperses over a wider area — with much of it entering a global mercury cycle.[51] EPA has adopted this point of view. In supporting materials that accompanied the release of the final mercury rule, the agency noted that only 1% of global mercury emissions comes from U.S. power plants.[52] EPA modeling in support of the final rule concluded that even if power plant emissions were reduced to zero, there would be little impact of methylmercury concentrations in U.S. lakes and rivers, and little consequent reduction in the concentrations of mercury in fish-eating women of child-bearing age.[53]

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[47] Ibid., pp. 13-15.

[48] Personal communication, U.S. EPA, Office of Air and Radiation, May 21, 2004.

[49] "Emission from Large MWC Units at MACT Compliance," memorandum from Walt Stevenson, Combustion Group, Office of Air Quality Planning and Standards, U.S. EPA, to Docket A-90-45, June 20, 2002.

[50] Environmental Defense, *Out of Control and Close to Home*, December 2003, p. 12.

[51] See Electric Power Research Institute written statement, as quoted in "Backers of Utility Rules Expect Florida Study of Effect of Mercury to Affect EPA Decisions," Bureau of National Affairs, *Daily Environment Report*, November 19, 2003, p. A-10. Also see EPRI's press statement, "Power Plants and Mercury," available at [http://www.epri.com/attachments/296982_1011415_Power_Plants_and_Mercury.pdf].

[52] [http://www.epa.gov/air/mercuryrule/pdfs/slide3.pdf].

[53] Revision of Regulatory Finding, 70 *Federal Register* 16029, March 29, 2005.

The concern over hot spots, and the impetus to address them, were reinforced in late 2003 by a study of mercury contamination in the Everglades. The study found that concentrations of mercury in fish and wading birds in the area dropped around 75% after Florida imposed stringent controls on incinerators and other local sources of mercury emissions in the 1990s.[54] Backers of strong controls on utility emissions have cited these results in arguing against a cap-and-trade approach. Cap-and-trade programs are not, in principle, well designed to address hot spots, they argue. The cap-and-trade approach allows facilities to purchase allowances and avoid any emission controls, if that is the compliance approach that makes the most sense to a plant's owners and operators. Opponents of the rule maintain that if plants near hot spots purchase allowances rather than install controls, the cap-and-trade system may not have an impact on mercury concentrations at the most contaminated sites. By contrast, a MACT standard or a very stringent cap would require reductions at all plants, and would, therefore, be expected to improve conditions at hot spots.

EPA's analysis of the cap-and-trade rule has addressed this issue.[55] In the preamble to the proposed rule, it noted that all states would remain free to establish more stringent controls to address local health-based concerns separate from the mercury cap-and-trade program requirements. But it went on to state that the agency does not anticipate hot spots, for two reasons. First, EPA's modeling suggests that larger coal-fired units, which have the highest "local deposition footprints," are likely to control emissions more than required and sell excess allowances achieved through overcompliance to smaller units. Second, mercury emissions come in several forms. The most difficult to control is elemental mercury, according to the agency, and it is the most likely to be transported long distances from the generating units. Thus, if plants focus on the more easily controlled forms of mercury, they will control mercury that would more likely be deposited locally. Finally, the agency raised the possibility that it could adjust the trading program to favor controls at units in sensitive areas.[56]

Effects on Eastern and Western Coal. Whether imposition of controls on mercury will affect the total amount and/or the types of coal consumed at the nation's power plants has been an important issue in the debate over power plant mercury controls. The United Mine Workers of America, for example, were critical of EPA's proposed MACT on the grounds that the standards could be met by a majority of Western subbituminous coals without the need for any emission control technologies, whereas Eastern bituminous coals, representing roughly one-half of domestic coal production, would have needed to meet an average emission removal rate of 75%.[57] The proposed MACT rule's costs and reductions in emissions came almost entirely from controls on bituminous units, according to EPA.

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[54] Florida Department of Environmental Protection, *Integrating Atmospheric Mercury Deposition With Aquatic Cycling in South Florida*, revised November 2003, available at [ftp://ftp.dep.state.fl.us/pub/labs/assessment/mercury/tmdlreport03.pdf], visited April 5, 2005. See especially, pp. 56-59.

[55] Mercury Proposal, 69 *Federal Register* 4702-4703.

[56] Ibid., p. 4701.

[57] Comments of Cecil E. Roberts on behalf of the United Mine Workers of America to EPA Docket ID No. OAR-2002-0056, April 30, 2004, p. 1.

Table 5. Estimated Changes in Coal Use from Imposition of the Mercury (Hg) Cap-and-Trade Rule, 2003-2020, by Region

(in million tons)

	2003	2010		2020	
Coal Supply Region		**Base**	**CAIR + Hg Rule**	**Base**	**CAIR + Hg Rule**
Appalachia	275	325	303	301	330
Interior	135	161	169	173	224
Western	526	603	589	714	572
National Total	936	1,089	1,061	1,188	1,127

Source: U.S. EPA, Regulatory Impact Analysis, Table 7-12.

The cap-and-trade rule, because it sets a national cap on emissions rather than imposing controls on specific units and coal types, appears more favorable to Eastern and Interior coals than the MACT rule would have been. Eastern coal interests, unions, and states continue to express concern, however, because of the way the rule will allocate allowances. Reducing an ounce of mercury from bituminous coal would generate one allowance under the cap-and-trade mercury rule, whereas equivalent reductions from subbituminous coal will generate 1.25 allowances. Reductions from lignite-powered facilities will generate 3 allowances per ounce. The agency's rationale is that it is more difficult to remove mercury from lignite and subbituminous coal emissions.[58]

Even with this allowance scheme, EPA projects greater growth in use of Eastern and Interior versus Western coal under the rules. As shown in **Table 5**, EPA projects 20% growth in utility coal use overall, between 2003 and 2020, with imposition of the CAIR and mercury rules, about 5% less than would have occurred without the regulations. By region,[59] Interior coal use is projected to grow 66%, Appalachian 20%, and Western 9%, under the CAIR and mercury rules, according to EPA.[60]

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[58] EPA's rationale is discussed in U.S. EPA, "Standards of Performance for New and Existing Stationary Sources: Electric Utility Steam Generating Units," Final Rule, Preamble, available at [http://www.epa.gov/ttn/atw/utility/camr_final_preamble.pdf], pp. 84-87.

[59] The Integrated Planning Model, which EPA uses to assess the impact of proposed regulations on utilities and the coal industry, divides the coal-producing states into several geographic regions: Appalachian (including Pennsylvania, Ohio, West Virginia, Eastern Kentucky, Tennessee and Alabama); Interior (including Illinois, Indiana, and Western Kentucky); and Western (principally the Rocky Mountain states and North Dakota, including the Powder River basin).

[60] In the base case, without CAIR or the mercury rule, EPA projected that Interior coal use would grow by 28%, Appalachian 9%, and Western 36%. In a sensitivity analysis, EPA notes that DOE's Energy Information Administration (EIA) assumes a higher electricity growth rate and a bigger differential between natural gas and coal prices than does EPA.

(continued...)

The Regulatory Process. The utility mercury rule is among the most controversial rules in EPA's 35-year history, not only because of its substance, but also because of claimed irregularities in the regulatory process.

Shortly after the proposed rule was published early in 2004, the Clean Air Task Force, a Boston-based environmental group, reported that significant portions of the proposal had been copied verbatim from memos written by Latham & Watkins, a law firm representing electric utilities. Both Jeffery Holmstead, the EPA Assistant Administrator for Air, and his chief counsel, Bill Wehrum, had worked at Latham & Watkins before joining EPA in 2001. Holmstead reportedly stated that he was unaware how the memos had found their way into the regulatory proposal.[61]

Both the EPA Inspector General (IG) and the Government Accountability Office (GAO) have released reports critical of the regulatory process. The IG's report concluded that the development of the rule was "not consistent with expected and past practices" — specifically that "EPA's rule development process did not comply with certain agency and Executive Order requirements, including not fully analyzing the cost-benefit of regulatory alternatives and not fully addressing the rule's impact on children's health."[62] The IG was particularly critical of the process used to establish the proposed mercury MACT limits — a point rendered moot by EPA's choice of the cap-and-trade option.[63]

GAO was critical of the analysis underlying both the MACT and cap-and-trade proposals. For example, GAO found that "EPA did not document some of its analysis or adhere to the principles of full disclosure and transparency as directed by OMB, and it did not provide decision makers or the public with consistent information on how changes in the proposed level of control would affect its estimates of net economic benefits for each option."[64]

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[60] (...continued)
With EIA's assumptions, total coal use by utilities would grow to 1,371 million tons in 2020 even with the CAIR and mercury regulations. Each of the three coal-producing regions would see at least 20% more coal production under EIA's assumptions. See EPA Regulatory Impact Analysis, Table 7-32 and p. 7-23.

[61] See "Two Democrats Say Mercury Rulemaking 'Improperly Influenced' by Industry Lobbying," *Daily Environment Report*, February 13, 2004, p. A-1.

[62] Office of Inspector General, U.S. EPA, *Additional Analyses of Mercury Emissions Needed Before EPA Finalizes Rules for Coal-Fired Electric Utilities*, February 3, 2005, "At a Glance," at [http://www.epa.gov/oigearth/reports/2005/20050203-2005-P-00003-Gcopy.pdf]. A fuller description of these conclusions is found on pp. 27-36 of the report.

[63] For example, the IG report stated: "Evidence indicates that EPA senior management instructed EPA staff to develop a Maximum Achievable Control Technology (MACT) standard for mercury that would result in national emissions of 34 tons annually, instead of basing the standard on an unbiased determination of what the top performing units were achieving in practice.... [T]he standard likely underestimates the average amount of mercury emissions reductions achieved by the top performing 12 percent of utilities, the minimum level for a MACT standard required by the Clean Air Act." See ibid., At a Glance, and pp. 11-16.

[64] U.S. GAO, *Clean Air Act:Observations on EPA's Cost-Benefit Analysis of Its Mercury* (continued...)

As noted above, the agency did not consider in its cost-benefit analysis two studies that would have indicated direct benefits of mercury control as much as three orders of magnitude above those it used in determining that more stringent standards were unnecessary. One of the unused studies was funded by the agency; an agency staffer was one of its principal authors, and other EPA staff had peer-reviewed it.[65]

Legislation in the 109th Congress[66]

Although EPA has now finalized standards for electric utility mercury emissions under Section 111, the Administration has also proposed that Congress amend the Clean Air Act by passing multi-pollutant legislation for utilities — the Clear Skies bill. A version of Clear Skies introduced by Senator Inhofe (S. 131) would establish nationwide cap-and-trade programs for SO_2, NOx, and mercury similar to those established by the CAIR and mercury rules. In addition, it would eliminate or suspend more than half a dozen specific regulatory programs for electric power plants including New Source Review, Prevention of Significant Deterioration, New Source Performance Standards, the NOx SIP call,[67] nonattainment area requirements, Best Available Retrofit Technology, and any mercury MACT. The Administration states that many of these rules would prove redundant under a multi-pollutant cap-and-trade regime, and that eliminating or suspending them would create a more efficient regulatory structure. (For a discussion of the ways in which Clear Skies would change the Clean Air Act, see CRS Report RL32782, *Clear Skies and the Clean Air Act: What's the Difference?*)

Other multi-pollutant or mercury bills also have been introduced. Most other legislation would reduce mercury emissions more and faster than Clear Skies.[68] Senator Jeffords' S. 150, for example, would reduce utility mercury emissions to a total of 5 tons (i.e., about 90%) by 2010. Representative Waxman's H.R. 1451

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[64] (...continued)
Control Options, February 2005, Report no. GAO-05-252, p. 4.

[65] *Economic Valuation of Human Health Benefits of Controlling Mercury Emissions from U.S. Coal-Fired Power Plants*, previously cited. Glenn Rice, one of the report's two authors, was on leave from the agency's Office of Research and Development. The Acknowledgments page of the report lists two EPA employees among the report's 8 peer reviewers, and acknowledges the assistance of 13 other EPA staff members. For additional detail, see "New EPA Mercury Rule Omits Conflicting Data," Washington Post, March 22, 2005, p. A1.

[66] This report focuses on mercury emissions to the air and on legislation to address such emissions. Congress is also considering legislation to reduce the amount of mercury in products and waste streams. For information on mercury in products and wastes, including congressional and state actions on the subject, see CRS Report RL31908, *Mercury in Products and Waste: Legislative and Regulatory Activities to Control Mercury.*

[67] The NOx SIP call refers to regulations under which State Implementation Plans in 22 eastern states and the District of Columbia must be revised to control NOx emissions in order to improve ozone air quality in downwind states.

[68] An exception is Representative Sweeney's H.R. 227, under which the Clean Air Act's existing provisions for mercury are essentially restated, with EPA to promulgate regulations for utility mercury emissions by March 15, 2005.

would set comparable requirements, a reduction of at least 90% from 1999 levels by 2010. Senator Leahy's S. 730 also envisions a 90% reduction. Under the Jeffords, Waxman, and Leahy bills, there would be no allowance trading or banking programs for mercury.

Two other bills from the 108th Congress remain under discussion. Senator Carper's S. 843 and its House counterpart, Representative Bass's H.R. 3093, presented a middle ground between Clear Skies and the Jeffords, Waxman, and Leahy bills. Like Clear Skies, the Carper/Bass bill would have established a tradeable allowance program to ease compliance. But it would also have established caps at individual units, and would have mandated sharper reductions sooner than Clear Skies — an 80% reduction in mercury emissions by 2013.

Conclusion

High concentrations of mercury in aquatic environments, and the resulting advisories to limit consumption of fish in order to protect human health, have focused attention on the role of mercury emissions from a variety of industrial sources. Among these, coal-fired power plants are the largest, accounting for 42% of total U.S. emissions; and they are the last major category of emission sources for which EPA has considered regulations. Under a consent agreement, EPA agreed to propose regulations controlling mercury emissions from this category by December 15, 2003, with promulgation by March 15, 2005.

In meeting this commitment, EPA promulgated cap-and-trade regulations rather than the Maximum Achievable Control Technology regulations it had previously found to be "appropriate and necessary." In doing so, it revised its earlier finding — a step that ten states have sued EPA to overturn.

The switch from MACT to cap-and-trade means that the control technologies installed will be primarily scrubbers and selective catalytic reduction — controls designed to reduce emissions of SO_2 and NOx to meet caps on those emissions under a simultaneously promulgated rule, the CAIR rule. Mercury will be reduced as a co-benefit of this other rule. During the next decade, EPA estimates that only 1% of electric generating units would be likely to install pollution control equipment specifically designed to capture mercury under these regulations.

The mercury cap-and-trade regulations are highly controversial. Read literally, they offer a reduction of 70% in mercury emissions by 2018; but the agency's accompanying analysis indicates that, due to emissions banking and trading, the full 70% reduction might not be achieved until 2030. The agency projects actual mercury reductions of 35% by 2010, and about 50% by 2020.

Many observers contend that EPA's estimates of the benefits of mercury control are understated. In its final analysis, the agency did not include two peer-reviewed studies — one of which it funded — that concluded that annual benefits of mercury control were as high as $1.3 billion or $5.2 billion. At least on paper, in order to select the cap-and-trade mercury control option, EPA passed over a MACT option that offered higher benefits for essentially the same cost.

In large part because of rapidly improving technology, the agency's supporting documentation relies on estimates of mercury control costs that are 4 to 20 times higher than current projections by pollution control industry sources. The agency disputes information suggesting that specific control technology is available now, arguing that it will not be available until after 2010.

EPA states that the mercury to which Americans are exposed — primarily in fish consumption — comes overwhelmingly from non-U.S. sources. From its perspective, a more flexible, cap-and-trade approach has economic advantages, allowing utilities to maximize the co-benefits of controlling several pollutants simultaneously. In the rule it proposed a year earlier, however, the agency found that more stringent, more quickly applied limits using Maximum Achievable Control Technology would also deliver co-benefits, which would outweigh the costs of compliance by an order of magnitude.

As promulgated, the utility mercury rule may raise equity concerns: other combustion sources (municipal waste combustors and medical waste incinerators) have been required to reduce mercury emissions more than 90% under existing Clean Air Act authority, with considerably shorter deadlines than those in the cap-and-trade regulation for utilities. Since similar technologies could be applied to coal-fired power plants, critics argue that different standards are being applied to different sources of the same pollutant. The agency has offered no explanation for its less stringent approach to the regulation of mercury from utility sources, other than its general desire to limit costs and provide flexibility.[69]

With the 1990 Clean Air Act amendments, Congress determined that electric utilities would be treated differently from other sources of hazardous air pollutants, before regulation. The amendments required that EPA report to Congress before determining whether regulating utility emissions of these pollutants was appropriate and necessary. This special treatment for electric power producers was motivated by a number of factors, including a desire to preserve the use of coal as an energy option, for both economic and energy security reasons. Whether these concerns justify the agency's approach to the utility sector's mercury emissions, and the balancing of those concerns against competing health and equity considerations, are at the core of the continuing debate over mercury issues.

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[69] Section 129, which addresses solid waste combustion controls, specifically does mention using Section 111 and 111(d) to control incinerator emissions. This would appear to give the agency a firmer statutory basis to provide flexibility to waste combustors in meeting mercury reduction targets. Yet the agency imposed MACT-like standards on incinerators, and achieved greater than 90% reductions in mercury emissions within three years of promulgation.