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Perspectives

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Reducing Mercury Pollution from Electric Power Plants

The technology to reduce emissions is at hand, but the Bush administration seems unwilling to require industry to use it. That's a mistake.

The majority of electricity in the United States is produced by power plants that burn coal, with 464 such plants producing 56 percent of all electricity. But these power plants also are the nation's single biggest source of mercury pollution. Each year, the plants spew a total of 48 tons of mercury into the atmosphere--roughly a third of all human-generated mercury emissions. There is sound evidence that mercury emissions from coal-burning power plants can, in fairly short order, be cut dramatically and cost-efficiently. Yet plans to curtail emissions of this hazardous pollutant have become enmeshed in an intense squabble as politicians and regulators debate the specific regulatory framework to be implemented.

The Environmental Protection Agency (EPA), which is required under the Clean Air Act to regulate hazardous air pollutants, is developing regulations that would require reducing mercury emissions by up to 90 percent in 2007. However, the Bush administration now is asking Congress to pass legislation requiring less stringent mercury reductions and spreading the reductions over a much longer time. In order to stave off this push, Sen. James Jeffords (I-Vt.), chair of the Senate Environment and Public Works Committee, has introduced his own legislation to codify the 90 percent reduction levels by 2007, and he has indicated that passage of this bill is his top priority. Given the significant threats that mercury pollution poses to human health and the environment, along with the recent strides made in improving emission control technologies, the wisdom of following Sen. Jeffords's lead is compelling.

When coal is burned in power plants, the trace amount of mercury that it contains passes along with the flue gas into the atmosphere. The mercury eventually falls back to earth in rain, snow, or as dry particles, either locally or sometimes hundreds of miles distant. According to data from mercury monitoring stations nationwide, the highest deposition rates occur in the southern Great Lakes, the Ohio Valley, the Northeast, and scattered areas in

the Southeast; basically, in areas around and downwind of coal-fired power plants.

Once the mercury is deposited on land or in water, bacteria often act to change the metal into an organic form, called methylmercury, that easily enters the food chain and "bioaccumulates." At the upper reaches of the food chain, some fish and other predators end up with mercury levels more than a million times higher than those in the surrounding environment. For the humans and wildlife that ultimately consume these species, these concentrations can be poisonous.

In the United States, the primary source of mercury exposure among humans is through consumption of contaminated fish. Women who are pregnant or may become pregnant, nursing mothers, and children are the populations of greatest concern. When a pregnant woman ingests mercury, it is easily absorbed by her blood and tissues and readily passes to the developing fetus, where it may cause neurotoxicity (damage to the brain or nervous system). This damage eventually may lead to developmental neurological disorders, such as cerebral palsy, delayed onset of walking and talking, and learning disabilities. Approximately 60,000 children may be born in the United States each year with neurological problems due to mercury exposure in the womb, according to a 2000 report by the National Research Council. Even after birth, young children who ingest mercury, from either breast milk or contaminated foods, remain especially susceptible to the pollutant's neurotoxic effects, because their brains are still in a period of rapid development.

To help protect the public against such potential dangers, the Food and Drug Administration (FDA), which regulates commercially sold fish and seafood, issued an advisory in 2001 for those groups of people deemed most at risk. The advisory recommended that these populations avoid eating swordfish, shark, king mackerel, and tilefish, and that they limit their consumption of other seafood to an average of 12 ounces per week. Concurrently, EPA issued a recommendation that sensitive populations limit their intake of freshwater fish to one meal per week, with adults limiting their total weekly consumption to 6 ounces and children to 2 ounces. States have taken action as well, with 41 states now advising residents to limit consumption of certain species of fish. Although all fish contain some levels of mercury, states generally advise residents to limit their consumption of those species, such as bass, northern pike, walleye, and lake trout, that prey on other fish.

There is disagreement, however, about which set of recommendations will provide the best measure of safety. Some groups maintain that EPA's approach is generally more protective than is FDA's, and some also have accused FDA of catering to the tuna industry by not adding this species to its fish advisory. FDA recently announced that its Foods Advisory Committee will reexamine its fish consumption advisory and issues surrounding mercury in commercial seafood. But even as this particular debate continues, it remains clear that, above all, adequate steps are needed to reduce the amount of mercury emitted into the environment in the first place.

Seeking satisfactory standards

The Clean Air Act Amendments, passed in 1990, require that EPA establish emission standards for the major sources of 188 different hazardous air pollutants, including mercury. These standards must require the maximum

degree of emission reductions that EPA determines to be achievable, and hence are known as Maximum Achievable Control Technology (MACT) standards. EPA already has set MACT standards for several major sources of mercury emissions. For incinerators used to burn municipal wastes and to destroy medical wastes, EPA has established standards that will reduce their mercury emissions by 90 percent and 94 percent, respectively. Similar standards also have been proposed for hazardous waste incinerators.

Utilities are the last major source of unregulated mercury emissions. The industry secured congressional exemptions from the MACT standards until EPA conducted a number of studies on mercury's sources and health effects. The studies concluded, among other things, that out of 67 toxic air pollutants emitted from coal-fired power plants, mercury was of greatest concern. Armed with these data and working under a deadline imposed by a federal court, EPA announced a plan to propose regulations for utility mercury emissions by 2003, finalize them in 2004, and require actual mercury reductions in 2007. Based on data already collected from analyses of coal-fired boilers, EPA has estimated that up to 90 percent reductions may be required under the MACT standard.

But as EPA was moving ahead, the Bush administration stepped in. On February 14, 2002, the administration proposed its "Clear Skies Initiative," which would reduce power plant emissions by only 46 percent in 2010 and 69 percent in 2018, rather than the 90 percent reduction in 2007 under a MACT standard. Because this proposal requires congressional action to become law, the administration is looking for an influential member of Congress to introduce it.

In response, numerous members of both parties in the Senate and House have called on the administration to continue developing strict MACT standards and to strengthen its legislative proposal for mercury. Their advice is sound, on both technical and economic grounds.

Technology available

Even though they are not yet required to reduce mercury emissions, utilities already have removed 35 percent of the mercury from the coal they burn, without really trying. This is because many of the pollution control technologies installed on power plants to remove nitrogen oxides (NOx), sulfur dioxide (SO2), and particulates also are removing mercury from the flue gas. With new regulations for NOx, SO2, and particulates expected in the near future, the industry's incidental mercury capture rate is expected to increase further as additional controls for these pollutants are installed. EPA estimates that 46 percent of mercury emissions can be reduced by 2010 in this manner--exactly the level of reduction called for in the administration's Clear Skies Initiative. It would seem, then, that this proposal is not calling for much extra effort on the part of utilities.

There is sound evidence that mercury emissions from coal-burning power plants can, in fairly short order, be cut dramatically and cost-efficiently.

Indeed, some combinations of existing pollution control technologies have achieved more than 98 percent mercury reductions at individual power plants. Of course, attaining consistent 90 percent mercury reductions across the industry, the level proposed by Sen. Jeffords and under EPA estimates, will be much more difficult than relying completely on other regulations and the

control technologies they require. To help reach this goal, the Department of Energy (DOE) has partnered with eight groups of utilities and entrepreneurs to fund mercury control projects on actual power plants. The basic strategy of these ventures is to find new ways to enhance the ability of existing control technologies to capture mercury. Through this program, DOE hopes to develop control options that are cost-effective and can reliably reduce mercury emissions by 50 to 70 percent by 2005, and by 90 percent by 2010. On the basis of preliminary results, DOE believes that it will meet the first goal this year, and although DOE's second goal of reaching 90 percent reduction by 2010 is three years after EPA's target date, the developers of the technology being tested, as well as other entrepreneurs in the field, believe that they will exceed this goal as well.

Utilities sometimes argue that these reduction levels will be more difficult to reach using certain types of coal. For example, mercury from subbituminous coal, common in the western states, is difficult to control because it exists mostly in the elemental form in flue gas. But some utilities that burn subbituminous coal already have achieved approximately 75 percent reductions using existing control equipment, and a number of new technologies are being developed that can reduce mercury from such coal as effectively as from bituminous coal. It also should be noted that EPA has considered having different requirements for different types of coal under the MACT standards being developed. Even under this scenario, EPA calculated that 43 tons of mercury emissions could be reduced overall, which is still a 90 percent reduction from the current total.

Another obvious concern for utilities is the cost of control measures. Today, the most well-developed option for controlling mercury emissions is called "activated carbon injection," a technology that has been used in incinerators for years. According to recent EPA estimates, use of this technology in power plants today would cost only fractions of a penny per kilowatt hour of electricity produced: a cost roughly the same as for technologies currently used to reduce NOx emissions. Although mercury and NOx pollution pose different health and environmental effects, it would be hard to argue that mercury is less important to mitigate. Also, because NOx regulations did not have a significant effect on consumer prices for electricity, it is not expected that mercury regulations will do so either.

Moreover, it is reasonable to assume that new mercury control technologies now being developed will be even less expensive. DOE's stated goal is to produce technologies that, by 2010, will be 50 to 75 percent cheaper than today's versions. Also, the Electric Power Research Institute currently is evaluating more than a thousand potential processes and sorbent materials for mercury control, and many of these already appear less expensive than using activated carbon. Finally, once regulations are set, control technology costs almost always go down as more entrepreneurs enter the business and more capital is expended in R&D. For example, the projected costs of the Clean Air Act's Acid Rain Program, a regulatory program for SO2 and NOx, fell by two-thirds between 1989 and 1997.

Utilities also express concern about some possible unintended effects of removing mercury from flue gas. For example, utilities now recycle some of the wastes from coal-fired boilers into useful products, such as wallboard, cement, and fertilizer, that are sold to help offset operating costs. The remaining wastes typically are put into landfills. Both options rest on the fact that today's wastes contain very low levels of mercury. However, future

control regulations likely will result in additional levels of mercury in the wastes. Although some observers believe that this minute addition of mercury (which will be in a solid, stable state) will not change the characteristics of the wastes or affect any byproducts produced from them, others are concerned that mercury might escape into the environment through water leaching or volatilization. Future wastes also will probably contain more activated carbon (one of the substances used to remove mercury), and there is some concern that this increase may render certain byproducts, such as cement, unmarketable. EPA, DOE, and others are looking into these issues to determine whether current practices can continue.

Another controversial issue to be addressed is whether the mercury control program eventually adopted should allow utilities to trade mercury credits among facilities. Under a trading program, a power plant could continue to emit high levels of mercury by buying credits from a plant that reduced mercury emissions beyond EPA's requirements. Most stakeholders support trading schemes for pollutants such as SO^2 and NOx. But environmentalists and various community groups think that trading is inappropriate for mercury. They believe mercury to have greater health and environmental effects at the local level than do other pollutants, and thus they think trading would lead to the formation of "hot spots" of contamination around dirty power plants. Answering this question definitively will require more research on mercury's fate once released into the environment. But it appears that there is some justification for treating mercury differently from other pollutants by ensuring that all power plants make significant cuts in their emissions of mercury. This idea is further confirmed by the Clean Air Act itself, under which trading is prohibited for hazardous air pollutants, such as mercury, that are regulated under the MACT program. Sen. Jeffords's proposed legislation also would prohibit mercury trading, whereas the administration's proposal would allow it.

With all these various forces at work, determining a solution to the mercury problem will not be easy, and members of Congress will have to consider a number of issues as they decide how to proceed. Fortunately, even if Congress fails to pass legislation to address mercury emissions, EPA still will be required to propose MACT standards for power plants by December 2003. Many observers believe that this route actually will be more effective in protecting human health, since it has been used successfully to regulate other hazardous air pollutants listed in the Clean Air Act. However, in light of the expected effort by the Bush administration to weaken EPA's position, the safest way to ensure swift and decisive action is for Congress to pass legislation calling for a 90 percent reduction in mercury emissions in 2007. Such action will protect the long-term health and well being of the nation's lakes, streams, wildlife, and--most important--its people.

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