APRIL 2014
FS:14-04-C

Protecting Our Waters from Toxic Power Plant Discharges and Reducing Water Use in the Process

In addition to using water for cooling, thermoelectric power plants use water to manage and transport waste and to operate air pollution control technologies. These air pollution control technologies themselves produce significant amounts of waste that contains toxic metals and other harmful pollutants. Every year, power plants dump millions of tons of toxic pollutants into our nation's waterways. Coal-fired power plants alone account for 72 percent of all toxic water pollution in the country. On June 7, 2013, the U.S. Environmental Protection Agency (EPA) published a proposed rule to amend its effluent limitations guidelines for steam electric power plants. The proposed guidelines, if finalized, will for the first time set federal limits on levels of toxic metal discharges from existing and new U.S. power plants. The proposed rule could also lead to a significant reduction in water use by power plants nationwide—but only if EPA chooses the right regulatory option.

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POWER PLANTS WITHDRAW WATER FOR PURPOSES OTHER THAN COOLING

Although the great majority of water withdrawn by thermoelectric power plants is used for cooling, water plays many other important roles in generating electricity. These "process water" roles includes (among other things) managing and transporting waste and operating air pollution control technologies.

Take coal-fired power plants as an example. As in all steam electric power plants, water is used to cool the steam that drives the turbines and to control toxic emissions from the plant. In addition, water is often used to manage the large quantities of ash that result from burning coal. There are two types of coal ash: fly ash, the tiny particles that escape up the chimney or stack; and bottom ash, which does not rise. After collection, the fly ash and bottom ash must be managed and disposed of, usually by depositing in unlined landfills or in wet surface impoundments. When managed in wet surface impoundments, significant amounts of water are used to flush the ash to ash ponds. Materials in landfills or surface impoundments, especially ones that are unlined, can leach into groundwater. Worse, the impoundment may fail altogether. In 2008, for example, a coal ash impoundment at the Tennessee Valley Authority's Kingston Fossil Plant collapsed, releasing an estimated 5.4 million cubic yards of fly ash onto the areas adjacent to the plant and into the main channel of the Emory River.[1] Coal ash contains toxic substances that can contaminate drinking water supplies and harm local ecosystems; thus, when coal ash disposal sites lack adequate safeguards, they pose a significant threat to surrounding communities.

Burning coal also emits large quantities of harmful pollutants, including sulfur dioxide, nitrous oxides, and mercury. Sulfur dioxide and nitrous oxides can mix with rain or snow to form acid rain, which increases the acidity of lakes and streams and can harm or kill plants and animals. Mercury is a toxic heavy metal that impairs the brain development of infants and children and has also been linked to heart problems. After leaving the smokestack, the mercury falls to the ground and accumulates in water bodies and subsequently in the tissues of fish and of people and animals that consume those fish. According to the EPA, coal plants are responsible for more than half of all U.S. emissions of mercury that result from human activity.

Pollution control equipment called scrubbers can significantly reduce power plant emissions of dangerous pollutants into the atmosphere. There are two types of scrubbers: wet and dry. Most coal-fired power plants use wet scrubbers, which require a significant amount of water to operate. In wet scrubbers, limestone powder is mixed with water and sprayed into the smokestack. As the smoke passes through this mixture, the limestone absorbs the sulfur dioxide, thereby preventing it from being released into the atmosphere. This process also produces tons of sludge waste that must be properly handled since it contains the harmful pollutants that would otherwise be emitted into the atmosphere.

EVERY YEAR THERMOELECTRIC POWER PLANTS DUMP MILLIONS OF TONS OF TOXIC POLLUTANTS INTO OUR NATION'S WATERWAYS

According to the EPA, thermoelectric power plants alone contribute 50 percent to 60 percent of all toxic pollutants discharged to surface waters by all industrial categories under the Clean Water Act (CWA).[2] Among the various types of thermoelectric generating units, coal-fired plants are the biggest source of that toxic pollution. Out of the 1,100 steam electric facilities currently operating in the United States, about half are coal-fired power plants.[3,4] Every year, these plants dump millions of tons of toxic heavy metals such as arsenic, selenium, lead, mercury, boron, and cadmium into waterways across the nation.

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EPA's Proposed Effluent Limitations Guidelines for Steam Electric Generating Units

On June 7, 2013, the EPA published a proposed rule to amend its effluent limitations guidelines (ELGs) for steam electric power plants. The proposed amendment, if finalized, will for the first time set federal limits on levels of toxic metal discharges from existing and new power plants nationally. Because coal-fired power plants are the largest source of toxic water pollution among all the steam electric generating facilities in the country, the proposed ELGs will have the biggest impact on coal-fired plants.

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The aim of the proposed rule is to reduce the amount of toxic metals and other pollutants discharged into surface waters by thermoelectric power plants. Such regulatory action is necessary in part because the development of new air pollution control technologies over the past 30 years has "altered existing waste streams or created new wastewater streams at many power plants," particularly those burning coal.[5] For example, while scrubbers are designed to capture toxic metals and other harmful air pollutants, when those pollutants are captured, the threats they pose are shifted from the air to the ground. In other words, the mercury and other pollutants that previously contributed to air pollution have become solid wastes that may be discharged through the ground into nearby surface waters. The proposed ELGs are designed to address this trade-off of one toxic environmental contamination for another.

The regulations propose to establish new or additional requirements for wastewater streams generated from seven types of processes or by-products: flue gas desulfurization (FGD) wastewater, fly ash transport water, bottom ash transport water, combustion residual leachate, nonchemical metal cleaning wastes, and wastewater from flue gas mercury control systems and gasification systems. To that end, the EPA presented a total of eight regulatory measures, four of which are EPA's "preferred options" for existing sources. the agency also identified one preferred alternative for the regulation of new sources. The regulatory options presented by the EPA differ in terms of the size of the units that would be subject to control and the stringency of the controls that would be imposed. Unfortunately, EPA's four preferred options for existing sources do not include the two most protective measures, Options 4 and 5. These options are the most protective because they establish a zero discharge effluent limitation requirement for pollutants in both fly ash and bottom ash transport water. Moreover, under Option 5, the discharge requirement for FGD wastewater is based on chemical precipitation and vapor compression evaporation, which is the leading technology for the treatment of FGD wastewater and the only type of treatment that addresses all the pollutants present in the FGD waste stream.

NRDC joined a set of technical comments prepared by the Environmental Integrity Project, the Sierra Club, Earthjustice, and others, urging the EPA to select Option 5, or at a minimum Option 4, as the final rule.[6]

EPA's Discharge Limits Can Significantly Reduce Power Plants' Water Use

If implemented, the proposed ELGs not only would significantly reduce or eliminate discharges of pollutants from coal ash and other types of power plant waste, but would also dramatically reduce the amount of water that is used to handle these pollutant discharges. The eight options presented by the EPA vary in their level of control; higher levels of control mean lesser amounts of toxic metals and pollutants are allowed to be discharged. In order to comply with the more protective effluent limitations standards, plants will have to adopt technologies that use little or no water at all for managing fly ash and bottom ash and for controlling their toxic emissions.

For example, under Options 4 and 5, EPA would establish a zero discharge effluent limitation requirement for discharges of pollutants in both fly ash and bottom ash transport water.[7] For fly ash, the recommended technology basis for achieving compliance with the discharge requirements under Options 4 and 5 is dry handling.[8] With respect to bottom ash, the recommended technology basis under Options 4 and 5 is either dry handling or a closed-loop system.[9]

Dry handling refers to a method of managing coal ash that avoids all use of water: Instead of using water to flush the ash to ash ponds, air is used to transport the ash to storage silos. For fly ash, dry handling is a well-established practice within the industry. In fact, all of the newer power plants employ dry fly ash handling methods because for more than 30 years, the CWA's New Source Performance Standards have required such handling for new sources. In addition, according to the EPA, many older plants have converted to dry fly ash handling systems.[10] As a result, the economic impact of requiring dry handling of fly ash would be relatively small, given that the overwhelming majority of plants that generate fly ash already use dry handling technology. The EPA projects that basing fly ash effluent limits on dry handling would cause only 12 percent to 13 percent of all coal-, petroleum coke-, and oil-fired plants to incur compliance costs.[11] In other words, 87 to 88 percent of all existing steam electric power plants would have zero compliance costs to comply with a discharge standard based on dry handling of fly ash. Thus, dry handling of fly ash is economically feasible for industry.

Similarly, the cost of converting to zero discharge systems for handling bottom ash can be reasonably borne by industry. Such is the conclusion even using the EPA's cost estimates, which overestimate costs by ignoring economies of scale, counting units that will likely retire or convert regardless of the proposed rule, and overstating projected operating and maintenance costs. The EPA estimates that requiring all units with an output greater than 50 megawatts to meet a zero discharge standard for bottom ash would require retrofits at only 22 percent of all power plants.[12] In other words, 78 percent of all steam electric generating units would have zero compliance costs as a result of a requirement to convert to dry bottom ash handling, thereby making this technology also economically feasible for industry. With respect to the handling of FGD wastewater, the recommended technology basis under Options 4 and 5 would require power plants to recycle it, thereby yielding further reductions in water use. The EPA calculated that power plants would reduce water use by 153 billion gallons per year, or about 419 million gallons per day, under Options 4 and 5, due to the recycling of FGD wastewater and reductions in water use for handling ash transport.[13] Although power plant cooling water withdrawals nationwide are substantially greater than 153 billion gallons per year, this reduction in process water is nearly equivalent to the amount of water supplied annually to residential customers by *all the water utilities in North Carolina* and thus is a significant amount of water to save with any single regulatory measure.[14]

In addition to joining the technical comments prepared by the Environmental Integrity Project and others, NRDC contributed a separate memorandum addressing the water savings aspect of the proposed ELGs. In the memo, NRDC urged the EPA to select Option 5—or, at minimum, Option 4—as the final rule because not only would Options 4 or 5 remove the most pollutants from coal-fired power plant discharges, but they would also yield the greatest amount of water savings.

ENDNOTES

1 Shaila Dewan, "Tennessee Ash Flood Larger Than Initial Estimate," *The New York Times*, December 26, 2008, www.nytimes.com/2008/12/27/us/27sludge.html?_r=0.

2 U.S. Environmental Protection Agency (EPA), *Proposed Rule, Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, 78 Fed. Reg. 34,432, June 7, 2013, 34,435 ("ELGs").

3 Thomas J. Feeley, III et al., *Department of Energy/Office of Fossil Energy's Water-Energy Interface Research Program*, U.S. Department of Energy, National Energy Technology Laboratory, Science Applications International Corporation, April 2006, citeseerx.ist.psu.edu/viewdoc/download;jsessionid=7F1ED0EFABAAD0FCB980500BCEAD0FC8?doi=10.1.1.151.6007&rep=rep1&type=pdf.

4 *See, e.g.*, U.S. EPA, *Steam Electric Power Generating Effluent Guidelines*, Proposed Rule, April 2013, water.epa.gov/scitech/wastetech/guide/steam-electric/.

5 *ELGs*, at 34,435.

6 Comments of the Environmental Integrity Project et al. to U.S. EPA, *Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: Proposed Rule*, 78 Fed. Reg. 34,432, June 7, 2013 (comments filed September 20, 2013) (Document ID No. EPA-HQ-OW-2009-0819; EPA-HQ-RCRA-2013-0209).

7 *ELGs*, at 34,461-34,462.

8 Ibid.

9 Ibid.

10 *ELGs*, at 34,439.

11 U.S. EPA, *Incremental Costs and Pollutant Removals for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, April 2013, p. 9-1.

12 *ELGs*, at 34,447.

13 U.S. EPA, *Technical Development Document for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category*, April 2013, p. 12-13, 12-14.

14 Joan F. Kenny et al., *Estimated Use of Water in the United States in 2005*, U.S. Geological Survey Report Circular 134 (2009), p. 38, pubs.usgs.gov/circ/1344/pdf/c1344.pdf.