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Coal Ash Disposal Challenge (Part 1)

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(Editor’s Note: This post is the first of a two-part series on coal ash disposal. The first part focuses on federal coal ash regulations. The second examines coal ash in Texas.)

In February of this year, we heard a lot about the discharge of coal ash into the Dan River, which runs along the North Carolina and Virginia border. At a retired Duke Energy coal-fired plant in Eden, North Carolina, two pipes ruptured at a coal ash containment basin, spilling as much as 39,000 tons of coal ash and 27 million gallons of contaminated water into the river. The coal ash contained arsenic and other heavy metals—such as aluminum and iron—at amounts exceeding state surface water standards. The U.S. Fish and Wildlife Service has described a “coal ash bar” near the site of the spill that is 5 feet thick, 75 feet long, and 15 feet wide. The FWS has also declared that the bottom of the Dan River is coated with coal ash for at least 70 miles.

The incident has raised some interesting questions: What is coal ash? Was the accident predictable, and if so, aren’t there regulations in place to prevent this kind of thing from happening? Why was the containment pond next to a river? Should we be alarmed? This blog post explores these questions and raises others, many as yet unanswered.

What is Coal Ash?

Coal ash is the common name for coal combustion residuals, the materials that remain after coal is burned for electricity and industrial applications. Coal ash contains contaminants, which can be toxic (e.g., arsenic, lead, mercury, cadmium, chromium, selenium, aluminum, antimony, barium, beryllium, boron, chlorine, cobalt, manganese, molybdenum, nickel, thallium, vanadium, and zinc). More than 100 million tons of coal ash are generated yearly. Of that, about 44% is reused in applications such as concrete, cement, fills, embankments, road base, and blasting grit/roofing granules.

The utilization of coal ash in encapsulated form (when bound into a product) is considered a “beneficial use” providing a functional benefit. That is, the production of materials using coal ash conserves natural resources that would otherwise be impacted through extraction of virgin materials, consumes less energy, generates fewer greenhouse gases, and has less impact on water resources.

Coal Ash Disposal and Associated Risks

When coal ash is not reused, however, its disposal creates a challenge—it’s the second-largest industrial waste stream in the U.S., after mining wastes. Approximately 56% of the coal ash generated is disposed of in either liquid form at surface impoundments, or in solid form at landfills. Coal ash is currently disposed of at approximately 2000 dumpsites across the U.S. Dumpsites could include: (1) surface impoundments; (2) surface landfills; and (3) mines where coal ash is used as fill.

When disposed of in unlined and clay-lined surface impoundments and landfills, coal ash contaminants can be released to the environment. The contaminants can be released via water and wind erosion and leaching from landfills, and via leaching through the bottom of surface impoundments. The contaminants can then be transported through various pathways, including air, overland runoff, surface water, and groundwater. Plants and animals can then take in and accumulate the contaminants, which can harm and kill them and the animals that feed on them.

Humans can be exposed to the contaminants directly and indirectly, through direct contact with or ingestion of contaminated air, water, soil, produce, beef, milk, and fish.

Exposure to coal ash contaminants pose serious human health concerns as the toxicants in coal ash can cause cancer, neurological damage, heart damage, lung disease, respiratory distress, kidney disease, birth defects, cognitive deficits, developmental delays, and behavioral problems.

The supporters of federal regulation believe is that coal ash is highly toxic, though challengers to this belief point out that after studying coal-fired utility wastes in 1993 and again in 2000, the EPA itself concluded that the regulation of certain large volume fossil-fuel combustion wastes—such as coal ash—as hazardous waste was unwarranted. An independent industry study in 1998 suggested that while trace elements may leach from coal ash that has been in prolonged contact with the water table, they generally do not migrate far from the ash site, and when they do, they present in very low concentrations; therefore, they do not present a health threat. In 2006, the EPA concluded that mercury in coal ash is unlikely to be leached at levels of environmental concern.

Lining pits can help mitigate the risks of human and environmental exposures. But the effectiveness of the mitigation hinges on the design and composition of the lining. Clay is commonly used for lining and yields lower leaching risks than unlined units. But clay-lining is not as effective as the more expensive composite-lining, which EPA reports have found to effectively reduce risks from all pathways and constituents below the risk criteria.

In addition, the catastrophic failure of a surface impoundment can result in the loss of human life, disruption of ecosystem habitats, and the destruction of property.

Regulation of Coal Ash Disposal

The federal government does not comprehensively regulate the disposal of coal ash, but general federal environmental laws may implicate certain aspects of disposal. For example, discharges of pollutants from coal ash management units to waters of the U.S. may be regulated under the National Pollutant Discharge Elimination System authorized by the Clean Water Act. And fugitive coal ash dust exceedances may be regulated under National Ambient Air Quality Standards for fine particulate matter.

Still, the regulation of coal ash disposal currently falls principally upon the states, which generally manage disposal through their solid waste management or water programs. This scheme has resulted in a patchwork of regulations that are inconsistent from state to state and sometimes provide insufficient protections against water contamination and surface impoundment failures.

For example, a 2011 report from Earthjustice and Appalachian Mountain Advocates found that most states do not require surface impoundments and landfills to employ safeguards such as composite liners, groundwater monitoring, leachate collection systems, and dust controls; nor do most States require that surface impoundments be operated to avoid catastrophic collapse. In addition, most States allow disposal sites to be placed in water tables, wetlands, and floodplains.

Water Contamination and Impoundment Failure

Since as early as 1967, toxics from coal ash disposal sites have contaminated groundwater and surface water with concentrations of certain heavy metals that exceed federal health-based standards for drinking water. About 200 such cases of contamination have been documented as of this year; however, because many states do not require monitoring at disposal sites, other instances of contamination may have gone undetected.

Furthermore, surface impoundment failures have occurred about every three years since 2002, releasing millions of pounds of toxic sludge into waterways and drinking water sources (about 42 releases were reported between 1995 and 2009, with 5 characterized by the EPA as “significant”—releases of between 1 million and 1 billion gallons—and 1 “catastrophic” release of over 1 billion gallons).

The Dan River accident is just the latest failure; however, the largest environmental disaster in U.S. history was associated with a coal ash surface impoundment failure. In 2008, a surface impoundment managed by the Tennessee Valley Authority broke open, creating a massive spill in Kingston, Tennessee. Over one billion gallons of coal ash was released into the Emory and Clinch Rivers, destroying 3 homes, damaging a dozen others, contaminating approximately 300 acres of land, and requiring hundreds of millions of dollars in cleanup costs and restoration of the environment. By volume, the Kingston spill was 100 times greater than the Exxon Valdez oil spill and 5 times larger than the BP Deepwater Horizon spill.

EPA’s Proposed Rule to Regulate Coal Ash

Coal ash was originally exempted from federal regulation under the 1980 Bevill Regulatory Determination (known as the Bevill exemption). The exemption provided that certain large-volume wastes generated primarily from the combustion of coal and other fossil fuels would not be regulated under subtitle C of the Resource Conservation and Recovery Act (RCRA), the provision that regulates hazardous waste.

Concerned about the potential health hazards posed by inconsistent coal ash disposal under state regulations, environmentalists urged the EPA to reverse the Bevill exemption, thereby allowing it to regulate coal ash as a hazardous waste. In 1993 and again in 2000, the EPA concluded that significant improvements were being made in waste management practices at the state level and that it would, therefore, retain the Bevill exemption. As a backstop, the Agency eventually agreed to issue a regulation establishing minimum national standards under subtitle D of RCRA, the provision that regulates non-hazardous waste. The subtitle D standards were never issued, however, and as a result, there are currently no national regulations of coal ash under RCRA.

Ultimately, the Kingston spill and remaining gaps in state regulations prompted the EPA to propose federal regulations in 2009 to provide consistent standards for the disposal and management of coal ash. The EPA issued a notice of proposed rulemaking to regulate the disposal of coal ash that included two options—one option under subtitle C and one under subtitle D. Although the agency released the draft rule about a half a decade ago, it has not yet adopted a final rule (the EPA has agreed to finalize the rule by December of this year). In the interim, it has continued to receive comments and investigate the viability of the two approaches.

Under both options, the rule would regulate coal ash from coal-fired electric utilities and independent power plants specifically, because surface impoundments and landfills are predominantly owned and operated by electric utilities. The two approaches are compared more fully below.

The Subtitle C Approach

RCRA subtitle C applies to the generation, transportation, treatment, storage, and disposal of pertinent solid wastes. Solid waste may become subject to regulation under subtitle C if it exhibits certain hazardous properties, called “characteristics” (ignitability, corrosivity, reactivity, or toxicity), or if EPA has specifically listed it as hazardous. A waste may be listed if it contains certain hazardous constituents and EPA concludes (based on scientific studies) that it has toxic effects on humans or other life forms.

Under the subtitle C option, coal ash destined to be disposed of in landfills or surface impoundments would be listed as “Special Wastes” in a new section of the regulation. This option would include a federal requirement for states to issue permits to facilities managing the disposal, treatment, or storage of coal ash. The EPA would also issue requirements for storage, including for containers, tanks, and containment buildings.

Facilities managing coal ash would also have to meet requirements for siting, liners, run-on and run-off controls, groundwater monitoring, fugitive dust controls, and financial assurance. Corrective actions, the closure of units, and post-closure care would be monitored by states and the EPA. The EPA and individual states would be able to pursue enforcement proceedings.

The rule would also regulate the disposal of coal ash in sand and gravel pits, quarries, and other large fill operations as a landfill. To address the potential for catastrophic releases from surface impoundments (such the Dan River and Kingston failures), the subtitle C option would also include requirements for dam safety and stability for impoundments; restrictions on treatment standards for coal ash stored in surface impoundments; measures intended to phase out the use of surface impoundments; and, a prohibition on the disposal of treated coal ash below the natural water table.

The Subtitle D Approach

Under RCRA, solid waste that does not qualify for regulation under subtitle C falls to subtitle D. However, subtitle D relates only to the disposal of solid waste—it does not have the cradle-to-grave comprehensiveness of subtitle C. Furthermore, under the subtitle D option of EPA’s proposed coal ash rule, the EPA would only be able to establish the overall regulatory direction by providing minimum nationwide standards and technical assistance, while the planning and implementation of solid waste programs would happen at the state and local level.

For example, the subtitle D option would not include a permitting mandate, although states could require permits as part of their own programs. Nor would the EPA issue requirements for storage. Corrective actions, the closure of units, and post-closure care would be monitored by the states alone. Enforcement would be handled primarily by states that would adopt their own management programs (although not federally enforceable, citizen’s suits could be filed). The EPA, however, may pursue enforcement actions if the handling, storage, treatment, transportation, or disposal of regulated wastes presents an imminent and substantial endangerment to health or the environment.

Other disposal standards mirror those in the subtitle C option. That is, facilities managing coal ash disposal would be subject to minimum standards with respect to: siting, liners, groundwater monitoring, fugitive dust controls, dam safety requirements, and financial assurance. Also, the disposal of coal ash in sand and gravel pits, quarries, and other large fill operations would be regarded as landfill.

Both of the options proposed by the EPA would require the closure of all existing surface impoundments that do not meet the new technical requirements (subject to a delayed compliance date); therefore, the EPA is also considering modifications to grandfather existing surface impoundments to operate for the remainder of their useful lives.

Timing

If the subtitle C option is chosen for the finalized rule, it would become effective as each state adopts the rule and could take 2 years or more to fully implement. On the other hand, if the subtitle D option is selected, it would be effective 6 months after the final rule is promulgated (certain provisions will have a longer effective date).

What the Proposed Rule Doesn’t Cover

The EPA is not proposing to change the regulatory determination under RCRA for beneficially used CCRs, which are currently exempt from hazardous waste regulation under RCRA. However, EPA plans to clarify this determination with regard to potential refinements for certain beneficial uses. The EPA’s proposal also doesn’t address the placement of coal ash in mines, but the EPA may address this in a later regulatory action in conjunction with the U. S. Department of Interior. And coal ash from non-utility boilers is not included—the EPA has suggested that it will decide on an appropriate action for these wastes after completing this rulemaking effort.

- coal, coal ash, epa, RCRA

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