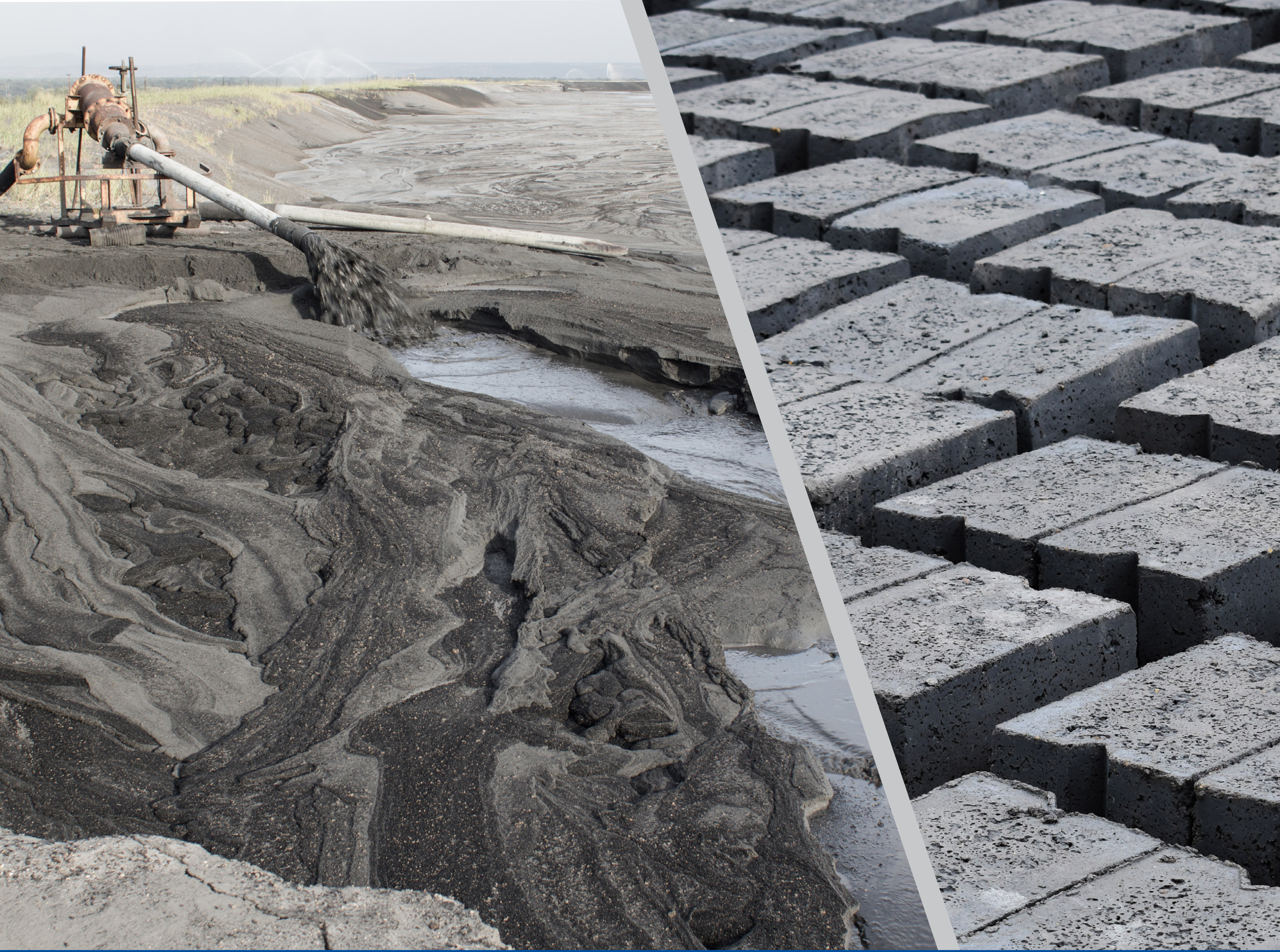

A COMPREHENSIVE SURVEY OF COAL ASH LAW AND COMMERCIALIZATION:

Its Environmental Risks, Disposal Regulation, and Beneficial Use Markets

National Association of Regulatory Utility Commissioners | January 2020

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Acknowledgments and Disclaimers

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SECTION 1:
Executive Summary

This white paper, ***A Comprehensive Survey of Coal Ash Law and Commercialization:*** *Its Environmental Risks, Disposal Regulation, and Beneficial Use Markets* (Comprehensive Survey) was commissioned by the National Association of Regulatory Utility Commissioners (NARUC) under a grant from the U.S. Department of Energy (DOE), in response to a major rule, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule* (Final Rule) issued by the U.S. Environmental Protection Agency (EPA) on April 17, 2015,[1] on coal ash disposal and remediation of disposal sites, which has significant implications to states. It subjects state environmental agencies and public utility commissions to regulatory responsibilities to implement federal regulations under the Final Rule and oversee the cost implications on electric customers. Members of the NARUC Subcommittee on Clean Coal and Carbon Management, along with DOE and NARUC staff and other state public utility commissioners, helped to conceptualize and guide this resource as a tool to assist state public utility commissions in understanding markets, regulations, and policy relevant to coal ash, including recent EPA rulemakings.

The EPA issued its Final Rule, using its authority over the management of hazardous and nonhazardous waste under the Resource Conservation and Recovery Act (RCRA[2]) to establish national minimum criteria for the disposal of coal combustion residuals (CCR) or coal ash as a nonhazardous waste. The Final Rule promulgates complex and technical criteria for the management of active coal ash disposal facilities and for closing facilities that cannot comply with the criteria, in addition to providing a regulatory exception for recycling and reuse activities that qualify as a beneficial use of CCR.

To better evaluate the regulatory issues underlying the choices facing utilities and independent power producers (IPPs) regarding coal ash management options under the Final Rule, an overview of coal ash production and disposal practices is helpful. This comprehensive survey provides background information on the following topics: (a) coal ash production by a coal combustion generation plant, (b) the historical practices of utility waste management practices, (c) coal ash toxicity and related constituents, (d) further understanding of potential impacts to groundwater, and (e) the aging structures and outdated designs of coal ash surface impoundments and landfills.

Together with the background provided in the overview, the history of regulatory oversight of coal ash waste establishes a foundation for understanding the regulatory drive to address the environmental risks of coal ash that resulted in the 2015 Final Rule. The question of regulating coal ash waste was first raised in relation to RCRA that was enacted in 1976 to address increasing concern that open dumping practices being used for municipal and industrial waste streams that qualified as hazardous waste risked public exposure to chemical and toxic substances. It was amended in 1984 by the Hazardous and Solid Waste Amendments (HSWA[3]) to add subtitle D, which prohibits "open dumps" and established a second regulatory framework applicable to the disposal of nonhazardous waste.

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1 Final Rule, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 80 *Federal Register* 21,302 (2015), [hereinafter *Final Rule*]. The Final Rule was signed by the EPA Administrator on Dec. 19, 2014, published in the Federal Register on Apr. 17, 2015; and became effective on Oct. 14, 2015. https://www.federalregister.gov/documents/2015/04/17/2015-00257/hazardous-and-solid-waste-management-system-disposal-of-coal-combustion-residuals-from-electric.

2 Resource Conservation and Recovery Act of 1976, 94 P.L. 580, 90 Stat. 2795 (codified as amended at 42 U.S.C. §§ 6901-6992k); amended by Solid Waste Disposal Act Amendments of 1980, 96 P.L. 482, 94 Stat. 2334 (codified at 42 U.S.C. §§ 6991-6991m); and Hazardous and Solid Waste Amendments of 1984, 98 P.L. 616, 98 Stat. 3221 (codified at 42 U.S.C. § 6924). https://www.law.cornell.edu/uscode/text/42/chapter-82.

3 Hazardous and Solid Waste Amendments of 1984, 98 P.L. 616, 98 Stat. 3221 (codified at 42 U.S.C. § 6924). https://www.law.cornell.edu/uscode/text/42/chapter-82.

The enactment of RCRA triggered a series of investigative proceedings by EPA to determine the need for regulation of coal ash as hazardous waste. The Bevill Amendment to RCRA in 1980 formalized investigations being conducted by EPA as to whether coal ash should be regulated as hazardous waste, requiring EPA to report back to Congress. Based on its investigations, EPA issued determinations in 1988,4 1993,5 and 20006 that coal ash should not be regulated as hazardous waste under RCRA subtitle C. Its 2000 Determination further announced EPA's intention to regulate coal ash waste as nonhazardous under subtitle D.

Before EPA could follow-through with its intention, the largest coal ash spill in U.S. history occurred in 2008.[7] The spill was caused by the failure of a dike at the surface impoundment sited at Tennessee Valley Authority's (TVA) Kingston generation station, highlighting the structural risks of these surface impoundments. The dike failure caused 5.4 million cubic yards of coal ash to spill into Tennessee's Emory River and across the neighboring community.[8] The environmental spillage was 100 times larger than the Exxon Valdez spill in Alaska and the BP oil spill in the Gulf Coast.

Two regulatory actions occurred following the Kingston spill. In 2010, EPA proposed its rules for regulating coal ash as nonhazardous waste[9]. EPA also commenced its *Coal Ash Surface Impoundment Integrity Assessment Program (Surface Impoundment Assessment Program),* working with utilities and IPPs to collect data and perform on-site inspections of 676 coal ash surface impoundments at 240 generation stations.[10] However, the efficacy of EPA's assessments and on-site inspections only went so far. In the same year, 2014, that EPA published its assessments' results, the third largest spill[11] in the country occurred at Duke Energy's Dan River generation station in North Carolina, almost five years after the Kingston spill. A break in a pipe underneath the station's surface impoundment allowed 39,000 tons of coal ash slurry to escape and flow into the Dan River.[12]

Finally, in 2015, shortly after the Dan River spill, EPA issued its Final Rule, using its authority over the management of hazardous and nonhazardous waste under RCRA to designate coal ash as nonhazardous waste and to establish national minimum criteria for the disposal of coal ash, more formally referred to as coal combustion residuals (CCR). The national minimum criteria promulgated in the Final Rule and succeeding amendments are highly technical and complex and are designed to address environmental risks from groundwater contamination, structural failures of CCR surface impoundments and fugitive dust emissions and

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4 Availability of Report to Congress on Wastes from the Combustion of Coal by Electric Utility Power Plants; Public Hearings, 53 *Federal Register* 9976 (Mar. 28, 1988).

5 Final Regulatory Determination, Final Regulatory Determination on Four Large-Volume Wastes from the Combustion of Coal by Electric Utility Power Plants, 58 *Federal Register* 42,466, 42,476 (Aug. 9, 1993).

6 Regulatory Determination, Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels, 65 *Federal Register* 32,214, (2000).

7 EPA Response to Kingston TVA Coal Ash Spill, EPA (Dec. 23, 2016). https://www.epa.gov/tn/epa-response-kingston-tva-coal-ash-spill.

8 Jamie Satterfield, *Knoxville News Sentinel* (April 17, 2019), (revealing that TVA's own tests revealed radium, heavy metals in coal ash before 2008 spill). https://www.knoxnews.com/story/news/local/tennessee/tvacoalash/2019/04/17/tva-internal-records-reveal-radium-heavy-metals-found-in-coal-ash/3275139002/.

9 Proposed Rule, *Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals from Electric Utilities,* Proposed Rule, 75 *Federal Register* 35,128 (June 21, 2010).

10 *Frequent Questions about the 2015 Coal Ash Disposal Rule,* EPA (Nov. 2, 2018), https://www.epa.gov/coalash/frequent-questions-about-2015-coal-ash-disposal-rule; *also see Effort to Assess Coal Combustion Residuals (CCR) Disposal Units*, EPA (Aug. 29, 2016). https://www.epa.gov/coalash/effort-assess-coal-combustion-residuals-ccr-disposal-units.

11 The second largest coal ash spill was in Wisconsin on October 31, 2011. A cliff collapsed and tons of coal ash fell into Lake Michigan. Associated Press, "A Look at 3 of the Largest Coal Ash spills in the US" (December 19, 2014), http://www.startribune.com/a-look-at-large-coal-ash-spills-in-the-us/286393991/. This coal ash spill receives little attention in the literature of coal ash spills. Apparently, this coal ash spill was significant in order of magnitude of coal ash volume but not in environmental impact relative to cleanup, duration, and property damage.

12 Taft Wireback, "EPA Knew of Faulty Pipes at Dan River Ash Basin in 2009," *Greensboro's News & Record* (Mar. 19, 2014). https://www.greensboro.com/news/article_a21bd962-afd0-11e3-80a2-001a4bcf6878.html.

to bring transparency to coal ash disposal operations in the electric generation sector. The national minimum criteria require any non-compliant CCR landfill or CCR surface impoundment to be closed consistent with the closure minimum criteria. However, compliance has become a moving target as certain provisions of the minimum criteria were challenged in various Court of Appeals cases and EPA considers revisions as a result of these legal challenges and court decisions.

Although EPA sets national minimum criteria for the management of coal ash disposal, the major responsibility for implementing and enforcing the regulatory criteria resides with the states under RCRA. Pursuant to the *Water Infrastructure Improvements for the Nation Act of 2016 (WIIN)*,[13] state environmental authorities are responsible for creating and obtaining EPA approval of a permitting program that incorporates and enforces disposal requirements that are at least as restrictive as the national minimum criteria. Once a state permit program is approved, it operates in lieu of EPA's CCR regulations. If a state does not adopt a permit program or its permit program is not approved by EPA, then EPA can implement a federal permit program and enforce permit requirements,[14] but only so long as Congress has appropriated funds for its administration. Congress appropriated the required funds for its implementation in 2018.[15] Two states, Oklahoma and Georgia, have applied for approval from EPA for their CCR permit programs pursuant to WIIN. Oklahoma's program was approved in 2018, but its approval has been challenged by environmentalists in the D.C. Federal District Court.[16] Georgia's program was approved in January 2020.[17]

Several other state legislatures have enacted their own legislative solutions to their coal ash problems that now will need to be integrated into their states' WIIN permit program. Virginia, Illinois, and Michigan enacted legislation in 2019. North Carolina enacted the Coal Ash Management Act (CAMA) in September 2014[18] following the Dan River spill. It subsequently amended CAMA in July 2016 to incorporate the national minimum criteria and performance standards of the Final Rule. CAMA provided an aggressive schedule for closing surface impoundments in North Carolina by 2029, prioritized depending on their CAMA hazardous classification.[19]

Serving as a contrast to regulation of coal ash as waste is the marketing of coal ash products as valuable resources. (See Section 7A for a detailed discussion of coal combustion products). In 2017, 64 percent of the byproducts generated by coal combustion for electricity in the United States were recycled and used in a beneficial end use. Future demand will only increase as research of new uses transition to commercial deployment, including the extraction of rare earth elements (REE) from coal ash, over which China currently has market power.

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13 42 U.S.C. § 6945(d). https://www.congress.gov/114/plaws/publ322/PLAW-114publ322.pdf.

14 EPA has submitted a proposed rule to the Office of Management and Budget on Federal permitting under the WIIN Act. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities: Federal CCR Permit Program, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=2050-AH07. In March 2018 (Pub. L. 115-141) and March 2019 (Pub.L. 116-6), Congress appropriated funding for federal CCR permitting. The proposal would establish a new federal permitting program for disposal of CCR." *Id.*

15 Steven A. Burns & David W. Mitchell, *EPA's Coal Ash Rule Relies on Unique Enforcement Framework*, ABA (Mar. 1, 2015). https://www.americanbar.org/groups/environment_energy_resources/publications/trends/2014-2015/march-april-2015/epas_coal_ash_rule_relies_unique_enforcement_framework/.

16 *See e.g.* Motions for Intervention, Waterkeeper Alliance, Inc. v. Wheeler, United States District Court for the District of Columbia, Jan 29, 2019, Civil Action No. 18-2230 (JDB) (D.D.C. Jan. 29, 2019). https://casetext.com/case/waterkeeper-alliance-inc-v-wheeler.

17 Georgia: Approval of State Coal Combustion Residuals Permit Program, January 10, 2020. https://www.federalregister.gov/documents/2020/01/10/2019-27665/georgia-approval-of-state-coal-combustion-residuals-permit-program.

18 S.B. 729, 2013 Sess. (NC 2013), (including text of CAMA as ratified). https://www.ncleg.net/Sessions/2013/Bills/Senate/PDF/S729v6.pdf.

19 *See* §130A-309.214, https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_130A/GS_130A-309.214.pdf. CAMA also provides a procedure for extending these deadlines. *See* §130A-309.215, Variance authority. https://www.ncleg.gov/EnactedLegislation/Statutes/PDF/BySection/Chapter_130A/GS_130A-309.215.pdf.

Beneficial uses of coal ash, however, are not subject to regulation by EPA under RCRA. Although RCRA was designed to "conserve valuable material and energy resources by [promoting] . . . new and improved methods of collection, separation, and recovery, and recycling of solid wastes,"[20] conservation activities are exempt from direct regulation. Consequently, in promulgating national minimum criteria for coal ash disposal, EPA promulgated a definition of beneficial use[21] to differentiate those use activities that would not be classified as disposal from regulated disposal activities. EPA's beneficial use definition distinguishes between two different forms of coal ash uses, encapsulated and unencapsulated. Both forms can qualify as beneficial uses so long as the use meets the definition's conditions applicable to the respective form.

End-use customers are concerned about maintaining access to byproduct supplies with the annual production rate of coal ash declining as existing coal-fired power plants are modified, repowered or decommissioned. Utilities and IPPs are under a time deadline to comply with environmental regulations that will certainly result in even more constrained supplies while the market demand for "homegrown fly ash" increases, particularly by the cement industry.[22] The commercial beneficial use markets thus are adversely affected by the regulatory pressure to close coal ash facilities. Consequently, public and private partnerships interested in the commercial value of coal ash are working to develop methodologies for harvesting needed coal ash products from the mixed contents of older CCR units. This may require, in turn, flexibility in utility regulatory models to allow utilities to position themselves to take advantage of additional revenue streams associated with these markets, which could partially offset clean-up and compliance costs under EPA's Final Rule.

Activities taken to comply with EPA/state requirements by utilities or IPPs subject to the Final Rule will be costly. Utilities' recovery of compliance costs will usually fall within the purview of state public utility commissions. Estimates of costs range from into the millions for individual coal ash ponds to billions for some utilities, and up to possibly hundreds of billions of dollars across the country, but true cost projections will be dependent on the closure and clean-up methods that are approved by state legislatures and/or environmental regulators. Compliance costs may effectively be established at the permitting stage well before costs are reviewed by public utility commissioners, rendering after-the-fact prudency hearings a controversial issue. Although there are supporters of utility responsibility, the magnitude of costs could impact utility credit ratings and shareholders. The burden of compliance and clean-up costs constitute a difficult question for state utility regulators in allocating liability to shareholders or ratepayers.

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20 Pub. L. 89–272, § 1002(a)(4), 42 U.S. Code § 6901. https://www.law.cornell.edu/uscode/text/42/6901.

21 80 *Federal Register* at 21,329.

22 Homegrown fly ash indicates demand looking to domestic cementitious products instead of imported. "During periods of strong economic performance, the U.S. cementitious market historically has seen approximately 80% of cement produced domestically, with the remaining 20% imported. 'Homegrown fly ash' has always filled a strategic need within the cementitious market, replacing roughly 15-20% of cementitious materials, which in times of healthy economic conditions reduces the amount of cement imported." Danny Gray, Alternative Supplementary Cementitious Materials Availability – The Next 50 Years, Ash at Work, Issue 1 at 6 (2019).

SECTION 2:
Introduction

This white paper, ***A Comprehensive Survey of Coal Ash Law and Commercialization****: Its Environmental Risks, Disposal Regulation, and Beneficial Use Markets* (Comprehensive Survey) was commissioned by the National Association of Regulatory Utility Commissioners under a grant by the United States Department of Energy, in response to a major rule, *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule* (Final Rule) issued by the U.S. Environmental Protection Agency (EPA) on April 17, 2015,[23] on coal ash disposal and remediation of inactive disposal sites, and its complicated antecedents and progeny.

The EPA issued its Final Rule, using its authority over the management of hazardous and nonhazardous waste under the Resource Conservation and Recovery Act (RCRA[24]) to establish national minimum criteria for the disposal of coal combustion residuals (CCR) or coal ash as a nonhazardous waste. The Final Rule promulgates complex and technical criteria for the management of active coal ash disposal facilities and for closing facilities that cannot comply with the standards, in addition to providing a regulatory exception for recycling and reuse activities that qualify as a beneficial use of CCR.

EPA, and not states, has led the regulatory assessment of CCR as hazardous or nonhazardous waste since enactment of RCRA. It issued multiple determinations finding that CCR was not hazardous and thus should not be regulated under subtitle C of RCRA. Not until its 2000 Determination did it announce its intention to pursue regulation of coal ash as nonhazardous waste. It issued a proposed rulemaking in 2010, followed by its Final Rule promulgating the national minimum criteria for management of coal ash waste disposal.

However, prior to the Final Rule, states had the major responsibility for implementing and enforcing the regulatory criteria for nonhazardous waste under RCRA. RCRA did not provide EPA authority to directly enforce its standards nor did it give EPA the authority to mandate that states enforce EPA's anti-dumping, solid waste criteria.[25] Consequently, implementation of EPA's national minimum criteria was generally reliant on a waste facility owner or operator's voluntary compliance. Its enforcement mechanism are citizen suits brought under RCRA for non-compliance with federal regulations adopted under subtitle D unless the state acted to adopt enforceable regulation and permit requirements.

In 2016, Congress addressed the Final Rule's enforcement gap by including provisions in the *Water Infrastructure Improvements for the Nation Act of 2016 (WIIN)* that would amend subtitle D's self-implementation provisions as they would otherwise apply to coal ash. WIIN allows a state to establish its own permit program which then must be submitted to EPA for approval. It can adopt EPA's national minimum criteria or adopt its own criteria for its permit program, so long as its permit program is at least as protective as EPA's federal regulations. Once a state permit program is approved, it operates in lieu of EPA's CCR regulations. However, if a state does not adopt a permit program or its permit program is not approved by EPA, then EPA can implement its own federal permit program but only so long as Congress has appropriated funds for its administration. In

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23 Final Rule, *supra* note 1.

24 Resource Conservation and Recovery Act of 1976, 94 P.L. 580, 90 Stat. 2795 (codified as amended at 42 U.S.C. §§ 6901-6992k); amended by Solid Waste Disposal Act Amendments of 1980, 96 P.L. 482, 94 Stat. 2334 (codified at 42 U.S.C. §§ 6991-6991m); and Hazardous and Solid Waste Amendments of 1984, 98 P.L. 616, 98 Stat. 3221 (codified at 42 U.S.C. § 6924). https://www.law.cornell.edu/uscode/text/42/6901.

25 Steven A. Burns & David W. Mitchell, *EPA's Coal Ash Rule Relies on Unique Enforcement Framework*, ABA (Mar. 1, 2015). https://www.americanbar.org/groups/environment_energy_resources/publications/trends/2014-2015/march-april-2015/epas_coal_ash_rule_relies_unique_enforcement_framework/.

2018, EPA received the required funding.[26] Coal ash units located in states that do not have an EPA-approved permit program would be required to obtain permits under the federal program.

Whether the minimum criteria are implemented through either a state or federal permit program, activities taken in order to comply with EPA/state requirements by utilities or IPPs subject to the Final Rule will be costly. Utilities' recovery of compliance costs will usually fall within the purview of state public utility commissions. Estimates of costs range into the millions for individual coal ash ponds, billions for some utilities, and into possibly hundreds of billions across the country, but true cost projections will be dependent on the closure and clean-up methods that are approved by state legislatures and/or environmental regulators. Compliance costs may effectively be established at the permitting stage well before costs are reviewed by public utility commissioners, rendering after-the-fact prudency hearings a controversial issue.

Utilities' recovery of compliance costs will usually fall within the purview of state public utility commissions. Estimates of costs range into the millions for individual coal ash ponds, billions for some utilities, and into possibly hundreds of billions across the country, but true cost projections will be dependent on the closure and clean-up methods that are approved by state legislatures and/or environmental regulators. Compliance costs may effectively be established at the permitting stage well before costs are reviewed by public utility commissioners, rendering after-the-fact prudency hearings a controversial issue.

Utilities are facing myriad regulatory compliance challenges that will affect (i) energy costs for ratepayers and electric customers and (ii) escalating costs for the fossil fuel aging fleet, already facing pressure to retire. In short, the challenge for state officials, including energy regulators and environmental regulators, will involve a significant balancing of environmental protection with the allocation of increasingly scarce resources, and yet, it is unclear as to where the responsibility for balancing resides. The implementation of the EPA rule will raise new and challenging issues for state officials that could have significant consequences for the environment and the price of electricity.

This Comprehensive Survey presents a broad survey of coal ash literature for the purpose of providing a context inclusive of the diverse issues and diverse perspectives on those issues associated with coal ash management for regulators and stakeholders challenged with formulating next steps in coal ash management and regulation. In Sections 3 and 4, it explores the legacy of coal ash, including environmentally catastrophic spills, and then provides a factual context of what coal ash is, including its environmental and public health risks. In Section 5, it lays out the legal framework for federal regulation under RCRA, EPA's promulgation of the Final Rule, and core provisions of EPA's national minimum criteria for coal ash disposal. Section 6 describes the shared responsibility for disposal regulation between federal and state officials under WIIN and what actions some states have taken to address coal ash issues in their state. Section 7 is, substantively, a major piece of the Comprehensive Survey. It explores the commercialization of coal ash as an alternative to coal ash disposal as a waste. It highlights the commercial and economic value of coal ash as a beneficially useful resource with a diverse and growing market demand. The environmental question of regulating coal ash as waste, which is explored in the first half of this Comprehensive Survey, is slowly converging into the broader economic question of recovering coal ash as a resource, as compared to the regulatory costs for complying with the Final Rule and states permit programs, which becomes a rate recovery issue to be decided by public utility commissions, as discussed in Section 8. Section 8 includes a detailed summary of North Carolina's approach to cost recovery as a valuable case study for other commissions that may need to respond to coal ash costs in the near future. Section 9 provides some conclusions.

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26 EPA has submitted a proposed rule to the Office of Management and Budget on Federal permitting under the WIIN Act. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities: Federal CCR Permit Program, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=2050-AH07. "In March 2018 (Pub. L. 115-141) and March 2019 (Pub. L. 116-6), Congress appropriated funding for federal CCR permitting. The proposal would establish a new federal permitting program for disposal of CCR." *Id.*

SECTION 3:
Coal Ash Spills and Setting the Regulatory Stage

Coal-fired electric generation results in the second largest industrial waste stream in the country after mine wastes. EPA estimates that an average of 110 million tons of coal ash, formally referred to as coal combustion residuals (CCR), are produced annually by coal-fired electric generation.[27] Coal and the mineral content within coal deposits may contain trace toxic metals at concentration levels similar to naturally occurring soil deposits, including mercury, cadmium, and arsenic. When burning coal for electricity generation, trace elements can concentrate within the coal combustion byproducts. Over the last century, coal ash containing varied concentrations of these metals was either placed in landfills or, more frequently, was sluiced by mixing the waste stream with water and pumped into surface impoundments built near generating plants. There, the solid particle ash settles and the clarified waters are discharged under water discharge permits. The remaining coal ash slurry has been accumulating in these surface impoundment facilities for decades during the time in which cheap electricity from coal-burning plants fueled a growing economy.

Although society has benefited from the prosperity and quality of life conveniences enabled by low-cost energy, it has also struggled with the environmental impact of coal-burning plants across the country. Since the 1970s, tremendous strides have been made to control air emissions under the Clean Air Act,[28] but the growing accumulation of coal ash slurry contained in surface impoundments on coal plant sites across the country did not capture national attention until one dike holding coal ash collapsed on December 22, 2008, spilling 5.4 million cubic yards (CYs) of coal ash into Tennessee's Emory River and over 300 acres, the equivalent of filling a football field ½ mile high.[29]

The failed impoundment was located at the coal-fired Kingston Steam Plant owned and operated by the Tennessee Valley Authority (TVA). TVA claimed that the immediate cause of the dike's failure was a combination of rain totaling six inches in ten days and 12°F temperatures, but later TVA executives and its own inspector general admitted that TVA was aware of, and missed, opportunities to fix the dike's stability issues, which could have avoided the collapse.[30] TVA's lack of attention to the environmental risk posed by Kingston's impoundment resulted in $11.5 million in fines, over a billion dollars in cleanup costs, and $43 million in lieu of tax payments being paid to affected local governments from lost property and sales tax revenue.[31]

From New York

27 Final Rule, *supra* note 1, at 21,327; for 2017 recent data, *see infra* note 46.

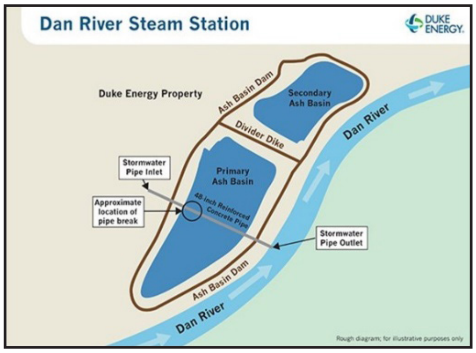
28 Clean Air Act, 42 U.S.C. §§7401-7642; *Overview of the Clean Air Act and Air Pollution*, EPA (Sept. 16, 2019), https://www.epa.gov/clean-air-act-overview.

29 EPA Response to Kingston TVA Coal Ash Spill, EPA (Dec. 23, 2016), https://www.epa.gov/tn/epa-response-kingston-tva-coal-ash-spill; Photograph of Coal Ash Spill by J. Miles Carey, *Knoxville News Sentinel*, reprinted in "Coal Ash Spill Revives Issue of Its Hazards", *New York Times* (Dec. 24, 2008), https://www.nytimes.com/2008/12/25/us/25sludge.html.

30 "TVA President: 'Missed Opportunities' to Avoid Coal Ash Spill," *Huntsville Times* (Sept. 21, 2011), https://www.al.com/huntsville-times-business/2011/09/tva_president_missed_opportuni.html.

31 S.B. 729, *supra* note 18 (including text of CAMA as ratified).

After the TVA spill, EPA assiduously began field work in 2009 to implement its multi-year *Coal Ash Surface Impoundment Integrity Assessment Program* (Surface Impoundment Assessment Program). It sent multiple rounds of data requests to utilities to gather information and arranged for on-site inspections of the structural integrity of 676 surface impoundments at 240 generation stations across the country.[32] In 2014, it published the data, including the extensive correspondence between EPA and the companies on an impoundment-by-impoundment basis. Some of the early poor ratings reflected the absence of required engineering documentation, but were raised once the documentation was supplied. Other utilities began to correct instability issues in response to EPA's on-going field work and inspections of coal ash sites. However, the efficacy of inspections only went so far. At the top of the EPA's final list for poor assessments was Duke Energy[33] which owned fifteen impoundments classified as "Poor" over four states, with six in North Carolina.[34] Rated by EPA as "Fair," however, was the impoundment at Duke's Dan River generation station in North Carolina, and yet, that same year, it resulted in the third largest coal ash spill in U.S. history.[35]



WFMY News

The spill occurred on February 2, 2014, after the rupture of a corrugated metal stormwater pipe that ran under the primary ash pond.[36] The break in the pipe allowed 39,000 tons of ash slurry to escape and flow into the Dan River. EPA's inspectors raised concerns regarding the integrity of the pipe in a report to the EPA in 2009, but their concerns were not included into the EPA's inspection letter to Duke. Duke made improvements to the impoundment consistent with the inspection letter, but because of the lack of notice, those improvements did not include the pipe that caused the catastrophe.[37] Although the public could point to the pipe's exclusion in the EPA inspection letter to Duke, other evidence showed that Duke was aware of the pipe's vulnerability and did nothing. For example, plant staff had requested $20,000 to install a camera to monitor pipes including the one that ruptured, but management refused to approve the expenditure. As a result of this kind of evidence being presented in a federal case to hold Duke criminally liable for the spill, Duke agreed to plead guilty to nine violations of the Clean Water Act (CWA) and pay $102 million in fines and restitution.[38] However, the real lesson from both TVA and Duke's stories isn't just for utilities, but also for federal and state regulators, as well.

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32 *See Frequent Questions about the 2015 Coal Ash Disposal Rule,* EPA (Nov. 2, 2018), https://www.epa.gov/coalash/frequent-questions-about-2015-coal-ash-disposal-rule; and *see Effort to Assess Coal Combustion Residuals (CCR) Disposal Units,* EPA (Aug. 29, 2016), https://www.epa.gov/coalash/effort-assess-coal-combustion-residuals-ccr-disposal-units.

33 Duke Energy and Progress Energy were separate companies at the time of EPA's Assessment. Duke and Progress merged into a single company in 2012. Matthew L. Wald, "Duke and Progress Energy Become Largest U.S. Utility," *New York Times* (July 3, 2012), https://www.nytimes.com/2012/07/04/business/energy-environment/duke-energy-merger-creates-largest-us-utility.html.

34 *Coal Combustion Residuals Impoundment Assessment Reports*, EPA (Apr. 19, 2016), https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/html/index-4.html [hereinafter, *Assessment Reports*].

35 The second largest coal ash spill was in Wisconsin on October 31, 2011. A cliff collapsed and tons of coal ash fell into Lake Michigan. Associated Press, "A look at 3 of the largest coal ash spills in the US" (December 19, 2014) http://www.startribune.com/a-look-at-large-coal-ash-spills-in-the-us/286393991/. This coal ash spill receives little attention in the literature of coal ash spills. Apparently, this coal ash spill was significant in order of magnitude of coal ash volume but not in terms of damage caused by the spill.

36 Diagram of Dan River Steam Station, *50,000 Tons of Coal Ash Spill Into Dan River*, WFMY (Feb. 5, 2014), https://www.wfmynews2.com/article/news/local/50000-tons-of-coal-ash-spill-into-dan-river/83-298080513.

37 Taft Wireback, "EPA Knew of Faulty Pipes at Dan River Ash Basin in 2009," *Greensboro's News & Record*, (Mar. 19, 2014), https://www.greensboro.com/news/article_a21bd962-afd0-11e3-80a2-001a4bcf6878.html.

38 *Duke Energy Fined $102 Million in Coal Ash Spill,* CBS News (May 14, 2015), https://www.cbsnews.com/news/duke-energy-fined-102-million-in-coal-ash-spill/; *see also Summary of Criminal Prosecutions,* EPA (Sept. 23, 2019), https://cfpub.epa.gov/compliance/criminal_prosecution/index.cfm?action=3&prosecution_summary_id=2746.

Although the Kingston spill occurred over a decade ago, remediation continues at tremendous costs. Newspaper headlines today continue to remind the public of not only the financial and environmental costs, but also the health costs as litigation continues, claiming inadequate protection of clean-up workers' safety and health.[39] The cleanup of the Dan River spill also continues at a cost of millions. Ratepayer recovery was denied to Duke for the costs of the spill[40] and North Carolina's attorney general has contested recovery of coal ash remediation of unrelated coal ash ponds.[41] Events that traumatized local communities such as those at Kingston and Dan River have expanded public awareness of coal ash risks beyond a local concern to a national priority.

Although studied and evaluated for years, a final determination on the question of whether and how to regulate coal ash, if not as a hazardous waste, then as a solid waste, had been postponed since the enactment of RCRA. In light of the environmental risks made evident by the Kingston and Dan River spills, EPA finally acted to fulfill its obligation under the 1980 Bevill Amendment to RCRA and issued its Final Rule regulating disposal of CCR under subtitle D of RCRA in 2015. EPA determined that for purposes of regulation, coal ash was a nonhazardous waste, and so established national minimum criteria for coal ash disposal by utilities and independent power producers. Yet, the application of coal ash's new regulatory framework continues to be challenged in court, debated at the state level, and implemented at a slow pace. Stakeholders have yet to agree on the level of regulation regarding what coal ash management practices are good enough, and at what costs.

39 "A federal jury ruled a global contractor tasked with keeping disaster clean-up workers safe instead endangered them – some fatally." Jamie Satterfield, "Jury: Jacobs Engineering endangered Kingston disaster clean-up workers," *Knoxville News Sentinel* (Nov. 8, 2018), https://www.knoxnews.com/story/news/crime/2018/11/07/verdict-reached-favor-sickened-workers-coal-ash-cleanup-lawsuit/1917514002/.

40 S.B. 729, *supra* note 18 (including text of CAMA as ratified).

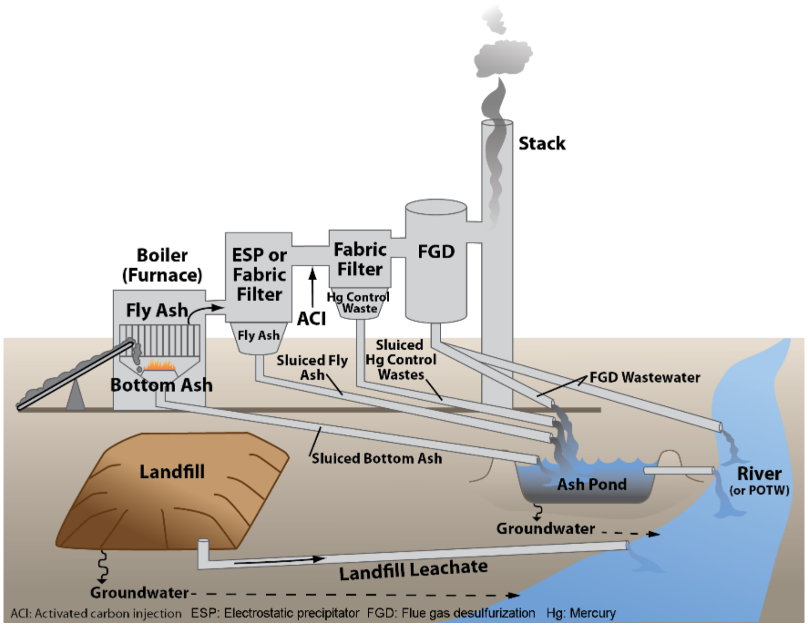
41 Deon Roberts, "NC attorney general gives reasons why Duke customers shouldn't pay for coal ash cleanup,"s *Charlotte Observer* (Apr. 26, 2019), https://www.charlotteobserver.com/news/business/banking/article229720699.html.

SECTION 4:
Coal Ash and Its Legacy

A. Facts about Coal Ash

Coal ash generally refers to what is left after coal is burned, usually for the generation of electricity. In the regulatory context, it is referred to as coal combustion residuals or CCR. Commercial markets use various CCR in manufacturing or construction because of their specific chemical or physical properties and refer to it as coal combustion products or CCPs. CCR or CCPs are individually identified at the stage at which they are produced during the generation process, as illustrated in **Figure 1.**[42] They include fly ash, bottom ash, boiler slag, and flue-gas desulfurization materials.

Figure 1: Illustration of Coal Generation Process



Individual CCPs are valued for their properties by a multitude of industries and are collected for subsequent beneficial use, a form of recycling, as they are generated. In 2017, 111.3 million tons of coal ash were generated, with 64 percent or 71.8 million tons being recycled.[43] The remainder was disposed of. Notwithstanding that the share of coal ash being recycled and reused continues to increase, coal ash is still primarily conceptualized as a solid waste requiring disposal by utilities and regulatory programs.

Coal ash may be disposed of wet or dry. Dry coal ash is disposed of in a landfill, which is simply a designated area of land for long-term disposal. EPA considers sand and gravel pits, and quarries that had occasionally been used for CCR disposal, as landfills. The Final Rule defines a landfill more through exclusion and by what it is not.[44]

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42 Diagram of Key Wastestreams, *Steam Electric Power Generating Effluent Guidelines - 2015 Final Rule,* EPA (July 5, 2019), https://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule.

43 *Coal Ash Recycling Reaches Record 64 Percent Amid Shifting Production and Use Patterns*, Am. Coal Ash Ass'n https://www.acaa-usa.org/Portals/9/Files/PDFs/Coal-Ash-Production-and-Use-2017.pdf.

44 "CCR landfill means an area of land or an excavation that receives CCR and which is not a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground or surface coal mine, or a cave. For purposes of this subpart, a CCR landfill also includes sand and gravel pits and quarries that receive CCR, CCR piles, and any practice that does not meet the definition of a beneficial use of CCR." 40 C.F.R. § 257.2; *see also* Final Rule, *supra* note 1, at 21,355.

Surface impoundments are natural topographic depressions, or depressions constructed by excavation, or diked areas formed primarily of earthen materials used in the waste industry for water treatment and solid waste management, including management of coal ash. This includes wet scrubber discharge from flue gas desulfurization (FGD), as well as the wet coal ash that occurs by adding water or sluicing the CCR at a collection point in the power plant to facilitate its movement to the disposal site.

Attempting to assess the degree of risks from coal ash disposal based on the number and location of coal ash ponds and landfills on any given site can be difficult and at times confusing. Many coal plant sites included previously closed landfills and surface impoundments. Larger coal power stations may have multiple disposal units that could include both impoundments and landfills on the station's site, as reflected in the numbers cited in the bullets that follow. There are also 111 inactive units that have been reported as remaining open and thus exposed. There is no reliable source on the number of inactive units that have been closed, many of which are located at retired generation plants. Still, though dated, EPA's 2008 data published in the Final Rule provides a reference point for understanding the size of the coal ash problem.[45]

Of the 478 plants generating coal ash, 307 plants disposed of coal ash on-site using one or more form(s) of the following CCR disposal: 201 plants used on-site landfills and 169 used on-site surface impoundments, with 197 transporting coal ash to off-site landfills.[46]

- Among those 478 plant sites, there were 310 active landfills and 735 active surface impoundments;
- The average size of landfills was over 120 acres, or 90 football fields, with a depth of 40 feet; and
- The average size of surface impoundments was 50 acres, with a depth of 20 feet.

Coal ash disposal sites are not uniformly distributed across the United States. According to EPA data on utility-owned CCR units, 18 states have no surface impoundments, whereas a heavy concentration of surface impoundments can be found in a few states. The table in **Figure 2** lists the top 10 states with the heaviest concentration in the EPA dataset:[47]

Figure 2: Top 10 States with Heaviest Concentration of Coal Ash Impoundments

RANK	STATE	TOTAL IMPOUNDMENTS
1	INDIANA	74
2	ILLINOIS	51
3	MISSOURI	42
4	PENNSYLVANIA	42
5	TEXAS	38
6	KENTUCKY	36
7	NORTH CAROLINA	33
8	GEORGIA	31
9	OHIO	30
10	IOWA	29

45 Final Rule, *supra* note 1, at 21,303 & 21,309.

46 Because of definitional differences, estimates of the number of coal ash ponds differs. EPA in its 2009 to 2014 data collection focused only on electric utilities and other electric generators, and even then, it was a subset of the total number of ponds that may have existed. There are, however, industrial coal ash units that are not included in EPA data. Environmentalists often produce numbers of coal ash ponds that may differ from EPA's list of ponds covered by the Final Rule. This may be because they are counting ponds not covered by the EPA or because their analysis focuses on a subset of ponds included in the EPA Rule. Earthjustice, for example, publishes an interactive map that provides access to information on individual CCR units, *see Mapping the Coal Ash Contamination*, Earthjustice (Aug. 20, 2019), https://earthjustice.org/features/map-coal-ash-contaminated-sites [hereinafter, *Interactive Map*]. Many of the generating plants have multiple CCR units on their generation sites, and some have both landfills and surface impoundments.

47 EPA published spreadsheets that included a synthesis of information on each coal ash unit for which utilities provided information. EPA published data on over 600 coal ash units and listed the states in which the coal ash units are located. These spreadsheets were used by the authors to characterize coal ash units to derive insights about coal ash units at the state level and to re-characterize the information on coal ash units in a more global manner. The main EPA spreadsheet can be found at https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/xls/summarytable_073114.xls.

B. Surface Impoundments: Compromised Structures

The size and structural stability of many of these CCR units are proportional to their long tenure of operation. Many, particularly surface impoundments, have been receiving coal ash for decades. Surface impoundments were designed to last for the operating life of coal-fired boilers, which typically was 40 years, but many were expanded in size when the coal plant continued to operate beyond their initially anticipated useful lives. This creates implications for the internal structural stability of many of these facilities. A majority are over 40 years old, with the oldest impoundment recorded by EPA, having been constructed in 1925, and now being almost 95 years old.[48] Many of the older impoundments were also not designed by professional engineers.[49] The question of their structural integrity is critical because surface impoundments are generally located adjacent to surface water. Coal plants are typically constructed near a water body that can be used as a source of cooling water and conveyance of waste. EPA's Surface Impoundments Assessment, conducted after the Kingston spill, rated 318 surface impoundments as a high or significant hazard potential for many of these reasons.[50] The several impoundments at TVA's Kingston Generating Station were between 40 and 50 years old at the time when one of the dikes failed, spilling 130 million tons of coal ash slurry into the river and neighboring community.

As part of its regular Surface Impoundment Assessment, EPA began its field survey in 2009 by sending multiple rounds of data requests to utilities to gather information. EPA further arranged for on-site inspections of the structural integrity of 676 surface impoundments at 240 generation stations across the country.[51] In 2014, it published the data submitted, including the extensive correspondence between EPA and the companies on an impoundment-by-impoundment basis. Based on the data, EPA classified the impoundments as "Satisfactory," "Fair," "Poor," "Unsatisfactory," or "Not Assessed." Utilities were given the opportunity to respond to the classifications to dispute or correct the basis for the classification, which resulted in 12 different rounds of data exchanges. The table in **Figure 3** shows the aggregate results per classification across the 559 impoundments reviewed, excluding those not assessed.

Figure 3: EPA Classifications of Reviewed Coal Ash Impoundments

EPA Rounds	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
Satisfactory	22	31	15	23	15	3	34	9	29	20	13	27	**241**
Fair	15	9	12	17	14	27	10	16	18	9	11	8	**166**
Poor	6	0	10	30	9	14	12	21	4	38	0	8	**152**
Unsatisfactory	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total # of Units Assessed	**43**	**40**	**37**	**70**	**38**	**44**	**56**	**46**	**51**	**67**	**24**	**43**	**559**

48 Based on the EPA's data, a subset of units for which age data were available showed approximately 195 active surface impoundments exceed 40 years of age; 56 units are older than 50 years, and 340 are between 26 and 40 years old. The authors derived these calculations from EPA's spreadsheet that collated the information from utilities on 676 individual coal ash units. *Information Request Responses from Electric Utilities*, EPA (Apr. 19, 2016), https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/html/index-3.html#note.

49 Final Rule, *supra* note 1, at 21,327.

50 *d.*

51 Assessment Reports *supra* note 34.

Figure 4 ranks states based on EPA's data by the number of total utility-owned impoundments within their respective border:

Figure 4: EPA Ranking of Utility-Owned Impoundments by State

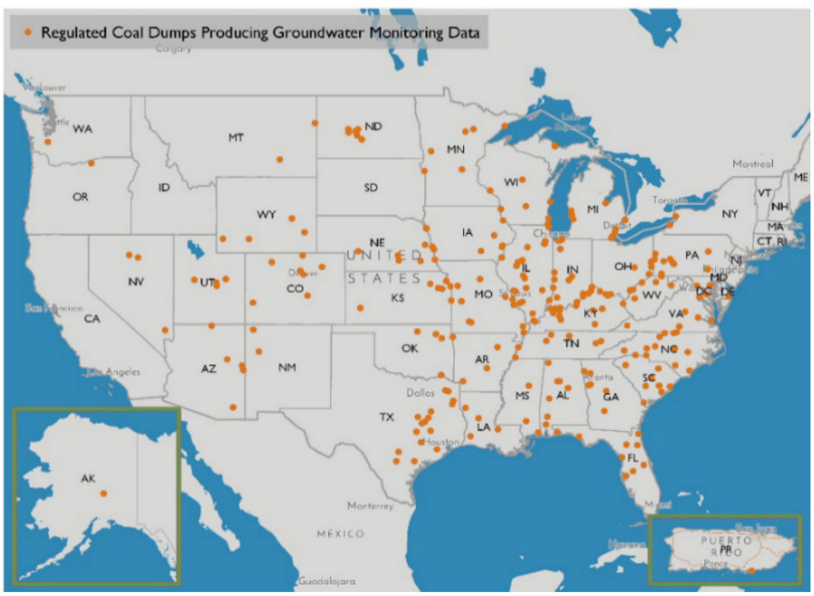
STATE	POOR	FAIR	SATISFACTORY	NOT ASSESSED	TOTAL
IN	33	17	11	13	74
IL	18	16	4	13	51
MO	10	13	13	6	42
PA	8	5	12	17	42
TX	4	4	22	8	38
KY	3	15	11	7	36
NC	6	9	16	2	33
GA	2	2	23	4	31
OH	15	9	6	0	30
IA	6	5	15	3	29
WI	4	1	16	2	23
SC	2	10	9	1	22
WY	10	2	5	3	20
TN	0	7	10	3	20
AL	3	3	12	1	19
ND	4	3	7	3	17
FL	2	6	4	5	17
MI	2	3	5	4	14
LA	7	5	1	0	13
KS	2	3	7	1	13
MN	2	2	8	1	13
WV	0	3	7	2	12
VA	2	7	2	0	11
AZ	0	0	10	0	10

C. CCR Units: Groundwater Exposure

In addition to the physical risks surface impoundments present to nearby surface waters, they also present the potential for groundwater impact and risks to groundwater quality, as do unlined CCR landfills. Many of the older CCR disposal units were built without any liner separating the coal ash from the ground; others used inadequate clay liners which were not designed to address hydraulic conductivity minimums.[52] EPA found that of the impoundments constructed pre-1994, 63 percent had no liners and 24 percent had clay liners.[53] Notwithstanding these numbers, EPA's Assessment Program conducted between 2009 and 2014 focused on the structural integrity of surface impoundments, but did not review leachate risks to groundwater from lack of liners or from insufficient liner design.[54]

It was the Final Rule that ultimately advanced a national effort to evaluate and make public groundwater's environmental exposure associated with CCR units, both from landfills and surface impoundments. Current groundwater data is now available due to EPA's ground water monitoring requirements and the requirement that groundwater data, among a myriad of other required information associated with the operation of CCR units, be posted on a publicly accessible website per the Final Rule. The Environmental Integrity Project[55] (EIP) partnered with other environmental organizations to review current groundwater data from 4,600 groundwater monitoring wells across 348 surface impoundments and 210 landfills, which represents ownership of 75 percent of coal power plants across the U.S., and are represented on EIP's map included in **Figure 5** here.[56]

Figure 5: Regulated Coal Dumps Producing Groundwater Monitoring Data



52 Hydraulic conductivity is a measurement that reflects the ease with which water moves through the subsurface and is used to calculate rates of groundwater movement. It is defined as the ability of a porous medium, such as soil, to transmit water under saturated or nearly saturated conditions. *"How to measure soil hydraulic conductivity—Which method is right for you?,"* Meter Group (last visited Sept. 23, 2019), https://www.metergroup.com/environment/articles/how-to-measure-soil-hydraulic-conductivity-which-method-is-right-for-you/.

53 Final Rule, *supra* note 1, at 21,324.

54 Final Rule, *supra* note 1, at 21,313 n.5.

55 *Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S.,* Environmental Integrity Project (Mar. 4, 2019; revised, July 11, 2019), http://www.environmentalintegrity.org/wp-content/uploads/2019/03/National-Coal-Ash-Report-Revised-7.11.19.pdf [hereinafter, *EIP Groundwater Report*]. Figure 5 depicts the interactive map hosted by EIP. The EIP Groundwater Report was produced by the Environmental Integrity Project (EIP) with assistance from Earthjustice and support from the Sierra Club, Prairie Rivers Network, and other organizations, as participants.

56 *See* Interactive Map, *supra* note 46.

Data were not available for the remaining plants because they were closed prior to the Final Rule's effective date, they qualified for an extension to comply, or they were exempt. EIP clarified in the report that it could only identify the quality of groundwater found at each coal plant location, but it was not possible to conclude how much each onsite CCR unit contributed to the contamination reported in the samplings. The presence of certain potentially harmful constituents in the water assumed leachate impact from the CCR unit. The report concluded that "242 coal plants, or 91 percent, have unsafe levels of one or more coal ash constituents in downgradient wells that appear to be affected by onsite, regulated coal ash dumps."[57]

EIP's analytical methods in the report have been criticized for allegedly relying on one set of raw data that results in overestimating groundwater impact,[58] although the report discussed analytical methods to include groundwater data in two stages and compared downgradient data to upgradient data. The groundwater data reported and posted per the Final Rule is only one factor to be considered within EPA's risk assessment framework that assesses a variety of factors, including toxicity, concentration, and exposure pathway, in determining downstream contamination risks for purposes of the Final Rule.[59] EPA's national minimum criteria identify the acceptable statistical methods used to evaluate individual sets of data that are required to be posted. EIP's report is notable in coal ash literature for its wide press coverage, particularly in local publications in areas where coal ash facilities were highlighted in the report. However, even without a context of detailed knowledge of statistical methods, the report, on its face, provides little, if any, conclusive information that could be used to infer downstream risks to drinking water generally.

57 *EIP Groundwater Report, supra* note 55, at 13.

58 Sonal Patel, Power Magazine, *Construction Power Companies Refute Findings of Widespread Coal Plant Groundwater Contamination* (Mar. 7, 2019), https://www.powermag.com/power-companies-refute-findings-of-widespread-coal-plant-groundwater-contamination/?pagenum=3.

59 Final Rule, *supra* note 1, at 21,444-446.

D. Coal Ash Toxicology

Although coal is mostly carbon, it also contains concentrations of trace elements and amounts of heavy metals that become mobilized during the combustion process and are captured in the waste streams. These elements are found in soils and throughout the environment, but they naturally occur in higher concentrations in coal ash as a result of coal formation from pressurization of decaying plant matter over millions of years. Coal ash is primarily made up of silicon, aluminum, calcium, and iron oxides, with lesser amounts of other metal oxides and sulfur. The presence of mercury, cadmium, chromium, lead, arsenic, and other metals, as well as boron, nitrates, and fluoride are also a concern. **Figure 6** lists many of the constituents found in coal ash, with their potential health impacts.[60]

Figure 6: Health Effects of Common Coal Ash Constituents

POLLUTANTS	HEALTH EFFECTS
Aluminum	Lung disease, developmental problems
Antimony	Eye irritation, heart damage, lung problems
Arsenic	Multiple types of cancer, darkening of skin, hand warts
Barium	Gastrointestinal problems, muscle weakness, heart problems
Beryllium	Lung cancer, pneumonia, respiratory problems
Boron	Reproductive problems, gastrointestinal illness
Cadmium	Lung disease, kidney disease, cancer
Chromium	Cancer, ulcers, and other stomach problems
Chlorine	Respiratory distress
Cobalt	Lung/heart/liver/kidney problems, dermatitis
Lead	Decreases in IQ, nervous system, developmental and behavioral problems
Manganese	Nervous system, muscle problems, mental problems
Mercury	Cognitive deficits, developmental delays, behavioral problems
Molybdenum	Mineral imbalance, anemia, developmental problems
Nickel	Cancer, lung problems, allergic reactions
Selenium	Birth defects, nervous system/reproductive problems
Vanadium	Birth defects, lung/throat/eye problems
Zinc	Gastrointestinal effects, reproductive problems

60 *Public Health Impacts,* Southeast Coal Ash.org (last visited Sept. 23, 2019), http://www.southeastcoalash.org/about-coal-ash/public-health-impacts/.

In the Final Rule, EPA found that there is significant potential for CCR landfills and CCR surface impoundments to leach hazardous constituents into groundwater, impair drinking water supplies, and cause adverse impacts on human health and the environment. Indeed, groundwater contamination is one of the key environmental and human health risks EPA has identified with CCR landfills and CCR surface impoundments.[61]

Accordingly, EPA established detection and assessment requirements for water monitoring in the Final Rule, targeting the constituents listed in **Figure 7** from EPA's Part 257 regulations.[62]

Figure 7: Constituents Targeted in EPA Final Rule

Appendix III to Part 257—Constituents for Detection Monitoring

Common name [1]
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

Appendix IV to Part 257—Constituents for Assessment Monitoring

Common name [1]
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

61 Final Rule, *supra* note 1, at 21,396.

62 *See infra.* at p. 28.

SECTION 5:
Federal Framework for Regulating Coal Ash Disposal

A. Pre-Kingston Spill

1. Legislative Origins of EPA's Regulatory Authority

Over the decades, the question of regulating the waste streams from the coal burning process in electricity generation has been embedded within the larger environmental conversation on the need to regulate industrial waste produced across all types of industries, as well as the regulation of municipal waste. Waste has been and continues to be viewed as a local matter, even during the rise of the modern environmental movement during the 1960s that saw the beginning of the shift from state and local responsibility to more federal oversight of environmental impacts.[63]

The first federal attempt to address solid waste, which had been exponentially growing since the Industrial Revolution, was the enactment of the Solid Waste Disposal Act of 1965 (SWDA).[64] Still, SWDA defined solid waste as a local responsibility and so limited federal involvement to providing federal assistance to states to promote better municipal waste disposal technology while encouraging states to consider waste management planning that focused on waste reduction and recycling.

In the 1970s, Congress stepped up federal involvement in environmental issues[65] with the enactment of the National Environmental Policy Act (NEPA),[66] the Clean Air Act[67] in 1970, and the Clean Water Act[68] in 1972. Congress then moved to address growing concern about public exposure to toxic substances contained in industrial and chemical waste streams as a result of open dumping practices that had become conventional with the next set of environmental statutes,[69] including RCRA. Enacted in 1976, it amended and effectively superseded SWDA in how waste streams that posed significant risks to public health were to be regulated.

RCRA authorizes EPA to establish controls that would ensure the safe management of hazardous waste from "cradle to grave."[70] Subtitle C of RCRA defines the factors that EPA is to use to identify wastes that are hazardous to public health; establishes a cradle-to-grave tracking system for hazardous wastes; sets standards for its treatment, storage, and disposal; and provides for state implementation of permitting systems to enforce the federal standards.

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63 Robert V. Percival et al., Environmental Regulation: Law, Science, and Policy 222 (4th ed. 2003).

64 Eugene H. Robinson, Jr., *Solid Waste Disposal Act (1965), Major Acts of Congress,* Encyclopedia.com (Sept. 19, 2019), https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/solid-waste-disposal-act-1965.

65 Dr. Neil S. Shifrin, *Environmental Management and Its History,* Envtl Science.org (last visited Sept. 23, 2019), https://www.environmentalscience.org/environmental-management-history.

66 42 U.S.C. §§4321-4370a.

67 Clean Air Act, 42 U.S.C. §§7401-7642.

68 33 U.S.C. §§1251-1376, enacted first as the Federal Water Pollution Control Act, and then renamed the Clean Water Act.

69 The other two toxic regulatory acts are the Safe Drinking Water Act in 1974 and the Toxic Substances Control Act in 1976 (15 U.S.C. §§2601-2629).

70 *Summary of the Resource Conservation and Recovery Act: 42 U.S.C. §6901 et seq. (1976),* EPA (Aug. 15, 2019), https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act.

In 1978, EPA proposed *Hazardous Waste Guidelines and Regulations*[71] to implement its new subtitle C responsibilities, including a proposed list of hazardous wastes. However, it deferred any proposed hazardous classification for certain high-volume, low-risk waste streams, including utility waste made up of fly ash, bottom ash, and scrubber sludge, until more information could be gathered to assess how they can best be managed should it be determined they were hazardous. EPA noted that it had limited information about these "special wastes" other than that (i) they occur in very large volumes; (ii) it appeared the potential hazards posed by the waste was relatively low; and (iii) the control techniques that had been developed for other toxic and hazardous wastes did not appear applicable to them.[72]

By the time EPA was ready, in May 1980, to issue its final order on hazardous classifications, Congress had also taken up the regulatory question on this group of special wastes in considering legislation to reauthorize RCRA. Consequently, EPA deferred taking any action on special wastes, pending further congressional action.[73] Meanwhile, Congress focused on similar questions raised in EPA's 1978 rulemaking regarding special wastes, including the potential cost to the associated industries if these wastes were to be regulated as hazardous waste, and the uncertainties of risks associated with their storage and disposal.

Congress' final bill, the Solid Waste Disposal Act Amendments of 1980,[74] included what is commonly referred to as the Bevill Amendment, which kicked the utility waste issue back to the EPA. The Bevill Amendment added a new subsection 3001(b)(3) to RCRA that required EPA to study and report back to Congress on these large-volume special wastes and to make a regulatory determination as to whether or not their regulation under subtitle C was warranted.[75] Covered under the Bevill Amendment were fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated from the combustion of coal or other fossil fuels.[76]

EPA began its study, but before it submitted its first report to Congress, Congress amended RCRA once again, passing the Hazardous and Solid Waste Amendments (HSWA) in 1984.[77] HSWA was a significant amendment in that it added a new subtitle D to RCRA, which provided a regulatory framework for nonhazardous solid waste. Subtitle D prohibits "open dumps," which are sites where nonhazardous solid waste is disposed and which do not qualify as sanitary landfills that require a finding of "no reasonable probability of adverse effects on health or the environment from disposal of solid waste at such [facilities]."[78] Under subtitle D, EPA sets minimum guidelines for sanitary landfills to be incorporated into a state's solid waste management plan for how nonhazardous solid waste should be managed.

In addressing the high-volume special wastes, including coal ash, HSWA reaffirmed their exemption from subtitle C, pending further study by EPA. Congress effectively left it to the states to decide whether to regulate these special wastes under their subtitle D programs unless and until EPA should classify coal combustion wastes as hazardous.

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71 Proposed Rule, Hazardous Waste Guidelines and Regulations, 43 Fed. Reg. 58,946 (Dec. 18, 1978).

72 *Id.* at 58,991-92.

73 Final Rule and Interim Final Rule, Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, 45 *Federal Register* 33,154, 33,175 (May 19, 1980).

74 96 P.L. 483, 94 Stat. 2360.

75 In RCRA § 8002(n), Congress directed EPA to conduct a detailed and comprehensive study based on eight study factors and to submit a Report to Congress on "the adverse effects on human health and the environment, if any, of the disposal and utilization of fly ash waste, bottom ash waste, slag waste, flue gas emission control waste, and other byproduct materials generated primarily from the combustion of coal or other fossil fuels." *See* discussion, *infra* at p. 31.

76 Linda Luther, Background on and Implementation of the Bevill and Bentsen Exclusions in the Resource Conservation and Recovery Act: EPA Authorities to Regulate "Special Wastes," *Cong. Research Serv.* (August 6, 2013).

77 Eugene H. Robinson, Jr., Hazardous and Solid Waste Amendments of 1984, Major Acts of Congress, Encyclopedia.com (Sept. 19, 2019), https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-maps/hazardous-and-solid-waste-amendments-1984.

78 42 U.S.C. §§ 6944(a), 6903(14), (26).

2. EPA's Follow-through of Its Legislative Directive

In March 1988, EPA published its Report to Congress on coal combustion wastes from electric utility power plants. The Report recommended preliminarily that high-volume coal combustion wastes not be regulated under subtitle C. In August 1993, EPA issued its final determination (1993 Determination) under the Bevill Amendment, addressing fly ash, bottom ash, boiler slag, and flue gas emission control waste, and found that these large-volume coal combustion wastes generated at a utility's or an IPP's power plant did not exhibit hazardous waste characteristics warranting a classification as hazardous wastes and therefore should not be subject to regulation under subtitle C of RCRA.[79] It reaffirmed its decision in 2000,[80] which left the management of coal ash to be regulated as nonhazardous in accordance with requirements established by individual states. Had EPA classified coal ash as a hazardous waste under part C, it would have strengthened the federal role in how coal ash should be managed.

In making its finding in the 1993 Determination not to classify coal combustion wastes as hazardous, EPA considered the eight study factors required under Section 8002(n) of the amended RCRA:

1. Sources and volumes of such material generated per year;
2. Present disposal and utilization practices;
3. Potential danger, if any, to human health and the environment from the disposal and reuse of such materials;
4. Documented cases in which danger to human health or the environment from surface runoff or leachate has been proved;
5. Alternatives to current disposal methods;
6. Costs of such alternatives;
7. Impact of those alternatives on the use of coal and other natural resources; and
8. Current and potential utilization of such materials as an alternative to disposal.[81]

EPA found that 95 percent of the materials found in coal ash were not of major concern, e.g., oxides of silicon, aluminum, iron, and calcium. Only trace constituents in the waste were toxic presenting risks to human health and the environment and were not found in leachate at levels above hazardous waste toxicity. EPA also found that current waste management practices appeared adequate to protect human health and the environment. Although there were documented impacts associated with coal ash management practices, the damage cases were at a very limited number of sites. It noted only 10 damage cases from among all the generation sites it examined. It also noted that there was minimal documentation of impacts on drinking water sources in the vicinity of coal-fired utilities. The known releases were from unlined units at older sites in states that had since implemented more stringent design and operating criteria.

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79 Final Regulatory Determination, *supra* note 5, at 42,466. EPA issued a second part to its Final Determination in April 1999 to address other fossil fuel combustion wastes, for which it reached a similar conclusion, except for oil combustion wastes that it determined required some form of disposal controls. See Notice of Availability, *Availability of Report to Congress on Fossil Fuel Combustion; Request for Comments and Announcement of Public Hearing*, 64 *Federal Register* 22,820 (April 28, 1999).

80 Regulatory Determination, Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels, 65 *Federal Register* 32,214 (2000).

81 Final Regulatory Determination, *supra* note 5. at 42,467.

Using specified assessment tools and criteria described in the 1993 Determination, EPA also found that contamination of groundwater and surface water through groundwater recharge was possible but only under certain plausible conditions, such as unlined units. However, the risk would mostly result in ecological and natural resource damages as the risk of human exposure was limited. Two considerations in EPA assessing the potential for human exposure were the population in the surrounding region and the remoteness of drinking water systems from the site. As for minimizing the risk of surface water waste discharge, EPA looked to the Clean Water Act controls under utilities' National Pollutant Discharge Elimination System (NPDES) permits, and found that, even should constituents reach surface waters, the volume of surface water and high flow rates would dilute the degree of constituents' concentration. The factors identified above, as well as others discussed in the 1993 Determination, demonstrate the changing character of these factors, particularly in the context of increasing volumes as these units continued to operate over the years and accept more and more coal ash.

However, at the same time EPA affirmed its early decision not to regulate under subtitle C in its 2000 Determination, EPA also announced its intention to regulate under subtitle D and to establish national minimum criteria for the disposal of coal combustion wastes in landfills or surface impoundments.[82] In support of its decision not to regulate coal ash waste under subtitle C, EPA took note of the significant improvement in coal ash waste management practices due to states adopting more stringent requirements and voluntary improvements by generation owners. However, it voiced concerns that there still existed significant gaps across the electric generation industry in implementing these better practices. Between 40 percent and 70 percent of sites lacked environmental controls, such as liners and/or groundwater monitoring as of 1995. EPA specifically noted that controls were much less common at surface impoundments than at landfills.[83] EPA believed that the regulatory process under subtitle D would be sufficient to cause the remaining states to close the regulatory gaps in environmental protection, notwithstanding EPA's limited enforcement authority.

EPA's determination to issue national minimum standards under subtitle D was based on information it had gathered and reviewed prior to 1995, and thus, EPA decided there was a need to update the factual record. It initiated a joint study with DOE in 2005 to collect more recent information on coal combustion waste management practices by the electric power industry. EPA also updated and completed a risk assessment on the conditions of surface impoundments owned by utilities and IPPs that it had begun for the 2000 Determination, evaluating types of coal ash waste, toxic constituents, liner types, receptors, and exposure pathways, with potential risks of leachate and spills. Finally, it reviewed cases of environmental damage associated with coal ash landfills and surface impoundments reported since its 2000 Determination. In 2007, EPA issued a Notice of Data Availability (NODA)[84] presenting the information it gathered and its assessment of public comments as its first step in preparing to propose minimum national standards for coal combustion waste disposal in landfills and impoundments. The next year saw the dike at TVA's Kingston impoundment fail, causing the largest coal ash spill in history.

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82 65 *Federal Register* at 32,214.

83 Final Rule, *supra* note 1, at 32,229.

84 Notice of Data Availability on the Disposal of Coal Combustion Wastes in Landfills and Surface Impoundments; Extension of Comment Period, 72 *Federal Register* 57,572 (Oct. 10, 2007).

B. Post-Kingston Spill

EPA followed the TVA Kingston coal ash spill by issuing a proposed rule in 2010[85] to regulate coal ash for the first time under subtitle D of RCRA. It provided the public a second opportunity to submit to EPA comments on how coal ash should be regulated, whether under subtitle C as a hazardous waste, or subtitle D as nonhazardous solid waste, and proposed a set of minimum criteria under each of the subtitles. While reviewing comments and completing the rulemaking process, EPA also conducted data requests, inspections, and other field work for its next Surface Impoundments Assessment. It completed the assessment five years later, publishing the findings discussed in Section 4[86] shortly before it finalized its proposed rule and issued the Final Rule in 2015. EPA issued its final decision to regulate coal ash as a nonhazardous waste under subtitle D over subtitle C. It also used its subtitle D authorization to establish national minimum criteria in the Final Rule for existing and new CCR landfills and surface impoundments that addressed location restrictions, design and operating criteria, groundwater monitoring and corrective action, closure requirements, post-closure requirements and care, recordkeeping, notification, and Internet posting requirements, all outlined in Section 5c.

Not surprisingly, the Final Rule was appealed on a multitude of grounds by a multitude of parties with diverse stakes in the Final Rule in *Utilities Solid Waste Activities Group, et al. v. EPA*.[87] Although the D.C. Circuit Court of Appeals agreed to a voluntary remand of many of the issues raised by appellants, giving EPA the opportunity to reconsider and revise the relevant sections of its minimum criteria,[88] the Court ultimately decided the following key issues, overturning certain of EPA's exemptions from compliance and expanding the number of CCR units that must now comply with the minimum criteria. EPA recently amended its regulations[89] to incorporate the Court's findings as follows:

1. The Court overturned the Final Rule's requirement that contamination must be detected at a unlined surface impoundment before it is subject to the closure criteria of the Final Rule.[90] As amended, EPA national minimum criteria now requires all unlined surface impoundments to cease accepting CCR for disposal by a specified date and to be closed or retrofitted in compliance with the minimum criteria.

2. All CCR units using a clay liner of any design would be considered unlined and thus must be closed or retrofitted consistent with the minimum criteria. Although EPA had concluded in the Final Rule that most of the clay liners installed were insufficient to protect against environmental contamination, it adopted minimum criteria providing that a clay liner meeting both the depth and hydraulic conductivity performance standards complies with the liner criteria and thus, would not trigger any closure requirements. The Court overturned this provision in the minimum criteria as conflicting with EPA's own factual record.[91]

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85 Proposed Rule, *Hazardous and Solid Waste Management System; Identification and Listing of Special Wastes; Disposal of Coal Combustion Residuals from Electric Utilities,* Proposed Rule, 75 *Federal Register* 35,128 (June 21, 2010).

86 *See* discussion, *infra* at Section 4.

87 Util. Solid Waste Activities Group v. EPA, 901 F.3d 414, 433 (D.C. Cir. 2018) [hereinafter *USWAG v. EPA*].

88 *Id.* at 437; ". . . we granted the EPA's unopposed motion to remand to itself several provisions of the Final Rule not at issue here that the EPA had decided to vacate . . . " *Id.* at 425 (citing Per Curium Order, *Utility Solid Waste Activities Grp. v. EPA,* No. 15-1219, 2016 U.S. App. LEXIS 24320 (D.C. Cir. June 14, 2016)).

89 Proposed Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; A Holistic Approach to Closure Part A: Deadline To Initiate Closure,* 84 *Federal Register* 65,941 (Dec. 2, 2019).

90 901 F.3d at 430, 432.

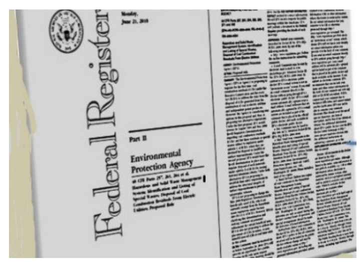
91 *Id.* at 431-32.

3. The Court overturned the EPA's finding that the minimum criteria would not apply to inactive surface impoundments located on retired or inactive electric generating stations.[92]

EPA noticed its intent to issue a future proposed rule in response to the Court's decision addressing inactive surface impoundments at retired stations.[93] EPA also issued a Direct Final Rule[94] in compliance with its voluntary vacatur of the Final Rule provisions that would have exempted surface impoundments that would have completed closure within three years from the issuance date of the Final Rule. It deleted these "early closure" provisions (as they are termed by EPA), and added a new section that clearly states that all inactive surface impoundments must comply with the same rules that apply to other surface impoundments. EPA then extended the compliance deadlines originally established in the Final Rule to compensate for these units' late notice of the need to comply.

EPA has additionally issued other subsequent rules, that at best, could be described as insubstantial as they relate to the overall impact of the Final Rule and the behavioral change in coal ash management intended by EPA in implementing subtitle D requirements. They address nuances in performance standards and other technical requirements and thus are not discussed in detail in this white paper.[95]

C. EPA's Final Rule: National Minimum Criteria for Coal Ash Disposal



EPA's national minimum criteria are designed to address environmental risks from groundwater contamination, structural failures of CCR surface impoundments, and fugitive dust emissions, and to bring transparency to coal ash disposal operations in the electric generation sector. EPA used its years of investigations and data gathering from its Surface Impoundments Assessments, NODAs, and surveys conducted on hundreds of utilities' and IPPs' landfills and surface impoundments, making the following broader-based findings:

- EPA declared, for the third time, that CCR should be considered a nonhazardous waste under RCRA subtitle D and not be subject to regulation under subtitle C as hazardous waste.

- The basic components of CCRs to be regulated include fly ash, bottom ash, boiler slag, and flue gas desulfurization (FGD) materials.

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92 *Id.* at 438-39.

93 84 *Federal Register* 65,941 at n.1.

94 Direct Final Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur,* 81 *Federal Register* 51,802 (Aug. 5, 2016).

95 *See e.g.* Final Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One),* 83 Fed. Reg. 36,435 (July 30, 2018), revising alternative performance standards that a State could adopt in place of the standards adopted by the minimum criteria where there is evidence that hazardous constituents could not migrate to the uppermost aquifer. In addition, the initial criteria required for compliance by a CCR unit with certain performance standards must be certified by a professional engineer. The amended criteria would now allow a technical certification in lieu of certification by a professional engineer. Finally, EPA established groundwater protection standards for particular contaminants for which no Maximum Contaminant Levels (MCL) had previously been established. Similar types of revisions are proposed in EPA's Proposed Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One),* 83 *Federal Register* 11,584 (Mar. 15, 2018). Many of these amendments could be perceived as a relaxation of environmental standards and attributable to the current political persuasion of the President and the Administration, including the EPA Administrator, but in evaluating these changes, it might well be remembered that the Court's decision which strengthened the application of the Final Rule resulted from eliminating exceptions that had been approved in the initial Final Order before the change in the Administration.

- Existing CCR units should be allowed to continue to operate unless and until the unit poses an unacceptable risk, in which case they should then be required to be closed or retrofitted. Unacceptable risks include:
    - CCR surface impoundments failing to achieve "factors of safety";
    - Improper siting of CCR landfills or surface impoundments; and
    - Leaking unlined surface impoundments.

However, the D.C. Court of Appeals disagreed with EPA as to the last risk listed above.[96] The Court found that EPA's own factual records on the high degree of risk of leachate from unlined surface impoundments did not support waiting until actual leaking from an unlined surface impoundment was detected before the impoundment could be required to cease operation and either close or be retrofitted. The fact that an impoundment is unlined should be sufficient to determine that it poses an unacceptable risk.

Although individual specific criteria are designed to protect against the types of risks listed previously how those criteria are implemented is dependent on the activity being regulated. Consequently, the Final Rule organizes the criteria as they pertain to two types of activities:

1. Criteria for how new and existing landfills and surface impoundments can continue to operate and receive CCR after the Final Rule's effective date, and

2. Criteria for how landfills and impoundments that cannot comply with the criteria to continue operations, or are presently inactive, should be cleaned up, decontaminated, and closed.

Criteria for both continued operations and closure also include informational requirements that will result in greater self-awareness by utilities and IPPs owning and operating CCR units and in public awareness regarding the environmental status of all CCR units subject to the Final Rule. This set of criteria includes groundwater monitoring, recordkeeping, and public access of operating records.

1. Who Must Comply

Although coal ash is produced from other industrial and manufacturing sectors, the Final Rule applies only to the coal ash produced by the burning of coal to produce electricity at power stations owned by electric utilities and IPPs.[97] It also does not apply to municipal solid waste landfills that are subject to other RCRA regulations.[98] Initially, the Final Rule held that the national minimum criteria would apply to:

(i) New and existing landfills[99] currently accepting CCR, both on site and off site, not including municipal solid waste landfills;

(ii) New and existing active surface impoundments located on site at an active generation station, regardless of the fuel currently being used for generation;

(iii) Active surface impoundments, even if located on site at a retired generation station;

96 901 F.3d 414.

97 40 C.F.R. § 257.50 (2019); *see also* 80 *Federal Register* 21,302 at 21,468 for exceptions, including coal ash produced by manufacturing facilities, universities, and hospitals, or generated by other combustion of fuels other than coal for electricity, or co-generation unless coal makes up more than 50 percent of the fuels burned.

98 Municipal solid waste landfill facilities (MSWLFs) accepting CCR are not covered by the Final Rule. EPA concluded that 40 C.F.R. § 258 establishing national minimum criteria for MSWLFs is as protective as the Final Rule criteria for CCR units, and therefore MSWLFs could be exempt. *See* 80 *Federal Register* at 21,341.

99 40 CFR § 257.54 (listing definitions of active, existing, and new CCR landfills and CCR surface impoundments).

(iv) Inactive surface impoundments located on site at any active generation station currently producing electricity, regardless of the fuel currently being used; and

(v) The lateral expansion of a CCR unit, which EPA concluded effectively meets the definition of a new unit and is treated as such.[100]

As this list indicates, inactive ponds located on site at a retired power station were not initially included under the Final Rule. However, the D.C. Circuit found in *USWAG v. EPA* that the basis for different regulatory treatment of inactive impoundments located at a closed site, versus an active generation site, was arbitrary and capricious and so remanded this discriminatory treatment back to EPA.[101] EPA subsequently amended its rule to apply to all inactive impoundments. EPA had clarified in the Final Rule that it was not proposing to require that previously closed units be re-closed in compliance with the minimum criteria.[102] There is nothing to indicate that the Court's decision would change EPA's position that CRR units closed before the Final Rule would not be required to re-close, consistent with the Final Rule.

100 80 *Federal Register* at 21,361.

101 *See* 901 F.3d 414.

102 80 *Federal Register* at 21,343 (noting "EPA proposed to regulate only "inactive" surface impoundments that had not completed closure of the surface impoundment before the effective date. "Inactive" surface impoundments are those that contain both CCR and water, but no longer receive additional wastes. By contrast, a "closed" surface impoundment would no longer contain water, although it may continue to contain CCR (or other wastes) and would be capped or otherwise maintained.").

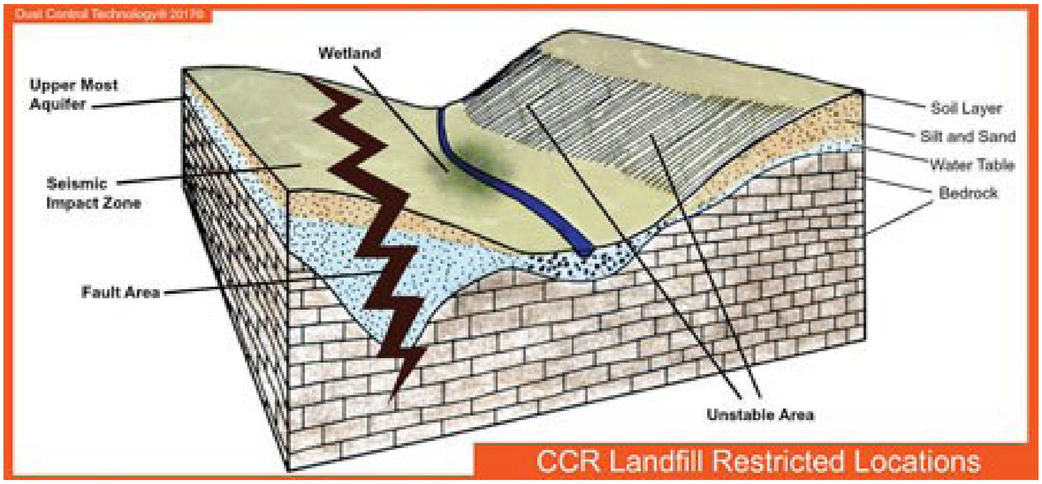
2. Key Technical Criteria Required for CCR Units' Continued Operations

The first set of key technical minimum criteria address day-by-day operating conditions that a CCR unit must meet, which can be broken down into the following four substantive areas:

a. Location Restrictions

The location criteria, as depicted in **Figure 8**,[103] restrict the placement of CCR where it could expose environmentally sensitive areas to possible contamination due to exceptional weather, earthquakes, structural failure of the CCR unit, or other circumstances. Environmentally sensitive areas include minimum separation from the uppermost groundwater aquifer, wetlands, fault areas, seismic impact zones, and any other unstable areas and/or conditions.

Figure 8: CCR Landfill Restricted Locations



b. Design Standards

The design criteria address risks of leachate impact on adjacent water systems and structural failures, as follows:

(i) Liner & Leachate Collection Systems: A critical design element for groundwater protection is installation of a composite liner system comprised of an EPA-compliant geomembrane upper liner in direct contact with a constructed clay liner (or engineered alternative equivalent) is required to minimize leaching of constituents from the CCR unit into the surrounding environment, and ultimately into groundwater or nearby surface waters. New landfills are also required to operate with a leachate collection and removal system (LCRS) that will remove excess leachate accumulating on the upper liner of the composite system.

103 Derek Schussele, *CCR Impound Regulations Spur Questions Over Dust Emissions and Wastewater Control*, PowerEng.com (Mar. 9, 2017), https://www.power-eng.com/2017/03/09/ccr-impound-regulations-spur-questions-over-dust-emissions-and-wastewater-control/#gref.

(ii) Structural Integrity: EPA recognized that the kind and degree of risks of possible failure of a CCR surface impoundment were very much linked to the structural design of an individual impoundment and the evolving conditions at the site. Consequently, rather than prescriptive engineering specifications, criteria to ensure structural integrity mostly rely on a mixture of various periodic assessments of certain structural elements that are listed in EPA's regulations. Minimum criteria specify certain minimum Factors of Safety standards to assess the safety of slope and set certain height limitations for damns, dikes, or other containment structure. These criteria only apply to surface impoundments.

c. Operating Standards

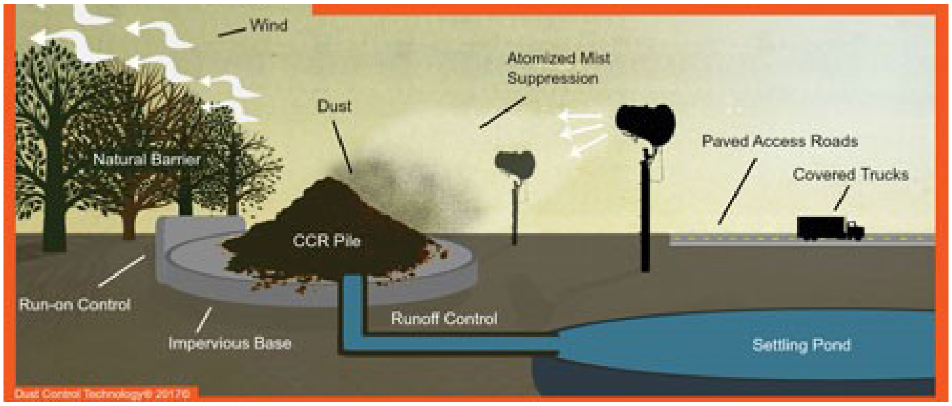
These minimum criteria apply to the day-to-day operations of CCR units to address the potential health and environmental impacts associated with their operations.

(i) *Fugitive Dust Control* – These air criteria serve to mitigate CCR from becoming air-borne. Each active CCR unit must implement a fugitive dust control plan, as depicted in **Figure 9**,[104] that minimizes CCR from becoming airborne and include the plan in its operating records. A report on compliance must be prepared each year as part of a unit's operating records. It should also record any complaints received and the corrective action taken in response.

(ii) *Run-on/Run-off for Landfills* – Each landfill must implement: (1) run-on controls that minimize the amount of surface water that can enter for the prevention of erosion, surface discharges of CCR, and generation of landfill leachate; and (2) run-off controls that also prevent erosion, protect downstream surface water from CCR releases from the unit, and minimize storm water run-off both in volume and velocity.

(iii) *Hydrologic and Hydraulic Capacity Requirements for Surface Impoundments* – CCR surface impoundments must meet hydrologic and hydraulic capacity specifications to ensure they can safely manage flood flows. A design meeting these specifications helps prevent uncontrolled overtopping of the impoundment and the erosion of the materials used in its construction. To ensure compliance, the criteria also requires periodic inspections to detect any indications of structural weakness with findings made a part of the operating records.

Figure 9: Fugitive Dust Control Plan Example



104 *See, infra* at p. 28.

d. Monitoring, Inspections, and Public Information

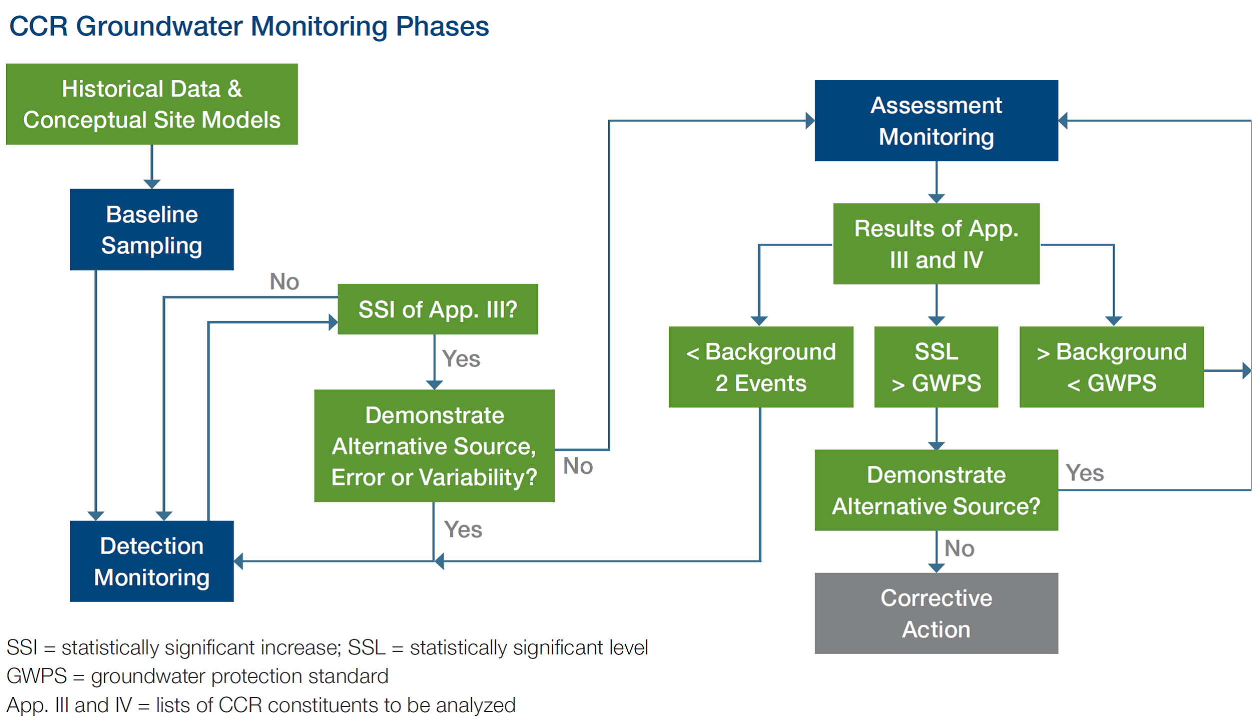
The following three criteria areas address the knowledge gap that has existed since before the Final Rule, both on the part of the owner/operator of CCR units and on the part of the public due to the lack of transparency and reporting failures.

(i) *Groundwater monitoring:* A groundwater monitoring program should consist of:

- Detection monitoring, which includes installation of a system of monitoring wells, and regularly conducting water sampling consistent with specified procedures and data analysis to detect a potential release of hazardous constituents from the CCR unit;
- Assessment monitoring to be implemented upon a determination of a statistically significant exceedance(s) of detection monitoring parameters in the monitoring well system; and
- Corrective action whenever the groundwater monitoring assessment confirms an exceedance of a groundwater protection standard(s) established for the listed constituents.[105]

The flowchart in **Figure 10**[106] illustrates the process in which the three criteria work together to protect groundwater standards and to result in a more timely reaction to events in which constituent concentrations (see Section 5C2) are approaching statistically significant levels (SSL) before violating groundwater protection standards (GWPS).

Figure 10: CCR Groundwater Monitoring Phases



105 *See Figure 7, supra* at p. 17.

106 *Assessment of Corrective Measures: CCR Rule Groundwater Monitoring Requirements,* TVA (Aug. 12, 2019), https://www.tva.gov/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Coal%20Combustion%20Residuals/Groundwater%20Fact%20Sheets/groundwater_executive_summary.pdf.

(ii) *Inspections for Surface Impoundments:* As a result of EPA's previous periodic Surface Impoundment Assessments discussed in Section 5B, EPA determined the need for structural stability criteria in the Final Rule,[107] including the requirement that all surface impoundments be inspected weekly for any evidence of structural weakness or other conditions that could disrupt the operation and safety of the impoundment. Instrumentation is required to be inspected at least every 30 days. Surface impoundments that exceed certain height parameters, must be inspected every year, as well as assessed for structural stability based on factors of safety every five years. Annual inspections are intended to be broader in scope than weekly inspections and are required to be conducted to ensure that the design, construction, operation, and maintenance of a CCR unit is consistent with recognized and generally accepted good engineering standards.[108] Inspections are to include review of past operating records, as well as visual inspections, and must be conducted by a qualified professional engineer.

e. Record Keeping and Internet Posting

Operating records must be maintained for each CCR unit, which is to include all data collected and inspection reports required under the different criteria codified in EPA's regulations. Whenever information is placed in the operating record, notice is to be provided to the appropriate state agency. Current operating records must be posted on an Internet site accessible to the public.[109]

3. Closure of Non-Compliant CCR Units and Post-Closure Care

The national minimum criteria require that any CCR landfill or CCR surface impoundment that is located within an area restricted by the minimum criteria, or that cannot meet the applicable factor of safety criteria for structural integrity, must be closed consistent with the closure requirements.[110] The Final Rule also provided that any existing unlined CCR surface impoundment *that is contaminating groundwater* above the groundwater protection standard set for the particular toxic constituent must cease accepting CCR and either be retrofitted or closed, with some limited exceptions. Units that used clay liners that meet certain depth and hydraulic conductivity performance standard were deemed lined and thus excluded from closure. As discussed previously, the Court overturned the clay-liner exception and the contamination condition, which expands the number of CCR units that are required to close. Consistent with the Court's decision, EPA has proposed to amend its regulations to require a surface impoundment to cease receipt of CCR and initiate closure by August 31, 2020, where the CCR unit either (1) is unlined or formerly ''clay-lined''; or (2) failed the aquifer location requirement, unless the generation facilities require additional time to develop alternate capacity to manage their waste streams.[111]

The minimum criteria for closure and post-closure care were designed to ensure the long-term safety of closed CCR units. The specific applicable criteria are dependent on the method used to close a CCR unit. In designing the Final Rule, EPA considered the two conventional closure methods (1) by leaving the CCR in place and installing a final cover system, which has been the conventional approach to closure referred to as "cap-in-place," or (2) through removal of the CCR and decontamination of the CCR unit, generally referred to as "excavate and haul" or "closure by removal."

107 80 *Federal Register* at 21,315.

108 *Id.*

109 EPA has a website that has links to all the companies' postings of their compliance with the EPA rule in alphabetical order by state. EPA, *List of Publicly Accessible Internet Sites Hosting Compliance Data and Information Required by the Disposal of Coal Combustion Residuals Rule*, https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required.

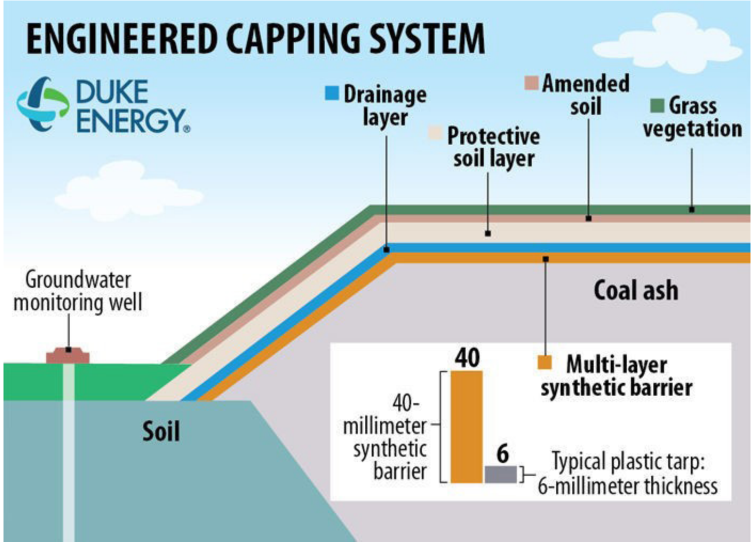
110 For fault areas, seismic impact zones, and unstable areas (using karst areas as a proxy) the EPA's Regulatory Impact Analysis (RIA) projected that 51 of the 1045 waste management units would be subject to the location restrictions resulting in an estimated 26 waste management units closing and safely relocating offsite.

111 84 *Federal Register* at 65,942.

a. Closure with CCR in Place

A cap-in-place approach to closure has historically been utilities' preferred approach to closure. It was a much simpler process involving placement of a cover over the coal ash after the coal ash has been dewatered and the coal ash stabilized. Costs were, correspondingly, significantly less.[112] The minimum criteria impose more performance standards for closure designs and continue to appear less costly, even if more environmentally risky, illustrated in **Figure 11**.[113]

Figure 11: Engineered Capping System Example



Minimum criteria for closure with CCR in place are designed to:

- Control, minimize, or eliminate, to the maximum extent feasible, future infiltration of liquids into the waste and releases of CCR, leachate, or contaminated runoff to the ground or surface waters or to the atmosphere;
- Preclude the probability of future impoundment of water, sediment, or slurry;
- Prevent the sloughing or movement of the final cover system during the closure and post-closure care period; and
- Minimize need for future maintenance.

Accordingly, closure will require: (1) dewatering or drainage to eliminate all free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues; and (2) stabilization of the contained CCR by reinforcing the dike or other sloping feature of the impoundment to protect against sloughing or movement of the final cover system. Dewatering activities and discharge of decant water may require new or revised NPDES as part of the closure permit.

112 80 *Federal Register* at 21,305.

113 Taft Wireback, 'What science demanded': Duke Energy ordered to excavate all coal ash in North Carolina," *Journal Now* (figure of Engineered Capping System) (Apr. 1, 2019), https://www.journalnow.com/news/local/what-science-demanded-duke-energy-ordered-to-excavate-all-coal/article_5b090c4a-ee70-54a5-b296-6aa3b1efbbe2.html (second picture).

Finally, the final cover system:

- Must restrict permeability based on the minimum criteria's performance standards,
- Include an infiltration layer minimizing the infiltration of liquids through the closed CCR unit, and
- Include an erosion layer of at least six inches of earthen material that minimizes the erosion of the final cover.

What the minimum criteria do not require for closure with CCR in place is a bottom liner to separate the CCR from its surrounding soil environment. Instead of guarding against leachate using a liner system, EPA relies on water monitoring requirements and other post-closure care requirements that are to be in effect for 30 years after closure is complete. Post-closure criteria include the obligation to:

- Maintain the integrity and effectiveness of the final cover system,
- Maintain the integrity and effectiveness of the leachate collection and removal system, and
- Maintain the groundwater monitoring system and continue monitoring groundwater consistent with the groundwater monitoring requirements of the minimum criteria.

If at the expiration of the 30-year post-closure period, the CCR unit is subject to assessment monitoring due to a previous failure of a water quality performance standard, the 30-year period can be extended.

Thus, a tradeoff for utilities in pursuing the less expensive cap-in-place is the assumption of a 30-year obligation with its associated liability. Future corrective action and the associated financial liabilities could off-set the present cost savings. Additionally, the long-term legal liability associated with the post-care obligation is evidenced by the further requirement that "the owner or operator must record a notation on the deed to the property, or some other instrument that is normally examined during title search," and that the notation "must in perpetuity notify any potential purchaser of the property that: (i) the land has been used as a CCR unit; and (ii) its use is restricted under the post-closure care requirements as provided by [EPA's regulations]."[114] This may be disconcerting for a utility or IPP who might consider selling its generating station within the 30-year timeframe.

On the other hand, the potential exposure of groundwater to leachate from a closed impoundment with CCR in place has resulted in environmentalists, nearby communities, and state environmental regulators — as well as some legislators — abandoning support for the cap-in-place closure,[115] notwithstanding that EPA held that cap-in-place could be as protective as removal and decontamination.[116] Cap-in-place could also mean the installation of other corrective action features such as slurry walls, etc., if there is either evidence of groundwater interaction with the CCR unit or if groundwater quality impacts are already detected. Groundwater reports posted to utility CCR compliance webpages indicate a large number of impoundments are in assessment monitoring, or have exceeded groundwater protection standards, which underscores the vulnerability of this closure approach.[117]

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114 40 C.F.R. § 257.102(i).

115 See, for example, Chelsea King, Residents oppose Duke Energy's preference to cap coal ash ponds (January 26, 2019), http://www.personcountylife.com/stories/residents-oppose-duke-energys-preference-to-cap-coal-ash-ponds,21595; Emily Sides, Dominion Energy open to coal ash cap; legislators say Possum Point pond has to go. (Dec 12, 2018), https://www.insidenova.com/news/politics/prince_william/dominion-energy-open-to-coal-ash-cap-legislators-say-possum/article_03b0060a-fe53-11e8-8bc0-0f5804636223.html.

116 80 *Federal Register* at 21,412.

117 *Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S.,* Envtl Integrity Project (Mar.4, 2019, revised July 11, 2019), http://www.environmentalintegrity.org/wp-content/uploads/2019/03/National-Coal-Ash-Report-Revised-7.11.19.pdf.

b. Closure through Removal and Decontamination

EPA also refers to this approach as "clean closure." The requirements in the minimum criteria pertaining to this closure approach are straightforward and hardly technical **(Figure 12)**, particularly as compared to the closure requirements, where CCR remains in place with the detailed specifications for the cover that is to be installed. The minimum criteria for closing a CCR unit by removing the CCR and decontaminating the unit's footprint appear to have the least long-term risks for utilities and IPPs. Although the minimum criteria for clean closure do not expressly specify dewatering in the requirements, excavation of the CCR would, by necessity, require impoundments to be dewatered before excavation begins. Disposal of the liquids from dewatering raises environmental concerns and could trigger revised or new NPDES requirements. There is no obligation for post-closure care of the CCR site once closure is complete. The closure of the unit is deemed complete when constituent concentrations throughout the unit and any areas affected by releases have been removed, and monitored concentrations do not exceed groundwater protection standards.

Figure 12: Overview of Closure by Removal

The conventional term for this approach, excavate and haul, underscores the more controversial transportation activities associated with EPA's remove and decontaminate closure approach. Transportation significantly contributes to the overall costs of closure by removal that may result in it being more costly than closure with CCR in place. However, from EPA's perspective, its regulatory responsibility ceases once the coal ash is placed on a truck or rail car for transportation. There is no post-monitoring or other post-care requirements: "Once a facility has removed the waste and any liner, the presumption is that the source of contamination has been removed as well."[118] It also provides for the title to be cleared. Unless prohibited by state law, the deed notation that would otherwise be required regarding the post-care obligation under cap-in-place would be removed upon certification that clean closure has been completed, effectively evidencing a regulatory cut-off of liability under the excavate and haul scenario.[119]

118 *Id.*

119 40 C.F.R. § 257.102(g)(4).

Two activities that are required for both closure methods but are not addressed in the Final Rule are dewatering and pre-construction stabilization. Ensuring site stability pre-closure for construction activities should also be a significant part of closure plans as the character of coal ash can change in response to construction activities, such as to the vibration of heavy truck activities that can exacerbate instability of a site. Safety of construction workers during closure activities is the central concern in assessing risks of stability failure during the construction process that could subject workers to exposure for longer duration and higher concentration with health risks.[120]

Although the EPA national minimum criteria do not address any specific requirements for dewatering, it is a significant activity in impoundment closures. Technical issues relating to dewatering and its role in structural stabilization are often challenging and very dependent on local conditions.[121] Treatment of the extracted water for ultimate safe discharge should also be addressed in closure plans. Site stabilization and dewatering are large contributing factors in the overall costs of closures, regardless of whether closure is achieved by leaving CCR in place or removal.

Some circumstances may promote a third option: on-site disposal via the development and construction of an on-site compliant landfill or innovative in-place closure, where CCR is excavated, lined, and capped. This option can be applied with a variety of hybrid ash basin closure methods using time tested remediation technologies. These technologies include innovative temporary closure covers with barrier walls and dewatering so the CCR materials can be excavated and used for beneficial use at a future date. This third option would require specialized stabilization methods that would use macroencapsulated CCRs and provide separation and protection of the groundwater.[122]

c. Closure Plans

A closure plan is required for all existing CCR units. It must identify how the CCR unit will be closed and the steps necessary to accomplish closure at any point during its active life. For closure with CCR in place, the plan must describe the final cover system and how it will meet the minimum criteria's performance standards, and the methods and procedures of how it will be installed and the estimated time schedule. The plan should estimate the largest size the CCR could achieve in acreage and volume. The closure plans were to be included in the CCR unit's operating records with a notice provided to the appropriate state agency by October 17, 2016.[123]

120 Mark Johnson, PG and Kent Nilsson, PE "Construction Concerns Are Key in Closure Planning for Coal Ash Ponds," *Power Magazine*, (Dec. 1, 2014), https://www.powermag.com/construction-considerations-are-key-in-closure-planning-for-coal-ash-ponds/?pagenum=4; also Kathryn Nash , Marcella Funderburg, P.E., Ryan Kamp, "Best Practices During Closure," *World of Coal Ash Conference,* (May 2019), http://www.flyash.info/2019/095-paper.pdf.

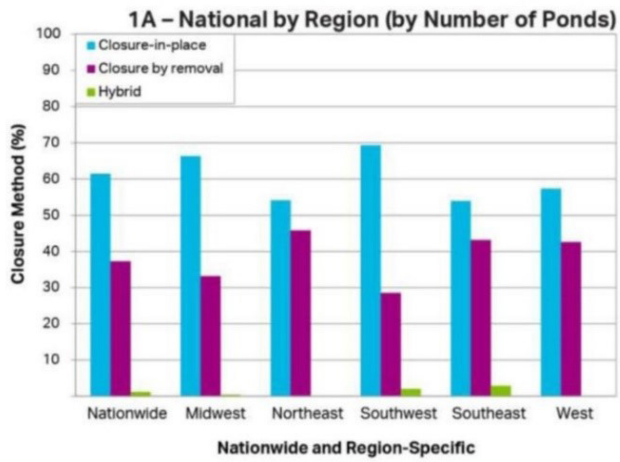
121 Jeffrey B. Heyman, G. Richard Bird, Stephen Couture, "CCR Pond Dewatering – Critical Planning and Characterization Tasks," *World of Coal Ash Conference* (May 2017), http://www.flyash.info/2017/214-Heyman-14-woca2017p.pdf.

122 Jeffrey T. Crate, John P. Swenson, Scott Sheridan, "Using geosynthetics for macroencapsulation for CCR on-site clean closure," *Geosynthetics Magazine* (August 1, 2017), https://geosyntheticsmagazine.com/2017/08/01/macroencapsulation-obtaining-on-site-clean-closure/.

123 40 C.F.R. § 257.101(b).

AECOM compiled data comparing CCR impoundments' closure plans for a report it prepared for Dominion Energy to submit to the Virginia General Assembly under Virginia SB1398. As seen in AECOM's chart in **Figure 13**,[124] nationwide more than 93 percent of ponds with CCR volumes greater than 5 million CY and 75 percent of surface impoundments with between 1 and 5 million CY are being closed in place.

Figure 13: Coal Ash Pond Types by Region



Closure-in-place and closure-by-removal are being used almost equally for surface impoundments with CCR volumes of less than 1 million CY. Although closure-by-removal is used more than closure-in-place for impoundments with areas of less than 20 acres, closure-in-place is the predominant option for surface impoundments larger than 20 acres (75 percent to 95 percent).[125] However, environmental pressure, local coal ash publicity, and the real fear of lawsuits felt by CCR unit owners and operators is shifting away from closure-in-place to excavate and haul, particularly as public policy looks to a "one size fits all" solution.

4. Final Rule Compliance Deadlines and Timelines for Closure

Deadlines for meeting the different criteria under the Final Rule all commence based on the publication of the Final Rule on April 17, 2015. Several of the deadlines for compliance by existing CCR units have already occurred between October 2015 and October 2018. Deadlines for compliance for a new CCR unit are triggered by its initial receipt of CCR. However, the minimum criteria were not applicable to inactive and early closure surface impoundments when the Final Rule issued. Subsequently, the Court vacated its conditional exemption, causing the EPA to amend its rule so that it would now apply to all active impoundments,[126] with the notation that it would issue a further order to establish compliance timeframes for surface impoundments newly affected by the Court's decision. EPA has yet to adopt dates for the applicable impoundments.

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124 Kula Kulasingam, Ph.D., P.E. & John Bove, P.E., *Closure in Place: Regulatory Design Issues and Impacts* (Mar. 20, 2018), http://carbon2019.org/wp-content/uploads/2018/04/4-r-kula-kulasingam.pdf (noting AECOM cautions that "[d]ata compiled from publicly available sources and can not [sic] be independently verified."), as cited in AECOM for Dominion Energy, *SB1398 Response: Coal Combustion Residuals Ash Pond Closure Assessment* (Nov.2017), p.3.1.

125 *Id.*

126 901 F.3d 414.

The Final Rule also establishes closure timeframes by the end of which closure must be completed and certified pursuant to EPA's regulations. Landfills must complete closure within six months of commencing closure and surface impoundments must complete compliance closure within five years of commencing closure. With appropriate documentation and justification beyond the control of the CCR unit's owner or operator, the deadline for a particular CCR unit may be extended. CCR landfills may extend the timeframe to complete closure but for no more than two one-year increments. CCR surface impoundments of 40 acres or smaller is limited to one extension for no more than two years. CCR surface impoundments larger than 40 acres may qualify for up to five two-year extensions, potentially resulting in a total timeframe of 15 years to complete closure.[127]

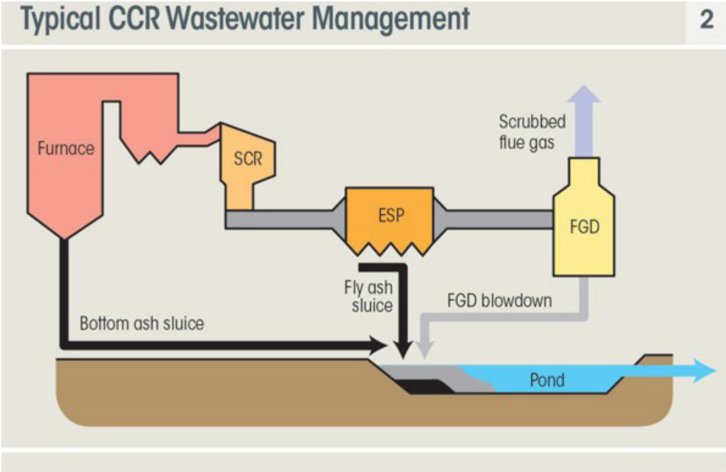
D. Coal Ash Regulation under the Clean Water Act (CWA)

1. CWA's Effluents Limits Guidelines and NPDES Permit Program

Several different liquid waste streams are discharged by coal-fired steam electric plants, as illustrated in **Figure 14**,[128] which include fly ash and bottom ash transport water, once through cooling water, cooling tower blowdown, coal pile runoff, and a broad class of low-volume waste, such as boiler feedwater treatment wastewater and flue gas desulfurization (FGD) wastewater.

These waste streams or effluents are generally managed in on-site wastewater treatment facilities or in CCR surface impoundments prior to being discharged into surface waters under defined terms in facility NPDES permits.

Figure 14: Typical CCR Wastewater Management



127 40 C.F.R. § 257.02(f); *see also* 80 Fed. Reg 21493.

128 Thomas E Higgins, Dennis Fink, Kristen Jenkins and Julianne Schucker, "Planning for the Wastewater Impacts of the CCR Rule and Effluent Limitation Guidelines," *Power Engineering*, Issue 5 and Vol. 119 (May 21, 2015), https://www.power-eng.com/2015/05/21/planning-for-the-wastewater-impacts-of-the-ccr-rule-and-effluent-limitation-guidelines/#gref.

Seepage is another form of discharge. Seepage is collected and managed through a seepage interception system that are built into surface impoundments to help prevent internal erosion of the impoundment's structure. Wastewater from these systems is either pumped back into the impoundment or discharged via a discrete conveyance. Whatever the conveyance that empties the effluent into a particular body of water, it is a regulated point source under the CWA.[129] Consequently, electricity generation facilities must obtain a permit under CWA that will attempt to control the pollutants being discharged through their wastewater systems. Closure of surface impoundments will require removal of decant water and dewatering as a preliminary step to excavation. These activities will require permits depending on how the closure plan proposes to dispose of them.

The CWA establishes a regulatory framework for regulating the direct discharge of designated pollutants from a point source into navigable waters through a permit program administered by the state or the regional office of the EPA as part of CWA's national pollutant discharge elimination system. The CWA is not intended to apply to any and all discharge(s), but only those from a specific point source.[130] CWA § 301 prohibits industrial discharge of pollutants into jurisdictional waters without a permit such as would be issued under CWA § 402 that creates the National Pollutant Discharge Elimination System (NPDES). An individual NPDES permit translates the general requirements of the CWA into specific provisions tailored to the industry, individual operations, and activities by the applicant and the specific effluents to be controlled.

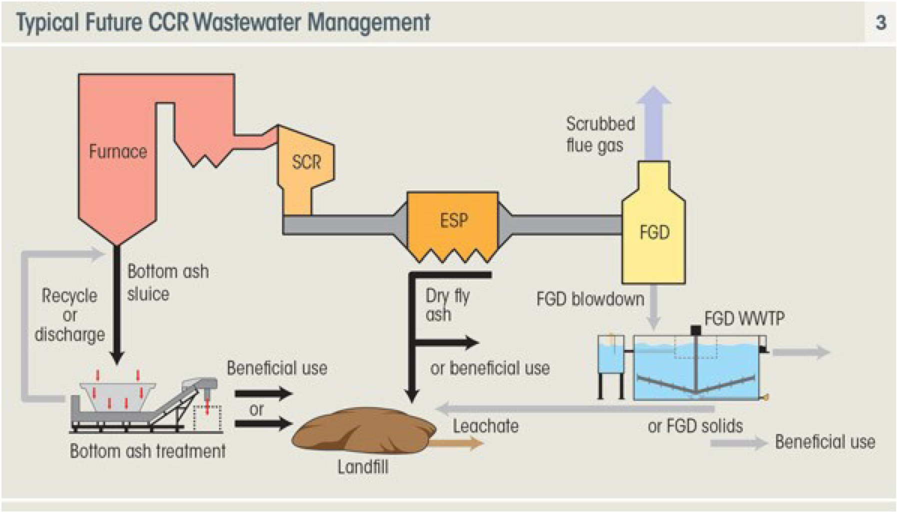
Conditions and restrictions placed on a NPDES permit are based on national wastewater discharge standards consistent with EPA's Effluent Guidelines developed by EPA on an industry-by-industry basis. They are technology-based regulations designed to achieve maximum pollutant reductions economically achievable for an industry. EPA identifies the best available technology that is economically achievable for that industry and sets regulatory requirements based on the performance of that technology. The Effluent Guidelines do not require facilities to install the particular technology identified by EPA but do require facilities to achieve the regulatory standards that were developed based on a particular model technology.[131]

129 EPA, Water Quality-Based Effluent Limits Coal Combustion Waste Impoundments, https://www3.epa.gov/npdes/pubs/wqp-coalcombustionwasteimpoundments.pdf.

130 CWA §502(12), see also Robert V. Percival, et al., *Environmental Regulation: Law, Science, and Policy 222* (4th ed. 2003).

131 See EPA's discussion of Effluent Guidelines at https://www.epa.gov/eg and subsequent web pages.

Figure 15: Typical Future CCR Wastewater Management



The same year that EPA issued its Final Rule on CCR regulations, EPA also issued a final rule that adopted effluent guidelines that would apply to coal-fired steam electric generation plants. As indicated in **Figure 15**,[132] it will affect the wastewater streams from the same processes and similar byproducts as affected under EPA's CCR Final Rule: FGD residuals, fly ash and bottom ash, with the addition of flue gas mercury control and gasification of fuels, such as coal and petroleum coke.[133] The Effluent Limitation Guidelines (ELG) require substantial investment in technology to achieve compliance, in addition to CCR compliance costs. Ultimate disposal of wastewater as part of CCR unit closures will also be affected by NPDES new conditions resulting from ELG compliance. EPA is very aware of the combined economic and time constraints from utilities and IPPs having to comply with both within the same timeframe:

> EPA also takes very seriously the concern that facilities are not prematurely compelled to make potentially irreversible operational changes or otherwise be forced to invest in compliance measures that may subsequently need to be modified. This was part of the reason that EPA originally chose to align key implementation and operational decisions under the CCR rule with EPA's schedule for issuing the effluent limitations guidelines and pretreatment standards (ELG) for the Steam Electric Power Generating Point Source Category.[134]

Meanwhile, in May 2019, EPA postponed issuance of an order revising ELG, projecting a proposed rulemaking by June 2019, and a final rule by August 2020.[135]

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132 https://www.power-eng.com/2015/05/21/planning-for-the-wastewater-impacts-of-the-ccr-rule-and-effluent-limitation-guidelines/#gref.

133 EPA issued the Final 2016 Effluent Guidelines Program Plan, 83 *Federal Register* 19,281 (May 2, 2018), https://www.federalregister.gov/documents/2015/11/03/2015-25663/effluent-limitations-guidelines-and-standards-for-the-steam-electric-power-generating-point-source.

134 83 *Federal Register* at 36,411.

135 See https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201904&RIN=2040-AF77.

2. CWA and Coal Ash Leachate Risk to Groundwater

The Clean Water Act (CWA) unambiguously regulates the discharge of pollutants into the navigable waters of the United States.[136] However, recent environmental litigation has raised the question of whether CWA provides for the regulation of pollutants being discharged into jurisdictional water indirectly via the contamination of groundwater. This question has been asked in the context of coal ash leachate that contaminates groundwater, which ultimately discharges the pollutants into nearby lakes, streams, and rivers. The Circuit Courts of Appeal who have heard cases on this question have split in their answer. Because of the split in the Circuits, the Supreme Court has agreed to hear the issue in its next term. In anticipation of the Supreme Court case, EPA recently issued an interpretative rule[137] addressing whether the CWA NPDES permit program applies to pollutants like coal ash from a point source to groundwater.

In *Sierra Club v. Dominion*, the Sierra Club sued Dominion for violation of CWA and violation of its Virginia Pollutant Discharge Elimination System Permit (VPDES),[138] the Virginia version of the NPDES. The Sierra Club alleged Dominion was discharging arsenic into navigable surface waters, via hydrologically connected groundwater, without permitting authority under the CWA and VPDES. The Eastern Federal District Court of Virginia broke its decision into two parts. First, it ruled that the CWA does cover groundwater discharge where it hydrologically connects with surface water, and therefore, since Dominion did not have a discharge permit for its CEC (Cation Exchange Capacity) coal ash pond, it violated the CWA. Second, however, the court gave deference to the DEQ's interpretation that VDPES regulations are not applicable to groundwater and so found that Dominion had *not* violated its VDPES permit. The District Court's decision was appealed, and in 2018 the Fourth Circuit Court of Appeals reversed the District Court's interpretation of the CWA, finding that leaching through groundwater into navigable waters did NOT constitute a "point source" that would trigger the CWA.[139] This is in conflict with an earlier Fourth Circuit opinion by another panel that adopted a more generous interpretation of the CWA.[140]

During this same timeframe, two Sixth Circuit cases[141] adopted a view similar to the Fourth Circuit's *Dominion Decision*, finding that the "conduit theory" was insufficient to implicate the CWA. The Ninth Circuit case decided this issue in agreement with the earlier Fourth Circuit's more expansive view of the CWA.[142] Given this split in the Circuits, the Supreme Court granted a petition for *certiorari* in February 2019.[143] Pending the hearing at the Supreme Court, EPA issued an interpretative ruling in April 2019, largely agreeing with the Sixth Circuit that the hydrological connection of groundwater to navigable waters does not implicate the CWA.[144]

136 *See* Summary of the Clean Water Act, 33 U.S.C. § 1251 *et seq.* (1972), https://www.epa.gov/laws-regulations/summary-clean-water-act.

137 Interpretive Statement on Application of the Clean Water Act National Pollutant Discharge Elimination System Program to Releases of Pollutants From a Point Source to Groundwater, 84 *Federal Register* 16810 (April 23, 2019), https://www.govinfo.gov/content/pkg/FR-2019-04-23/pdf/2019-08063.pdf.

138 *See Virginia Pollutant Discharge Elimination System Permit Program,* Va. DEQ (last visited Oct. 3, 2019), https://www.deq.virginia.gov/Programs/Water/PermittingCompliance/PollutionDischargeElimination.aspx.

139 *Sierra Club v. Va. Elec. & Power Co.,* 903 F.3d 403 (4th Cir. 2018), hereinafter *Dominion Decision.*

140 *Upstate Forever v. Kinder Morgan Energy Partners, L.P.*, 887 F.3d 637 (4th Cir. 2018).

141 *Ky. Waterways All. v. Ky. Utils. Co.,* 905 F.3d 925 (6th Cir. 2018); *Tenn. Clean Water Network v. TVA*, 905 F.3d 436 (6th Cir. 2018), *reh'g denied,* 913 F.3d 592 (6th Cir. 2019).

142 *Hawai'i Wildlife Fund v. Cty. of Maui,* 886 F.3d 737 (9th Cir. 2018) *cert granted*, 139 S.Ct. 1164 (2019), https://www.scotusblog.com/case-files/cases/county-of-maui-hawaii-v-hawaii-wildlife-fund/.

143 The Writ of Certiorari was granted on February 19, 2019, and oral argument was held on November 6, 2019. No decision has been reached as of the publication of this report, https://www.scotusblog.com/case-files/cases/county-of-maui-hawaii-v-hawaii-wildlife-fund/.

144 EPA, Interpretive Statement on Application of the Clean Water Act National Pollutant Discharge Elimination System Program to Releases of Pollutants From a Point Source to Groundwater, https://www.federalregister.gov/documents/2019/04/23/2019-08063/interpretive-statement-on-application-of-the-clean-water-act-national-pollutant-discharge.

However, the Supreme Court might find on the facts of the case before it relative to the conduit theory under the CWA, the application of its decision in the coal ash context is mostly moot. The Final Rule addresses groundwater protection through monitoring and corrective action criteria under RCRA's solid waste regulation and so further regulation under CWA would be mostly duplicative. Many of these cases were most likely brought because of the frustration of environmentalists with the lack of action in implementing the Final Rule that was issued in 2015 with little actually happening. Should the Supreme Court find that the CWA does apply as challenged, then the environmentalists will have another means of pressuring for action by the EPA and CCR unit owners.

SECTION 6:
State Environmental Regulatory Role in Coal Ash Management

A. RCRA's Self-Implementing Enforcement before WIIN

Section 7002 of RCRA generally provides for limited federal enforcement of EPA regulation of solid waste disposal under subtitle D.[145] Subtitle D regulations have been described as self-implementing, meaning that while EPA can adopt national minimum criteria, it can neither enforce compliance nor mandate a state to enforce compliance.[146] Consequently, implementation of national minimum criteria promulgated by EPA in regards to solid waste disposal are generally reliant on a waste facility owner or operator to voluntarily comply. Otherwise, the only enforcement mechanism is a citizen suit under RCRA that would open the door for courts to enforce compliance. EPA's only recourse would be to use its imminent and substantial endangerment authority where there has been demonstrable environmental and public health harm.[147]

EPA discussed this self-implementing character of subtitle D in the Final Rule, recognizing that its authority over CCR waste disposal was limited to adopting national minimum CCR criteria[148] and that it needed the states to adopt its minimum criteria if it were to be effective in changing coal ash waste management practices. Consequently, it turned to the provisions outlining a process for state solid waste management plans (SWMP) under §4002 of RCRA, which EPA must approve. EPA "strongly recommended" that states take advantage of this process to amend their existing SWMP to include coal ash requirements consistent with the Final Rule and to submit their amended plans to EPA for approval.[149] However, subsequent action by Congress addressed EPA's enforcement limitation and provided EPA a stronger stick to incentivize states to adopt EPA's minimum criteria for CCR disposal.

145 42 U.S.C. § 6972.

146 Steven A. Burns & David W. Mitchell, *EPA's coal ash rule relies on unique enforcement framework,* Am. Bar. Ass'n (Mar. 1, 2015), https://www.americanbar.org/groups/environment_energy_resources/publications/trends/2014-2015/march-april-2015/epas_coal_ash_rule_relies_unique_enforcement_framework/.

147 *Id.*

148 Final Rule, *supra* note 1, at 21,303; *see also* discussion on the voluntary character of the Final Rule, *id.*, at 21,311: "The federal standards apply directly to the facility (are self-implementing) and facilities are directly responsible for ensuring that their operations comply with these requirements. States are not required to incorporate or implement these requirements under any state permitting program or other state law requirement, and EPA is not authorized to impose such requirements, directly or indirectly on the states. States and citizens may enforce this prohibition (and therefore, the federal criteria) using the authority under RCRA section 7002."

149 Final Rule, *supra* note 1, at 21,430.

B. WIIN: A New Federal and State Cooperative Enforcement

However, as noted earlier, in 2016, after the issuance of the Final Rule, Congress enacted the *Water Infrastructure Improvements for the Nation* (*WIIN*)[150] establishing a different federal and state cooperative framework for enforcement of federal coal ash regulations only. As an alternative to amending its SWMP, a state can establish its own permit program (or other system that would require prior approval and conditions under state law), which then must be submitted to EPA for approval. EPA must approve the program if it determines that it complies with the national minimum criteria as set forth in EPA's regulations or with other state criteria that is "at least as protective" as EPA's criteria. It also allows the permit program to include flexibility in issuing individual permits. Conditions placed on a permit can deviate from any national minimum criteria when needed to address unique on-site circumstances, so long as they are as environmentally protective. Once a state permit program is approved, it operates in lieu of EPA's regulations for CCR disposal. Until a CCR unit has obtained a permit, however, it continues to be subject to EPA's CCR disposal criteria.

WIIN goes beyond the SWMP process used for other nonhazardous waste. In the event that a state does not file a permit program for CCR disposal activities, or that EPA does not approve a permit program submitted by a state (both identified as a "nonparticipating state"), EPA can implement its own permit program for the nonparticipating state, but only where Congress provides funding for EPA's permit program. WIIN also provided EPA with the authority to directly enforce the federal CCR Rule in nonparticipating states. Otherwise, the Final Rule would continue to be self-implementing under RCRA and enforceable through citizen lawsuits.

Because WIIN was enacted after the CCR Final Rule was issued, two petitions for reconsideration were filed with EPA on May 12, 2017, and May 31, 2017, requesting EPA to reconsider those provisions of the rule that could be affected by WIIN. EPA granted the petitions.[151] Meanwhile, however, some states have filed their permit programs.

In August 2017, EPA issued its *Coal Combustion Residuals State Permit Program Guidance Document* (Guidance) intended as a "technical resource to States that may be useful in developing and submitting a State Coal Combustion Residuals (CCR) Permit Program to EPA for approval."[152] The Guidance includes four chapters:

1. An overview of the provisions of WIIN;
2. The process and procedures EPA will use to review and make determinations on state CCR permit programs and the documentation that should also be submitted for approval;
3. A checklist of all the requirements of the Final Rule as codified at 40 CFR Part 257 subpart D; and
4. A checklist of those items to be submitted by a state when seeking approval of its permit program.

Although EPA noted its anticipation that the Guidance would be updated as the rules are revised and as it considers comments it invited the public to submit, EPA has not yet provided any revised or updated version.

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150 42 U.S.C. § 6945(d). Text of WIIN Act at https://www.congress.gov/114/plaws/publ322/PLAW-114publ322.pdf.

151 EPA to Reconsider Certain Coal Ash Rule Provisions, EPA, (September, 14, 2017), https://www.epa.gov/newsreleases/epa-reconsider-certain-coal-ash-rule-provisions.

152 *Coal Combustion Residuals State Permit Program Guidance Document,* EPA, at iv (Aug. 2017), https://www.epa.gov/sites/production/files/2017-08/documents/eo12866_ccr_state_permit_prog_guide_2050-za10_significant_guidance_20170809_final_omb_clean_copy_002508.pdf.

C. Individual State Actions on Coal Ash Permitting

As discussed, federal structure for waste environmental regulation often relies on cooperative relationships with states through a permit program. Since the Final Rule was issued, there have been several state actions regarding the state permitting function. Oklahoma and Georgia submitted their permit program to EPA for approval under WIIN, and Oklahoma has received approval.[153] Four states have passed coal ash legislation that will need to be integrated into their permit program under WIIN or into a coal ash amendment to their SWMP: Illinois, Michigan, North Carolina, and Virginia. Additionally, many state environmental offices have amended their solid waste regulations to include EPA's minimum criteria.[154] Compliance with the Final Rule will be implemented more or less through the standard permitting process generally implemented by states.

1. WIIN State Permit Programs

a. Oklahoma

Oklahoma was the first state to submit its own permit program for EPA approval under WIIN. It was approved by EPA on June 18, 2018, thereby allowing it to operate in lieu of EPA's Federal CCR program.[155] However, EPA's approval is being challenged in the D.C. Federal District Court on two grounds:[156]

1. EPA failed to develop and publish minimum guidelines for public participation in the design, implementation, and approval of state CCR programs.
2. EPA approval of Oklahoma's permit program included the same federal CCR regulations that had been vacated in USWAG v. EPA.

b. Georgia

Georgia submitted its permit program and associated regulations for partial approval by the EPA. On June 28, 2019, EPA published its proposed approval for public comment and held a public hearing on August 6, 2019.[157] Georgia asked for partial approval, excluding from EPA review two definitions, ''CCR Landfills'' and ''CCR Surface Impoundments,'' which expand the types of landfills and surface impoundments that would be subject to Georgia's CCR regulations that are not now covered by federal CCR regulations. Georgia's definitions include dewatered surface impoundments, inactive (but not dewatered) surface impoundments at inactive facilities, and inactive CCR landfills. Although the definitions were to be excluded from EPA's review, EPA commented that the definition, by requiring that inactive units located at inactive generation facilities, aligns with the decision in USWAG v. EPA.[158] However, because EPA had not yet promulgated final regulations

153 See Permit Programs for Coal Combustion Residual Disposal Units, https://www.epa.gov/coalash/permit-programs-coal-combustion-residual-disposal-units#guidance, for a discussion of state permitting generally and the Oklahoma and Georgia applications specifically.

154 *See e.g.* Utah Admin. Code r. 63G-3-102(5), -701 (Sept. 1, 2019), https://rules.utah.gov/publicat/code/r315/r315-319.htm; Ind. Code § 13-19-3-3 (2017), https://www.in.gov/idem/landquality/2503.htm; Sonal Patel, "EPA Urges States to Submit CCR Programs Even as Coal Ash Regulatory Overhaul Continues," PowerMag.com (June 26, 2019), https://www.powermag.com/epa-urges-states-to-submit-ccr-programs-even-as-coal-ash-regulatory-overhaul-continues/; *but see* "Coal Combustion Residuals," Ky.com (2019), https://eec.ky.gov/Environmental-Protection/Waste/solid-waste/i-need-information/Pages/coal-combustion-residuals.aspx.

155 https://www.epa.gov/coalash/us-state-oklahoma-coal-combustion-residuals-permit-program.

156 *See e.g.,* Motions for Intervention, Waterkeeper Alliance, Inc. v. Wheeler, United States District Court for the District of Columbia, Jan 29, 2019, Civil Action No. 18-2230 (JDB) (D.D.C. Jan. 29, 2019) https://casetext.com/case/waterkeeper-alliance-inc-v-wheeler.

157 *U.S. State of Oklahoma Coal Combustion Residuals Permit Program*, EPA (July 10, 2019), https://www.epa.gov/coalash/us-state-georgia-coal-combustion-residuals-ccr-permit-program.

158 *Georgia: Approval of State Coal Combustion Residuals Permit Program,* 84 *Federal Register* 30,977, 30,980 (June 28, 2019), https://www.federalregister.gov/documents/2019/06/28/2019-13907/georgia-approval-of-state-coal-combustion-residuals-permit-program.

consistent with the USWAG v. EPA decision, it had no comparative basis on which to make a determination that Georgia's permit rules were at least as strict as EPA's.[159] Georgia otherwise adopted by reference nearly all the technical criteria contained in federal CCR regulations. Georgia's CCR regulations can be found in 391-3-4-.10 of the Georgia Compilation of Rules and Regulations.

Environmentalists have challenged the Oklahoma program and have indicated that they oppose aspects of the Georgia program.[160] "[E]nvironmentalists are concerned that a state-operated permit program encroaches on the ability to file citizen suits in federal court. 'Citizens would potentially be able to challenge state permits ... in state court. But that process is a lot more complicated than being able to bring a citizen suit in federal court.'"[161]

2. Recent State Coal Ash Legislation Post-Final Rule

a. Virginia

Virginia's General Assembly enacted coal ash legislation, SB 1355,[162] in 2019 that effectively prohibits closure by leaving CCR in place (cap-in-place). It mandates that all inactive CCR units located at specified generating stations owned by Virginia's primary utility, Dominion Energy, be closed by removing all CCR from the CCR unit in accordance with Virginia DEQ standards and that the excavated CCR must be either beneficially reused or disposed in a permitted landfill, either on-site or off-site. Permitted landfills accepting CCR must have a composite liner and leachate collection system that meets or exceeds EPA's national minimum criteria set out in its regulations.

Beneficial reuse under the Bill must be in a recycling process for encapsulated beneficial use, which SB 1355 defines as a beneficial use of CCR that "binds the CCR into a solid matrix and minimizes its mobilization into the surrounding environment." An example of an encapsulated use is the use of fly ash in cement products. Unencapsulated uses, such as for structural fill, are not allowed, even if the unencapsulated use would be consistent with industry specifications and environmental standards.[163] In addition, Virginia's largest utility, Dominion Energy, is required to beneficially reuse a total of 6.8 million CY from no fewer than two of the sites specified in the Bill. Closure projects must be completed within 15 years of commencement.

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159 Under WIIN, EPA has 180 days to review a state's petition. Accordingly, a decision by EPA is expected in mid-December 2019.

160 Catherine Morehouse, "EPA recommends Georgia become 2nd state to run its own coal ash permit program," *Utility Dive* (June 26, 2019), https://www.utilitydive.com/news/epa-recommends-georgia-become-2nd-state-to-run-its-own-coal-ash-permit-prog/557623/.

161 *Id.* (quoting Southern Environmental Law Center attorney, April Lipscomb).

162 Va. Code Ann. § 10.1-1402.03 (July 1, 2019), https://lis.virginia.gov/cgi-bin/legp604.exe?191+sum+SB 1355.

163 *See* discussion, *infra* at Section 7, for detailed explanation of unencapsulated and encapsulated.

The exclusion of closure with CCR in place will likely cause tons of CCR to be transported to remote landfills, with only a limited amount to be disposed of in on-site landfills located at the generation plants. During the legislative process on SB 1355, Dominion Energy prepared a report for the General Assembly summarizing responses to its Request for Proposals asking for bids on a combined recycling and closure project for each of its coal generation stations. The report's summary included the chart shown in **Figure 16**,[164] which represented the transportation requirements associated with those projects removing and transporting CCR to either a disposal or beneficiation plant.

Figure 16: Transportation Requirements Associated with CCRs

Power Station	Transportation Options	Vehicle Volume	Project Duration (Years)
Bremo Power Station		124 to 161 Trucks/day	10 to 11
		270 Railcars/year	14
Chesapeake Energy Center		65 to 143 Trucks/day	5 to 11
		20 Trucks/day + 67 Railcars/year	11
		Up to 5 Barges/year	10
Chesterfield Power Station		278 to 300 Trucks/day	15
		34 Trucks/day + 260 Railcars/year	13
		2,500 to 3,750 Railcars/year	15
Possum Point Power Station		105 to 114 Trucks/day	7 to 11
		232 Railcars/year	10

In response to the potential local and regional impacts from the number of trucks projected to move through communities every day, SB 1355 requires the utility to prepare a transportation plan in consultation with each county, city, or town within two miles of the CCR site that (1) minimizes traffic impact on adjacent property and surrounding communities, and (2) uses a mix of transportation options, including rail and barge when possible, as needed to meet the closure timeframe. Finally, the plan must include details of truck transportation, including the frequency of truck travel, travel route, noise mitigation, traffic impact, safety, and fugitive dust caused by truck travel.

SB 1355 also provides instructions for the utility's recovery of costs associated with closing the applicable CCR units. Closure costs are recoverable through a rate adjustment clause authorized by the State Corporation Commission. Costs associated with closure by leaving the CCR in place will be disallowed. Finally, it caps the utility costs for closure at $225 million, which it will be allowed to recover annually through the rate adjustment clause, with some deferral ability for any under-recovery amount and for carrying cost. The utility may begin accruing costs on July 1, 2019, but no approved rate adjustment clause charges shall be included in customer bills until July 1, 2021. Recoverable costs shall be allocated to all Virginia customers served by the utility as a non-bypassable charge.

164 AECOM *CCR Recycling/Beneficial Use Assessment Business Plan*, prepared for Dominion Energy, https://www.dominionenergy.com/library/domcom/media/about-us/electric-projects/coal-ash/ccr-recycling-beneficial-use-assessment-business-plan.pdf?la=en.

b. Illinois

Illinois enacted the Coal Ash Pollution Prevention Act[165] on July 30, 2019. It requires that all closure plans submitted for approval must include a closure alternative analysis across all considered closure methods, including removal of CCRs from the CCR unit. It further sets a timeline for the Illinois EPA to propose, and the Illinois Pollution Control Board to adopt, rules to implement the new Act, including:

- Deadlines;
- Prioritizing of impoundments posing the highest risks to public health and environment and considering environmental justice concerns;
- Defining when complete removal of CCR is achieved; and
- Setting standards for responsible removal of CCR from CCR surface impoundments.

Because Illinois utilities divested their generation facilities when Illinois adopted retail choice, many of the CCR units are owned by IPPs. Consequently, the Act requires for-profit generators to post a performance bond or other financial security to ensure that companies have the funds to close and maintain CCR surface impoundments or remediate releases from the impoundments. It also sets fees of $50,000 for each closed CCR surface impoundment and $75,000 for each CCR surface impoundment that hasn't yet closed, as well as annual fees ranging from $15,000 to $25,000 per impoundment. The fees will be deposited into the state's "Environmental Protection Permit and Inspection Fund," which will be used to pay for regulatory purposes.

c. Michigan

Michigan's legislature enacted HB 6269 in December 2018,[166] revised its existing solid waste statutory framework to include provisions applying to coal ash consistent with EPA's CCR regulations. It also requires Michigan DEQ to adopt regulations mirroring EPA's CCR regulations and national minimum criteria. It established licensing fees specific to coal ash and payments into a perpetual coal ash care fund based on a per ton or per yard levy for coal ash disposed in the CCR unit since 1990 up to a cap of $1,156,000.[167] The fund should continue until 30 years after the final closure of the CCR unit.

d. North Carolina

North Carolina did not wait for the federal government to address coal ash after the Dan River spill in its state. It adopted the Coal Ash Management Act in September 2014,[168] which it subsequently amended in July 14, 2016, after the issuance of EPA's Final Rule. The 2016 amendments generally incorporated the national minimum criteria into CAMA. Overall, however, CAMA's coal ash requirements are considered stricter than those adopted in EPA's Final Rule.

Before CAMA, wet storage of coal ash was not considered solid waste for purposes of North Carolina's solid waste management regulations. Under CAMA, only dry storage of coal ash is allowed, and all surface impoundments must be closed. The deadline for closure depends on the impoundment's risk classification among the Act's three levels of risk. High-risk impoundments are to be closed by December 31, 2019. The coal ash is required to be excavated and moved to an onsite or offsite synthetically lined landfill, or a municipal solid waste facility, or structural fill, or it can be beneficially reused. The definition of beneficial use allows flexibility of potential uses that include (i) as an ingredient in an industrial process to make a product or in a function, or (ii) in an application as a substitute for a commercial product or natural resource.

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165 415 Ill. Comp. Stat. 5/3.140 (July 30, 2019), http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=101-0171.

166 H.B. 6269, 99th Leg., Reg. Sess. (Mi. 2018), https://www.legislature.mi.gov/documents/2017-2018/publicact/pdf/2018-PA-0640.pdf.

167 Emily S. Smith & Austin Scott, *Compliance with Fed. and State Admin. Rules for Coal Ash, H.B. 6269 as Introduced,* House Fiscal Agency (Sept. 26, 2018), http://www.legislature.mi.gov/documents/2017-2018/billanalysis/House/htm/2017-HLA-6269-533A01FE.htm.

168 S.B. 729, *supra* note 18 (including text of CAMA as ratified).

CAMA also required Duke Energy to develop three "beneficiation" plants capable of annually producing 300,000 tons of ash "to specifications appropriate for cementitious products" from wet waste impoundments. The sites are to be operational within two years of permit issuance, and if the carbon content is too high, further processing should be used. Finally, the impoundments at those sites must be emptied of ash by December 31, 2029. Duke is proceeding on three beneficiation projects at the requisite three sites.[169]

3. Standard State Permitting Process

As a general matter, for each CCR unit that is required to be closed under EPA's Final Rule or other state coal ash legislation, the owner or operator will typically need to obtain approval and acquire the necessary permits from the state's environmental agency that oversees RCRA solid waste authority for the state, although some states may not yet have established permitting rules specifically applicable to CCR disposal. The permitting procedure under which a closure plan will be approved by a state's environmental agency will vary from state to state, although their permitting requirements will likely align with the environmental framework established under RCRA and the CWA. A typical process presumes the existence of state permitting rules applicable to CCR units and a federal CCR permit program for non-participating states as laid out in WIIN. EPA issued a proposed rule for Federal Permitting under WIIN in December 2019. Congress appropriated the designated funds required under WIIN.[170] Accordingly, the process will generally include the following steps:

- File for an NPDES under the CWA, or alternatively, an amendment to any existing NPDES held by the relevant CCR unit if the closure activity will result in discharges related to the dewatering of the disposal facility and removal of decant water. The application should be filed with either the applicable EPA region or a state environmental agency that is approved by EPA to oversee the NPDES permit program.
- Submit the closure plans and application for a solid waste permit that will set out the closure design particular to the relevant CCR unit. The environmental agency that is authorized by EPA to manage the state's SWMP under RCRA or has been authorized to administer the CCR permit program as approved by EPA will oversee the issuance of permits. If the state has not adopted a permit program or adopt CCR rules in its SWMP that has been approved by EPA, and is thus a non-participant under WIIN, EPA will review the permit application consistent with its own permit program once finalized and the national minimum criteria. The state or EPA will issue the applicable permits that will include requirements that are tailored to specific site conditions consistent with either the state's CCR permit program that has been approved by EPA or EPA's CCR permit program.
- Apply for any necessary permits or an amendment to an existing permit applicable to the construction and operation of impoundments under dam safety regulations administered by the appropriate state agency.

Permits will note the applicable water discharge limits that are calculated to ensure that discharges comply with water quality standards and maximum contaminant levels (MCL) regulations. EPA established MCL for those pollutants identified in its national minimum criteria but for which no water quality standards have been set.[171] The permit will also be conditioned on compliance with monitoring requirements that are at least as strict as EPA's national minimum criteria or consistent with state law.

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169 *Coal Ash Beneficiation Projects*, NC DEQ (Sept. 4, 2018), https://files.nc.gov/ncdeq/Coal+Ash/CoalAshDAQ-Handout-090418.pdf (listing the three sites as the Buck Steam Station, the H.F. Lee, and the Cape Fear plants).

170 EPA issued a prepublication version of a proposed rule on Federal Permitting on December 19, 2019. https://www.epa.gov/coalash/proposed-rule-disposal-coal-combustion-residuals-electric-utilities-federal-ccr-permit.

171 83 *Federal Register* at 36,444.

EPA intends permit rules to provide for extensive public involvement. The Final Rule required that each CCR unit, active or inactive, have a closure plan included in the unit's operating record and that current information on any proposed or final permits for each CCR unit at coal generating stations are available on a website hosted by the owner or operator of the CCR unit. EPA discussed in the Final Rule the importance of these notice criteria for an informed public on whom enforcement relied under the self-implementing provisions of RCRA pre-WIIN.[172] After enactment of WIIN, EPA issued a guidance document on what a state CCR permit program should contain for EPA approval, including public participation procedures that create an "inclusive dialogue."[173] However, notwithstanding EPA's guidance document, environmentalists challenged EPA's approval of Oklahoma's permit program partially based on EPA failure to develop and publish minimum guidelines for public participation in the design, implementation, and approval of state CCR programs.[174]

Whereas these state procedures may vary, public input could occur either after the closure application is filed or after regulatory review has been completed and a draft permit has been prepared. For instance, in Virginia a formalized public review process is initiated via an announcement that the draft permit is available for public review.[175] Based on the volume and nature of the comments received during the public comment period, a public hearing may be held. The director of the regulatory body will consider the nature of public comments, including whether there is new information that had not been considered previously during draft permit development. Upon termination of the public participation process, the director of the regulatory body may deny the permit, proceed with the permit as drafted, or modify the draft permit.

Generally, adjudicated hearings are not required to meet the public participation criteria prior to the issuance of an environmental permit, unless the permit will have a direct impact on a landowner. Typically, legislative-type hearings are held if any hearings at all are necessary.[176]

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172 Final Rule, *supra* note 1, at 21,399.

173 Coal Combustion Residuals State Permit Program Guidance Document, Interim Final, August 2017, at 12, https://www.epa.gov/sites/production/files/2017-08/documents/eo12866_ccr_state_permit_prog_guide_2050-za10_significant_guidance_20170809_final_omb_clean_copy_002508.pdf.

174 Ibid.

175 See, e.g., *Coal ash management in Virginia*, https://www.deq.virginia.gov/ConnectWithDEQ/EnvironmentalInformation/CoalAshPermits.aspx.

176 *See e.g. Getting Heard: When Are Hearings Before the NJDEP or Courts Available?* https://www.csenviroblog.com/2009/04/articles/environmental-litigation/getting-heard-when-are-hearings-before-the-njdep-or-courts-available/.

SECTION 7:
Coal Ash Products and Beneficial Uses

A. CCPs and Their End Uses

Coal-burning processes will naturally result in the generation of secondary solid materials that the Final Rule defines as CCR. CCPs differ from CCR primarily as a matter of perception. The American Coal Ash Association (ACAA), which is the leading trade association representing cross sections of stakeholders having an interest in CCP markets, chronicles the history of coal ash terminology and how those terms track the growth of commercial interests in coal ash. First, coal combustion wastes (CCW) were seen as a disposal problem. Next, CCW became coal combustion byproducts (CCBP), as coal ash's image changed from waste to being a secondary resource looking for a market where it could be sold as an alternative to disposal; and finally, CCBP dropped the byproduct from its acronym to become coal combustion products (CCP) that are in demand at a market price similar to other commodities.[177] Even EPA's use of the term CCR in the regulatory context relative to disposal rules is applauded by ACAA for at least not sliding back into a characterization as "waste."[178]

ACAA, in its role as the leading trade association for coal ash markets, tracks each year the production and use of those CCPs that are generated in the highest volumes and make up the largest markets. These CCPs coincidentally are the same constituents identified in EPA's definition of CCR:

1. **Fly ash** is a powdery material that is captured by emissions control equipment before it can escape through the stack. It is a pozzolan, a substance containing aluminous and siliceous material and having mechanical and chemical properties that make it a valuable ingredient in a wide range of concrete products. Fly ash's major use is in concrete, substituting for manufactured cement.[179] It makes the concrete measurably stronger and more durable than concrete made with cement alone, and so can commonly be found in roads, bridges, and buildings. Because cement requires extreme heat for production, substituting fly ash for cement in concrete reduces carbon emissions from the offset in cement production. ACAA projects that every ton of fly ash used as a substitute for traditional cement roughly results in one ton of CO_2 emission reduction, which approximates two months' average emissions from an automobile. Consequently, based on the average annual use of fly ash in concrete, carbon emissions could be reduced by an estimated 13 million tons of carbon each year.[180] Fly ash is also used in the construction of structural fills and embankments, waste

177 John Ward, "What Lies Ahead for Beneficial Use of Coal Combustion Products," *Ash at Work*, Issue 2 at 27 (2018), https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH02-2018.pdf.

178 *Id.*

179 *Coal Combustion Residual Beneficial Use Evaluation: Fly Ash Concrete and FGD Gypsum Wallboard*, EPA, at 3 (Feb. 2014), https://www.epa.gov/coalash/coal-combustion-residual-beneficial-use-evaluation-fly-ash-concrete-and-fgd-gypsum-wallboard.

180 *About Coal Ash*, ACAA (last visited Sept. 30, 2019), https://www.acaa-usa.org/aboutcoalash/ccpfaqs.aspx#Q3.

stabilization and solidification, mine reclamation, and as raw feed in cement manufacturing. ACAA cites the American Road & Transportation Builders Association, which estimated that using fly ash in roads and bridges saved $5.2 billion per year in U.S. construction costs.[181] It is also a source of cenospheres, which are microscopic hollow spheres. Cenospheres are strong and lightweight, making them useful as fillers in a wide variety of materials, including concrete, paint, plastics, and metal composites.[182] They are being researched for a number of new applications as discussed later in this section.

2. Bottom ash is a heavier, granular material collected from the "bottom" of coal-fueled boilers. Its agglomerated particles are too large to be carried in the flue gases and collect on furnace walls or fall through open grates to an ash hopper at the bottom of the furnace. Bottom ash is often used as an aggregate substitution for sand and gravel and as a lightweight aggregate ingredient in manufacturing concrete masonry or cinder blocks. Like fly ash, it can also be used in constructing structural fills and embankments, mine reclamation, and as raw feed in cement manufacturing.[183]

3. Boiler slag is a molten ash collected at the base of older generation wet-bottom boilers. Bottom ash is kept in a molten state in the boilers until it is actively removed. It flows into water that cools it rapidly causing it to crystallize immediately into a black, dense, glassy mass that fractures into sharp, angular particles. These particles are known as boiler slag, and can be crushed into different sizes for a variety of uses.[184] Boiler slag is in high demand for use as: (i) blasting grit and roofing granules; (ii) a mineral filler in asphalt; (iii) fill material for structural applications and embankments; and (iv) as snow and ice traction control material, as well as feed stock in cement production and aggregate in lightweight concrete products. Almost 90 percent of boiler slag is recycled or reused. However, although demand continues to grow, supplies are decreasing as a result of the retirement of older coal plants.[185]

181 Beneficial Use of Coal Combustion Products: An American Recycling Success Story, ACAA, at 4 (last visited Sept. 30, 2019), https://www.acaa-usa.org/Portals/9/Files/PDFs/ACAA-Brochure-Web.pdf.

182 *Id.*

183 *Id.* at 6.

184 Bethel Afework, Jordan Hanania, Kailyn Stenhouse, Jason Donev, *Boiler Slag,* Univ. of Calgary, Energy Educ. (Jan. 4, 2019), https://energyeducation.ca/encyclopedia/Boiler_slag.

185 *American Recycling, supra* note 181, at 6.

4. **Flue gas desulfurization (FGD)** is a chemical process using a sorbent that binds with the sulfur and oxides pollutants that are released from the combustion of coal. FGD sorbents are typically lime, limestone and ammonia, although far less commonly used in the U.S. The sulfur dioxide (SO_2) reacts with the sorbent to form calcium sulfite. At some plants, added process equipment can convert the calcium sulfite to calcium sulfate, a synthetic gypsum. Although FGD gypsum is not technically "ash" because it is not present in the coal and refined by its combustion, it is still included as a CCP.[186] Depending on the scrubber configuration, the byproducts vary in consistency from wet sludge to dry powdered material. Synthetic gypsum can be substituted for natural gypsum, which must be mined. It is used extensively in the manufacturing of wallboard. In fact, wallboard manufacturers will often be located adjacent to power plants to allow the FGD material to be delivered directly to the wallboard facilities. This synergistic relationship not only is economically attractive, with less need to mine natural gypsum, but also it produces a positive environmental impact. Another rapidly growing use of synthetic or FGD gypsum is by the agricultural industry to improve soil conditions and prevent runoff of fertilizers and pesticides. It can also be used for waste stabilization and mine reclamation, and in cement manufacturing.[187]

The size of the 2017 markets for each of these CCP compared to the amount produced is shown in ACAA's chart in **Figure 17**:

186 *About Coal Ash*, *supra* note 180, at Q5.

187 *Id.*

Figure 17: 2017 Coal Combustion Product Production & Use Survey Report

American Coal Ash Association Phone: 720-870-7897
38800 Country Club Drive Fax: 720-870-7889
Farmington Hills, MI 48331 Internet: www.ACAA-USA.org
Email: info@acaa-usa.org

2017 Coal Combustion Product (CCP) Production & Use Survey Report

Beneficial Utilization versus Production Totals (Short Tons)

2017 CCP Categories	Fly Ash	Bottom Ash	Boiler Slag	FGD Gypsum	FGD Material Wet Scrubbers	FGD Material Dry Scrubbers	FGD Other	FBC Ash	CCP Production / Utilization Totals
Total CCPs Produced by Category	**38,189,790**	**9,655,931**	**2,574,673**	**32,707,136**	**11,311,344**	**2,454,818**	**6,293**	**14,469,553**	**111,369,538**
Total CCPs Used by Category	**24,095,590**	**4,839,420**	**1,570,375**	**22,839,385**	**3,905,009**	**382,048**	**2,407**	**14,134,477**	**71,768,712**
1. Concrete/Concrete Products /Grout	14,065,791	785,527	0	67,009	0	0	0	0	14,918,326
2. Blended Cement/ Feed for Clinker	4,579,724	1,622,612	132,183	2,317,445	0	51	0	0	8,652,015
3. Flowable Fill	86,379	0	0	0	0	0	0	0	86,379
4. Structural Fills/Embankments	465,653	871,875	0	0	0	0	0	0	1,337,529
5. Road Base/Sub-base	674,155	159,084	0	2,460	0	11,931	0	0	847,630
6. Soil Modification/Stabilization	360,796	48,876	0	0	0	0	0	0	409,673
7. Mineral Filler in Asphalt	59,317	0	0	0	0	7,019	0	0	66,336
8. Snow and Ice Control	69,192	276,989	4,220	0	0	0	0	0	350,402
9. Blasting Grit/Roofing Granules	0	17,705	1,412,685	44,981	0	0	0	0	1,475,371
10. Mining Applications	901,181	232,110	0	927,949	3,905,009	202,092	0	14,037,913	20,206,254
11. Gypsum Panel Products (formerly Wallboard)	0	0	0	15,859,606	0	0	0	0	15,859,606
12. Waste Stabilization/Solidification	1,065,993	48,964	0	3,026	0	114,646	0	96,564	1,329,193
13. Agriculture	0	0	0	1,157,877	0	35,121	0	0	1,192,998
14. Aggregate	0	10,237	21,287	0	0	0	0	0	31,524
15. Oil/Gas Field Services	78,716	0	0	0	0	11,188	0	0	89,905
16. CCR Pond Closure Activities	1,468,203	730,600	0	2,270,326	0	0	0	0	4,469,130
17. Miscellaneous/Other	220,489	34,840	0	188,705	0	0	2,407	0	446,442

Summary Utilization to Production Rate

CCP Categories	Fly Ash	Bottom Ash	Boiler Slag	FGD Gypsum	FGD Material Wet Scrubbers	FGD Material Dry Scrubbers	FGD Other	FBC Ash	CCP Utilization Total
Totals by CCP Type/Application	24,095,590	4,839,420	1,570,375	22,839,385	3,905,009	382,048	2,407	14,134,477	**71,768,712**
Category Use to Production Rate (%)	**63.09%**	**50.12%**	**60.99%**	**69.83%**	**34.52%**	**15.56%**	**38.25%**	**97.68%**	**64.44%**
2017 Cenospheres Sold (Pounds)	147,958								
CCPs Imported in 2016 (Short Tons)	0								
CCPs Exported in 2016 (Short Tons)	0								

Data in this survey represents 145.20701 GWs of Name Plate rating of the total industry wide approximate 263.0478 GW capacity based on EIA's July 2017 Electric Power Monthly.

B. Commercialization of Coal Combustion Byproducts

1. CCP Market History and Present Sales

The recycling and reuse of coal ash products have been consistently growing over the decades of coal generation primacy. Use of fly ash in cement was discussed in the first published university research study on the subject in 1937. Its first large-scale use was in the construction of the Hungry Horse Dam in Montana in 1949. The first commercial company to market fly ash as a construction material was the Chicago Fly Ash Company, formed in 1949, which sold fly ash as a cement replacement to enhance the qualities of concrete.[188]

Subsequent commercial success of CCPs as valued resources for end uses beyond cement is demonstrated by the expanding influence of the ACAA, formed in 1968 as a nonprofit trade association. ACAA's stated mission is the support of the recycling of CCPs as *valuable* materials that "support environmental sustainability, minimize the need for disposal, generate revenues, and reduce liability."[189] The history of ACAA tells the story of the growing demand for coal ash and its maturation into a resource industry distinct from waste management.[190]

Utility leaders were early participants in the ACAA, seeing the potential commercial and environmental value in recycling their wastes' output. ACAA and utilities continue to work closely together through utilities' direct participation as members, which has resulted with the close partnership between ACAA and EEI's Utilities Solid Waste Activities Group (USWAG). ACAA has also worked with EPRI and DOE for decades, researching to improve the use of fly ash in cement and to develop other CCP commercial uses. As a consequence, coal ash has significantly overcome its stigmatization. Markets also have expanded as a result of ACAA working with standard setting organizations, such as ASTM, to develop standards and specifications for using CCPs in various end products.[191] Standards in CCP processes ensures the quality and environmental safety of end-use products made with coal ash and its toxic constituents.

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188 D.F. Pflughoeft-Hassett, E.A. Sondreal, E.N. Steadman, K.E. Eylands, & B.A. Dockter, *Barriers to the Increased Utilization of Coal Combustion/Desulfurization By-Products by Government and Commercial Sectors Update 1998,* U.S. DOE Office of Scientific & Technical Info, at 35 (July 1, 1999), https://www.osti.gov/servlets/purl/777109.

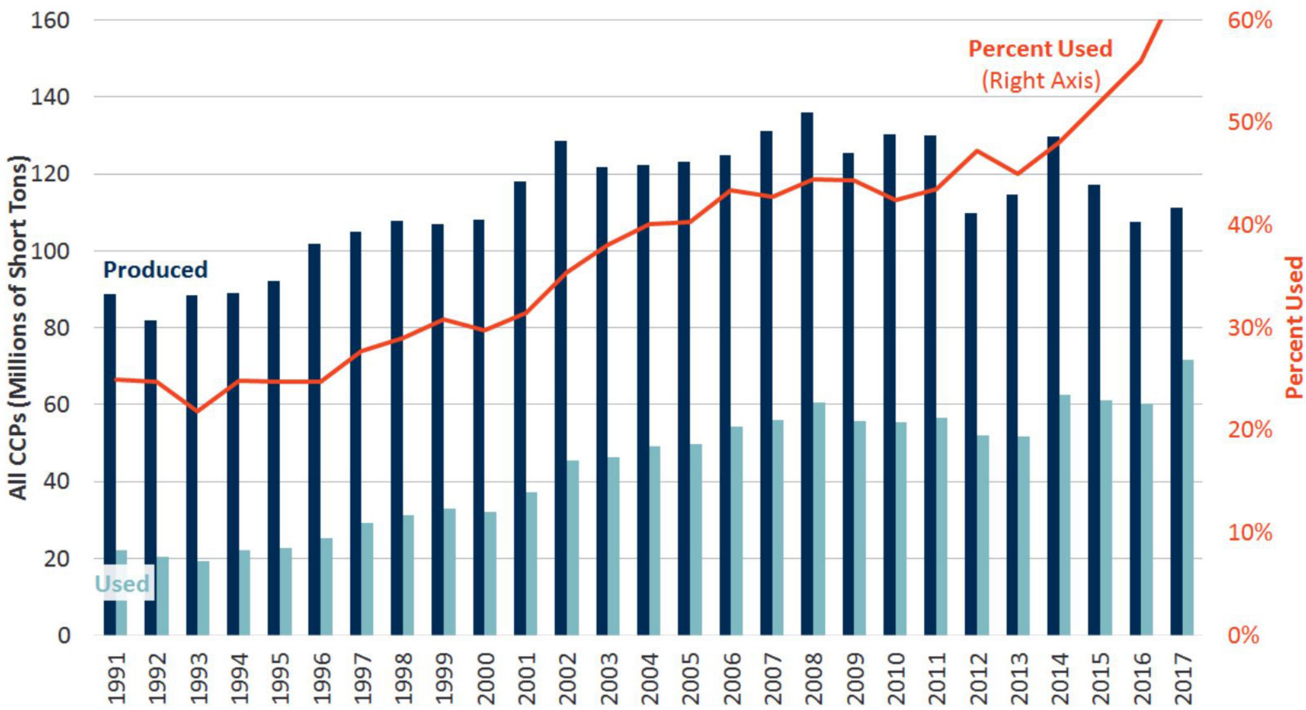
189 See *About ACAA,* ACAA (last visited Sept. 30, 2019), https://www.acaa-usa.org/aboutacaa/joinacaa.aspx.

190 Goss, David, "Fifty Years of Ash Management and Reuse," *Ash at Work*, Issue 2 at 6 (2018), https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2019.pdf.

191 Because CCPs have many uses in engineering activities, a number of organizations issue technical standards or guidelines for the use of CCPs, including the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), the Federal Highway Administration (FHWA), the Federal Aviation Administration (FAA), the Army Corps of Engineers, the American Association of State Highway and Transportation Officials (AASHTO), the American Concrete Paving Association (ACPA), the National Ready Mixed Concrete Association (NRMCA), the American Society for Civil Engineers (ASCE) and many state departments of transportation (DOT). *See About Coal Ash, supra* note 180.

The growth of CCP markets over the last 27 years compared to coal ash production is shown on ACAA's chart in **Figure 18**. There was an increase in CCP demand in 2017, during which 71.8 million tons of coal combustion products were recycled and used out of 111.3 million tons produced, which equals a record 64 percent of coal ash production being recycled rather than disposed.[192] This is an increase from 56 percent in coal ash utilization in 2016, whereas coal ash production only increased 4 percent over the same period. In reporting the 2017 results, ACAA further states that "concrete producers would have used more fly ash if they could get it; numerous key markets can be characterized as 'under-supplied.'"[193] However, to increase the percentage of CCP used versus disposal, the fly ash and other CPPs need to be more consistent and available to meet customers' schedules, which will require investments in technology and logistics.

Figure 18: CCP Market Growth, 1991 – 2017



192 Ward, *supra* note 177, at 51.

193 Goss, *supra* note 190, at 28.

2. Future Commercial CCP Uses

The Department of Energy (DOE) has shown the government's interest in advancing the reuse of coal ash. It issued a Request for Information (2019 RFI)[194] in March 2019 that included a request for information about new advancements in fossil fuel byproduct utilization and the development of pathways to produce value-added products from CCR. The National Energy Technology Lab (NETL), whose mission is to maximize the value of coal as a feedstock and develop new high-value products derived from coal, initiated the Coal Beneficiation Program. Research includes the testing of laboratory- and pilot-scale technologies, which extends to coal ash and the development of additional revenue-producing products.

Possible future uses will be the result of research into the chemical and physical makeup of fly ash into its elemental parts. For example, fly ash could be a source for carbon nanomaterials, which are being studied for a wide range of uses from electronics to medicine.[195] These nanomaterials have the ability to form covalent bonds with many other types of atoms, which will then adapt their chemical properties while adding strength to the new composition. Consequently, they are highly valuable for their use in a multitude of applications. For example, bonding carbon nanotubes with carbon fiber results in a stronger material.

Fly ash also contains cenospheres, which are fine microscopic structures that are strong but hollow bubbles. Because of their high value, they are measured by the pound, compared to other CCPs that are valued by the ton. They are easily separated from the rest of the fly ash material using water, because they float, whereas the rest sink. Coating the spheres with nickel, copper, or other composite metal or ceramic material can create an ultra-strong yet lightweight material that can be mixed in with a variety of metals. Dr. Nikhil Gupta, associate professor of mechanical and aerospace engineering at the Polytechnic Institute of New York University, has researched the use of cenospheres to produce lightweight materials for car manufacturing, although this application has value for other industries, as well.[196]

The use of cenosphere-based material in construction of cars would dramatically cut the use of steel or aluminum in cars, making the cars lighter without compromising the strength of the metal. He projects that the weight of a car could be reduced by at least 10 percent, which translates to reduced fuel consumption and emissions. Weight is extremely significant in the design of electric cars. Weight affects travel range, which is a key manufacturing challenge. Bigger and heavier batteries are needed to power an electric car for longer distances, but a heavier battery, in turn, increases the energy needed to power the car, which thus, decreases the travel range of the car. Dr. Gupta is also working on the use of cenospheres in the construction of battery casings. He projects he can reduce a battery's weight by 20 percent to 30 percent.[197] Dr. Gupta is working with the University of Wisconsin and industry partners to manufacture battery prototypes.[198]

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194 *Request for Information: Strategies for Improving or Creating Emission Reduction Technology and Byproduct Utilization for Hazardous Substances Resulting from Coal Combustion*, NETL.DOE.gov (Mar. 25, 2019), https://www.netl.doe.gov/node/8548.

195 *See* Mohammed Alrashed, *The Use of Coal Fly Ash as a Catalyst Support in the Fabrication of Carbon Nanotubes,* Emporia State Univ. (Dec. 6, 2016), https://esirc.emporia.edu/handle/123456789/3550.

196 Nathaniel Gronewald, "Will the Car of the Future Be Made from Coal Ash?" *Scientific Am.* (Mar. 28, 2011), https://www.scientificamerican.com/article/will-car-of-future-made-from-coal-ash/.

197 *Id.*

198 *Id.*

Dr. Gupta has also led in the development of syntactic foams using cenospheres, which are mixed with matrix materials to create a resulting composite of higher specific strength (strength divided by density). Because of the light weight and high strength characteristics of the cenosphere, and the flexibility of foam to be tailored to a specified end use, syntactic foams can be used in designs involving multifunctional requirements such as in aerospace structures, subsea applications, microwave electronics, and EMI shielding.[199]

The hurdle with broad commercializing of emerging CCP technologies, however, is the inconsistency of fly ash quality due to differences in coal types burned and the differences in the waste produced which is dependent on the pollution control equipment installed at the thousands of coal generation plants[200] across the country.

States are also pursuing new CCP markets in finding new coal ash uses that can help reduce the amount of CCRs disposed. For example, as part of North Carolina's CAMA program, utilities owning coal generation plants were required to perform a study of coal combustion product (CCP) uses and markets and submit results to the legislature. The state required that utilities, in the third phase of the study, identify promising alternative and innovative technologies and to understand their technical readiness. In May 2016, Duke Energy submitted its study, discussing 18 technologies and more than 50 products.[201] However, in conclusion, Duke cautioned regarding investment by power companies in these technologies:

> Because sustainable markets for these technologies are not fully developed, they will require greater time and financial commitment by the power company. Most of the technologies will require a commitment to working with the vendors to develop the products, obtain regulatory approvals, and communicate with end users to stimulate the nascent markets.[202] Should and when these technologies prove ready for commercialization, they could provide additional revenues for utilities and IPPs, which will, in turn, enhance the economics of coal as a higher-value fuel for existing and advanced coal plants.[203] To take advantage of the investment into research and development of an expanding array of CCP products requires a shift in the perspective of utilities from seeing coal as a problem to be rid of, and environmentalists who would prefer coal plants close. DOE's research into the life cycle of CCPs from the point of their production through their end use could help the development of a policy that envisions coal combustion plants as an integrated part of an industrial closed loop eco-system.[204]

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199 What is Syntactic Foam? *Synfoam* (2016), https://synfoam.com/What-Is-Syntactic-Foam.

200 For the number of generation plants in the U.S., *see How many power plants are there in the United States?* U.S. Energy Info. Admin. (Oct. 26, 2018), https://www.eia.gov/tools/faqs/faq.php?id=65&t=2.

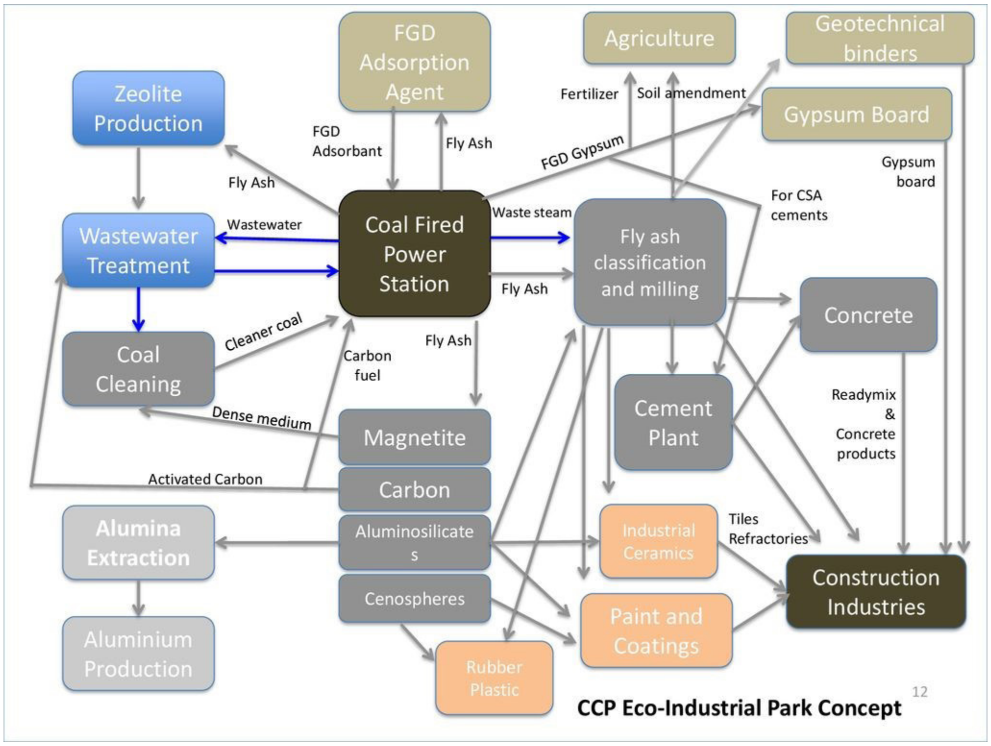
201 *Duke Energy Coal Combustion Product Management Study Phase 3 - Alternative and Innovative Technologies Final Report,* Elec. Power Research Inst., at ES-2 (May 2016), http://southeastenergynews.com/wp-content/uploads/sites/58/2016/09/Phase-3-Innovative-Technologies-Final-Report.pdf.

202 *Id.*

203 *Coal Beneficiation Program Factsheet*, NETL.DOE.gov (Aug. 2019), https://www.netl.doe.gov/sites/default/files/2019-09/Program-151.pdf.

204 Robert A. Frosch & Nicholas E. Gallopoulos, (1989). "Strategies for Manufacturing," *Scientific Am.* (Reprinted with permission.), http://isfie.onefireplace.com/resources/Documents/Strategies_For_Manufacturing_Sci_American_1989.pdf.

Figure 19: CCP Eco-Industrial Park Concept



Asian countries, including China, are seeking ways to better manage their growing coal power plants by advancing the CCP markets for their coal ash waste. Working with Optimus, an extension of the University of Kentucky, the Asian Coal Ash Association is developing a plan for a CCP Eco-Industrial Park. A schematic of its closed loop eco-system is shown in **Figure 19**.[205] However, valuating coal combustion plants as a critical component in a greater ecological loop will require a significant shift away from the traditional utility business model.

3. Rare Earth Elements

Coal ash has come to national attention recently as a potential source of rare earth elements (REE) in the context of the trade tensions between the U.S. and China, who last year, in 2018, controlled 70 percent of supply in the global REE market.[206] The vulnerability of U.S. defense industries and major economic sectors including cell phones, computers and other electronics, engines, and even clean energy technologies, has demonstrated the need to cultivate a domestic supply that includes not just a domestic source of the elements themselves but also domestic processing and refinery facilities to purify the elements so they can be used. Technology is the pathway to stabilizing supply/demand volatility from geopolitics and ensuring REE processing does not add to already heightened environmental concerns. Technology applied to coal ash resources could be a solution. Research shows the promise of processing technology that could extract REEs from coal ash, while reducing the waste impact of coal combustion and creating another value stream for coal combustion generation, a win-win for the environment and the economy.

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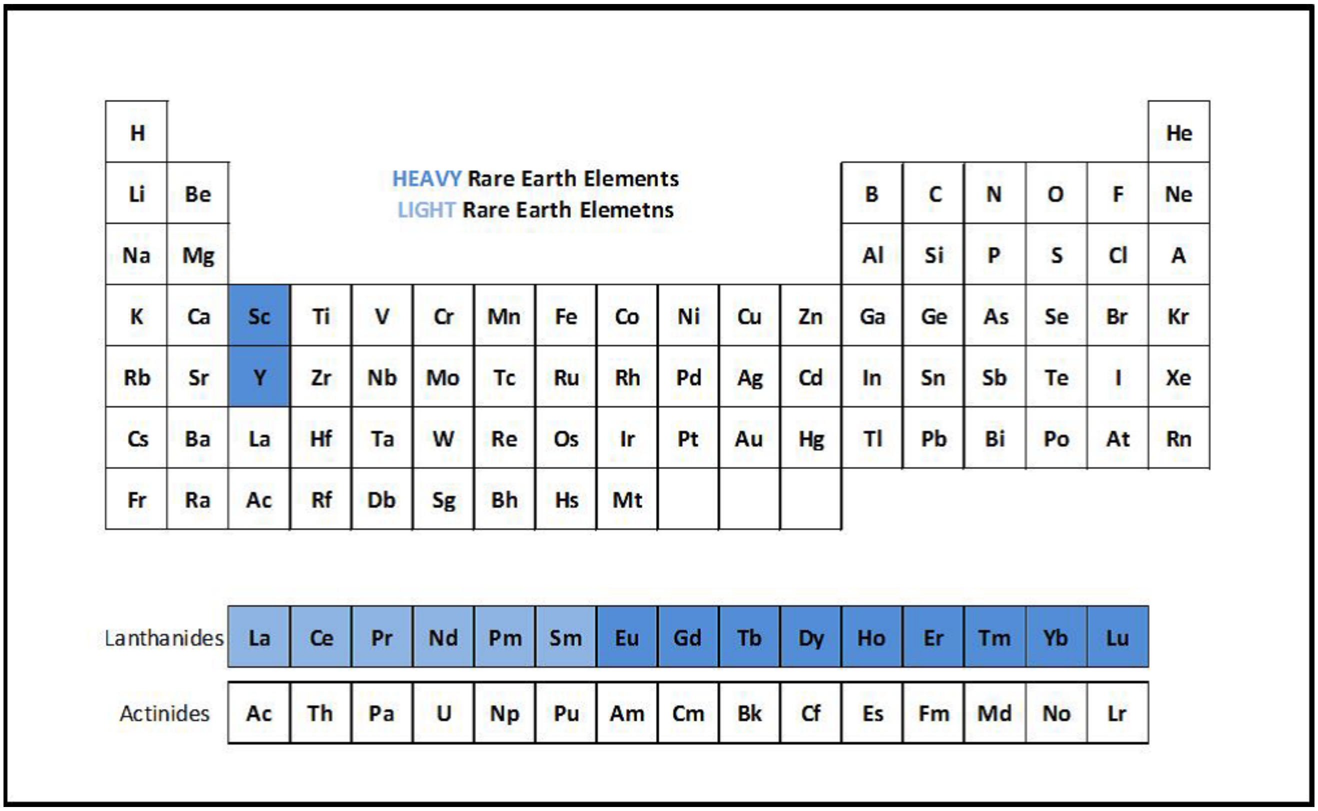
205 David Harris, *Coal Combustion Products & the Circular Economy*, Asian Coal Ash Assoc. Optimus Mgmt. Ltd., at slide 12 (2017), http://unia-ups.pl/wp-content/uploads/2016/03/Harris.pdf.

206 *See* Russ Read, *Pentagon turns to coal ash to escape Chinese dominance of rare earth elements*, Washington Examiner (June 3, 2019), https://www.washingtonexaminer.com/policy/defense-national-security/pentagon-turns-to-coal-ash-to-escape-chinese-dominance-of-rare-earth-elements. More significant is that China produces 90 percent of the world's permanent magnet alloys that is a necessary component in products throughout major economic sectors. *See The Geopolitics of Rare Earth Elements,* Strafor WorldView (April 8, 2019), https://worldview.stratfor.com/article/geopolitics-rare-earth-elements.

Figure 20: Rare Earth Elements



Rare earth elements are 17 metals, specifically fifteen lanthanides plus scandium and yttrium, as highlighted in the periodic table in **Figure 20**. Although they are abundant within the earth's crust, they are not found in isolated form and they exist generally in low concentrations, a few thousand parts per million, which are too scarce for economical extraction.[207] They also require a lot of energy to extract and process according to specifications for their ultimate use. Processing requires grinding, extraction, and purification (99.9 percent) to transform the ores to the high purity needed for commercial applications. However, due to their unique magnetic, phosphorescent, and catalytic properties, they are in high demand for high-tech applications. Neodymium, for example, is used to manufacture the most commonly used permanent magnet that is a critical component in personal computers, engines, rechargeable batteries, cameras, and all forms of electronics including cell phones. **Figures 21** and **22** identify high valued end-uses for each of the different elements. Technology industries rely on them so much so that DOE refers to them as technology metals.[208]

207 John Simpson, "Mining Coal Ash for Rare Earth Elements," *Ash At Work*, Issue 1 at 16 (2019), https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2019.pdf.

208 The REEs highlighted in the periodic table in Figure 15 include lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), and lutetium (Lu). The rare earths are also often considered to include the metals scandium (Sc) and yttrium (Y). See *Report on Rare Earth Elements from Coal and Coal Byproducts*, NETL.DOE.gov, 2-3 (Jan. 2017), https://www.energy.gov/sites/prod/files/2018/01/f47/EXEC-2014-000442%20-%20for%20Conrad%20Regis%202.2.17.pdf.

Figure 21: Major End Uses of Light Rare Earths

Light Rare Earths	Major End-Use
Scandium	TVs, fluorescent and energy-saving lamps
Lanthanum	hybrid engines, metal alloys
Cerium	catalysts, metal alloys
Praseodymium	Magnets
Neodymium	catalysts, hard drives in laptops, headphones, hybrid engines
Promethium	watches, pacemakers
Samarium	Magnets
Europium	red color for television, computer screens

Figure 22: Major End Uses of Heavy Rare Earths

Heavy Rare Earths	Major End-Use
Terbium	phosphors, permanent magnets
Dysprosium	permanent magnets, hybrid engines
Erbium	phosphors
Yttrium	red color, fluorescent lamps, ceramics, metal alloy agent
Holmium	glass coloring, lasers
Thulium	medical x-ray units
Lutetium	petroleum catalysts
Ytterbium	lasers, steel alloys
Gadolinium	magnets

The importance of REEs to the U.S economy is illustrated by stock trading in one of the highest traded U.S. companies, Apple. Apple's iPhone uses nine of the 17 REEs in its manufacturing. Barron's attributed a 40 percent decline in Apple's stock during the last quarter of 2018 due to trade tensions between the U.S. and China, cautioning that it "may drop even further if rare earths become the latest casualty in the trade war."[209] Barron's also referenced a similar cautionary statement by Goldman Sachs' analysts, assessing Apple's preparation to ramp up production of its new iPhone, that "even a short-term action affecting production could have longer term consequences for the company."[210]

209 Sophia Cai, *Companies Like Apple That Depend on Rare-Earth Metals Have Nowhere to Turn*, Barron's (May 30, 2019), https://www.barrons.com/articles/stocks-exposed-rare-earths-metals-51559164960.

210 *Id.*

Figure 23: Prices of Selected Rare Earth Element Ores

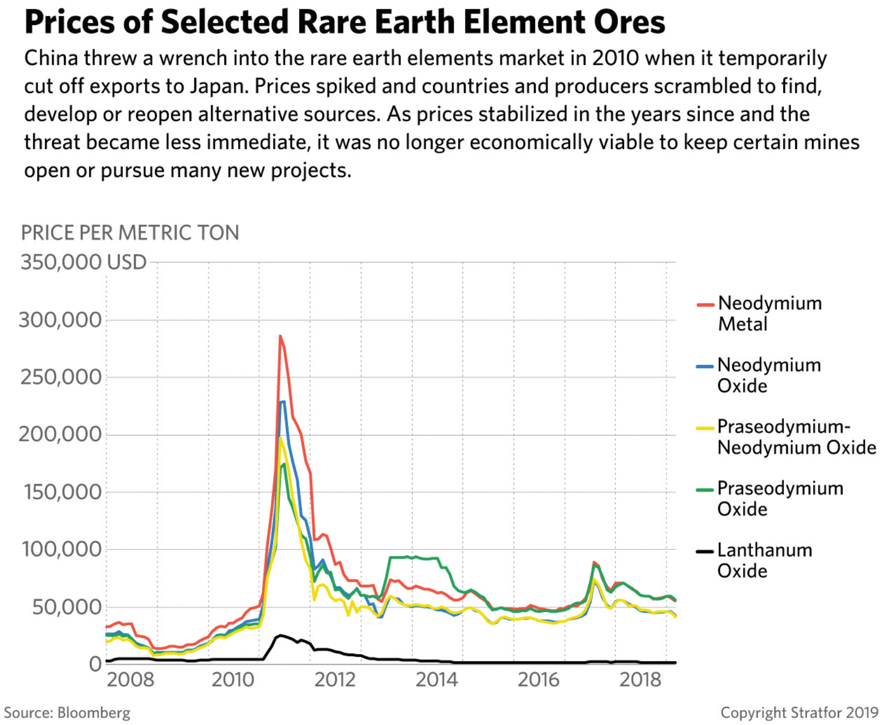


Figure 23 demonstrates the global price sensitivity of REEs, showing the spike in prices in 2010 when China imposed strict quotas on REE exports to Japan. Prices show a slight increase from 2006 to 2010 as China began to limit its REE exports as a protectionist step to build up its own domestic reserves to meet growing demand in its own electronics industry. Then, in 2010, China and Japan's territorial dispute in the East China Sea resulted in China banning REE shipments to Japan, which DOE projected would result in market shortages in five of the more valued REEs. REE prices quadrupled in 2010 and then doubled again in the first quarter of 2011. In 2012, China announced new export REE quotas for 2013, but they set quotas higher than the actual amount of REEs exported, so the quotas had no market impact and market prices began to stabilize. Stable prices were also helped by new supplies from Australia and growing black market supplies from within China. Then in 2014, the U.S. won a World Trade Organization's complaint against China on REEs, which resulted in China eliminating quotas for 2015.[211]

The history of the U.S.'s only domestic REE supplier demonstrates the supply dynamics of a complex resource like REEs. Large deposits of bastnasite ore were discovered at Mountain Pass, California, in 1949. Bastnasite ore contains an 8 percent to 12 percent concentration of REE, specifically europium, which is used in color television screens.[212] In 1952, Molycorp, Inc. commenced operating the mine and a refinery to meet europium demand and subsequently other REEs. Mountain Pass became the world's largest supply of REEs between 1965 and 1995.[213] In fact, its owner, Molycorp, Inc., was the only global vertically integrated producer of REEs, owning both the mine and downstream refinery and processing facilities. To extract REEs from bastnasite ore, the ore must be dissolved in solutions of acids, over and over again, then filtered, and dissolved once more. Old technologies required 1,800 different extraction stages in series and in parallel for purification.[214]

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211 WTO Dispute Settlement, *China - Measures Related to the Exportation of Rare Earths, Tungsten and Molybdenum,* WT/DS431/AB/R (Aug. 7, 2014), https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds431_e.htm.

212 Lisa Margonelli, "Clean Energy's Dirty Little Secret," *The Atlantic* (May 2009), https://www.theatlantic.com/magazine/archive/2009/05/clean-energys-dirty-little-secret/307377/.

213 *Id.*

214 Simpson, *supra* note 207, at 16.

One of the environmental challenges in processing REEs is the content of radioactive thorium that is naturally found with rare earth deposits. While the higher concentrations of REEs contributed to Mountain Pass's commercial viability, the costs of environmental impacts from its operations, on the other hand, eventually resulted in Mountain Pass's unprofitability.[215] In the 1980s, Molycorp began piping its wastewater 14 miles to evaporation ponds. Mineral deposits, called scale, accumulated in the pipelines, and were radioactive. During routine cleaning of the pipelines, multiple breaks occurred, causing the radioactive waste to leak and contaminate surface soil. In addition, two larger radioactive wastewater spills occurred in 1989 and 1990, subjecting the company to escalating environmental penalties and cleanup costs.[216] Meanwhile, Molycorp could not compete with China's cheap labor costs and less restrictive environmental regulations that enabled China to gain market power over global supply. The U.S. ceded its position to China as the leading supplier in 1988. Although Mountain Pass has continued to mine bastnasite ore, it ceased separating and processing REEs.

Seeing the global price spike in 2010 caused by China's Japanese quotas and the government's growing concern regarding reliance on China for REE supplies as opportunities, Molycorp decided to re-open Mountain Pass and re-enter the REE market. It raised capital through a public offering in July 2010, and by May 2011, it had a market capitalization of more than $5 billion.[217] It then purchased Canada's Neo Material Technologies and constructed a $1.25 billion state-of-the-art processing facility. However, it had not prepared for prices to drop as China lifted its quotas. Ultimately, Molycorp had to shut down operations and file for restructuring under bankruptcy law in 2015. Its Mountain Pass operation was sold in June 2017 to MP Materials, with a minority interest to a Chinese REE company.

Once again, however, China's REE market power is under scrutiny. The current trade conflict between the U.S. and China has highlighted the vulnerability of both national security and the U.S. economy to China's control of REE products. The use of REEs is ubiquitous through core economic sectors that define today's quality of life. Current U.S. policymaking has begun to evaluate China as an economic aggressor unfairly competing as an economic superpower in global markets, rather than as a fair and mutually advantageous trading partner. China's monopoly control over downstream processing facilities presents high risk to the U.S. economy and national defense. While the U.S. and other countries mine and excavate ores containing REEs, the ore is shipped to China for processing. In June 2019, China set a 25 percent tariff on rare earth ores imports into China for processing. President Trump proposed to retaliate by imposing a 10 percent tariff on China's REEs, but it was eventually dropped, which served to highlight U.S. reliance on Chinese REE supply.[218] Meanwhile, MP Materials is producing REEs from Mountain Pass but is having to ship its production, like other REE producers, to China for processing and pay the Chinese tariff. This is another incentive for MP Materials to complete work to operate its own separation and processing facilities, which it announced should be completed by the end of 2020.[219]

The Department of Defense has tracked China's dominance in REE global production closely since China's geopolitical play in 2010. It has voiced particular concern regarding China's control over production of heavy REEs that are the most scarce of the 17 elements, and, therefore, the most expensive. These heavy REEs are critical to national defense systems. U.S. defense end uses equal 1 percent of the total U.S. demand.

215 Molycorp was acquired by Union Oil in 1977, which later became a part of Chevron in 2005.

216 Kemakta Konsult, *Health and safety issues in REE mining and processing,* EURare, at 10 (Sept. 2014) http://www.eurare.eu/docs/internalGuidanceReport.pdf; *see also* Eugene Gholz, *Rare Earth Elements and National Security,* Council of Foreign Relations, at 2 (Oct. 2014), https://cdn.cfr.org/sites/default/files/pdf/2014/10/Energy%20Report_Gholz.pdf.

217 Simon Casey, "A Cautionary Rare Earths Tale Can Be Found in Molycorp's Rise and Fall," *Bloomberg* (May 20, 2019), https://www.bloomberg.com/news/articles/2019-05-29/cautionary-rare-earths-tale-found-in-molycorp-s-rise-and-fall.

218 Eric Ng, "Caught between Trump and its biggest market, America's sole rare earths mine is an unusual victim in the US-China trade war," *South China Morning Post* (May 26, 2019), https://www.scmp.com/business/commodities/article/3011687/caught-between-trump-and-its-biggest-market-americas-sole-rare.

219 *Id.*

For example, a F-35 jet uses 920 pounds of material made from rare earths.[220] The CIA's 2013 World Threat Assessment warned about China's control over REE supplies, years before China's recent reminder of the U.S.' vulnerability when its trade negotiators raised the possibility of a ban on REEs exports during current trade negotiations.[221] China had previously leveraged its supply dominance in international negotiations, as it did against Japan.[222] In response, U.S. policy is supporting research and development of a domestic resource, including researching fly ash, which has shown strong promise as a domestic resource from which these rare earth elements could be extracted.

Since then, the federal government has been active in studies and research initiatives to assess coal and coal byproducts for their REEs potential. In the 2014 appropriation bill,[223] Congress allocated $15 million to NETL to perform an assessment and analysis of the feasibility of economically recovering REEs from coal and coal byproduct streams, such as fly ash, coal refuse, and aqueous effluents. DOE was instructed to report the findings and, if determined feasible, to outline a multi-year research and development program for recovering REEs. DOE subsequently issued a report on REEs in January 2017, affirming that "opportunities to recover REEs from coal and coal byproducts appear possible," but it will require improved economics and technology developments, particularly in better separation technologies.[224] Coal byproducts' advantage is that REEs are present in materials already being produced and certain byproducts have elevated concentrations of heavy REEs. Economic projections and national security assessments place heavy REEs at higher risks as they are in lower supply; they serve critical needs in significant sectors of the economy and national defense; their demand is projected to increase significantly; and their market price reflects their constrained supply.[225]

ACAA supported research by Duke University and University of Kentucky to characterize the content of a broad selection of U.S. coal ashes to rank their potential for REE recovery.[226] It collected coal ash from coal plants that burned coal from the 3 largest sources, the Appalachian Mountains, southern and western Illinois, and the Powder River Basin in Wyoming and Montana. The value of REEs extractable from fly ash is based on the REE content of the fly ash and the concentration of REEs present. Research shows that these two factors are dependent on the geological origin of the feed coal. Appalachian coals indicate higher REE contents. Its ash was found to contain REEs at 591 parts per million (ppm), compared to Illinois at 403 ppm, and Powder River Based at 337 ppm. This suggests that Appalachian sources should be prioritized in any REE recovery operation. The REE contents in the subject coal ash were found to be superior to the bastnasite ores from the largest Chinese REE deposit. Research findings overall showed that "coal fly ashes currently being produced in the U.S. would provide more than three times the critical REE mass per kg of total REE extracted than conventional ores."[227]

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220 Alexandra Ma, "From iPhones to fighter jets: Here's a list of American products that could be affected if China banned rare-earth metal exports to the US as a trade-war weapon," *Business Insider* (May 31, 2019), https://www.businessinsider.com/china-rare-earth-list-of-us-products-could-affected-2019-5.

221 *Worldwide Threat Assessment Statement for the Record,* U.S. Intelligence Cmty, at 11 (March 12, 2013), https://nsarchive2.gwu.edu/NSAEBB/NSAEBB424/docs/Cyber-090.pdf.

222 Keith Johnson, Elias Groll, *China Raises Threat of Rare-Earths Cutoff to U.S.*, ForeignPolicy.com (May 21, 2019), https://foreignpolicy.com/2019/05/21/china-raises-threat-of-rare-earth-mineral-cutoff-to-us/); *see also Report on Rare Earth Elements, supra* note 208, at 26 (citing NETL-issued RFI for *Funding Opportunity Announcement* (FOA) DE-FOA0001202).

223 *Report on Rare Earth Elements, supra* note 210, (citing Consolidated Appropriations Act, Pub. L. 113-76 (2014)).

224 *Id.* at 8.

225 *Id.*

226 Simpson, *supra* note 207, at 17.

227 Ross K. Taggart, James C Hower, Gary S. Dwyer, & Heileen Shu-Kim, *Trends in the Rare Earth Element Content of U.S.-Based Coal Combustion Fly Ashes,* Am. Chemical Soc'y Pubs., 5919, 5922 (2016), https://pubs.acs.org/doi/pdfplus/10.1021/acs.est.6b00085.

Fly ash has several advantages over the lengthier processing of REE ores, beginning with its broad availability as a waste product with its environmental incentives for alternative uses. Avoided disposal costs can offset the costs of processing the fly ash. REE avoids costly excavation of coal or other ores containing REEs, benefiting from excavation of coal for electric generation that bears the costs. In addition, fly ash is a fine powder that is ideal for chemical processing, which eliminates several costly ore process steps. In addition, fly ash is already used for recovery of other metal, including gallium, germanium, and aluminum. These recovery activities could be combined with REE recovery for maximizing fly ash value as a resource. The ability to process multiple products in addition to REEs is a key factor to the economic recovery of REEs from fly ash or other coal byproducts. The second key is reduction in operating expenses. According to DOE, "operating costs far exceeded an annualized capital cost, on a per-ton-of-product-produced basis."[228] Moving beyond these studies, innovators are planning demonstration projects that could bring added value to coal generation to offset environmental costs associated with what was once perceived as waste.

C. Beneficial Use Exemption from RCRA Disposal Criteria

1. RCRA Conservation Objective

RCRA's conservation and recovery objective is based on the congressional observation that "millions of tons of recoverable material which could be used are needlessly buried each year."[229] Consequently, RCRA was designed to "conserve valuable material and energy resources by [promoting] . . . new and improved methods of collection, separation, and recovery, and recycling of solid wastes and environmentally safe disposal of nonrecoverable residues."[230] Many of RCRA definitions reflect the priority of the conservation and resource recovery objective:

- "Resource conservation" means the "reduction of the amounts of solid waste that are generated, reduction of overall resource consumption, and utilization of recovered resources";[231]
- "Resource recovery" means "the recovery of material or energy from solid waste";[232] and
- "Solid waste management" and "comprehensive planning" includes "planning or management respecting resource recovery and resource conservation."[233]

These definitions reflect RCRA's underlying purpose to support the public interest in recovery of valued materials, metals, or other resources captured in waste streams, and in their reuse, which can achieve conservation and other benefits. However, RCRA limits EPA's authority over these resource recovery and recycling activities to providing federal technical assistance to state and local governments regarding these activities, while granting EPA broader regulatory authority over disposal practices. RCRA directs EPA to develop national minimum criteria under subtitles C and D for those "solid waste management practices" that might otherwise constitute "open dumping of solid waste or hazardous waste," now prohibited under RCRA.[234] Thus, only those activities that are deemed disposal are regulated and those waste management activities that relate to recycling and resource use are not regulated.[235] Consequently, in developing disposal criteria under its RCRA obligations, EPA also had to develop criteria to distinguish exempt beneficial uses from disposal.

228 Simpson, *supra* note 207, at 19.

229 Pub. L. 89–272, § 1002(c), 42 U.S. Code § 6901, https://www.law.cornell.edu/uscode/text/42/6901.

230 *Id.* at § 1002(a)(4).

231 *Id.* at §1004(21).

232 *Id.* at §1004(22).

233 *Id.* at §1004(30).

234 *Id.* at §1008(a)(3).

235 While EPA had postponed answering the question of whether CCR should be regulated under subtitle C or D in its 2000 Regulatory Determination, it did determine that CCR used for beneficial purposes would be exempt from regulation as hazardous waste under §3001(b)(3)(A) of RCRA. In electing subtitle D in the Final Rule, EPA affirmed its decision to exempt CCR uses that meets the Final Rule's definition of beneficial use from any disposal requirements.

2. Encapsulated Beneficial Use versus Unencapsulated Beneficial Use

The Final Rule, in developing beneficial use criteria, discusses the regulatory implications of the form in which CCR is used. Whether CCR is encapsulated or unencapsulated triggers the level of environmental scrutiny required to qualify as a beneficial use. Encapsulation is illustrated in the use of fly ash in concrete products while unencapsulation can be generally understood to mean the use of coal ash in a loose, unbound state, such as fill for structural support. The Final Rule defines an encapsulated beneficial use as a use that "binds CCR into a solid matrix that minimizes its mobilization into the surrounding environment,"[236] but does not define unencapsulated beneficial use. Consequently, unencapsulated use is any use that does not meet the regulatory definition of encapsulated beneficial use, and because of the environmental risk associated with loose, unbound ash, the unencapsulated form of CCR becomes a significant factor in evaluating a CCR beneficial use and its exemption from the Final Rule's national minimum criteria regulating coal ash disposal.

It is easy to envision how the use of loose, unbound coal ash in large quantities could be disposal disguised as a resource use to avoid regulation. EPA acknowledged in the Final Rule that allowing a beneficial use exemption for particular uses of large quantities of unencapsulated CCR can be problematic when unencapsulated CCR poses greater environmental risks of leachate, as compared to encapsulated uses. The need for regulatory treatment of unencapsulated applications depends on the chemical characteristics of the CCR, the amount of material placed, how it is placed, and the site conditions.[237] To demonstrate unencapsulated uses that would not be considered a beneficial use, the Final Rule used examples such as fill for old quarries or gravel pits and certain landscape applications, which uses EPA noted are more akin to disposal.[238] A more controversial use of unencapsulated CCR is as structural fill. EPA found that the use of 1.1 million yards of fly ash for contouring a golf course in Chesapeake, Virginia, was not a beneficial use. This is the same project that garnered national attention as part of a CBS 60 Minutes report on coal ash in August, 2010.[239] EPA reviewed this use as a potential damage case rather than a proven damage case due to groundwater contamination above MCLs at the edges and corners of the golf course, but not in residential wells.[240]

Yet, EPA refused to disqualify for beneficial use all CCR uses as structural fill on a blanket basis, but rather conditioned their qualification on whether the CCR use provides a conservation benefit and meets environmental performance objectives.[241] EPA noted that many unencapsulated CCR uses like structural fill are subject to other environmental regulations and oversight by other agencies. The American Society for Testing and Materials (ASTM) and the Utility Solid Waste Activities Group (USWAG) provide standard guidance and methodologies for using CCR in a structural fill project, including consideration of engineering properties and behaviors, testing procedures, and design considerations.[242] Unencapsulated uses that comply with industry-established engineering specifications and material requirements, many of which address environmental risks, do not resemble "disposal." As an example, EPA points to industry specifications for agricultural uses of CCR that limit the amount of CCR that can be placed on the land.[243] Another example is the unencapsulated use of fly ash in highway construction that is subject to regulation by the Department of Transportation and the Federal Highway Administration.[244]

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236 40 C.F.R. §257.53; *see also "Methodology for Evaluating Beneficial Uses of Industrial Nonhazardous Secondary Materials,* EPA, 530-R-16-011 n.1 (April 2016).

237 80 *Federal Register* at 21,328.

238 *Id.* at 21,330.

239 *See Coal Ash: 130 Million Tons of Waste*, CBS NEWS 60 MINUTES (Aug. 15, 2010), https://www.youtube.com/watch?v=1PYexB76KIQ.

240 Final Rule, *supra* note 1, at 21,328.

241 *Id.* at 21,351-52.

242 *Id.* at 21,350 (citing *Engineering and Environmental Guidance on the Beneficial Use of Coal Combustion Products in Engineered Structural Fill Projects,* USWAG; and ASTM Standard E2277-03, since updated in ASTM Standard E2277-14).

243 *Id.* at 21,330.

244 *Id.* at 21,328.

3. EPA's Final Rule Definition of Beneficial Use

The Final Rule adopts a definition of beneficial use that consists of a four-pronged qualifying test that incorporates RCRA's conservation objective while imposing checks on unencapsulated uses to protect against disguised disposal. It maximizes opportunities for CCR uses as an alternative to disposal by allowing unencapsulated uses with some environmental protections.

> The beneficial use of CCR [both encapsulated and unencapsulated] when performed correctly, can offer significant environmental benefits, including greenhouse gas (GHG) reduction, energy conservation, reduction in land disposal (along with the corresponding avoidance of potential CCR disposal impacts), and reduction in the need to mine and process virgin materials and the associated environmental impacts.[245]

To qualify as a beneficial use and thus be exempt from subtitle D regulation, unencapsulated CCR uses must meet all of definition's four conditions, whereas encapsulated uses must meet only the first three:[246]

> (1) The CCR must provide a functional benefit;
>
> (2) The CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices, such as extraction;
>
> (3) The use of the CCR must meet relevant product specifications, regulatory standards or design standards when available, and when such standards are not available, the CCR is not used in excess quantities; and
>
> (4) When unencapsulated use of CCR involving placement on the land of 12,400 tons or more in non-roadway applications, the user must demonstrate and keep records, and provide such documentation upon request, that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil, and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.[247]

In August 2019, however, the EPA issued proposed rules in its Reconsideration of Beneficial Use and Piles[248] that would revise this fourth prong of CCR beneficial use definition by replacing the mass-based numerical threshold of 12,400 tons that triggers the environmental demonstration that an unencapsulated use is required to conduct, with specific location-based criteria based on the location restrictions EPA imposed on CCR landfills and impoundments in its Final Rule.[249] A location-based criteria would include placement within: (i) a specified distance from the uppermost aquifer, (ii) a wetland, (iii) an unstable area, (iv) a flood plain, (v) a specified distance from a fault area, and (vi) a seismic zone. EPA also invited comments on a trigger that would be a combination of land-based and mass-based numerical criteria.[250]

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245 80 *Federal Register* at 21,329.

246 *Id.* at 21,349.

247 40 C.F.R. §257.53.

248 Proposed Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Enhancing Public Access to Information; Reconsideration of Beneficial Use Criteria and Piles*, 84 *Federal Register* 40,353 (Aug.14, 2019).

249 *See* 40 C.F.R. §257.60.

250 84 *Federal Register* at 40,358.

EPA provided further explanation of each prong in the Final Rule:

> *(1) Functional benefit:* This criterion requires that the CCR must serve a legitimate function in the product or use that demonstrates a value to the end use product that rebuts that the use is merely a substitute for disposal. For example, CCR provides a functional benefit when used in concrete, not only as a replacement for cement, but also in increasing its durability and strength against degradation from saltwater. FGD gypsum serves the same function as mined gypsum in wallboard, and CCR as a soil amendment adjusts the pH of soil to promote plant growth.[251] The use of CCR as structural fill or in other construction applications reduces land use needs for CCR that would have otherwise been headed to landfills.
>
> *(2) Substitution of a virgin material:* The substitution requirement ensures that the use is "beneficial" from an environmental perspective and RCRA's conservation goals.[252] EPA discusses how virgin materials require mining and excavation which can impair wildlife habitats and disturb otherwise undeveloped land.[253] Reducing the need for mining virgin materials likewise reduces waste and environmental footprints, as well as reduce impacts associated with transportation of the materials, such as energy usage. Finally, this substitution criterion advances land conservation principles, as EPA indicates, by reducing the need for additional landfill space coupled with associated environmental impacts. Examples in the Final Rule include:
>
> - FGD gypsum used in manufacturing wallboard or drywall, which decreases the need to mine and thus conserve, natural gypsum as a natural resource;[254]
> - CCR as a substitute in structural fill for sand, gravel and other traditional earthen materials requiring excavation;[255]
> - Fly ash as a substitute for Portland cement that conserves (i) the raw materials used in high quantities, principally clay, shale and limestone; (ii) land use as the raw materials are mined in open pits; and (iii) the large amount of energy needed for heat in the manufacturing process; and
> - CCR as a substitute for traditional earthen materials.

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251 80 *Federal Register* at 21,347.

252 *Id.* at 21,349.

253 *Id.* at 21,239.

254 *Id.* at 21,347.

255 In fact, EPA acknowledges the value of substituting CCR for earthen materials in construction of final cover systems consistent with the Final Rule's closure design criteria, stating. "the process for procuring at-specification earthen material in the volumes necessary for the final cover system construction can complicate completion of closure requirements within the required time frames." Proposed Rule, *Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Amendments to the National Minimum Criteria (Phase One),* 83 *Federal Register* 11,584, 11,605 (Mar. 15, 2018).

(3) Relevant product specifications, regulatory standards or design standards: This third criterion serves to verify the conservation purpose of the CCR use versus disposal by demonstrating that CCR is not used in more quantity than justified by the specific use. EPA noted in the Final Rule that where "excessive volumes of CCR are used—*i.e.,* greater than necessary for a specific project—that calls into question whether the purpose of the application was in fact a sham to avoid compliance with the disposal regulations."[256] Compliance with industry standards is particularly informative when evaluating an unencapsulated CCR use, which because of its loose form could more closely resemble disposal, and should not be a difficult condition to meet to qualify as a beneficial use. Specifications and standards exist for most of the popular uses of CCR. One example in the Final Rule is the use of fly ash as a stabilized base course in highway construction based on ASTM C 593 test for compaction and the ASTM D 560 freezing.[257] It also references two sources for standards and engineering designs for structural fill using CCR: ASTM Standard E2277-03,[258] *The Standard Guide for Design and Construction of Coal Ash Structural Fills*, and USWAG's "*Engineering and Environmental Guidance on the Beneficial Use of Coal Combustion Products in Engineered Structural Fill Projects.*"[259]

(4) An environmental demonstration for unencapsulated uses of CCR when triggered by mass-based numerical threshold or location restrictions: The Final Rule acknowledged the environmental concern associated with unencapsulated uses of large quantities, ranging from hundreds of thousands of tons to millions of tons per year and identified many of these large quantity applications, such as flowable fill, soil modification/stabilization, waste stabilization/solidification, agricultural use as a soil amendment, and aggregate, as well as CCR use, as structural fill.[260] However, EPA did not conclude that such large scale fill operations would not qualify "per se" as a beneficial use. It acknowledged that, if constructed properly, fill operations could meet all of the criteria for a beneficial use, subject to mitigating the environmental risks that these projects could present.[261] The fourth criterion conditions the qualification of these uses as a beneficial use on an environmental demonstration that projects using unencapsulated CCR do not violate environmental standards and include protections against these potential risks.

EPA provided guidance for applying the four prongs of its beneficial use definition in its *Methodology for Evaluating Encapsulated Beneficial Uses of Coal Combustion Residuals.*[262] As the title indicates, the guidance is limited to encapsulated uses of CCR only. EPA later expanded its guidance to include unencapsulated uses and broadened its application to beneficial uses of all nonhazardous secondary materials, as indicated in its title: *Methodology for Evaluating Beneficial Uses of Industrial Nonhazardous Secondary Materials.*[263] EPA uses the flow chart in **Figure 24** to depict the methodology for applying the four conditions in the beneficial use definition to a particular CCR use or application.

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256 80 *Federal Register*. at 21,349-350.

257 *Id.* at 21,350.

258 Since the issuance of the issuance of the Final Rule, ASTM Standards E2277-03 has been replace with version E2277-14.

259 As cited in EPA's Final CCR Rule, 80 *Federal Register* at 21,351.

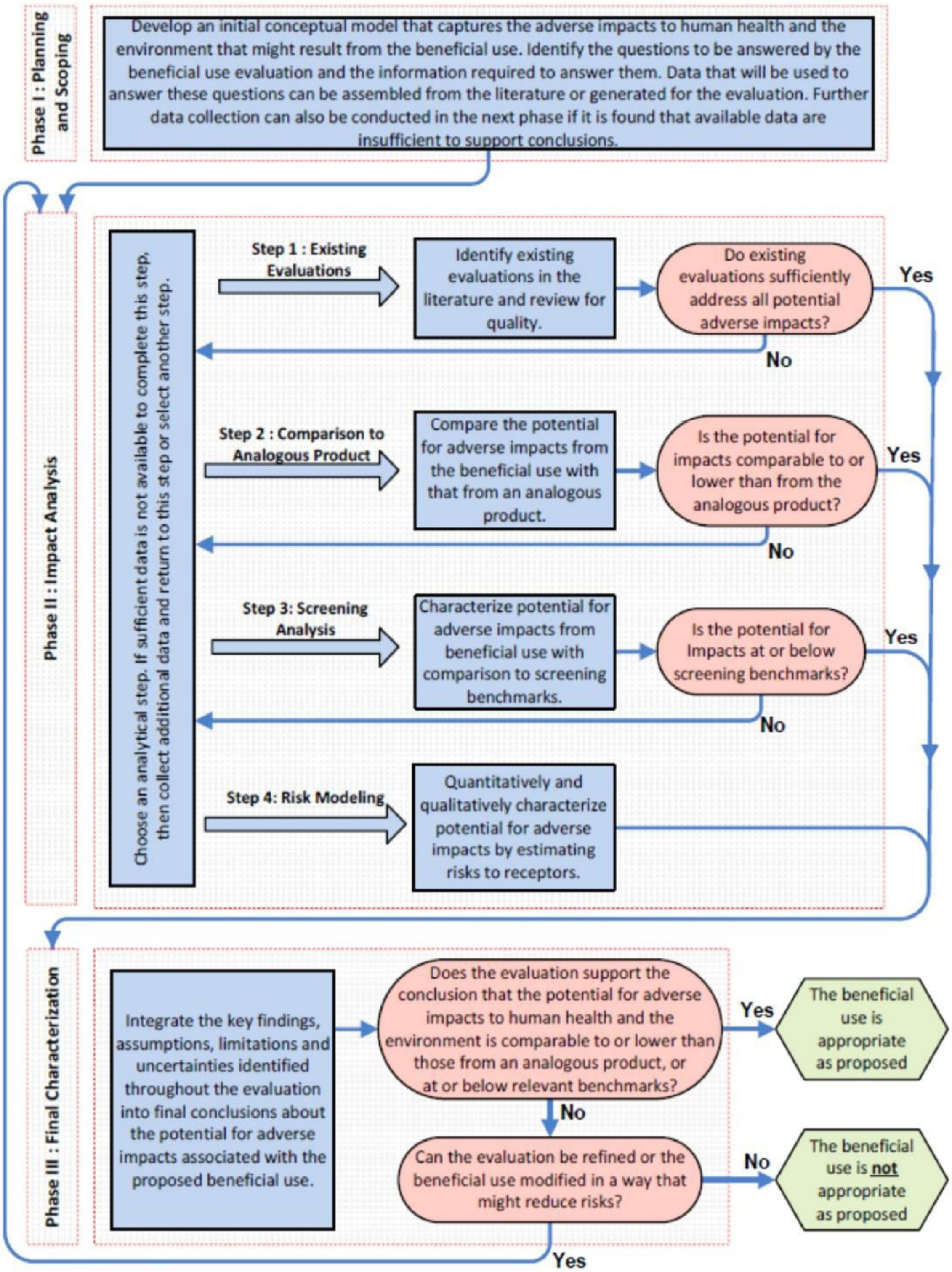
260 80 *Federal Register* at 21,353.

261 80 *Federal Register* at 21,351.

262 *Methodology for Evaluating Encapsulated Beneficial Uses of Coal Combustion Residuals*, EPA (Dec. 19, 2014), https://www.epa.gov/coalash/methodology-evaluating-encapsulated-beneficial-uses-coal-combustion-residuals.

263 *Methodology for Evaluating Beneficial Uses of Industrial Nonhazardous Secondary Materials*, EPA, at 2 n.1 (Apr. 2016), https://www.epa.gov/sites/production/files/2016-07/documents/methodology_for_evaluating_beneficial_use_of_secondary_materials_4-14-16.pdf (explaining "Encapsulated beneficial uses are those where the secondary material is bound in a solid matrix that minimizes mobilization into the surrounding environment.").

Figure 24: Summary Flowchart of the Beneficial Use Methodology



Summary Flowchart of the Beneficial Use Methodology

D. Temporary Storage for Beneficial Use

EPA has attempted to address where the beneficial use characterization attaches to determine what is regulatory versus non-regulatory. It recognized the need of either the CCR unit operator or the beneficial end-user to sometime hold CCP as a potentially necessary intermediate point on the CCP's commercial pathway from its point of origin at the coal plant to its ultimate end use. EPA saw the need to distinguish between a CCR pile that is non-compliant disposal and a pile being held pending its beneficial use per the Final Rule, and EPA has drawn that distinction in the Final Rule's definition of CCR pile. It adopted a definition of CCR pile to ensure that this intermediary activity was properly classified, and not be disguised disposal.

> *CCR pile or pile* means any non-containerized accumulation of solid, non-flowing CCR that is placed on the land. CCR that is beneficially used off-site is not a CCR pile.[264]

EPA interprets "place on the land" to mean piles on-site, at the generation station, and thus on-site piles constitute disposal and therefore can be subject to containment criteria. CCR that is beneficially used off-site is interpreted to "mean temporary piles of CCR off-site (a beneficial use site), based on whether CCR from the pile could fairly be considered to be in the process of being beneficially used."[265] Consequently, a temporary pile located at a beneficial use site is, on one hand, excluded from the definition of a CCR pile, but on the other hand, it must meet the four prong conditions of the beneficial use definition to qualify as a beneficial use, including the last condition for an environmental demonstration applicable to unencapsulated CCR.

Using location, however, as the determining factor for whether a temporary holding of CCR is regulated or not is an arbitrary criterion that could improperly deny exemption of CCR that factually is an extension of a beneficial use. Consequently, in September 2019, EPA proposed to delete the term *CCR pile or pile* and replace it with the term *CCR **storage** pile* defined as "any temporary accumulation of solid, non-flowing CCR placed on the land that is designed and managed to control releases of CCR to the environment." Temporary accumulation is one that is neither permanent nor indefinite and to help identify an accumulation's temporary status, EPA proposes to require some record that evidences a contract, purchase order, facility operation and maintenance plan, or fugitive dust control plan, documenting that all of the CCR in the pile will be completely removed according to a specific timeline. EPA proposed to recognize the temporary holding status pending delivery of the CCR to a specific beneficial use market, regardless of whether it is located on-site or off-site. Creating a role for storage accommodates a need of the beneficial use markets to be able to temporarily store CCR pending transportation or its ultimate use.

EPA recognized in its Final Rule that many states had existing beneficial use programs that incorporated similar criteria as adopted in EPA's definition. Consequently, a state determination that a particular CCR use constitutes a beneficial use could be deemed to satisfy the first two conditions: (i) provides a functional benefit, and (ii) substitutes for the use of a virgin material and conserves natural resources. Also, where a state has established environmental standards for a particular use as part of its beneficial use programs, compliance with those standards could be used to meet the third and fourth prong. EPA referenced how Wisconsin and Virginia allow evaluation of their sites' suitability *prior to* construction that proposes to use CCR as structural fill.[266]

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264 80 *Federal Register* at 21,470.

265 84 *Federal Register* at 40,326.

266 80 *Federal Register* at 21,350.

However, after the Final Rule had issued, Virginia effectively outlawed unencapsulated uses of CCR generated within the state. In March 2019, its General Assembly enacted SB 1355,[267] which mandated removal of all CCR from CCR units within the Chesapeake Bay watershed. The excavated CCR must be either beneficially reused in a recycling process for an *encapsulated beneficial use* or disposed in a permitted landfill with a composite liner and leachate collection system. It sets a minimum of 6.8 million CY of CCR from at least two CCR units that must be recycled in an encapsulated form, which equals 25 percent of the total 27.3 million CY of CCR that must be removed under the statute. It defines "encapsulated beneficial use" consistent with the Final Rule's definition where CCR is bound "into a solid matrix and minimizes its mobilization into the surrounding environment." Consequently, CCR excavated from a CCR unit in Virginia can no longer be used as unencapsulated structural fill.

Hopefully, states will remain open to retaining the flexibility of the Final Rule in developing their own permitting requirements and SWMP coal ash program. Limiting beneficial uses of CCR to encapsulated uses frustrates RCRA's conservation objectives and pushes more CCR to landfills at a time when landfill capacity is becoming constrained.

E. Disposal versus Storage and Warehousing for Future Beneficial Use

RCRA envisions two alternative pathways for CCR destination: disposal or beneficial use markets. As discussed earlier, EPA's authority to regulate waste management activities under RCRA only extends to those activities that are deemed disposal. EPA does not have regulatory authority over activities that relate to beneficial use. However, its definition of beneficial use within the CCR context achieves backdoor regulation by requiring unencapsulated uses to demonstrate conformance with applicable environmental standards to meet the definition. If an unencapsulated use cannot provide evidence of environmental qualification, the use is deemed disposal and subject to EPA's national minimum criteria.

As discussed previously,[268] EPA attempts to answer the question of where to draw the line in differentiating beneficial use activities and disposal. It recognizes the reality of the need to engage in certain preliminary activities, such as temporarily holding coal ash in piles, before the CCR is processed at a beneficiation facility. However, it proposes to restrict extending the beneficial use exemption to CCR piles unless there are records and other documentation, such as a contract, demonstrating that the piles are temporary and are committed to a beneficiation facility or specific end use.

Restricting coal ash management to a choice between only two options: (i) immediate, real-time reuse/beneficiation, and (ii) disposal, ignores the current state of beneficial use markets. Earlier, this Section quoted information compiled by the American Coal Ash Association that reported 64 percent utilization of the 111 million tons of CCP produced in the United States for the year 2017, and the increasing rate of beneficiation of CCR versus the declining volume of production. As promising as these statistics are, the overall picture is less impressive. Earthjustice estimates that 1,971,614,293 million CY of CCR also reside within open and closed CCR units. Thus, it is apparent that although current successful methods of beneficiation offer a long-term solution to the CCR management dilemma, the availability of real-time beneficiation falls far short of satisfying the total demand necessitated by short-term closures, as well as current production. However, over time current methods of beneficiation could play a large role in managing the volume of ash produced and stored in this country, subject to the status of the economy, proximity of ash to market, and the quality of stored CCR.

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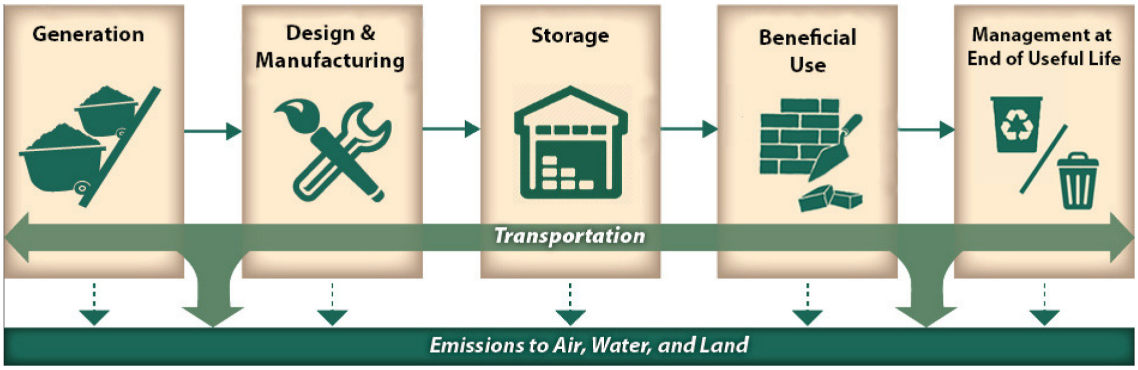
267 S.B. 1355, ch 651, 2019 Sess. (Va. 2019), (passing the same version as H.B. 2786, ch 650, 2019 Sess. (Va. 2019), http://lis.virginia.gov/cgi-bin/legp604.exe?191+ful+CHAP0650+pdf.

268 *See, infra* at p 85.

This section also described promising breakthroughs for new uses of CCR, which will expand the value of CCPs in other economic sectors, such as auto manufacturing, health care, and national defense. The sense of urgency to close coal ash ponds conflicts with the hopeful anticipation and enthusiasm to bring these potentially significant CCP applications to market. Disposal as the dominating policy option could undermine this new emerging independent CCP industry.

EPA published a methodology for evaluating whether a particular reuse qualifies as a beneficial use under EPA's definition.[269] To qualify, the evaluation must consider the aggregate of adverse impacts to human health and the environment resulting at each stage of the life cycle of the beneficially used byproduct. As illustrated in **Figure 25**, EPA identifies storage as an intermediate stage between production of the byproduct and its ultimate end use.[270]

Figure 25: Byproduct Lifecycle and Impacts



ACAA has articulated its CCP customers' supply concerns in response the decline in CCR generation due to the shift to renewable energy and gas power generation, partially in response to environmental regulations, while the market demand for "homegrown fly ash" increases, particularly by the cement industry. The commercial beneficial use markets thus will be adversely affected by the possible premature drive to close coal ash facilities by methods that could foreclose future CCR excavation:

> EPA stated that its CCR rule was directed at disposal and exempted beneficial use. However, the exemption is not as clear and the impact tentacles are both direct and indirect as we move forward . . . "The direct result is that impoundments are closing. Additionally, in many cases the cost to install wet-to-dry collection equipment and/or composite-lined management systems are prohibitive, and utilities are making the decision to prematurely close plants or generation units. The indirect impact on the CCP industry is that fly ash material sources are disappearing . . ."[271]

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269 The detailed methodology referenced here addresses the definition of beneficial use criteria, specifically the requirement that the potential adverse impacts to human health and the environment resulting from the proposed reuse of an industrial byproduct, such as CCR, that must be comparable to or less than the impacts from an analogous product, discussed *supra* at pp. 83-85. *See Methodology for Evaluating Beneficial Uses of Industrial Nonhazardous Secondary Materials,* EPA (Apr. 2016), https://www.epa.gov/sites/production/files/2016-10/documents/methodology_for_evaluating_beneficial_use_of_secondary_materials_4-14-16.pdf.

270 *Beneficial Use Compendium: A Collection of Resources & Tools to Support Beneficial Use Evaluations*, EPA at 2-1 – 2.2 (June 2016), https://www.epa.gov/sites/production/files/2016-06/documents/ben_use_compendium_062216.pdf.

271 Danny Gray, "Alternative Supplementary Cementitious Materials Availability – The Next 50 Years," *Ash at Work*, Issue 1 at 7 (2019). https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2019.pdf.

What EPA and states do in response to the environmental threat of these aging coal ash units will impact the fly ash market, which "will be felt for decades to come."[272] Policy outcomes prioritizing closure and disposal could slow investments in beneficiation facilities and detrimentally hamper the growth of fly ash use, as an example of one unintended outcome.

A response to EPA's closure policies has been the development of capabilities to harvest from utilities' legacy coal ash ponds desirable CCR content that can be further processed for purposes of beneficiation to meet future beneficial use markets. ACAA calculated that there are over 1.5 billion tons of previously disposed coal ash in both landfills and surface impoundments, based on production and use surveys it conducted. Harvesting and beneficiation of these ash deposits "provides a potential avenue for recouping some of the expenses associated with such closures."[273] However, to meet EPA's deadlines for required closure of CCR units under its rule, utilities and IPPs need a clear regulatory pathway to transfer the excavated CCR to alternative *storage* facilities offering the capability to harvest CCPs for eventual beneficiation. EPA's concept of temporary storage piles needs to be extended to long-term storage facilities offering services above and beyond landfill disposal.

In support of the movement to develop harvesting capabilities, ASTM recently published the *Standard Guide for Harvesting Coal Combustion Products Stored in Active and Inactive Storage Areas for Beneficial Use.*[274] Its guidance on harvesting CCPs also includes evaluation of storage areas for harvesting, detailed characterization of CCP storage areas; planning and scoping of harvesting projects; and detailed design and approval of CCP storage areas for harvesting. These standards could be used to distinguish storage facilities serving beneficial use markets consistent with the EPA's beneficial use definition from disposal with its minimum criteria under EPA regulations.

Waste management companies are preparing for an increase in demand for landfill capacity to meet disposal needs for CCR at a time when landfill capacity may be facing critical regional shortages.[275] In addition, many landfill owners-operators are making additional investments to craft design and structural changes to their facilities in order to comply with the minimum criteria to qualify as a CCR landfill. Higher demand and increased regulatory costs mean higher tipping fees for disposal in the overall closure cost calculations. To encourage an alternative and competing response by CCR management firms to enter the "storage" market, a clarification of EPA's Final Rule to exempt or reclassify these storage facilities under CCR regulation under RCRA is needed quickly. Second, utilities/IPPs should be encouraged to determine and catalog the constituent elements in their coal ash that will help match supply with market demand specifications. Just as there was an information gap regarding the pollutants contained in their coal ash waste streams, there is also a gap regarding the potentially useful components in the coal ash. DOE's research role could support creating an index and catalogue system for registering CCR information for these nascent markets and evaluating closure alternatives could also include an evaluation of the beneficial use value of the components in the CCRs.

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272 *Id.*

273 Rafic Minkara, Ph.D. P.E., "Digging through the Past: Harvesting Legacy Ash Deposits to Meet Future Demand," *Ash at Work*, Issue 1 at 22-23 (2019). https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2019.pdf.

274 For an overview of ASTM Guide, *see* Ivan Diaz Loya, *ASTM Guide for Harvesting CCPs from Active & Inactive Storage Areas for Beneficial Use – Task Group Overview*, BORAL (Mar. 29, 2018), http://worldofcoalash.org/wp-content/uploads/2018/11/12_ivan-diaz_panel-discussion_first-speaker.pdf. For other discussion of Harvesting Coal Ash, *see ACAA, Ash at Work,* Issue 1 at 22, 28, 36, 43 (2019), https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2019.pdf.

275 *See* James Thompson & Rob Watson, *Time is Running Out: The U.S. Landfill Capacity Crisis,* Solid Waste Envt'l Excellence Protocol (SWEEP) (May 4, 2018), https://nrra.net/sweep/time-is-running-out-the-u-s-landfill-capacity-crisis/.

Third, public policy consideration of regulatory and financial incentives under Subchapter VIII of RCRA[276] would advantage the development of environmentally secure storage and incentivize utilities' decision-making, away from disposal, to either transfer excavated CCR to storage or convert on-site CCR units into qualifying storage facilities, qualifying as used and useful facilities under regulated rate-making principles. Utilities/IPPs themselves using available macroencapsulation technologies and/or working with a qualified strategic landfill partner would help utilities make decisions on coal ash management that would maximize beneficial use value and potentially reduce costs for closure and post-closure care, while complying with EPA's Final Rule. Storage using available environmentally isolating technology (macroencapsulation, not disposal) on or off site would allow utilities to offset conversion costs with potential earnings from CCPs markets. Policies supporting public/private partnership's investment in beneficiation storage and harvesting align with the conservation mission of RCRA.

276 42 U.S. Code § 6981 to 6987. Subchapter VIII—Research, Development, Demonstration, and Information, https://uscode.house.gov/view.xhtml?path=/prelim@title42/chapter82&edition=prelim.

SECTION 8:
PUC Challenges with Utility Cost Recovery Applications

A. Ratemaking Implications for Utility Recovery of CCR Compliance Costs

As discussed in Section 5, the Final Rule provides for two primary methods to close CCR surface impoundments: (i) close with CCR in place in the existing impoundment and cover with an EPA-compliant cap; or (ii) remove the CCR and re-dispose of it in a landfill, if not beneficially used. Between these two options, the cost differential is substantial. For example, TVA noted in its EIS that estimated costs for closure with CCR in place could range from $3.5 million to $200 million, whereas the range of costs for closure by removal and re-disposal is between $20 million to $2.3 billion.[277] Because each CCR unit is unique, its site-specific conditions affect the costs, including the need to shore up structural stability to better handle onsite construction and transportation activities. However, if choosing between spending $200 million versus $2.3 billion, utilities must first consider which could more significantly affect and benefit their electricity customers.

The impact of compliance costs incurred under EPA's Final Rule will affect customers' electricity rates, and will manifest differently depending primarily on whether the CCR unit is owned by a utility or IPP. Utilities may attempt to recover their costs through their regulated rates charged to customers. IPPs, however, will attempt to recover their costs through the competitive wholesale market. The higher costs incurred by IPPs could potentially change the independent system operator's (ISO) generation stacking order for economic dispatch and ultimately impact market clearing prices. In the end, the IPP's shareholders bear the risk, as the law firm Wilkinson Barker Knauer and the Power Research Group state in a June 2017 report: "The key weakness of the merchant generation business model is that generators' revenues generally do not cover the all-in cost of supply, which includes the cost of capital recovery as well as the variable cost of operation."[278] This risk to a corporate bottom line was born out recently in Vistra Energy Corp.'s (formerly Dynegy) 2018 annual report in which it reported $605 million in "coal ash and other" noncurrent liabilities as of December 31, 2018. Its power generation subsidiary operates merchant coal-fired plants in the ERCOT, MISO, and PJM wholesale power markets and has no end-use ratepayers from whom it can directly recover costs. "Independent power producers face a much different set of economics, [Morningstar Research Services analyst Travis] Miller said."[279]

Although it is clear that IPP shareholders bear the market risks associated with the CCR compliance costs for each of their merchant power plants, it is not clear, at the present time, whether regulated utilities will be allowed by their public utility commissions to recover all their CCR compliance costs. Coal ash cleanup presents somewhat unique circumstances that do not fit easily into the conventional public utility business model, which rests on the regulatory principle that, in exchange for accepting the obligation to serve, a utility is provided an opportunity to recover its costs of service plus a fair rate of return on its investment. However, the utilities' opportunity for recovery is also subject to other ratemaking principles of least-cost, prudency, and just and reasonable rates, and there are few lessons in the historical analogues of commissions'

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277 Ashley R. Farless, *Final Ash Impoundment Closure Envt'l Impact Statement*, TVA (June 2016), https://www.tva.gov/file_source/TVA/Site%20Content/Environment/Environmental%20Stewardship/Environmental%20Reviews/Closure%20of%20Coal%20Combustion%20Residual%20Impoundments/Final%20EIS%20Part%20I.pdf.

278 Kennedy Maize, "What Is the Future of Independent Power?," *PowerMag.com* (Jan. 3, 2018), https://www.powermag.com/what-is-the-future-of-independent-power/?pagenum=2. See, Vistra Energy, *2018 Annual Report*, page 169, https://s21.q4cdn.com/410616722/files/doc_financials/annual/2018/Vistra-Energy_2018-Annual-Report.pdf.

279 Darren Sweeney, Ashleigh Cotting, & Zack Hale, *Cost questions loom as utilities prepare to close hundreds of coal ash sites*, S&P Global Market Intelligence (June 17 2019), https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/52117110.

application of these ratemaking principles to help public utility commissions in upcoming rate determinations regarding coal ash compliance costs. North Carolina adopted coal ash legislation both before and after EPA issued its Final Rule and is thus ahead of most states in dealing with questions associated with regulatory treatment of coal ash compliance costs.

The magnitude of the costs based on the closure option chosen by any given utility was summed up by *Townhall*, a publication that does not generally write on energy topics, but which realized the national significance of these costs. To provide a better comparison of the cost of regulation, it compared the following utilities' costs on a per impoundment basis:[280]

- Duke Energy, with its low-end $4 billion project cost, can expect to pay an average of $125 million to cleanup each ash basin. Duke Energy's costs, however, could soar if the state's environmental agency maintains intermediate- and high-risk ratings for its 32 basins. Intermediate and high-risk rated impoundments require the most expensive option for managing coal ash waste: excavate-and-remove. Under an all-excavate program, Duke Energy's project cost could reach $10 billion, or about $312 million per pond.
- Georgia Power's $2 billion estimated total cleanup expense averages to about $68 million per pond.
- Dominion Virginia Power's $500 million of total cleanup costs is equivalent to approximately $45 million per pond.

Townhall included a caveat regarding the use of an average cost per impoundment that costs could widely vary for any specific individual impoundment. "Waste removal experts say excavation versus cap-in-place aren't the only decisions that affect estimates. Basin size, amount of material, wet-versus-dry storage methods, union labor requirements, hauling costs, and distance to alternate landfills all factor into ash pond closing costs."[281]

One potentially useful historical analogy involved costs expended by utilities to comply with air pollution control regulations. EPA commissioned a study in 2011 to better understand how PUCs would treat costs that were both unexpected and extraordinary.[282] Typically, an electric utility would apply to a state's environmental permitting agency for approval of its proposed plan to comply with EPA's air quality mandates.[283] The utility would then file with the PUC to have the costs of the approved plan included in its rates. The study notes:

> Filing a rate case is the traditional method for curing a revenue deficiency. Historically, the capital investment aspects of the rate case are reviewed after-the-fact, i.e., the investment has been made and the project entered into service before the case is filed. The PUC

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280 Bruce Parker, *Regulations create wide-ranging costs for coal-ash cleanups, Townhall* (June 29, 2016), https://townhall.com/watchdog/virginia/2016/06/29/coal-ash-regulations-create-wide-ranging-costs-for-power-companies-n9586. It should be noted that this article was written in 2016, and this source is referenced here to demonstrate the range of potential costs. At that time, utilities were estimating coal ash unit closure costs, but had not yet provided specific closure plans on which to provide a more accurate assessment of costs. Since then there have been legal developments affecting these costs for both Dominion and Duke.

281 *Id.*

282 *Public Utility Commission Study,* SRA International (Mar. 31, 2011), https://www3.epa.gov/airtoxics/utility/puc_study_march2011.pdf.

283 *Permitting Under the Clean Air Act,* EPA, (July 2, 2019), https://www.epa.gov/caa-permitting; *see e.g. Oklahoma Air Quality Division,* OK DEQ (last visited Oct. 6, 2019), https://www.deq.ok.gov/divisions/aqd/.

determines whether the investment was prudent. The prudence review is based on the conditions prevailing when the decisions were made and often includes questions such as:

- Are the costs incurred to meet the needs of customers?
- Are the costs necessary to provide adequate service?
- Are the costs reasonable?
- Was the technology selection prudent?
- Is the plant investment used and useful?
- Will ratepayers derive a benefit?
- Is the capital investment consistent with any commission mandated integrated resource plan?

All prudent aspects of the investment will be added to the rate base, whereas costs deemed imprudent will be disallowed and borne by shareholders.[284]

The study continued, however, to note that, despite the incurrence of costs to comply with laws requiring pollution control technologies, the costs were not always approved for recovery by PUCs.

> As a general rule, capital investment in pollution controls that are required for compliance will be deemed a prudent investment. For example, as stated by the Alabama Public Service Commission in a case establishing an environmental compliance cost recovery mechanism:
>
> > [Environmental compliance costs] by definition are the product of governmental mandates establishing environmental requirements with which Alabama Power, by law, must comply. These are not costs that Alabama Power can simply choose not to incur, which in turn strongly supports a presumption that they are prudent expenditures.[285]
>
> However, there are often nuances to this general rule that make approval less certain. For example, multiple options could be available to reach compliance, each with different costs and benefits. In addition, regulatory burdens may be uncertain or undefined, potentially making early compliance strategies more of a risk. In another possible scenario, aspects of a nominally prudent investment could be deemed imprudent and disallowed (e.g., because of inadequate cost controls). For example, a case in Indiana rejected activated carbon injection (ACI) technology to reduce mercury emissions, based on the assertion that there were numerous mercury emission control technologies under development at the time that could prove to be more economical and efficient.[286]

284 *Public Utility Commission Study, supra* note 282, at 16.

285 Re Ala. Power Co., Nos. 18117 & 18416, 237 P.U.R.4th 337 (Oct. 29, 2004).

286 *Public Utility Commission Study, supra* note 282, at 16.

Many such nuances arise in the context of coal ash remediation and recovery of its associated costs. Consequently, electric utilities have several fundamental considerations in developing a closure plan in compliance with EPA's rule that could have impact on its ability to recover its compliance costs:

- How much of the CCR is capable of being sold as a beneficial use, exempting the CCR from EPA's disposal regulation and potentially lowering the cost of remediation?
- Should the unit be closed with the CCR in place (on-site closure), which will trigger the 30-year monitoring requirement, including the obligation to engage in corrective action to address any groundwater contamination or structural instability that occurs during or following closure of the CCR unit?
- Should the unit be excavated and the CCR hauled to a remote location (off-site disposal) with attendant high costs and potential for additional environmental impacts associated with transporting millions of tons of ash to remote locations? After excavation and removal of the CCR, the excavated basin will require decontamination to ensure that groundwater protection standards are met.
- Is there a middle ground solution, such as retrofitting the impoundment and converting it to a landfill that complies with EPA's national minimum criteria?
- What time frame should be adopted for the remediation of existing coal ash ponds and how will this impact ratepayers as well as costs given possible advances in beneficiation technology and remediation technology?
- Should it matter in choosing closure alternatives whether the CCR unit is inactive and no longer accepting coal ash or it is inactive and part of the facilities at a generation site that has been retired and no longer generating electricity, so that the unit is potentially considered no longer used and useful?

Each of the above decisions will involve a significant amount of subjective judgment, like many regulatory decisions. While it may not be surprising that utilities and environmentalists may differ significantly as to what is the proper decision, a utility's choice of closure option may not be rationally decided based on economics alone:

> The decision to close [a surface impoundment (SI)] in place or excavate and re-dispose of the stored CCR is a critical question, but one that is often not based on pragmatic evaluations that fully consider the full set of issues and downstream consequences associated with each closure option. Based on media reports and actions taken by non-governmental organization (NGO) public interest groups, the prevailing public sentiment seems to be that closing an SI via CCR excavation and re-disposal is the preferred option; this seems to be driven by the notion that removing CCR from the existing SI is the only way to ensure that the groundwater and surface water surrounding the SI are completely protected. This position is at odds with the Rule, which explicitly states, " . . . both methods of closure (i.e., clean closure and closure with waste in place) can be equally protective, provided they are conducted properly." Despite this, public pressure rooted in these assumptions and the threat of litigation has caused some utilities to pursue plans to excavate and re-dispose of the CCR in their SIs.[287]

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287 Ari Lewis & Andrew Bittner, Methods of Closing CCR Surface Impoundments: Holistic Assessment Key to Developing Effective Plans, *Ash at Work,* Issue 2 at 6-7 (2016), https://www.acaa-usa.org/Portals/9/Files/PDFs/AshAtWork/ASH01-2016.pdf. (citing Final Rule, 80 Fed. Reg. 21,302 (2015)).

This raises the potential for conflict between the policy objectives of the state environmental agency in establishing permitting conditions for a utility's CCR closure plan to comply with the EPA's minimum criteria and the commission's mission in reviewing compliance costs for ratemaking purposes. For example, the NCDEQ has ordered closure requirements using an excavate and haul approach for Duke's surface impoundments to achieve its clean closure objectives. Duke estimates costs to comply with NCDEQ's requirements could be as much as an additional $5 billion, which costs are at risk of recovery through rates, notwithstanding that Duke managed coal ash no differently than other utilities across the country.

Kentucky's regulatory process to address coal ash remediation offers a model that may minimize this potential for conflict. While a typical process, such as the process used in North Carolina, begins with the environmental agency granting the required permits for closure of coal ash units and the utility then expending funds to comply with the permit followed by regulatory review of the utility's costs, this sequence subjects the utility to financial risks and uncertainty as to the size of the utility's liabilities which can ultimately affect its credit rating. In Kentucky, the process begins with the Kentucky Energy and Environment Cabinet, Division of Waste Management issuing a permit for the remediation of a coal ash unit.[288] The utility next applies to the PUC for a Certificate of Public Convenience and Necessity[289] to build or close a coal ash unit under a unique statutory provision specifically covering recovery of coal ash costs. The utility's plan for a CCR unit's construction or closure and the costs are reviewed by the PUC. If the plan is approved, the costs are recovered using a statutory recovery mechanism for coal ash costs.[290]

This procedural approach is illustrated in a Kentucky Utilities Company Order[291] by the Kentucky Public Utility Commission. The utility company had to make several changes to its previously filed plan with Kentucky's DEQ to build new ash units and to close several ash units. As a result, the dual track procedure before closure activities commenced, provided the utility assurance of cost recovery; the Commission has the ability to evaluate the overall costs of closure before costs are incurred; and the DEQ can consider changes to closure permits informed by the impact on customers' rates.

Indiana follows a similar procedural approach. Indiana specifically requires utilities to file for a certificate of public convenience and necessity for "federally mandated" environmental costs.[292] The Indiana Code provides that: "The commission shall issue a certificate of public convenience and necessity under section 7(b) of this chapter if the commission finds that the proposed compliance project will allow the energy utility to comply directly or indirectly with one (1) or more federally mandated requirements."[293] The statute specifically covers environmental costs required by RCRA.[294]

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288 https://eec.ky.gov/Environmental-Protection/Waste/solid-waste/Pages/default.aspx.

289 Kentucky Revised Statutes Title XXIV. Public Utilities § 278.020. Certificate of convenience and necessity required for construction provision of utility service or of utility; exceptions; approval required for acquisition or transfer of ownership; public hearing on proposed transmission line; limitations upon approval of application to transfer control of utility or to abandon or cease provision of services; hearing; severability of provisions, https://codes.findlaw.com/ky/title-xxiv-public-utilities/ky-rev-st-sect-278-020.html.

290 Kentucky Revised Statutes Title XXIV. Public Utilities § 278.183. Surcharge to recover costs of compliance with environmental requirements for coal combustion wastes and by-products; environmental compliance plan, review and adjustment, https://codes.findlaw.com/ky/title-xxiv-public-utilities/ky-rev-st-sect-278-183.html.

291 Electronic Application of Kentucky Utilities Company for a Certificate of Public Convenience and Necessity and Approval of Amendment to its 2016 Compliance Plan for Recovery by Environmental Surcharge, Case NO. 2017-00483, https://psc.ky.gov/pscscf/2017%20Cases/2017-00483//20180709_PSC_ORDER.pdf.

292 https://codes.findlaw.com/in/title-8-utilities-and-transportation/in-code-sect-8-1-8-4-6.html.

293 *Id.*

294 TITLE 8. Utilities and Transportation Article 1. Utilities Generally Chapter 8.4. Federally Mandated Requirements for Energy Utilities 8-1-8.4-5. "Federally mandated requirements" IC 8-1-8.4-5 "Federally mandated requirements, https://law.justia.com/codes/indiana/2017/title-8/article-1/chapter-8.4/section-8-1-8.4-5/.

This all raises several upfront key questions in evaluating a utility's request for cost recovery:

1. What closure options did the utility have and what impact did these options have on costs?
2. What additional safety requirements and structural changes are necessary for safe excavation and to protect workers' health, as well as to protect the environment during the closure process?
3. How much will it cost to remediate coal ash units?
4. Was the utility imprudent in how it handled the coal ash units in the past?
5. Are coal ash expenses used and useful?
6. Should all costs of closure and remediation be passed on to ratepayers?
7. Should utility shareholders bear some of the expenses?
8. Over what period of time should the costs be recovered?
9. Should the utility be allowed to earn a rate of return on the costs of remediation?

These questions and the application of rate principles to their answers will form the arguments made in support of and in opposition to a utility's request for recovery of its compliance costs. The recent court filings in the appeal of Duke Energy's rate case in North Carolina[295] provides a near perfect case study for evaluating how these various arguments could potentially play out in other jurisdictions throughout the country.

295 *State ex rel. Utils. Comm'n v. AG*, 829 S.E.2d 488 (N.C. 2019), https://www.ncappellatecourts.org/search-results.php?sDocketSearch=271A18&exact=1.

B. North Carolina Rate Case: Leading the Way on CCR Costs Recovery

The North Carolina Utilities Commission (NCUC) issued decisions in two rate cases filed by Duke Energy's utility subsidiaries in 2018,[296] approving recovery of nearly $800 million in combined costs between the two utilities for coal ash remediation costs they had incurred between 2015 and 2017. None of these costs were attributable to or associated with clean-up costs and other damages for the Dan River spill at Duke's generation facilities in 2014, which were prohibited by legislation. The costs were incurred in association with Duke's other coal ash ponds to comply with CAMA, as well as EPA's Final Rule, and were consistent with the NCDEQ permit requirements. Still, the North Carolina Attorney General (AG), joined by the Sierra Club, appealed both NCUC's decisions, specifically on the issue of the NCUC's approval of these costs and allowing their recovery in rates. The Attorney General's position was also reflected in proposed bills filed by several legislators in 2019 that would prevent Duke from recovery of any further coal ash clean-up costs, even costs unrelated to the Dan River spill.[297]

The NCUC's decisions allowed Duke to recover $800 million in coal ash remediation costs, which had accumulated in a deferral account, amortized over 5 years, with a rate of return on unamortized amounts. The NCUC, however, reduced the initial amount of costs Duke requested for recovery by imposing a $100 million management penalty that would be offset against the costs that Duke asked to recover. The NCUC also deemed an additional $9.5 million to be non-recoverable. Duke had filed for $200 million for inclusion in future rates based on the amount it anticipated it would spend on coal ash remediation in the future test year. The NCUC denied recovery of these costs in current rates but required Duke to put the $200 million into a deferral account to be included in the next rate case.[298]

Three parties appealed the NCUC decisions to the North Carolina Supreme Court (NC Supreme Court): the North Carolina AG, the Sierra Club, and the Public Staff[299] of the NCUC. These parties filed briefs in April 2019.[300] Duke filed reply briefs on September 24, 2019, defending the NCUC order.[301] As of the date this white paper was finalized, oral argument had not been set, nor has a decision been issued by the NC Supreme

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296 The first case was filed by Duke Carolinas, Duke Energy's larger utility subsidiary serving North and South Carolinas; the second was for Duke Progress, also a utility subsidiary serving part of North and South Carolinas which had formerly been owned by Progress Energy. The two cases were joined for purposes of appeal. Consequently, reference to the companies and to the underlying NCUC cases will be simply to Duke. *In the Matter of Application of Duke Energy Carolinas, LLC, for Adjustment of Rates and Charges Applicable to Electric Util. Serv. in N.C.*, Nos. E-7, Sub 1146; E-7, Sub 819; E-7, Sub 1152; E-7, Sub 110, at 23-24 (Jan.-Mar. 2018), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=80a5a760-f3e8-4c9a-a7a6-282d791f3f23; and Nos. E-2, Sub 1131; E-2 Sub 1142; E-2 Sub 1103; E-2 Sub 1153 (Sept.-Nov. 2017), https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=d2b2a1a0-dae1-45de-af9c-c987d4aeddc8.

297 Bruce Henderson, NC House Democrats file bills to block Duke from passing coal ash costs to consumers, *Charlotte Observer* (Apr. 5, 2019), https://www.charlotteobserver.com/news/local/article228874829.html.

298 Duke filed another rate case on Sept. 30, 2019. Hannah Smoot, The Charlotte Observer, Duke Energy files new NC rate case. Here's what it means for your bill, (September 30, 2019), https://www.wbtv.com/2019/10/01/duke-energy-files-new-nc-rate-case-heres-what-it-means-your-bill/.

299 N.C. Gen. Stat. § 62-15 (Session Laws 2018-145 of the 2018 Regular Session and the 1st, 2nd, and 3rd Extraordinary Sessions of the General Assembly, but not including Session Laws 2018-146 or corrections and changes made to Session Laws 2018-132 through 2018-145 by the Revisor of Statutes, and through Session Laws 2019-3 of the 2019 Regular Session of the General Assembly, but not including corrections and changes made to the 2019 legislation by the Revisor of Statutes) (holding that the Public Staff represents consumers, stating "It shall be the duty and responsibility of the public staff to . . . intervene on behalf of the using and consuming public, in all Commission proceedings affecting the rates or service of any public utility).

300 Brief for Intervenor-Appellant AG, *State ex rel. Utils. Comm'n v. AG*, 829 S.E.2d 488 (N.C. 2019) (Nos. 271A18 & 401A18), https://www.ncappellatecourts.org/show-file.php?document_id=246329; Brief for Intervenor-Cross-Appellant Pub. Staff N.C. Utils. Comm'n, 829 S.E.2d 488 (N.C. 2019) (Nos. 271A18 & 401A18), https://www.ncappellatecourts.org/show-file.php?document_id=246337; *also see* Amicus Curiae Brief of the N.C. DEQ, 829 S.E.2d 488 (N.C. 2019) (Nos. 271A18 & 401A18), https://www.ncappellatecourts.org/show-file.php?document_id=254510.

301 Joint Brief of Appellees Duke Energy Carolinas, LLC & Duke Energy Progress, *State ex rel. Utils. Comm'n v. AG*, 829 S.E.2d 488 (N.C. 2019) (Nos. 271A18 & 401A18), https://www.ncappellatecourts.org/show-file.php?document_id=254504; Brief of Appellee Duke Energy Carolinas, LLC in Response to Joint Brief of Intervenor-Appellants N.C. Sustainable Energy Assoc., *et. al*, 829 S.E.2d 488 (N.C. 2019) (Nos. 271A18 & 401A18), https://www.ncappellatecourts.org/show-file.php?document_id=254506.

Court. The NCUC's two orders and the five briefs filed with the NC Supreme Court consider the recovery of coal ash remediation costs in the context of the following six principles of ratemaking. This Section provides a summary of how these principles underlie the parties' positions in the appeal.

1. Known and Measurable Principle
2. Just and Reasonable Principle
3. Prudency Principle
4. Used and Useful Principle
5. Cost Causation Principle, and
6. Expenses/Property Distinction.

1. Known and Measurable

To be recoverable, coal ash costs must be "known and measurable." Ordinarily, the known and measurable principle applies to whether certain costs can be included in a future test year,[302] in those states that have a future test year methodology. In the Duke case, known and measurable came up in two contexts. First, the NCUC found that the roughly $800 million in the historic deferral account met the "known and measurable" test, and no party disputed that Duke had spent that amount on coal ash remediation between 2015 and 2017. On the other hand, the NCUC also determined that about $200 million could NOT be included in the future test year on grounds that it was speculative, i.e., not "known and measurable." The NCUC did, however, allow future expended costs to continue to be included in a deferral account for a future rate case, presumably when it would be known and measurable.

2. Just and Reasonable and Prudency

Just and reasonable rates is a principle enunciated in the Federal Power Act and most states' public utility statutes.[303] Similarly, PUCs are usually required to ensure that costs were prudently incurred before allowing them into rates.[304] In analyzing the Duke rate case, the parties rarely distinguished between the principles of reasonableness and prudence, often seemingly using the terms interchangeably. This is not unusual in the practical application of these principles in real world cases. Quoting from energy lawyer and analyst Steve Isser's *Just and Reasonable: The Cornerstone of Energy Regulation:*

> " 'Just and Reasonable' is the standard language in both the Federal Power Act and most state regulatory acts, yet it is rarely defined. Parsing the terms provides little illumination as to their meaning. Just is defined as 'conforming to or consonant with what is legal or lawful.' Reasonable is 'fair, proper, just, moderate, suitable under the circumstances.' Fit and appropriate to the end in view."[305]

302 Ken Costello, *Future Test Years: Challenges Posed for State Util. Comm'rs*, National Regulatory Research Institute. (July 2013), https://pubs.naruc.org/pub/FA86C105-05F5-9766-BC78-29829AC50361. (discussing deeper the test year concept and the impact of "known and measurable costs.").

303 Steve N. Isser, *Just and Reasonable: The Cornerstone of Energy Regulation*, SSRN (June 30, 2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2625131 (providing an in-depth scholarly discussion of just and reasonable).

304 Robert E. Burns, *The Prudent Investment Test in the 1980s*, National Regulatory Research Institute (Apr. 1985), http://ipu.msu.edu/wp-content/uploads/2016/12/Burns-Prudent-Investment-Test-84-16-85-1.pdf.

305 Isser, *supra* note 303, at 1.

In an interesting article on prudence, Isser noted:

> Does "Prudence" Get Sufficient Attention? … To prevent excess costs, we must insist on utility prudence. We have the legal tool: the "just and reasonable" standard. … "Just and reasonable" and "prudence" are only chapter headings. Commissions define "prudent" as "what a reasonable person would do." What would a "reasonable person" do with a billion-dollar choice among nuclear, clean coal, transmission, and demand response? Courts have defined prudence circularly, as avoiding "unreasonable costs," operating at "lowest feasible cost," and "operat[ing] with all reasonable economies."[306]

Just and reasonable and prudency principles have two implications in the coal ash context:

1. Was the utility reasonable in its historic actions relating to coal ash ponds?

2. Was the utility reasonable in how they have chosen to comply with federal and state regulations relating to treatment of coal ash ponds going forward?

Accordingly, the parties argued in their Supreme Court briefs whether Duke's historic decisions were reasonable and prudent, and whether Duke's coal ash mitigation costs were just and reasonable and/or prudently incurred. To answer these questions, the briefs extensively discussed the history of coal ash management practices in the U.S., particularly in the Southeast. Duke argued that it followed the industry standard and its coal ash management practices were consistent with all state and federal regulations relating to solid waste disposal. Environmentalists argued that it was always imprudent to dispose of coal ash in unlined ponds regardless of industry practice or state and federal law.

A refinement of this argument relates to timing. Assuming it was reasonable to dispose of coal ash in unlined ponds initially, the debate over the past decades in EPA's RCRA proceedings centered on whether coal ash should be classified as hazardous or nonhazardous. Consequently, environmentalists argued that Duke had notice of the environmental risks for which Duke should have prepared. At some point, the environmentalists argue, it should have been apparent that there was potential for leaching of coal ash contaminants into groundwater and that "reasonableness" and "prudence" required utilities to take more aggressive action to protect against groundwater contamination.

Commission determinations of just and reasonable and prudence will depend on the specific and unique circumstances of the utility's policy and actions regarding coal ash units. Indeed, the federal government took nearly four decades to determine the national policy on remediation of coal ash, maintaining an environment of regulatory uncertainty for utilities.

3. Used and Useful

The "used and useful" principle protects current customers. It provides that they will benefit from a utility's investment during the period in which they pay for services. In the case of coal ash, however, utilities are incurring costs for cleaning coal ash produced from the generation of electricity that benefited past customers over the decades coal ash waste was deposited in these CCR units. Charging current customers for costs

306 Scott Hempling, "Prudence": Who's Minding The Store? (January 2011), (footnotes deleted) https://www.scotthemplinglaw.com/essays/prudence.

associated with electricity services provided to prior customers raises questions about the application of the "used and useful" principle. Before he was a FERC commissioner and chairman, Dr. James Hoecker had considered the continued significance of the used and useful doctrine:

> Regulators still determine whether utility investments are or are not used and useful in the public service and thereby establish whether or when certain investments are recoverable. It is a credible practice [but nevertheless is applied flexibly]. Used and useful no longer necessarily requires that there be a direct and immediate benefit to identifiable ratepayers. It is often used interchangeably with other equitable ideas and modern risk allocation concepts and, regrettably, is invoked without explanation. Its continued viability as a substantive rule of policy will therefore depend on the quality of agency decision making. Given the limited importance of used and useful in the era of end results and its constitutional limitations under Hope Natural Gas, the usefulness of used and useful is imperiled.[307]

The North Carolina Attorney General directly confronted this argument:

> To qualify under the ratemaking statute for a return, Duke's expenses had to be spent on property that is used and useful. Property is used and useful when it is employed to provide current service to a utility's customers. Duke's coal-ash expenditures fail this test. Duke has spent money on dewatering coal ash, digging it out of the ground, and hauling it to a landfill. Those are waste-management expenses, not investments in facilities that provide current service to customers. The coal ash at issue in these cases, moreover, was created when Duke burned coal to generate power years ago. Indeed, many of the basins and plants at issue in this case have been retired for years.[308]

Duke argued that coal ash costs are "property used and useful." The term "used and useful," although not defined by statute, encompasses that which both (1) serves the public, and (2) is funded by debt and/or equity investors.[309] The NCUC agreed with Duke's position, and observed:

> In general, the [North Carolina] Supreme Court's treatment of the concept has been in the negative, i.e., asserting as a basis for its decision that something is not "used and useful" – for example, excess common facilities are not "used and useful" as a matter of law, see Thornburg II, 325 N.C. at 495-96, 385 S.E.2d at 469, and a water treatment plant that was not in service as of the end of the test year and would never again be in service was not "used and useful" within the meaning of N.C. Gen. Stat. § 62-133(b)(1). State ex rel. Utils. Comm'n v. Carolina Water Serv., Inc., 335 N.C. 493, 508, 439 S.E.2d 127, 135 (1994). The reverse, of course, is that if the expenditures do support and provide service to customers, the costs are "used and useful."[310]

The NCUC thus concluded that "[c]apital expenditures undertaken to enable compliance with the law qualify as 'used and useful,' in that the Company does not have the option to fail to comply, and . . . are routinely recoverable in rates."[311]

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307 James J. Hoecker, "Used and Useful": Autopsy of a Ratemaking Policy, 8 Energy L.J. 303 (1987), https://www.eba-net.org/assets/1/6/25_8EnergyLJ303(1987).pdf.

308 AG Brief, *supra* note 300, at 39 (including the AG's used and useful argument which goes to whether the NCUC should grant a return on the coal ash costs not whether it should grant recovery of the costs themselves).

309 Duke Carolinas Brief, *supra* note 301, at 2 n.1 (citing *Utilities Comm'n v. Virginia Elec. & Power Co.*, 285 N.C. 398, 414-15, 206 S.E.2d 283, 295-96 (1974))..

310 *Re Duke Energy Carolinas*, N.C. Utils Comm'n, Nos. E-7, Sub 1146; E-7, Sub 819; E-7, Sub 1152; E-7, Sub 110 (June 22, 2018), at 259.

311 *Id.* at 268-69.

4. Cost Causation

Similar to used and useful, there is a timing issue in the application of the cost causation principle in the context of remediation of legacy coal ash units. Causation is less problematic to demonstrate in support of rate recovery for active CCR units that continue to receive coal burning waste. Costs caused by retrofitting or converting surface impoundments into dry CCR storage or landfills, arguably, meet the causation test. Current customers receive the benefit of EPA compliant disposal of coal ash waste when it is produced from the generation of electricity currently serving customers' needs.

Causation is more complicated to demonstrate relative to compliance costs, where the utility is incurring those costs to resolve environmental risks that it accrued in the past. Arguably, CCR units used for disposal of coal ash waste from the coal burned to generate electricity for past ratepayers do not benefit current ratepayers, because it is the byproduct of the electric needs for a different set of ratepayers, perhaps decades in the past. Indeed, many of the coal ash units have been inactive for years, and several of those are located at generation stations that are retired. Some utility customers might challenge whether it is fair be held responsible for such historical costs. On the other hand, it is impossible for the utilities to retroactively collect these costs from past ratepayers. These are not costs that benefit the shareholders either. The utilities complied with existing environmental law and only incur these costs because both the circumstances and the law changed.

Whereas the "cost causation" principle requires a connection between the costs imposed on a ratepayer and the incurrence of the cost: "[u]nder cost causation, 'all approved rates [must] reflect to some degree the costs actually caused by the customer who must pay them,'"[312] it is not typically used to exclude costs from recovery, but rather used to determine the allocation of costs among different customer classes. The NCUC applied the cost causation principle to coal ash mitigation costs in just this way. It did not propose to use cost causation to limit the recovery costs, but chose to use an energy allocation factor, rather than a demand factor, to allocate the CCR costs among all customer classes. The NCUC stated:

> [The witness] argued that this approach is contrary to cost causation principles because coal ash is a by-product of consumption of a fuel, and the volume of coal ash produced is associated with overall energy use, not demand during a single hour of the year. He recommended that all coal ash remediation costs approved for recovery be allocated using an energy allocator.[313]

5. Operating versus Capital Expenses

Utilities are entitled to recover all of their costs, but their costs are separated into two categories of expenses: (i) operating expense, generally defined as operation and maintenance costs (O&M), depreciation, and all taxes; and (ii) capital expenses that constitutes a utility's rate base, which is the net amount of investment in the utility's plants and other assets that are committed to rendering electricity service to customers, i.e., they are used and useful. Although a utility can only pass through its operating expenses, it is entitled to also earn a rate of return on its capital expenses. Regarding assets, both real and personal properties, utilities are entitled to a return on their investment through recovery of depreciation expense.[314] In the context of coal ash costs, the question arises as to whether they should be classified as operating expenses or capital expenses relating to property.

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312 *Principles of Cost Causation and Cost Allocation*, PJM (Nov. 13, 2014), https://pjm.com/-/media/committees-groups/task-forces/emustf/20141113/20141113-item-03c-cost-causation-slides.ashx (citing *KN Energy, Inc. v. FERC*, 968 F.2d 1295, 1300 (D.C. Cir. 1992)).

313 *Re Duke Energy Carolinas, supra* note 310, at 324.

314 Darryl Tietjen, *Tariff Development I--Basic Ratemaking Process*, Pub. Util. Comm'n Tex. (last visited Oct. 6 2019), https://pubs.naruc.org/pub.cfm?id=538E730E-2354-D714-51A6-5B621A9534CB.

In the Duke rate case, the AG characterizes the costs as "expenses" rather than "property that is used and useful." On the other side, Duke characterizes such costs as "property that is used and useful." The parties seem to agree that if the coal ash costs are "expenses" then there should be no rate of return allowed on such costs. The Public Staff agrees with the AG that no return should be allowed on coal ash costs. If characterized as "property that is used and useful" then a return would be appropriate. The NCUC concluded that coal ash remediation costs accounted for in the deferral account were subject to a rate of return, inferring that they were not merely operating expenses but rather represented a capital investment on which a return was appropriate:

> While arguments by the parties through analogy to cases on other issues provide some helpful context, the issue of amortization of deferred CCR remediation costs required to comply with EPA CCR requirements and CAMA is sui generis and distinguishable. These expenditures, as FERC and GAAP refer to them, are "costs" or an "asset" of remediation. They have been deemed by the Commission without objection as extraordinary, as not being recovered through current rates and have for those reasons been deferred. As such, they are investor-supplied funds, not ratepayer-supplied funds and under principles of equity, law and fairness are eligible for a return. Otherwise the investor supplying these funds is deprived of the time value of money and is inadequately compensated resulting in an increased risk and ultimately increasing the Company's cost of capital. The Commission in its discretion hereby authorizes a return, but discounts it as discussed below.[315]

The application of these principles to utilities' cost recovery application may not be a one-size fits all resolution of the issues. Analysis of these doctrines and the specific facts of individual cases may lead PUCs to myriad conclusions in individual cases. Many of these decisions may turn on specific facts relevant to a particular situation. PUCs may conclude, as did the NCUC, that it is unfair to disallow all the coal ash remediation costs because utilities were following the industry practice at the time. On the other hand, a PUC may also conclude that it is unfair to require today's ratepayers to pay for retired assets that represent costs that benefited historic customers. Still yet, the PUC may conclude that the utility may bear some responsibility for not anticipating that unlined coal ash ponds near groundwater would require some remediation at some point.

PUCs may raise the prudency of a specific plan that the state environmental agency has approved but which is much more costly than an alternative that the utility had included in its permit application. Illinois's Coal Ash Pollution Prevention Act[316] requires that all closure plans submitted for approval with its environmental agency must include a closure alternative analysis across all considered closure methods. In the context of regulatory rate recovery, this Illinois requirement is moot because Illinois is a retail choice state. In a regulated utility jurisdiction, this requirement to consider other options could create an opportunity for parties to challenge prudency of one choice over another.

The NCUC Public Staff, possibly recognizing the conundrum of cost recovery in the context of coal ash remediation, had recommended an "equitable sharing" of the costs between current ratepayers and Duke's shareholders. However, the NCUC rejected NCUC Public Staff's equitable sharing approach. The AG and the NCUC Public Staff also recommended a solution to balance the equities identified by the application of the above rate principles. Duke would be allowed to create a deferral account for ongoing incurrence of coal

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315 *Re Duke Energy Carolinas*, *supra* note 270, at 276.

316 415 Ill. Comp. Stat. Ann. 5/3.140 (through P.A. 101-309, except for portions of P.A. 101-48, 101-221, 101-238, and 101-275 of the 2019 Regular Session of the 101st General Assembly) (July 30, 2019), http://www.ilga.gov/legislation/publicacts/fulltext.asp?Name=101-0171.

ash costs and to amortize these costs over time. The utility would collect the full costs incurred for coal ash remediation but would not be allowed to earn a rate of return on the deferred account. This could possibly ameliorate any potential rate shock from such extraordinary costs.

C. Addressing Future Coal Ash Costs in the Present

Other sectors of the energy industry have learned to anticipate the possibility of and appropriately allocate costs relating to future environmental impacts, cleanup, and facility decommissioning. For example, it is interesting to contrast the issue of coal ash disposal with the policy on nuclear waste disposal.[317] Largely as a result of the Three Mile Island failure in 1979, Congress passed the Nuclear Waste Policy Act (NWPA) in 1982,[318] which established the Nuclear Waste Fund (NWF).[319] The act requires that electric utilities contribute $720 million annually to the NWF that would be used to pay for the central disposal of spent nuclear fuel (with the balance having grown to $40 billion[320]). While the goal of centralized disposal has not been realized, as the site continues to be debated, the concept of internalizing the cost of waste disposal in the energy price might be a worthy consideration even now relating to coal ash.

Unlike the nuclear power sector, the coal burning power sector did not establish any contingency fund to deal with the future financial risks associated with the accumulating environmental challenge from its waste practices. No contingency fund was established to pay for the eventual costs relating to onsite disposal of coal ash, which at the time was the most cost-effective method. The prevailing thought was that unlined coal ash units could just be covered in place and these limited costs would then be included in the utility's rates. Environmental sensitivity was not what it was when coal ash units were being constructed as it is now. The industry, and by extension, regulators, did not anticipate the costs relating to the cleanup of coal ash units.

Although the financial and environmental focus is on the closure of non-compliant active and inactive CCR units, many utilities will continue to operate monofills (landfills used for disposal of one type of waste) on their generation site. As offsite, remote landfill capacity becomes more constrained, particularly in the event of excavate and haul scenarios, utilities and IPPs may need to manage coal ash waste onsite more often. While future closure of active sites that have been operating in compliance with federal and state CCR regulations should therefore result in lower costs, the industry still could learn from the nuclear power sector to consider the regulatory establishment of a closure fund. Such a fund may be similar to the NWF in providing a mechanism by which current customers – not future customers – will bear the responsibility for future environmental costs caused by their demand for electricity service.

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317 Another example is in the offshore wind sector that requires financial assurances for eventual decommissioning as part of the federal government's offshore lease: "The Lessor will require a decommissioning bond or other form of financial assurance based on the anticipated decommissioning costs in accordance with applicable BOEM regulations (30 CFR 585.515-537). The decommissioning obligation must be guaranteed through an acceptable form of financial assurance, and will be due on a schedule to be approved by BOEM in accordance with the number of facilities installed or being installed." U.S. Department of Interior Bureau of Ocean Energy Management, *Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf, Mayflower Wind Energy,* Section III(b)(3) (April 1, 2019), https://www.boem.gov/sites/default/files/renewable-energy-program/State-Activities/MA/Lease-OCS-A-0521.pdf; also see 30 CFR 585.515-537. Interestingly, in the original notice for comment of the standardized lease terms for offshore wind projects, the Bureau of Ocean Energy Management did not require financial assurances for eventual decommissioning. See, BOEM, Notice, *Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf*, (February 3, 2012), https://www.federalregister.gov/documents/2012/02/03/2012-2496/commercial-lease-of-submerged-lands-for-renewable-energy-development-on-the-outer-continental-shelf.

318 Nuclear Waste Policy, 42 U.S.C.S. §§ 10101-10108 (through Public Law 116-56, approved August 23, 2019), https://www.law.cornell.edu/uscode/text/42/chapter-108; *Nuclear Waste Fund Activities Management Team*, Energy.gov (last visited Oct. 9, 2019), https://www.energy.gov/gc/nuclear-waste-fund-activities-management-team.

319 42 U.S.C. § 10222, https://www.law.cornell.edu/uscode/text/42/10222.

320 *Audit Report*, DOE-OIG-19-08, U.S. DOE (Nov. 2018), https://www.energy.gov/sites/prod/files/2018/11/f58/DOE-OIG-19-08_0.pdf.

D. Afterthoughts for Regulatory Consideration

Several conclusions can be made at this early stage in the development of a state PUC response to the coal ash challenge.

- First, coal ash remediation will be a significant cost center for utilities over the next two decades. Both the EPA rule and state legislation and regulation on nearly a thousand CCR units will be a significant challenge in an economy sensitive to electricity prices. In addition, depending on the timing and method of closure of a CCR unit, some units may have monitoring responsibility for 30 years with a requirement to take corrective action in the event that environmental impacts are found. For a utility that uses cap-in-place as its closure method, it is penalized by the liability that attaches to the value of its property, as evidence by the title notation required under the Final Rule.

- Second, coal ash remediation will be expensive. The early actions in Virginia and North Carolina suggest that the costs will be in the billions for complying with the state's response to evidence of water contamination and that the costs projections are still in flux. There is no evidence of the cost impact from hundreds of CCR units contracting for labor and services in order to complete closure within the same time frame or on disposal costs as an already constrained landfill industry attempts to respond to coal ash requirements.

- Third, the costs spent on coal ash remediation will be competing with many other cost challenges to electric utilities, including EPA's effluent standards under the CWA. As a result, electric utilities are at a crossroads in many respects. In addition to other environmental regulatory costs, there are demands for significant investment in infrastructure for grid modernization, build-out of electric vehicle infrastructure and renewable energy. There are potential climate change mandates that require significant challenges to the traditional electric utility business model. Utilities are needing to look forward to new demands as sectors of our economy become more reliant on electricity. The challenge to electric utilities to balance these demands will be enormous.

- Fourth, the role of PUCs is both heightened and uncertain with the potential of legislative cost directives as states wrestle with CCR remediation costs. Only four states have passed legislation and there has not yet been a state court decision on a major rate case that challenges coal ash recovery costs, though a decision in North Carolina can be expected soon.

- Fifth, major decisions relating to coal ash will likely be made by state legislatures and state environmental permitting agencies. So, agencies other than PUCs are directing coal ash remediation, while PUCs, if North Carolina's Duke rate case is emblematic, will decide who bears the costs of disposal facility closure and clean-up. If Virginia and North Carolina are portents of things to come, it will be a very political process, involving a broad and diverse group of stakeholders, other than the PUC. Yet, the PUC will be bound by the dictates of the ratemaking process to be objective, analytical, and fair.

All this suggests that coal ash management and remediation will create significant challenges for PUCs, which might be better served to be proactive where possible in working with state legislatures, environmental agencies, and state energy offices in decisions regarding how utilities should address coal ash management going forward.

SECTION 9: Conclusion

As a result of the coal ash spills affecting major rivers and neighboring communities in Tennessee and North Carolina, regulation of coal ash has become a public policy priority. This Comprehensive Survey serves to build an informed context to the regulatory issues underlying the choices facing utilities and IPPs regarding cleaning up the accumulation of coal ash that presents growing concerns for potential environmental and public health threats.

Disposal is not the only alternative solution. Beneficial use markets for coal ash have been developing over the same time duration as coal ash has been accumulating. In 2017, 64 percent of coal ash produced was used in a beneficial end use, and more would have been used except for the lack of quality coal ash availability. Private markets are investing in means and methodologies to improve the production of coal ash during the coal combustion process at coal burning plants. Concerned with a potential decline in the supply of coal ash byproducts as a result of the decline in coal-based electricity generation and closure of CCR units, private and public investment is also supporting research in extracting marketable byproducts from legacy coal ash. While this research continues and while new applications for coal ash become commercially deployable, there is a need for long-term storage of coal ash inventory as opposed to disposal facilities.

Before closure of CCR units, regulatory policy may consider re-examination to find regulatory pathways that incentivize the conservation of coal ash as a commercial resource consistent with RCRA's conservation objectives. Meanwhile, it appears certain that the next phase of litigation is commencing, as utilities attempt to recover cleanup and compliance costs from ratepayers, especially as environmentalists engage on groundwater quality issues. How these costs will be recovered will have significant impacts on the electricity customers served by public utilities.