A Decade Later: A Review of Congressional Action, Environmental Protection Agency Rules, and Beneficial Use Opportunities for Coal Ash

U.S. House Committee on Energy & Commerce
Environment Subcommittee
June 26, 2025

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Introduction and Summary

Beneficial use is anticipated in the very name of the Resource **Conservation and Recovery** Act that is the basis for coal ash regulation.

In beneficial use settings, coal ash is a valuable mineral resource that conserves natural resources, saves energy, reduces greenhouse gas emissions, and in many cases improves durability and performance of finished products. Millions of tons of coal ash are currently beneficially used annually in proven applications featuring robust quality control and adhering to consensus engineering standards.

As coal-fueled power plants close and the supply of new ash declines, the industry has begun harvesting previously disposed ash – with an estimated 4 million tons of material harvested for use in 2023 and numerous new harvesting operations currently under development. The more than 2 billion tons stockpile of previously disposed coal ash in the United States should be viewed not as an environmental liability, but as a secure domestic resource that can be utilized using long-proven technologies to produce more sustainable infrastructure and building materials.

The potential opportunity to simultaneously extract strategic rare earth elements from this resource provides additional incentive for regulators and other policymakers to return to the Resource **Conservation and Recovery** mindset that was present at the outset of the nation's solid waste regulatory structure. ACAA encourages policymakers at all levels to identify and remove regulatory barriers and to take a more active role in encouraging coal ash beneficial use.

About ACAA

The American Coal Ash Association (“ACAA”) was established in 1968 as a trade organization devoted to beneficial use of the materials created when coal is burned to generate electricity. Our members comprise the world's foremost experts on coal ash (fly ash and bottom ash), boiler slag, flue gas desulfurization (“FGD”) gypsum (aka "synthetic gypsum”), and other FGD materials captured by emissions controls. ACAA's mission is to advance the management and use of these coal combustion products (“CCP”) in ways that are: environmentally responsible, technically sound, commercially competitive, and supportive of a sustainable global community.

A note on terminology: Coal Combustion Residuals (“CCR”) is a term adopted by the U.S. Environmental Protection Agency (“EPA”) in its 2015 Final Rule regulating disposal of the solid materials produced by coal combustion for the generation of electricity. Coal Combustion Products is a term (also previously used by EPA) referring to the same family of materials when utilized in a beneficial use setting. Popular media often refer to the same family of materials generically as “coal ash.” These comments use the term “CCR” to refer to the materials in a disposal setting and “CCP” or “coal ash” to refer to the same materials in a beneficial use setting.

Coal Ash Beneficial Use Overview

Coal remains the fuel source for 20 percent of electricity generation in America and produces large volumes of solid coal combustion products – primarily ash and synthetic gypsum from emissions control devices.

There are many good reasons to view coal combustion products as a resource, rather than a waste. Recycling them conserves natural resources and saves energy. In many cases, products made with CCP perform better than products made without it. For instance, coal fly ash makes concrete stronger and more durable. It also reduces the need to manufacture cement, resulting in significant reductions in greenhouse gas emissions – about 12 million tons in 2023 alone.

Major uses of coal combustion products include concrete, gypsum wallboard, blasting grit, roofing granules, and a variety of geotechnical and agricultural applications. Numerous research efforts are also under way exploring the potential for extracting rare earth elements from the abundant coal ash resource.

The use of coal ash in concrete, in particular, is a practice of strategic importance. Builders of roads, bridges, and other concrete structures routinely utilize coal ash to improve the workability of concrete as it is being placed and to improve the long-term durability of the finished material. In a 2011 study[1], the American Road and Transportation Builders Association concluded that use of coal ash in concrete saves $5.2 billion per year in federally funded road and bridge construction costs, chiefly because of the increased lifespan of structures using the material.

For additional background on the types of coal ash and their beneficial uses, see ACAA's brochure entitled: "Beneficial Use of Coal Combustion Products – An American Recycling Success Story."[2]

Coal Ash Beneficial Use Trends

ACAA has conducted a survey quantifying the production and use of coal combustion products in the United States each year since 1968.[3] Data is compiled by directly surveying electric utilities and utilizing additional data produced by the U.S. Energy Information Administration. The survey's results have been widely utilized by federal agencies including the U.S. Environmental Protection Agency and U.S. Geological Survey.

Production and Use Survey Results

Survey results from 2023 – the most recent year available – indicate that 69 percent of the coal ash produced during that year was beneficially used – increasing from 62 percent in 2022 and marking the ninth consecutive year that more than half of the coal ash produced in the United States was beneficially used rather than disposed.

Notably, use of coal fly ash in concrete increased from 10.9 million tons in 2022 to 11.9 million tons in 2023. Concrete producers and consumers indicated a desire to use more fly ash, but several regional markets continued to be affected by shifting supply dynamics associated with closures of coal-fueled power plants. Use of all coal combustion products in cement production increased from 6 million tons in 2022 to 6.8 million tons in 2023.

More detail on 2023 CCP production and use is available on the ACAA website.[4]

"Harvesting" Activities Growing Rapidly

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[1] American Road and Transportation Builders Association Transportation Development Foundation, "The Economic Impacts of Prohibiting Coal Fly Ash Use in Transportation Infrastructure Construction," September 2011, https://acaa-usa.org/wp-content/uploads/2021/05/2011FlyAshStudy_lowres-FINAL.pdf

[2] 25-ACAA-Brochure_5-20v2.pdf

[3] Production & Use Reports – ACAA

[4] News-Release-Coal-Ash-Production-and-Use-2023.pdf

In addition to this "fresh" ash production and use, a rapidly growing practice of "harvesting" previously disposed ash has begun to supply significant volumes of material to beneficial use markets. ACAA estimates more than 4 million tons of previously disposed ash was utilized in a variety of applications in 2023, including coal ash pond closure activities, concrete products, cement kiln raw feed, and gypsum panel manufacturing.

Harvested ash utilization represents growth in coal ash beneficial use above and beyond the increasing volumes of ash recycled from current power plant operations. The rapidly increasing utilization of harvested CCP shows that beneficial use markets are adapting to the decline in coal-fueled electricity generation in the United States. New logistics and technology strategies are being deployed to ensure these valuable resources remain available for safe and productive use. Conservative estimates of the volume of previously disposed coal ash conclude that more than 2 billion tons of material are available – making coal ash an abundant domestic natural resource.

The rapid expansion of coal ash harvesting is being supported by adoption of engineering standards for the activity. The consensus standards organization ASTM International in 2019 published a guide[5] for harvesting activities and in 2023 published a guide[6] for characterization of harvested materials. Harvesting activities utilizing thermal beneficiation are now in commercial operation in South Carolina and at three facilities in North Carolina. Harvesting activities that require less capital-intensive processing of the CCP are now in commercial operation in Pennsylvania, Virginia, Kentucky, Florida, Arkansas, Arizona, New Mexico, and Louisiana. Numerous additional harvesting projects are under development nationwide.

These harvesting operations require significant capital investment for material recovery, processing, and product distribution to end markets. Current coal ash disposal regulations requiring closure of ash facilities on aggressive timelines constitute a barrier to some of these investments. A regulatory pathway encouraging "closure by removal **for** beneficial use" is a concept for consideration that would allow the United States to maximize the potential for its abundant, domestic coal ash resource while simultaneously removing large volumes of material from the disposal setting permanently.

Charts depicting production and use trends for all types of CCPs and for coal fly ash specifically are reproduced below. (These charts do not include utilization of additional volumes from harvesting activities.) Also included below is a map showing locations of ash harvesting operations that are active and currently under development.

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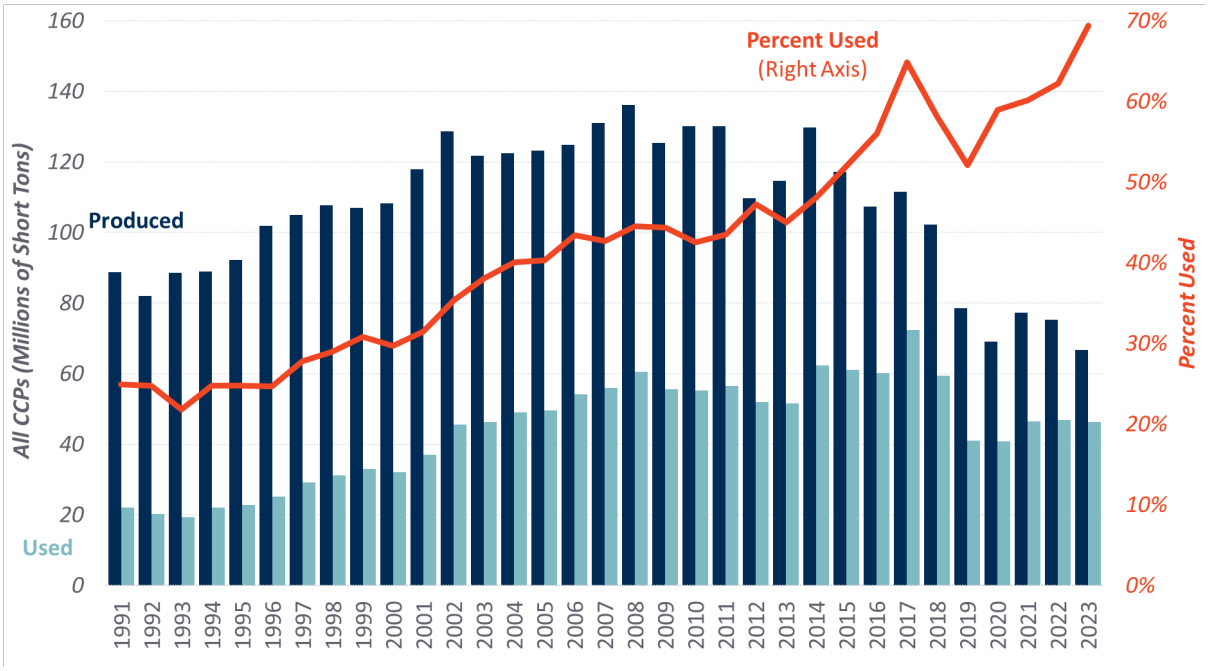
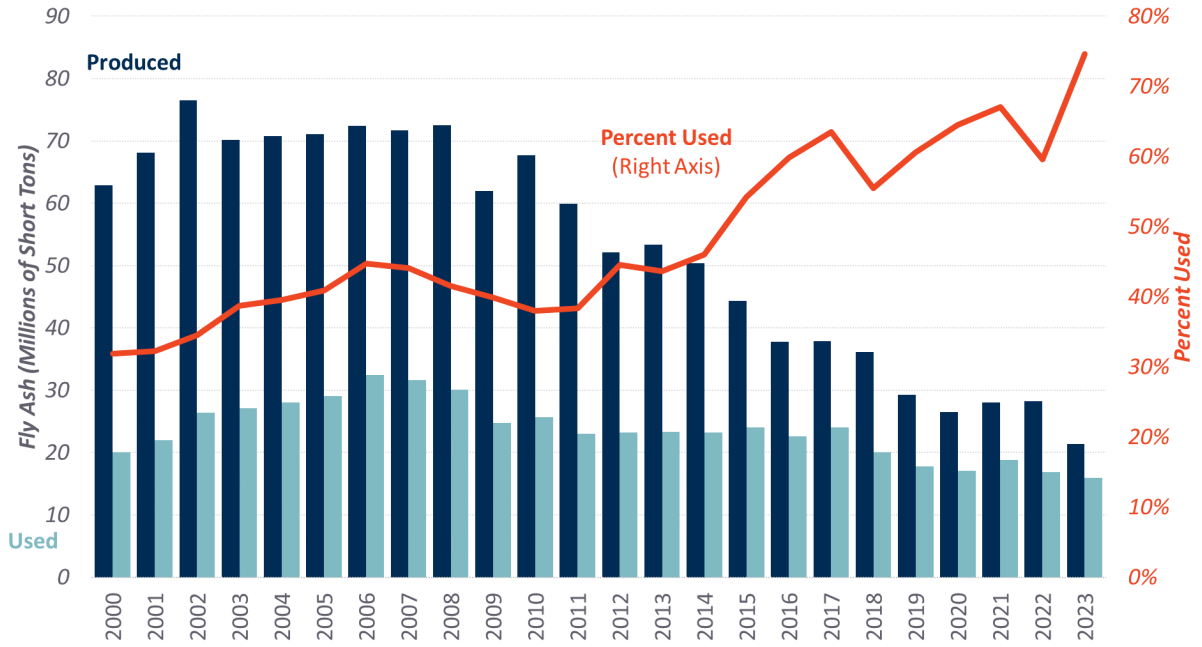
[5] ASTM E3183 Standard Guide for Harvesting Coal Combustion Products Stored in Active and Inactive Storage Areas for Beneficial Use

[6] ASTM E3355 Standard Guide for Characterization of Coal Combustion Products (CCPs) in Storage Area(s) for Beneficial Use

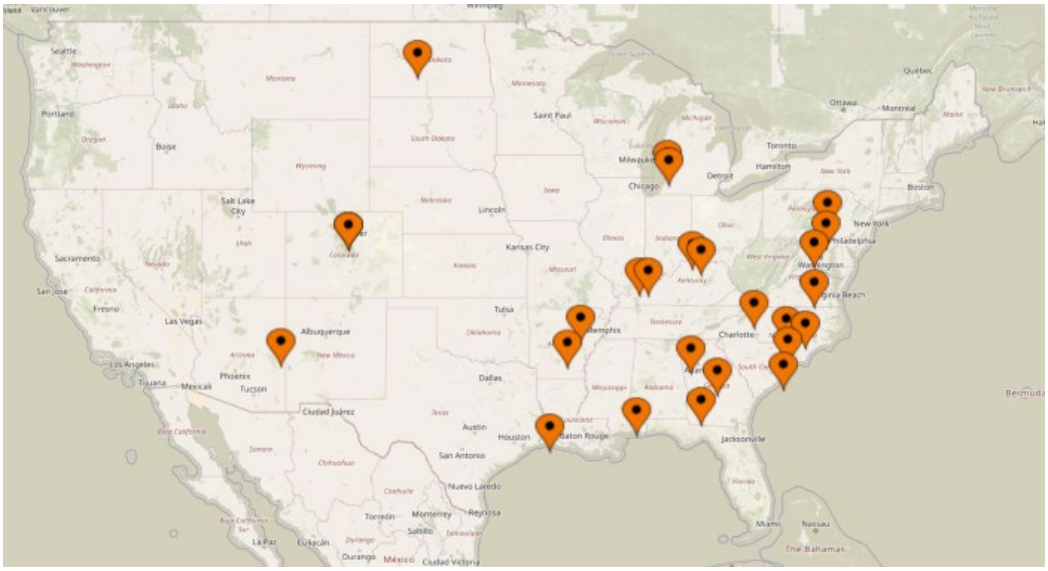
All CCPs Production and Use with Percent Used



Fly Ash – Production and Use



Coal Ash Harvesting Operations (Active and Under Development)



Federal Policy Impact on Coal Ash Beneficial Use – Past and Present

CCP beneficial use is anticipated in the very name of the Resource **Conservation and Recovery** Act that is the basis for coal ash regulation. In beneficial use settings, CCP is a valuable mineral resource that conserves natural resources, saves energy, reduces greenhouse gas emissions, and in many cases improves durability and performance of finished products.

Although CCR beneficial use, as that term is defined in 40 CFR 257.53, is exempt from federal regulation, CCR disposal regulations can be instrumental in either encouraging or creating barriers to beneficial use.

Disposal Regulations Affecting Exempt Beneficial Use

Decades of EPA activities under both Democratic and Republican administrations – including Reports to Congress in 1988 and 1999; Regulatory Determinations in 1993 and 2000; and the 2015 CCR Final Rule – all concluded that beneficial use should be exempt from regulation. But even though beneficial use itself is exempt from regulation, CCR disposal regulations (and regulatory uncertainty related to CCR disposal regulations) have significant impacts on beneficial use activities.

For example, the volume of CCP utilization stalled between 2009 and 2013 as EPA pursued a protracted rulemaking process that posed the threat of a “hazardous waste” designation

for CCRs that are disposed. Even though beneficial use was exempt from the proposed regulation, ash producers, specifiers, and users restricted coal ash use in light of the regulatory uncertainty and often negative publicity surrounding EPA's activities. In 2014, EPA began signaling that the "hazardous waste" designation proposal was off the table and in December 2014 finalized CCR disposal regulations under the non-hazardous section of federal law. Ash utilization began to increase again once regulatory certainty was restored. Analysis of CCP production and use trends by the American Road and Transportation Builders Association[7] demonstrated that the 2009-2013 performance was not linked to an economic downturn inasmuch as every previous recession saw CCP utilization increase as users sought out more economical materials.

According to ACAA Production and Use Surveys, CCP utilization remained below 2008 levels for the five consecutive years of regulatory uncertainty concluding in 2013. If those five years had simply remained equal with 2008's utilization, 26.4 million tons less coal ash would have been disposed in landfills and impoundments.

Previous Federal Actions Supporting Beneficial Use

EPA initiatives can also create positive impacts on CCP beneficial use. For instance, a program led by EPA was in place during the most rapid expansion of coal combustion products beneficial use in history. The Coal Combustion Products Partnership (C2P2 program) was a cooperative effort between EPA, American Coal Ash Association, Utility Solid Waste Activities Group, U.S. Department of Energy, Federal Highway Administration, Electric Power Research Institute, and U.S. Department of Agriculture Agricultural Research Service to encourage beneficial use of CCP as an environmentally preferable alternative to disposal. The initiative included a challenge program, various barrier breaking activities, and development of coal combustion products utilization workshops.

In 2000, when EPA issued a Final Regulatory Determination that CCP should be regulated under "non-hazardous" RCRA Subtitle D and subsequently initiated the C2P2 program, beneficial use volume was 32.1 million tons. Just eight years later, beneficial use volume had nearly doubled to 60.6 million tons. However, EPA abruptly terminated this successful C2P2 program after it initiated the CCR disposal rulemaking that concluded in 2015. Beneficial use volume of fresh ash produced by power plants in 2023 had declined to 46.3 million tons.

[7] American Road and Transportation Builders Association, "Production and Use of Coal Combustion Products in the U.S. – Historical Market Analysis, May 2015, https://acaa-usa.org/wp-content/uploads/free-publications/ARTBA-final-historical.compressed.pdf

EPA Has an Obligation to Encourage Beneficial Use

It is important to remember that EPA's CCR disposal regulations are under the authority of the Resource **Conservation and Recovery** Act. In its findings establishing the Act, Congress stated:

> "The Congress finds with respect to materials, that— (1) millions of tons of recoverable material which could be used are needlessly buried each year; (2) methods are available to separate usable materials from solid waste; and (3) the recovery and conservation of such materials can reduce the dependence of the United States on foreign resources and reduce the deficit in its balance of payments."[8]

Furthermore, Congress stated specific objectives for encouraging materials recovery and reuse throughout Section 1003 of the Solid Waste Disposal Act.

The beneficial use of CCP is fully integrated in many sectors of the U.S. economy, including natural resources, energy, transportation, agriculture, and manufacturing settings. Beneficial use of CCP is a key component in improving the sustainability and economic productivity of these industries. If it is EPA's objective to use environmental policy to encourage sustainability and economic productivity, then it cannot ignore the impacts on a sector that accounts for the beneficial use of more than half of a large resource base, even if the primary focus of a regulation is disposal.

The original rulemaking docket for EPA's 2015 CCR Final Rule contains numerous statements concerning beneficial use by international entities, as well as statements by professional standards-setting organizations whose standards are globally adopted. These statements make it clear that EPA's decisions on CCR disposal regulations affect beneficial use worldwide.

A Voluminous Record Supports Beneficial Use as a Preferred Management Alternative

In its 2015 Final Rule for CCR disposal, EPA expressly elected to preserve the regulatory exemption for beneficial use, stating:

> "As EPA stated in the May 2000 Regulatory Determination, 'In the [Report to Congress], we were not able to identify damage cases associated with these types of beneficial uses, nor do we now believe that these uses of coal combustion wastes present a significant risk to human health and the environment. While some

[8] Solid Waste Disposal Act, Section 1002 (c)

> commenters disagreed with our findings, no data or other support for the commenters' position was provided, nor was any information provided to show risk or damage associated with agricultural use. Therefore, we conclude that none of the beneficial uses of coal combustion wastes listed above pose risks of concern.' (See 65 FR 32230.) EPA noted that since the original Regulatory Determination, the Agency had found no data or other information to indicate that existing efforts of states, EPA, and other federal agencies had been inadequate to address the environmental issues associated with the beneficial use of CCR that were originally identified in the Regulatory Determination."

For decades EPA has expressly supported CCP beneficial use.

> "EPA encourages the beneficial use of coal ash in an appropriate and protective manner, because this practice can produce positive environmental, economic, and product benefits such as:
>
> - reduced use of virgin resources,
> - lower greenhouse gas emissions,
> - reduced cost of coal ash disposal, and
> - improved strength and durability of materials."[9]

CCP Use Is a Key Component of Sustainable Materials Management

EPA advocates that:

> "Sustainable materials management (SMM) is a systemic approach to using and reusing materials more productively over their entire life cycles. It represents a change in how our society thinks about the use of natural resources and environmental protection. By looking at a product's entire life cycle, we can find new opportunities to reduce environmental impacts, conserve resources and reduce costs."[10]

Beneficial use of CCP has been well-established for decades, with use rates exceeding 50 percent of production for the past nine years. Use of recovered materials such as CCP is consistent with longstanding EPA policy that:

> "The beneficial use of industrial non-hazardous secondary materials (secondary materials) is a key part of EPA's Sustainable Materials Management (SMM) effort.

[9] https://www.epa.gov/coalash/coal-ash-reuse
[10] https://www.epa.gov/smm

> The appropriate beneficial use of secondary materials can advance the goals of EPA's SMM program, which emphasizes a materials management approach that aims to reduce impacts to human health and the environment associated with materials over their entire life cycle (e.g., extraction, manufacture, distribution, use, disposal). Through SMM, EPA is helping change the way our society protects the environment and conserves resources for future generations."[11]

Current Regulatory Challenges

Since EPA's abrupt termination of the Coal Combustion Products Partnership in 2010, the Agency has focused almost exclusively on development of coal ash disposal regulations with little apparent regard for the beneficial use impacts of those regulations and no active support for beneficial use activities. This posture was adopted in a policy environment characterized by relentless publicity by environmental non-governmental organizations ("ENGOs") touting the purported dangers of "toxic coal ash."

To be clear, coal ash is not "toxic." Coal ash contains only trace amounts of metals of potential concern. A 2012 study based on U.S. Geological Survey data[12] concluded that metals are found in coal ash at levels similar to the levels in ordinary soils. Millions of tons of coal ash are safely recycled every year into construction materials like concrete and wallboard. In truth, coal ash is no more "toxic" than the materials it replaces when used in these products.

Furthermore, EPA itself has validated the safety of coal ash beneficial use in risk evaluations of major uses including fly ash used in concrete and synthetic gypsum used in wallboard[13], as well as synthetic gypsum used in agriculture[14]. ACAA has also utilized EPA's risk evaluation methodology to validate the safety of ash use in controlled low-strength material (aka "flowable fill[15]")

Nevertheless, EPA's coal ash disposal regulations enacted in 2015 and 2024 have memorialized new and poorly defined terms that erect new barriers to CCP beneficial use.

2015 CCR Rule and the Definition of Beneficial Use

In establishing the regulatory exemption for beneficial use contained in the 2015 CCR Rule, EPA created a new four-part definition of what constitutes beneficial use. That definition

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[11] https://www.epa.gov/smm/sustainable-management-industrial-non-hazardous-secondary-materials
[12] https://acaa-usa.org/wp-content/uploads/free-publications/ACAA_CoalAshMaterialSafety_June2012.pdf
[13] https://acaa-usa.org/wp-content/uploads/2023/04/ccr_bu_eval.pdf
[14] acaa-usa.org/wp-content/uploads/2023/04/FGD_Ben_Use_Eval_with_Appendices_March_2023_508.pdf
[15] https://acaa-usa.org/wp-content/uploads/2021/03/CLSM-Evaluationpdf.pdf

contained a mathematical error that EPA refused to correct, which led to the U.S. Circuit Court for the District of Columbia remanding the issue to EPA for further rulemaking. EPA in 2021 made one attempt to propose an alternative beneficial use definition that was roundly criticized by all stakeholders, after which EPA moved the issue to its "Long-Term Actions" list, where it remains today. For more background on the definition issue, see ACAA's comments in the 2021 rulemaking docket.[16] [17]

The 2015 CCR rule also introduced new terminology characterizing coal ash beneficial uses as either "encapsulated" or "unencapsulated." This has served as fodder for the aforementioned ENGOs to characterize "unencapsulated" uses as dangerous despite decades of experience without damage cases and the presence of robust consensus standards defining best practices for these important beneficial use activities.[18] [19] [20]

2024 "Legacy" Rule and CCR Management Units

EPA's most recent CCR regulation – the 2024 "Legacy" Rule – introduced new terminology for CCR Management Units ("CCRMU"). In proposing the rule that was eventually finalized, EPA itself acknowledged its CCRMU definition is "broad." In fact, it may sweep under regulation a host of activities including structural fills, storage piles, subbase for plant access roads, use as foundation for power plant structure, and use as a sub-base below railways and spurs.

This broad expansion of the universe of activities proposed for regulation was undertaken with no factual demonstration of risk to human health or the environment other than a recently revised coal ash risk assessment that was significantly flawed.[21] The agency appeared to assert that any amount of CCR placed anywhere on the ground at any time exceeds the agency's acceptable risk levels under RCRA, even in the face of demonstrated evidence that the area does not pose a risk or was compliant with consensus standards or oversight by state regulatory authorities. For more background on the CCRMU issue, see ACAA's comments in the 2024 rulemaking docket.[22]

Potential Federal Actions to Support Coal Ash Beneficial Use

[16] https://www.regulations.gov/comment/EPA-HQ-OLEM-2020-0463-0027
[17] https://www.regulations.gov/comment/EPA-HQ-OLEM-2020-0463-0047
[18] https://acaa-usa.org/wp-content/uploads/2021/07/ASH-2021-1-7-12-21.pdf
[19] https://acaa-usa.org/wp-content/uploads/ash-at-work/ASH02-2019.pdf
[20] https://acaa-usa.org/wp-content/uploads/ash-at-work/ASH01-2020.pdf
[21] https://acaa-usa.org/wp-content/uploads/2024/04/ASH-2024-1_f-web.pdf (See page 18)
[22] https://www.regulations.gov/comment/EPA-HQ-OLEM-2020-0107-0296

EPA has publicly indicated that it intends to reconsider the 2024 "Legacy" Rule, with potential publication of its proposal before the end of 2025. Within that context and any other forthcoming CCR regulatory actions, ACAA will advocate for:

- Reconsideration of the faulty CCR risk assessment utilized to justify the rule.
- Creation of greater regulatory flexibility for "closure by removal for beneficial use."
- Correction of the long-standing error in EPA's definition of coal ash beneficial use.

ACAA also encourages policy makers at all levels to take a more active role in encouraging coal ash beneficial use. The more than 2 billion tons stockpile of previously disposed coal ash in the United States should be viewed not as an environmental liability, but as a secure domestic resource that can be utilized using long-proven technologies to produce more sustainable infrastructure and building materials. The potential opportunity to simultaneously extract strategic rare earth elements from this resource provides additional incentive for regulators and other policymakers to return to the Resource **Conservation and Recovery** mindset that was present at the outset of the nation's solid waste regulatory structure.

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