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Appropriations Committee

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Dear Colleagues,

Thank you for your engagement and interest in HB 1331 (Coal Ash Recycling Act of 2022). As requested, my team has assembled the following pages to outline the national problem waste coal ash in storage presents to rural and urban communities. Further we have highlighted the beneficial use of coal ash in a variety of waste to value products, but specifically cementitious use in the building products industry.

For background, waste coal ash in storage is a recognized source of ground water contamination due to the heavy metal leaching. It should be noted that these issues are specifically acute in disadvantaged communities and rural communities.

The solution to waste coal ash in storage is beneficial use and specifically through encapsulation to bind the molecules and prevent leaching.

Prairie Research Institute, 2020, Coal Ash Response Team final report: Champaign, Prairie Research Institute, 61 p., https://prairie.illinois.edu/illinois-issues/coal-ash/

"*There are ways for CCR to be beneficially used. Encapsulated uses, which involve binding the fly ash to minimize migration into the environment, are preferred. The leading beneficial use of fly ash is as a mixture in concrete and related products and in cement manufacture.*"

The Maryland Department of Natural Resources has invested significant resources on this topic and their findings are recently published in Maryland Power Plants and the Environment: A review of the impacts of power plants and transmission lines on Maryland's natural resources.
https://dnr.maryland.gov/pprp/Documents/CEIR-19-Full%20Document.pdf

I specifically draw your attention to Section 4.6.3 Disposition and Beneficial Use Beneficial Use

"When properly engineered and correctly applied, Coal Combustion By-products (CCBs) can be utilized in manufacturing, civil engineering, mine restoration, and agricultural applications (see Table 4-10). The beneficial use of CCBs as raw materials in applications that are environmentally sound, technically safe, and commercially competitive leads to a reduction in disposal, which may contribute to reduced GHG emissions. The most direct contribution to reducing GHG emissions occurs when fly ash is used as a supplementary material in concrete and concrete products. By substituting fly ash in place of cement, the carbon emissions associated with cement production (an

energy-intensive process) are avoided. Each ton of fly ash utilized represents approximately one ton of CO2 avoided. A continued increase in the beneficial utilization of Maryland CCBs will likely lead to:

- *Conservation and protection of the natural resources of the State.*
- *Reductions in the cost of producing electricity and cost for consumers.*
- *Substantial savings for end-users of CCBs; and*
- *Decreased need for landfill space"*

Table 4-10 that follows in this report outlines the current CCBs Produced in Maryland and Common Uses in State.

As you make your way through this comprehensive report, I would humbly submit to my colleagues, that the issue we collectively need to address is a legacy environmental ground water issue due to coal ash in storage and greenhouse gas emissions due to virgin cement production. The beginning of the solution to both issues is encapsulated beneficial use of coal ash outlined in HB 1331.

The following technical papers have been assembled to address your specific questions of peer reviewed studies on the subject.

Beneficial Reuse of Coal Ash from Dominion Energy Coal Ash Sites: Feasibility Assessment Gardner, Kevin H., and Scott Greenwood. 2017. Prepared for Southern Environmental Law Center and the Potomac Riverkeeper Network. https://www.southernenvironment.org/wp-content/uploads/legacy/words_docs/Coal_Ash_Recycling_Feasiblity_Assessment.pdf

Page 10 – *"In 2008 owners of the R. Paul Smith Power Plant began working with the Maryland Environmental Restoration Group (MERG) and local cement producers to beneficially use legacy CCPs that had been landfilled since 1947 on the banks of the Potomac River. Within 3 years, approximately 250,000 tons of ash had been removed from the landfill and beneficially used in cement production. As of 2015, approximately 1.5 million tons of ash had been removed from the landfill. It's expected that the ash will be fully mined by 2020, allowing the area to be regraded, vegetated, and closed, eliminating any remaining environment risks and liabilities of large scale CCP storage. The total amount of ash originally in the landfill that is expected to be 11 completely removed and reused from 2008-2020 is estimated to be 3.6 million tons from current utilization rates. As mining nears an end, cement manufactures are actively seeking similar stockpiles for continued reuse in the future."*

A Comprehensive Survey of Coal Ash Law and Commercialization: Its Environmental Risks, Disposal Regulation, and Beneficial Use Markets. https://pubs.naruc.org/pub/A6923B2D-155D-0A36-31AA-045B741819EC Seidler, Maria, and Ken Malloy. 2020. Washington, DC: National Association of Regulatory Utility Commissioners.

Electric Power Research Institute - Coal Ash: Characteristics, Management and Environmental Issues https://www.epri.com/research/products/000000000001019022

"Coal-fired power plants in the United States produce more than 92 million tons of coal ash per year. About 40% is beneficially used in a variety of applications, and about 60% is managed in storage and disposal sites. This technical update summarizes information and data on the physical and chemical characteristics of coal ash, beneficial use applications, disposal practices, and management practices to mitigate environmental concerns."

Interestingly, recognizing the requirement for beneficial use of legacy coal ash, the American Society for Testing and Materials (ASTM) has recently published directive E3183-19 Standard Guide for Harvesting Coal Combustion Products Stored in Active and Inactive Storage Areas for Beneficial Use

US Environmental Protection Agency www.epa.gov/coalash/coal-ash-reuse
Coal Ash Reuse

"Coal ash, also referred to as coal combustion residuals (CCR), can be used in different products and materials. Coal ash can be beneficially used to replace virgin materials removed from the earth, thus conserving natural resources. 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.*

While the beneficial use of coal ash has these potential benefits, the environmental impacts associated with their use should also be considered. The most recent available data from responses to an American Coal Ash Association (ACAA) survey of electric utilities shows that in 2018, at least 41 million tons of coal ash were beneficially used."

American Coal Ash Association - www.acaa-usa.org
Coal Combustion Products

"Coal combustion products (CCP) are the materials produced when we burn coal to generate electricity. They include ash, bottom, boiler slag,flue gas desulfurization gypsum, and other power plant by-products. The term "product" was coined by the U.S. Environmental Protection Agency to promote recycling these and other industrial by-products.

Using CCP rather than disposing of them conserves natural resources, reduces greenhouse gas emissions, and saves taxpayers significant costs.

When selecting materials for construction we have the choice of substituting recycled materials for conventional products to achieve sustainable design and drastically reduce a myriad of environmental impacts. In most cases these materials cost less, are available locally, and are technically equivalent or superior to virgin materials.

A multibillion dollar industry has "risen from the ashes" since the 1940s when the U.S. Bureau of Reclamation began using concrete made with fly ash to construct dams. Today, coal combustion products are incorporated into a wide range of building materials as well as engineered composite materials, such as metal alloys and plastics to provide strength without adding weight. Fly ash, bottom ash, FGD gypsum, and boiler slag are known worldwide as coal combustion "products" to emphasize the benefits of recycling over landfilling."

What are some of the beneficial uses of CCPs?

The term "beneficial use" was coined by the U.S. EPA to emphasize recycling CCPs rather than disposing of these materials in landfills. The EPA considers industrial materials recycling a "national priority."

Every year the ACAA reports the amount of CCPs produced and the amount recycled in its "CCP Production and Use Reports." Fly ash in concrete accounts for the largest volume of CCPs recycled annually. Fly ash and bottom ash can be used to produce road base materials, manufactured aggregates, flowable fills, structural fills, and embankments. Coal ash is also used to replace natural materials in the production of portland cement. Other applications for CCPs include wallboard manufacturing, roofing tiles and shingles. CCPs are also used for waste stabilization, snow and ice control, soil modification, as mineral fillers, in agriculture and mining and for very specialized uses. For example, some CCPs have properties suitable for metal castings in the aerospace and automotive industries.

Why does the use of fly ash reduce greenhouse gases?

For each ton of fly ash used in place of traditional cement a reduction of slightly less than one ton of carbon dioxide is achieved. To put this in perspective, one ton of carbon dioxide is equivalent to about two months' emissions from an automobile. Estimating based upon the amount of fly ash used annually in concrete, approximately 13 million tons of carbon dioxide is prevented from entering the earth's atmosphere.

Are there technical standards that pertain to CCPs?

Because CCPs have many uses in engineering activities, there are a number of organizations that issue technical standards or guidelines for the use of CCPs. These include:

US Navy

American Society for Testing and Materials (ASTM),

American Concrete Institute (ACI),

Federal Highway Administration (FHWA),

Federal Aviation Administration (FAA),

Army Corps of Engineers,

American Association of State Highway and Transportation Officials (AASHTO),

More Resources

Optimizing the Use of Fly Ash in Concrete
https://www.cement.org/docs/default-source/fc_concrete_technology/is548-optimizing-the-use-of-fly-ash-concrete.pdf By: Michael Thomas, Ph.D., P.Eng., Professor of Civil Engineering, University of New Brunswick

Chemical and engineering properties of fired bricks containing 50 weight percent of class F fly ash
MIM Chou, V Patel, CJ Laird, KK Ho - Energy Sources, 2001 - Taylor & Francis
… The chemical characteristics and engineering properties of … Fly ash generated from the combustion of Illinois bituminous coals is usually classified as ASTM class F, whereas the ash …

Maryland Dept. Of Natural Resources – Coal Combustion By-products Use 2017
https://dnr.maryland.gov/pprp/Documents/Coal_Combustion_Byproducts.pdf

Chemical and Engineering News - A New Life for Coal Ash
https://cen.acs.org/articles/94/i7/New-Life-Coal-Ash.html

Coal Combustion Utilization Handbook
https://www.we-energies.com/environment/pdf/ccp_handbook.pdf

How Ash Is Helping ASU Achieve Its Sustainability Promise
https://www.adaa.asn.au/blog/2022/02/how-ash-is-helping-asu-achieve-its-sustainability-promise

Report finds widespread contamination at nation's coal ash sites
The Washington Post - March 3, 2019