# Environmental & Natural Resource Protection Committee

State Representative Greg Vitali
*Democratic Chairman*
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MEMORANDUM

DATE: 8/4/2025

TO: House Environmental & Natural Resource Protection Members

FROM: Representative Greg Vitali, Majority Chairman
House Environmental & Natural Resource Protection Committee

RE: Environmental & Natural Resource Protection Committee Public Hearing – Monday, August 11$^{th}$

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The House Environmental and Natural Resource Protection Committee will hold a public hearing on **Monday, August 11th at 10:00am in Room G-50 Irvis Office Building.**

The subject of this hearing is how Pennsylvania should subsidize the remediation of waste coal piles.

Please contact Hayley Shupe at 717-787-7647 or hshupe@pahouse.net with any questions. If you are unable to attend this meeting, please submit an Official Leave of Absence Form prior to the start of the meeting. Members will have the option to attend virtually if you cannot be there in person.

Thank you,

GV/hs

***House Environmental Resources & Natural Protection Committee***

***Public Hearing Agenda:***
How PA should subsidize the remediation of waste coal piles?

Monday, August 11th, 2025
10:00am – 12:00pm
Room G-50, Irvis Office Building

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|---|---|
| 10:00am – 10:10am | Call to Order<br>Roll Call<br>Opening Remarks |
| 10:10am – 10:25am | Nate Houtz<br>Deputy Secretary, Office of Active and Abandoned Mine Operations<br>Department of Environmental Protection |
| 10:25am – 10:55am | Rob Altenburg<br>Director, Energy and Climate<br>PennFuture |
| | Robert Routh<br>Policy Director, Pennsylvania, Climate and Energy<br>Natural Resources Defense Council |
| 10:55am – 11:10am | Jaret Gibbons<br>Executive Director<br>Appalachian Region Independent Power Producers Association |
| 11:10am – 11:40am | Tom Schuster<br>Director, Clean Energy Program<br>Sierra Club |
| | Charles McPhedran<br>Senior Attorney<br>Earthjustice |
| 11:40am – 11:50am | Closing Remarks |
| 12:00pm | Adjournment |

PRINTER'S NO. 1478

THE GENERAL ASSEMBLY OF PENNSYLVANIA

# HOUSE BILL

# No. 501 Session of 2025

INTRODUCED BY OTTEN, WAXMAN, VENKAT, SAPPEY, ABNEY, HILL-EVANS, HOWARD, MADDEN, PIELLI, SCHLOSSBERG, MALAGARI, NEILSON, VITALI, SANCHEZ, O'MARA, CEPEDA-FREYTIZ, BOROWSKI, K.HARRIS, DONAHUE, BOYD, CIRESI, McNEILL, ISAACSON, RIVERA, WARREN, HOHENSTEIN, GUENST, PROBST, D. WILLIAMS, POWELL, T. DAVIS, KHAN, SHUSTERMAN, WEBSTER, MULLINS, GIRAL, BENHAM, SAMUELSON, FRIEL, CERRATO, BRENNAN, BRIGGS, KRUEGER, PROKOPIAK, SCHWEYER, BURGOS, HANBIDGE, STEELE, SMITH-WADE-EL, PASHINSKI, BIZZARRO, HADDOCK, TAKAC, SALISBURY, SOLOMON, FIEDLER, SCOTT, MERSKI, FRANKEL, KINKEAD, DALEY, GREEN, PARKER, MADSEN, DOUGHERTY AND MAYES, APRIL 23, 2025

REFERRED TO COMMITTEE ON ENVIRONMENTAL AND NATURAL RESOURCE PROTECTION, APRIL 23, 2025

AN ACT

Amending the act of November 30, 2004 (P.L.1672, No.213), entitled "An act providing for the sale of electric energy generated from renewable and environmentally beneficial sources, for the acquisition of electric energy generated from renewable and environmentally beneficial sources by electric distribution and supply companies and for the powers and duties of the Pennsylvania Public Utility Commission," further providing for definitions; providing for force majeure; further providing for alternative energy portfolio standards, for portfolio requirements in other states, for health and safety standards and for interagency responsibilities; providing for zero emissions credits; and making editorial changes.

The General Assembly of the Commonwealth of Pennsylvania hereby enacts as follows:

Section 1. Sections 1 and 2 of the act of November 30, 2004 (P.L.1672, No.213), known as the Alternative Energy Portfolio Standards Act, are amended to read:

Section 1. Short title.

This act shall be known and may be cited as the [Alternative Energy Portfolio] Pennsylvania Reliable Energy Sustainability Standards Act.

Section 2. Definitions.

The following words and phrases when used in this act shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Advanced reactor." A nuclear fission reactor consistent with the definition of "advanced nuclear reactor" in 42 U.S.C. § 16271 (relating to nuclear energy). The term includes a small modular reactor.

["Alternative energy credit." A tradable instrument that is used to establish, verify and monitor compliance with this act. A unit of credit shall equal one megawatt hour of electricity from an alternative energy source. The alternative energy credit shall remain the property of the alternative energy system until the alternative energy credit is voluntarily transferred by the alternative energy system. (Def. amended July 17, 2007, P.L.114, No.35)

"Alternative energy portfolio standards." Standards establishing that a certain amount of energy sold from alternative energy sources is included as part of the sources of electric generation by electric utilities within this Commonwealth.

"Alternative energy sources." The term shall include the following existing and new sources for the production of electricity:

(1) Solar photovoltaic or other solar electric energy.

(2) Solar thermal energy.

(3) Wind power.

(4) Large-scale hydropower, which shall mean the production of electric power by harnessing the hydroelectric potential of moving water impoundments, including pumped storage that does not meet the requirements of low-impact hydropower under paragraph (5).

(5) Low-impact hydropower consisting of any technology that produces electric power and that harnesses the hydroelectric potential of moving water impoundments, provided such incremental hydroelectric development:

(i) does not adversely change existing impacts to aquatic systems;

(ii) meets the certification standards established by the Low Impact Hydropower Institute and American Rivers, Inc., or their successors;

(iii) provides an adequate water flow for protection of aquatic life and for safe and effective fish passage;

(iv) protects against erosion; and

(v) protects cultural and historic resources.

(6) Geothermal energy, which shall mean electricity produced by extracting hot water or steam from geothermal reserves in the earth's crust and supplied to steam turbines that drive generators to produce electricity.

(7) Biomass energy, which shall mean the generation of electricity utilizing the following:

(i) organic material from a plant that is grown for the purpose of being used to produce electricity or is protected by the Federal Conservation Reserve Program (CRP) and provided further that crop production on CRP lands does not prevent achievement of the water quality protection, soil erosion prevention or wildlife enhancement purposes for which the land was primarily set aside; or

(ii) any solid nonhazardous, cellulosic waste material that is segregated from other waste materials, such as waste pallets, crates and landscape or right-of-way tree trimmings or agricultural sources, including orchard tree crops, vineyards, grain, legumes, sugar and other crop by-products or residues.

(8) Biologically derived methane gas, which shall include methane from the anaerobic digestion of organic materials from yard waste, such as grass clippings and leaves, food waste, animal waste and sewage sludge. The term also includes landfill methane gas.

(9) Fuel cells, which shall mean any electrochemical device that converts chemical energy in a hydrogen-rich fuel directly into electricity, heat and water without combustion.

(10) Waste coal, which shall include the combustion of waste coal in facilities in which the waste coal was disposed or abandoned prior to July 31, 1982, or disposed of thereafter in a permitted coal refuse disposal site regardless of when disposed of, and used to generate electricity, or such other waste coal combustion meeting alternate eligibility requirements established by regulation. Facilities combusting waste coal shall use at a minimum a combined fluidized bed boiler and be outfitted with a limestone injection system and a fabric filter particulate removal system. Alternative energy credits shall be calculated based upon the proportion of waste coal utilized to produce electricity at the facility.

(11) Coal mine methane, which shall mean methane gas emitting from abandoned or working coal mines.

(12) Demand-side management consisting of the management of customer consumption of electricity or the demand for electricity through the implementation of:

(i) energy efficiency technologies, management practices or other strategies in residential, commercial, institutional or government customers that reduce electricity consumption by those customers;

(ii) load management or demand response technologies, management practices or other strategies in residential, commercial, industrial, institutional and government customers that shift electric load from periods of higher demand to periods of lower demand; or

(iii) industrial by-product technologies consisting of the use of a by-product from an industrial process, including the reuse of energy from exhaust gases or other manufacturing by-products that are used in the direct production of electricity at the facility of a customer.

(13) Distributed generation system, which shall mean the small-scale power generation of electricity and useful thermal energy.

"Alternative energy system." A facility or energy system that uses a form of alternative energy source to generate electricity and delivers the electricity it generates to the distribution system of an electric distribution company or to the transmission system operated by a regional transmission organization.]

"Biogas energy." The generation of electricity that uses:

(1) biogas resultant of anaerobic digestion of organic

material, including yard waste such as grass clippings and leaves, food waste, animal waste and sewage sludge; or

(2) landfill gas.

"Biomass energy." The generation of electricity that uses:

(1) organic material from a plant that is grown for the purpose of being used to produce electricity or is protected by the Federal Conservation Reserve Program, and provided that crop production on Federal Conservation Reserve Program lands does not prevent achievement of the water quality protection, soil erosion prevention or wildlife enhancement purposes for which the land is primarily set aside; or

(2) any solid nonhazardous, cellulosic waste material that is segregated from other waste material, including waste pallets, crates and landscape or right-of-way tree trimmings or agricultural sources, including orchard tree crops, vineyards, grain, legumes, sugar and other crop by-products or residues.

"Clean hydrogen." Hydrogen produced through a process that results in a lifecycle greenhouse gas emissions rate of less than 0.45 kilograms of $CO_2e$ per kilogram of hydrogen.

"Coal mine fugitive emissions." Methane gas emitted from an abandoned or working coal mine.

"Combined heat and power system." A combined heat and power system installed on a commercial, institutional or industrial facility site within this Commonwealth that is a qualified facility under the Public Utility Regulatory Policies Act of 1978 (Public Law 95-617, 92 Stat. 3117) and has an annual operating efficiency of at least 60% with at least 25% of the total annual energy output being useful thermal energy. A combined heat and power system shall qualify as a Tier II PRESS energy source for up to 25 megawatts of aggregate electric nameplate capacity on a site.

"Commission." The Pennsylvania Public Utility Commission.

["Cost-recovery period." The longer of:

(1) the period during which competitive transition charges under 66 Pa.C.S § 2808 (relating to competitive transition charge) or intangible transition charges under 66 Pa.C.S. § 2812 (relating to approval of transition bonds) are recovered; or

(2) the period during which an electric distribution company operates under a Pennsylvania Public Utility Commission-approved generation rate plan that has been approved prior to or within one year of the effective date of this act, but in no case shall the cost-recovery period under this act extend beyond December 31, 2010.]

"Customer-generator." A nonutility owner or operator of a net metered distributed generation system with a nameplate capacity of not greater than 50 kilowatts if installed at a residential service or not larger than 3,000 kilowatts at other customer service locations, except for customers whose systems are above three megawatts and up to five megawatts who make their systems available to operate in parallel with the electric utility during grid emergencies as defined by the regional transmission organization or where a microgrid is in place for the primary or secondary purpose of maintaining critical infrastructure, such as homeland security assignments, emergency services facilities, hospitals, traffic signals, wastewater treatment plants or telecommunications facilities, provided that technical rules for operating generators interconnected with facilities of an electric distribution company, electric cooperative or municipal electric system have been promulgated by the Institute of Electrical and Electronic Engineers and the Pennsylvania Public Utility Commission.

"Demand-side management." The management of customer consumption of electricity or the demand for electricity through the implementation of:

(1) energy efficiency technologies, management practices or other strategies in residential, commercial, institutional or government customers that reduce electricity consumption by those customers;

(2) load management or demand response technologies, management practices or other strategies in residential, commercial, industrial, institutional and government customers that shift electric load from periods of higher demand to periods of lower demand, such as virtual power plants; or

(3) industrial by-product technologies consisting of the use of a by-product from an industrial process, including the reuse of energy from exhaust gases or other manufacturing by-products, including combined heat and power systems and waste-heat-to-power systems, that are used in the direct production of electricity at the facility of a customer.

"Department." The Department of Environmental Protection of the Commonwealth.

"Distributed generation system." Small-scale power generation of electricity, not including combined heat and power.

"Electric distribution company." The term shall have the same meaning given to it in 66 Pa.C.S. Ch. 28 (relating to restructuring of electric utility industry).

"Electric generation supplier." The term shall have the same meaning given to it in 66 Pa.C.S. Ch. 28 (relating to restructuring of electric utility industry).

"Energy price index." The average of the day-ahead locational marginal prices at the highest PJM Interconnection, L.L.C., pricing node in Pennsylvania for each hour of the three prior years.

"Energy storage resource." A technology, including any electromechanical, thermal and electromechanical technology, or any technology defined as "energy storage technology" in 26 U.S.C. § 48E (relating to clean electricity investment credit) or 26 CFR 1.48E-2(g)(6) (relating to qualified investments in qualified facilities and EST for purposes of section 48E) as of the effective date of this definition that is capable of absorbing and storing electrical energy for use at a later time.

"Environmental justice area." A geographic area characterized by increased pollution burden and sensitive or vulnerable populations based on demographic and environmental data as identified by the department.

"Force majeure." [Upon its own initiative or upon a request of an electric distribution company or an electric generator supplier, the Pennsylvania Public Utility Commission, within 60 days, shall determine if alternative PRESS energy resources are reasonably available in the marketplace in sufficient quantities or are likely to be developed in sufficient quantities due to alternative compliance payments or economics for the electric distribution companies and electric generation suppliers to meet their obligations for that reporting period under this act. In making this determination, the commission shall consider whether electric distribution companies or electric generation suppliers have made a good faith effort to acquire sufficient PRESS alternative energy to comply with their obligations. Such good faith efforts shall include, but are not limited to, banking reliable alternative energy credits during their transition periods, seeking reliable alternative energy credits through competitive solicitations and seeking to procure reliable alternative energy credits or PRESS alternative energy through long-term contracts. In further making its determination, the commission shall assess the availability of alternative reliable energy credits in the Generation Attributes Tracking System (GATS) or its successor and the availability of reliable alternative energy credits generally in Pennsylvania and other jurisdictions in the PJM Interconnection, L.L.C. regional transmission organization (PJM) or its successor. The commission may also require solicitations for reliable alternative energy credits as part of default service before requests of force majeure can be made. If the commission further determines that PRESS alternative energy resources are not reasonably available in sufficient quantities in the marketplace for the electric distribution companies and electric generation suppliers to meet their obligations under this act, then the commission shall modify the underlying obligation of the electric distribution company or electric generation supplier or recommend to the General Assembly that the underlying obligation be eliminated. Commission modification of the electric distribution company or electric generation supplier obligations under this act shall be for that compliance period only. Commission modification shall not automatically reduce the obligation for subsequent compliance years. If the commission modifies the electric distribution company or electric generation supplier obligations under this act, the commission may require the electric distribution company or electric generation supplier to acquire additional reliable alternative energy credits in subsequent years equivalent to the obligation reduced due to a force majeure declaration if the commission determines that sufficient reliable alternative energy credits exist in the marketplace.] The determination made by the commission under section 2.1.

"Fuel cells." A device that converts chemical energy in a hydrogen-rich fuel directly into electricity, heat and water without combustion including an integrated system comprised of a fuel cell stack assembly or linear generator assembly and associated balance of plant components which converts a fuel into electricity using electromechanical means. The term does not include an assembly which contains rotating parts.

"Fusion energy." The product of fusion reactions inside a fusion device and used to generate electricity.

"Geothermal energy." The utilization of natural heat of the earth found below the surface of the earth, which is then used to generate electricity.

(1) The term includes:

(i) Devices that generate electricity using a product of geothermal process including heat, indigenous steam, pressure, hot water and hot brines, gases and byproducts.

(ii) Devices that generate or distribute energy from a geothermal heating and cooling system.

(2) The term does not include helium, oil, hydrocarbon gas or any other hydrocarbon substances.

"Geothermal heating and cooling system." A system that:

(1) Exchanges thermal energy from groundwater or a

shallow ground source to generate thermal energy through an electric geothermal heat pump or a system of electric geothermal heat pumps interconnected with a geothermal extraction facility that:

(i) Is a closed loop or a series of closed loop systems in which fluid is permanently confined within a pipe or tubing.

(ii) Does not come in contact with the outside environment or an open loop system in which ground or surface water is:

(A) circulated in an environmentally safe manner directly into the facility; and

(B) returned to the same aquifer or surface water source.

(2) Meets or exceeds the current Federal Energy Star product specification standards.

(3) Replaces or displaces less efficient space or water heating systems, regardless of fuel type.

(4) Replaces or displaces less efficient space cooling systems that do not meet Federal Energy Star product specification standards.

(5) Does not feed electricity back to the grid.

"Hydropower." The production of electric power by harnessing the hydroelectric potential of moving water impoundments, including pumped storage that does not meet the requirements of low-impact hydropower.

"Lifecycle greenhouse gas emissions." As defined under 26 CFR §§ 1.45V-1 (relating to credit for production of clean hydrogen), 1.45V-2 (relating to special rules), 1.45V-3 (relating to rules relating to the increased credit amount for prevailing wage and apprenticeship), 1.45V-4 (relating to procedures for determining lifecycle greenhouse gas emissions rates for qualified clean hydrogen), 1.45V-5 (relating to procedures for verification of qualified clean hydrogen production and sale or use) and 1.45V-6 (relating to rules for determining the placed in service date for an existing facility that is modified or retrofitted to produce qualified clean hydrogen) as of the effective date of this definition.

"Low-impact hydropower." Technology that produces electric power and harnesses the hydroelectric potential of moving water impoundments, if the incremental hydroelectric development:

(1) Does not adversely change existing impacts to aquatic systems.

(2) Meets the certification standards established by the Low Impact Hydropower Institute and American Rivers, Inc., or its successors.

(3) Provides an adequate water flow for protection of aquatic life and for safe and effective fish passage.

(4) Protects against erosion.

(5) Protects cultural and historic resources.

"Municipal solid waste." This will include energy from existing waste to energy facilities which the Department of Environmental Protection has determined are in compliance with current environmental standards, including, but not limited to, all applicable requirements of the Clean Air Act (69 Stat. 322, 42 U.S.C. § 7401 et seq.) and associated permit restrictions and all applicable requirements of the act of July 7, 1980 (P.L.380, No.97), known as the Solid Waste Management Act.

"Net metering." The means of measuring the difference between the electricity supplied by an electric utility and the electricity generated by a customer-generator when any portion of the electricity generated by the [alternative] PRESS energy [generating] system is used to offset part or all of the customer-generator's requirements for electricity. [Virtual] The term includes virtual meter aggregation on properties owned or leased and operated by a customer-generator and located within two miles of the boundaries of the customer-generator's property and within a single electric distribution company's service territory [shall be eligible for net metering].

"PRESS energy sources." The term shall include existing and new sources for the production of electricity including Tier I, Tier II and Tier III PRESS energy sources.

"PRESS energy system." A facility or energy system that uses a form of PRESS energy sources to generate electricity and delivers the electricity generated to the distribution system of an electric distribution company or to the transmission system operated by a regional transmission organization.

"Regional transmission organization." An entity approved by the Federal Energy Regulatory Commission [(FERC)] that is created to operate and manage the electrical transmission grids of the member electric transmission utilities as required under [FERC] Federal Energy Regulatory Commission Order 2000, Docket No. RM99-2-000, [FERC] Federal Energy Regulatory Commission Chapter 31.089 (1999) or any successor organization approved by the [FERC] Federal Energy Regulatory Commission.

"Reliable energy credit." A tradable instrument that is used to establish, verify and monitor compliance with this act. A unit of credit shall equal one megawatt hour of electricity from a PRESS energy source. The reliable energy credit shall remain the property of the reliable energy system until the reliable energy credit is voluntarily transferred by the reliable energy system.

"Reliable energy sustainability standards." Standards establishing that a certain amount of energy sold from PRESS energy sources is included as part of the sources of electric generation by electric utilities within this Commonwealth.

"Reporting period." The 12-month period from June 1 through May 31. A reporting year shall be numbered according to the calendar year in which it begins and ends.

"Retail electric customer." The term shall have the same meaning given to it in 66 Pa.C.S. Ch. 28 (relating to restructuring of electric utility industry).

"Small modular reactors." An advanced nuclear reactor with a rated capacity of less than 300 electrical megawatts that can be constructed and operated in combination with similar reactors at a single site.

["Tier I alternative energy source." Energy derived from:

(1) Solar photovoltaic and solar thermal energy.

(2) Wind power.

(3) Low-impact hydropower.

(4) Geothermal energy.

(5) Biologically derived methane gas.

(6) Fuel cells.

(7) Biomass energy.

(8) Coal mine methane.

"Tier II alternative energy source." Energy derived from:

(1) Waste coal.

(2) Distributed generation systems.

(3) Demand-side management.

(4) Large-scale hydropower.

(5) Municipal solid waste.

(6) Generation of electricity utilizing by-products of the pulping process and wood manufacturing process, including bark, wood chips, sawdust and lignin in spent pulping liquors.

(7) Integrated combined coal gasification technology.]

"Tier I PRESS energy source." Electric energy derived from:

(1) Solar photovoltaic and solar thermal energy.

(2) Wind power.

(3) Low-impact hydropower.

(4) Geothermal energy.

(5) Advanced reactors.

(6) Fusion energy.

(7) Coal mine fugitive emissions.

(8) Biogas energy.

"Tier II PRESS energy source." Electric energy derived from:

(1) Natural gas or coal using at least 80% clean hydrogen co-fired blend or equivalent carbon intensity reduction technologies.

(2) Non-Tier I distributed generation systems.

(3) Demand-side management.

(4) Hydropower.

(5) Fuel cells.

(6) Biomass energy.

(7) Storage resources co-located with a Tier I PRESS energy source certified to possess the technical capacity to deliver 10% nameplate capacity of the Tier I PRESS energy source every hour for a 24-hour period.

(8) Combined heat and power system.

(9) Tier I PRESS energy source that meets the

requirements of section 3(e)(16).

"Tier III PRESS energy source." Electric energy derived from:

(1) Natural gas or coal using 20% clean hydrogen co-fired blend or equivalent carbon reduction technologies.

(2) Waste coal.

(3) Municipal solid waste.

(4) Integrated combined coal gasification technology.

(5) Generation of electricity utilizing by-products of the pulping process, including bark, wood chips, sawdust and lignin in spent pulping liquors.

(6) Tier I PRESS energy source that meets the requirements of section 3(e)(16).

"True-up period." The period each year from the end of the reporting year until September 1.

"Virtual currency." A type of digital unit that is used as a medium of exchange or a form of digitally stored value. The term shall be broadly construed to include a digital unit of exchange that:

(1) has a centralized repository or administrator;

(2) is decentralized and has no centralized repository or administrator; or

(3) may be created or obtained by computing or manufacturing effort.

"Waste coal." The combustion of waste coal in a facility:

(1) In which the waste coal was disposed or abandoned prior to July 31, 1982, or disposed of thereafter in a permitted coal refuse disposal site regardless of when disposed of, and used to generate electricity, or other waste coal combustion meeting alternate eligibility requirements

established by regulation.

(2) That uses at a minimum a combined fluidized bed boiler and is outfitted with a limestone injection system and a fabric filter particulate removal system.

Reliable energy credits shall be calculated based upon the proportion of waste coal utilized to produce electricity at the facility.

"ZEC." A zero emission credit authorized under section 8.1.

Section 2. The act is amended by adding a section to read:

Section 2.1. Force majeure.

(a) Determination of commission.--

(1) Upon the commission's own initiative or upon a request of an electric distribution company or an electric generator supplier, the commission shall determine if PRESS energy resources are reasonably available in the marketplace in sufficient quantities or are likely to be developed in sufficient quantities due to alternative compliance payments or economics for the electric distribution companies and electric generation suppliers to meet their obligations for that reporting period under this act.

(2) In making the determination under paragraph (1), the commission shall consider whether electric distribution companies or electric generation suppliers have made a good faith effort to acquire sufficient PRESS energy to comply with their obligations. The good faith efforts shall include, but are not limited to, banking reliable energy credits during their transition periods, seeking reliable energy credits through competitive solicitations and seeking to procure reliable energy credits or PRESS energy through long-term contracts.

(3) In further making a determination, the commission shall assess the availability of reliable energy credits in the Generation Attributes Tracking System or its successor and the availability of reliable energy credits generally in this Commonwealth and other jurisdictions in the PJM Interconnection, L.L.C., regional transmission organization or its successor. The commission may also require solicitations for reliable energy credits as part of default service before requests of force majeure can be made.

(b) Modifications of obligations.--

(1) If the commission further determines that PRESS energy resources are not reasonably available in sufficient quantities in the marketplace for the electric distribution companies and electric generation suppliers to meet the obligations under this act, then the commission shall modify the underlying obligation of the electric distribution company or electric generation supplier or recommend to the General Assembly that the underlying obligation be eliminated.

(2) Commission modification of the electric distribution company or electric generation supplier obligations under this act shall be for that compliance period only. Commission modification shall not automatically reduce the obligation for subsequent compliance years.

(3) If the commission modifies the electric distribution company or electric generation supplier obligations under this act, the commission may require the electric distribution company or electric generation supplier to acquire additional reliable energy credits in subsequent years equivalent to the obligation reduced due to a force

majeure declaration if the commission determines that sufficient reliable energy credits exist in the marketplace.

Section 3. Sections 3, 4, 6 and 7 of the act are amended to read:

Section 3. [Alternative energy portfolio] Pennsylvania reliable energy sustainability standards.

(a) General compliance and cost recovery.--

(1) [From the effective date of this act through and including the 15th year after enactment of this act and each year thereafter,] Beginning February 28, 2005, the electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in this Commonwealth shall be comprised of electricity generated from [alternative] PRESS energy sources and in the percentage amounts as described under subsections (b), [and] (c) and (c.1).

(2) Electric distribution companies and electric generation suppliers shall satisfy [both] requirements [set forth] specified in subsections (b), [and] (c) and (c.1), provided, however, that an electric distribution company or an electric generation supplier shall be excused from its obligations under this section to the extent that the commission determines that force majeure exists.

(3) All costs for:

(i) the purchase of electricity generated from [alternative] PRESS energy sources, including the costs of the regional transmission organization, in excess of the regional transmission organization real-time locational marginal pricing, or its successor, at the delivery point of the [alternative] PRESS energy source for the electrical production of the [alternative] PRESS energy sources; and

(ii) [payments for alternative energy credits, in both cases that are voluntarily acquired by an electric distribution company during the cost recovery period on behalf of its customers shall be deferred as a regulatory asset by the electric distribution company and fully recovered, with a return on the unamortized balance, pursuant to an automatic energy adjustment clause under 66 Pa.C.S. § 1307 (relating to sliding scale of rates; adjustments) as a cost of generation supply under 66 Pa.C.S. § 2807 (relating to duties of electric distribution companies) in the first year after the expiration of its cost-recovery period. After the cost-recovery period,] any reasonable or prudent direct or indirect costs for the purchase by electric distribution of resources to comply with this section, including, but not limited to, the purchase of electricity generated from [alternative] PRESS energy sources, payments for [alternative] reliable energy credits, cost of credits banked, payments to any third party administrators for performance under this act and costs levied by a regional transmission organization to ensure that [alternative] PRESS energy sources are reliable, shall be recovered on a full and current basis pursuant to an automatic energy adjustment clause under 66 Pa.C.S. § 1307 as a cost of generation supply under 66 Pa.C.S. § 2807.

(b) Tier I and solar photovoltaic shares.--

(1) [Two years after the effective date of this act and through May 31, 2025,] Beginning February 28, 2007, through

May 31, 2026, at least 1.5% of the electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in this Commonwealth shall be generated from Tier I [alternative] PRESS energy sources. Except as provided in this section, the minimum percentage of electric energy required to be sold to retail electric customers from [alternative] Tier I PRESS energy sources shall increase to 2% three years after the effective date of this act. The minimum percentage of electric energy required to be sold to retail electric customers from [alternative] PRESS energy sources shall increase by at least 0.5% each year so that at least 8% of the electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in that certificated territory in the 15th year after the effective date of this subsection is sold from [alternative] Tier I PRESS energy resources.

(1.1) Beginning on June 1, 2026, at least 10.7% of electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in this Commonwealth shall be generated from Tier I PRESS energy sources. Beginning on June 1, 2027, through May 31, 2035, the minimum percentage of electric energy required to be sold to retail electric customers from Tier I PRESS energy sources shall increase by at least 3% each year so that at least 35% of the electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in that certificated territory is sold from Tier I PRESS energy resources by May 31, 2035.

(2) The total percentage of the electric energy sold by an electric distribution company or electric generation

supplier to retail electric customers in this Commonwealth that must be sold from solar photovoltaic technologies is:

(i) 0.0013% for June 1, 2006, through May 31, 2007.

(ii) 0.0030% for June 1, 2007, through May 31, 2008.

(iii) 0.0063% for June 1, 2008, through May 31, 2009.

(iv) 0.0120% for June 1, 2009, through May 31, 2010.

(v) 0.0203% for June 1, 2010, through May 31, 2011.

(vi) 0.0325% for June 1, 2011, through May 31, 2012.

(vii) 0.0510% for June 1, 2012, through May 31, 2013.

(viii) 0.0840% for June 1, 2013, through May 31, 2014.

(ix) 0.1440% for June 1, 2014, through May 31, 2015.

(x) 0.2500% for June 1, 2015, through May 31, 2016.

(xi) 0.2933% for June 1, 2016, through May 31, 2017.

(xii) 0.3400% for June 1, 2017, through May 31, 2018.

(xiii) 0.3900% for June 1, 2018, through May 31, 2019.

(xiv) 0.4433% for June 1, 2019, through May 31, 2020.

(xv) 0.5000% for June 1, 2020, [and thereafter] through May 31, 2031.

(3) Upon commencement of the beginning of the 6th reporting year, the commission shall undertake a review of the compliance by electric distribution companies and electric generation suppliers with the requirements of this act. The review shall also include the status of [alternative] PRESS energy technologies within this

Commonwealth and the capacity to add additional [alternative] PRESS energy resources. The commission shall use the results of this review to recommend to the General Assembly additional compliance goals beyond year 15. The commission shall work with the department in evaluating the future [alternative] PRESS energy resource potential.

(c) Tier II share.--Of the electrical energy required to be sold from [alternative] PRESS energy sources identified in Tier II, the percentage that must be from these technologies is for:

(1) Years 1 through 4 - 4.2%.

(2) Years 5 through 9 - 6.2%.

(3) Years 10 through 14 - 8.2%.

(4) Years 15 [and thereafter] through 19 - 10.0%.

(5) Beginning on June 1, 2026, through May 31, 2027, the electrical energy required to be sold from PRESS energy sources identified in Tier II, the percentage that shall be from these technologies is 6%.

(6) Beginning June 1, 2027, through May 31, 2035, the percentage that must be from these technologies shall increase by 0.5% each year so that at least 10% of the electric energy is sold from PRESS energy sources identified in Tier II by May 31, 2035, and each year thereafter.

(c.1) Tier III share.--Of the electrical energy required to be sold from PRESS energy sources identified in Tier III, the percentage that must be from these technologies is:

(1) June 1, 2026, through May 31, 2029 - 3.8%.

(2) June 1, 2029, through May 31, 2032 - 4.4%.

(3) June 1, 2032, and thereafter - 5%.

(d) [Exemption during cost-recovery period.--Compliance with subsections (a), (b) and (c) shall not be required for any electric distribution company that has not reached the end of its cost-recovery period or for electric generation supplier sales in the service territory of an electric distribution company that has not reached the end of its cost-recovery period. At the conclusion of an electric distribution company's cost-recovery period, this exception shall no longer apply, and compliance shall be required at the percentages in effect at that time. Electric distribution companies and electric generation suppliers whose sales are exempted under this subsection and who voluntarily sell electricity generated from Tier I and Tier II sources during the cost-recovery period may bank credits consistent with subsection (e)(7).] (Reserved).

(e) [Alternative] Reliable energy credits.--

(1) The commission shall establish [an alternative] a reliable energy credits program as needed to implement this act. The provision of services pursuant to this section shall be exempt from the competitive procurement procedures of 62 Pa.C.S. (relating to procurement).

(2) The commission shall approve an independent entity to serve as the [alternative] reliable energy credits program administrator. The administrator shall have those powers and duties assigned by commission regulations. [Such] The powers and duties shall include, but not be limited to, the following:

(i) To create and administer [an alternative] a reliable energy credits certification, tracking and reporting program. [This program should] The program shall include, at a minimum, a process for qualifying [alternative] PRESS energy systems and determining the manner credits can be created, accounted for, transferred and retired.

(ii) To submit reports to the commission at such times and in such manner as the commission shall direct.

(3) All qualifying [alternative] PRESS energy systems [must] shall include a qualifying meter to record the cumulative electric production to verify the advanced energy credit value. Qualifying meters will be approved by the commission as defined in paragraph (4).

(4) (i) An electric distribution company or electric generation supplier shall comply with the applicable requirements of this section by purchasing sufficient [alternative] reliable energy credits and submitting documentation of compliance to the program administrator.

(ii) For purposes of this subsection, one [alternative] reliable energy credit shall represent one megawatt hour of qualified [alternative] electric generation, whether self-generated, purchased along with the electric commodity or separately through a tradable instrument and otherwise meeting the requirements of commission regulations and the program administrator.

(5) The [alternative] reliable energy credits program shall include provisions requiring a reporting period [as defined in section 2] for all covered entities under this act. The [alternative] reliable energy credits program shall also include a true-up period [as defined in section 2]. The true-up period shall provide entities covered under this act the ability to obtain the required number of [alternative] reliable energy credits or to make up any shortfall of the [alternative] reliable energy credits they may be required to obtain to comply with this act. A force majeure provision

shall also be provided for under the true-up period provisions.

(6) An electric distribution company and electric generation supplier may bank or place in reserve [alternative] reliable energy credits produced in one reporting year for compliance in either or both of the two subsequent reporting years, subject to the limitations [set forth] specified in this subsection and provided that the electric distribution company and electric generation supplier are in compliance for all previous reporting years. [In addition, the] The electric distribution company and electric generation supplier shall demonstrate to the satisfaction of the commission that [such] the credits:

(i) were in excess of the [alternative] reliable energy credits needed for compliance in the year in which they were generated and that [such] the excess credits have not previously been used for compliance under this act;

(ii) were produced by the generation of electrical energy by [alternative] PRESS energy sources and sold to retail customers during the year in which they were generated; and

(iii) have not otherwise been nor will be sold, retired, claimed or represented as part of satisfying compliance with alternative or renewable energy portfolio standards in other states.

[(7) An electric distribution company or an electric generation supplier with sales that are exempted under subsection (d) may bank credits for retail sales of electricity generated from Tier I and Tier II sources made prior to the end of the cost-recovery period and after the effective date of this act. Bankable credits shall be limited to credits associated with electricity sold from Tier I and Tier II sources during a reporting year which exceeds the volume of sales from such sources by an electric distribution company or electric generation supplier during the 12-month period immediately preceding the effective date of this act. All credits banked under this subsection shall be available for compliance with subsections (b) and (c) for no more than two reporting years following the conclusion of the cost-recovery period.]

(8) The commission or its designee shall develop a registry of pertinent information regarding all available [alternative] reliable energy credits, credit transactions among electric distribution companies and electric generation suppliers, the number of [alternative] reliable energy credits sold or transferred and the price paid for the sale or transfer of the credits. The registry shall provide current information to electric distribution companies, electric generation suppliers and the general public on the status of [alternative] reliable energy credits created, sold or transferred within this Commonwealth.

(9) The commission may impose an administrative fee on [an alternative] a reliable energy credit transaction. The amount of this fee may not exceed the actual direct cost of processing the transaction by the [alternative] reliable energy credits administrator. The commission [is authorized to] may utilize up to 5% of the alternative compliance fees generated under subsection (f) for administrative expenses directly associated with this act.

(10) The commission shall establish regulations governing the verification and tracking of energy efficiency and demand-side management measures [pursuant to] under this act, which shall include benefits to all utility customer classes. When developing regulations, the commission [must] shall give reasonable consideration to existing and proposed regulations and rules in existence in the regional transmission organizations that manage the transmission system in any part of this Commonwealth. All verified reductions shall accrue credits starting with the [passage] enactment of this act.

(11) The commission shall [within 120 days of the effective date of this act] not later than March 30, 2005, develop a depreciation schedule for [alternative] reliable energy credits created through demand-side management, energy efficiency and load management technologies and shall develop standards for tracking and verifying savings from energy efficiency, load management and demand-side management measures. The commission shall allow for a 60-day public comment period and shall issue final standards within 30 days of the close of the public comment period.

(12) Unless a contractual provision explicitly assigns [alternative] reliable energy credits in a different manner, the owner of the [alternative] reliable energy system or a customer-generator owns any and all [alternative] reliable energy credits associated with or created by the production of electric energy by such facility or customer, and the owner or customer shall be entitled to sell, transfer or take any other action to which a legal owner of property is entitled to take with respect to the credits.

(13) No PRESS energy system shall be eligible to sell reliable energy credits associated with or created by the production of electric energy subsequently utilized to generate or produce virtual currency at a facility co-located with the PRESS energy system, or where a power purchase agreement commits the offtake of electric energy to a virtual currency generator or producer. Reliable energy credits may be sold based upon the proportion of electric energy at the facility that is not utilized to generate or produce virtual currency.

(14) An individual generating unit with a nameplate capacity over 250 megawatts must be located inside or within 15 miles of this Commonwealth to be eligible for reliable energy credits. The commission may promulgate a regulation to change the nameplate capacity for purposes of this paragraph if the commission determines that a change to the nameplate capacity is necessary to prevent a force majeure event or the ongoing imposition of alternative compliance payments due to lack of availability of reliable energy credits.

(15) No PRESS energy source may be offered to meet the compliance requirements of more than one tier unless:

(i) the source is owned or leased by and located on the grounds of a school district as defined in section 102 of the act of March 10, 1949 (P.L.30, No.14), known as the Public School Code of 1949. If a PRESS energy source is owned or leased by and located on the grounds of a school district, a school district may offer credits from a Tier I PRESS energy source to meet the compliance requirements of Tier I and either Tier II or Tier III. A school district may not offer credits to meet the compliance obligations of more than one tier in any year in excess of the school district's requirement for electricity in the same year.

(ii) The source is a Tier I PRESS energy source co-located with an energy storage resource, certified to possess the technical capacity to deliver 10% nameplate capacity of the Tier I PRESS energy source every hour for a 24-hour period. The Tier I PRESS energy source co-located with a certified energy storage resource may receive credits to reach the compliance requirements of Tier 1 equal to the energy output of the Tier I energy source and may additionally receive credits to meet the compliance requirements of Tier II equal to the energy output of the co-located storage resource.

(16) (i) PRESS energy sources eligible for compliance requirements in Tier II, Tier III and solar photovoltaic technologies eligible for compliance requirements under subsection (b)(2) must meet one of the following requirements:

(A) directly deliver the electricity generated to a retail customer of an electric distribution company or to the distribution system operated by an electric distribution company operating within this Commonwealth and obligated to meet the compliance requirements contained under this act;

(B) be directly connected to the electric system of an electric cooperative or municipal electric system operating within this Commonwealth;

(C) connect directly to the electric transmission system at a location that is within the service territory of an electric distribution company operating within this Commonwealth; or

(D) generate electricity at generation units whose construction and operation is subject to and complies with permits issued by the department under the act of January 8, 1960 (1959 P.L.2119, No.787), known as the Air Pollution Control Act, or the act of July 7, 1980 (P.L.380, No.97), known as the Solid Waste Management Act.

(ii) This paragraph shall not be construed to affect a binding written contract, entered into prior to the effective date of this paragraph, for the sale and purchase of alternative energy credits derived from alternative energy sources until June 1, 2029.

(iii) Beginning June 1, 2031, 6% of the electric energy sold by an electric distribution company or electric generation supplier to retail electric customers in this Commonwealth and that is used to satisfy Tier I obligations shall be generated from Tier I PRESS energy sources that meet one of the requirements of subparagraph (i). The percentage shall increase by 1.333% in each subsequent compliance year through June 1, 2036, and increase by 0.6% in each subsequent compliance year through June 1, 2051.

(17) Energy from a geothermal heating and cooling system is eligible to sell reliable energy credits associated with or created by the production of energy of the system. Reliable energy credits from a geothermal heating and cooling system shall be created based on the amount of energy, converted from BTUs to kilowatt-hours, that is generated by a

geothermal heating and cooling system for space heating and cooling or water heating. The commission shall determine the form and manner in which the reliable energy credits are verified.

(18) For binding written contracts for the sale and purchase of alternative energy credits derived from alternative energy sources entered into prior to the effective date of this paragraph, the following shall apply until June 1, 2029:

(i) A Tier I alternative energy source may be offered for compliance purposes as a Tier I PRESS energy source.

(ii) A Tier II alternative energy source may be offered for compliance purposes as a Tier II PRESS energy source.

(f) Alternative compliance payment.--

(1) At the end of each program year, the program administrator shall provide a report to the commission and to each covered electric distribution company showing their status level of [alternative] reliable energy acquisition.

(2) The commission shall conduct a review of each determination made under subsections (b), [and] (c) and (c.1). If, after notice and hearing, the commission determines that an electric distribution company or electric generation supplier has failed to comply with subsections (b), [and] (c) and (c.1), the commission shall impose an alternative compliance payment on that company or supplier.

(3) [The] (i) Through May 31, 2027, the alternative compliance payment, with the exception of the solar photovoltaic share compliance requirement [set forth]

specified in subsection (b)(2), shall be $45 times the number of additional [alternative] reliable energy credits needed in order to comply with subsection (b) or (c).

(ii) Subject to subparagraph (iii), beginning June 1, 2027, and continuing each year thereafter, the alternative compliance payment, with the exception of the solar photovoltaic share compliance requirement specified in subsection (b)(2), shall be $45 times the number of additional reliable energy credits needed in order to comply with subsection (b). The alternative compliance payment shall be $35 times the number of reliable energy credits needed in order to comply with subsection (c). The alternative compliance payment shall be $15 times the number of reliable energy credits needed in order to comply with subsection (c.1).

(iii) Beginning June 1, 2030, and continuing each year thereafter, the commission shall adjust the alternative compliance payment amount applicable in any tier under this paragraph by the percentage difference between the energy price index on June 1 of the prior year and the current value of the energy price index.

(4) The alternative compliance payment for the solar photovoltaic share shall be 200% of the average market value of solar renewable energy credits sold during the reporting period within the service region of the regional transmission organization, including, where applicable, the levelized up-front rebates received by sellers of solar renewable energy credits in other jurisdictions in the PJM Interconnection, L.L.C. transmission organization (PJM) or its successor.

(5) The commission shall establish a process to provide for, at least annually, a review of the [alternative] PRESS energy market within this Commonwealth and the service territories of the regional transmission organizations that manage the transmission system in any part of this Commonwealth. The commission will use the results of this study to identify any needed changes to the cost associated with the alternative compliance payment program. If the commission finds that the costs associated with the alternative compliance payment program must be changed, the commission shall present these findings to the General Assembly for legislative enactment.

(g) Transfer to sustainable development funds.--

(1) Notwithstanding the provisions of 66 Pa.C.S. §§ 511 (relating to disposition, appropriation and disbursement of assessments and fees) and 3315 (relating to disposition of fines and penalties), alternative compliance payments imposed pursuant to this act shall be paid into Pennsylvania's Sustainable Energy Funds created under the commission's restructuring orders under 66 Pa.C.S. Ch. 28 (relating to restructuring of electric utility industry). Alternative compliance payments shall be paid into a special fund of the Pennsylvania Sustainable Energy Board, established by the commission under Docket M-00031715, and made available to the Regional Sustainable Energy Funds under procedures and guidelines approved by the Pennsylvania Energy Board.

(2) The alternative compliance payments shall be utilized solely for <u>reliability</u> projects that will increase the amount of electric energy generated from [alternative energy resources for purposes of compliance with subsections

(b) and (c).]:

(i) geothermal energy;

(ii) storage resources co-located with a Tier I PRESS energy source certified to possess technical capacity to deliver 10% nameplate capacity of the Tier I PRESS energy resource every hour for a 24-hour period; or

(iii) a Tier I PRESS energy source owned or leased by and located on the grounds of a school district as defined in section 102 of the Public School Code of 1949.

(3) No less than 40% of funds shall be dedicated to reliability projects located in environmental justice areas under paragraph (2).

(h) Nonseverability.--The provisions of subsection (a) are declared to be nonseverable. If any provision of subsection (a) is held invalid, the remaining provisions of this act shall be void.

Section 4. Portfolio requirements in other states.

If an electric distribution supplier or electric generation company provider sells electricity in any other state and is subject to renewable energy portfolio requirements in that state, they shall list any such requirement and shall indicate how it satisfied those renewable energy portfolio requirements. To prevent double-counting, the electric distribution supplier or electric generation company shall not satisfy Pennsylvania's [alternative] reliable energy [portfolio] requirements using [alternative] PRESS energy used to satisfy another state's portfolio requirements or alternative energy credits already purchased by individuals, businesses or government bodies that do not have a compliance obligation under this act unless the individual, business or government body sells those credits to the electric distribution company or electric generation supplier. Energy derived from [alternative] PRESS energy sources inside the geographical boundaries of this Commonwealth shall be eligible to meet the compliance requirements under this act. Energy derived from [alternative] PRESS energy sources located outside the geographical boundaries of this Commonwealth but within the service territory of a regional transmission organization that manages the transmission system in any part of this Commonwealth shall only be eligible to meet the compliance requirements of electric distribution companies or electric generation suppliers located within the service territory of the same regional transmission organization. For purposes of compliance with this act, [alternative] PRESS energy sources located in the PJM Interconnection, L.L.C. regional transmission organization (PJM) or its successor service territory shall be eligible to fulfill compliance obligations of all Pennsylvania electric distribution companies and electric generation suppliers. Energy derived from [alternative] PRESS energy sources located outside the service territory of a regional transmission organization that manages the transmission system in any part of this Commonwealth shall not be eligible to meet the compliance requirements of this act. Electric distribution companies and electric generation suppliers shall document that this energy was not used to satisfy another state's renewable energy portfolio standards.

Section 6. Health and safety standards.

The department shall cooperate with the Department of Labor and Industry as necessary in developing health and safety standards, as needed, regarding facilities generating energy from [alternative] PRESS energy sources. The department shall establish appropriate and reasonable health and safety standards to ensure uniform and proper compliance with this act by owners and operators of facilities generating energy from [alternative] PRESS energy sources [as defined in this act].

Section 7. Interagency responsibilities.

(a) Commission responsibilities.--The commission [will] shall carry out the responsibilities delineated within this act. The commission also shall, in cooperation with the department, conduct an ongoing [alternative] PRESS energy resources planning assessment for this Commonwealth. [This assessment will] The assessment shall, at a minimum, identify current and operating [alternative] PRESS energy facilities, the potential to add future [alternative] PRESS energy generating capacity and the conditions of the [alternative] PRESS energy marketplace. The assessment [will] shall identify needed methods to maintain or increase the relative competitiveness of the [alternative] PRESS energy market within this Commonwealth.

(b) Department responsibilities.--The department shall ensure that all qualified [alternative] PRESS energy sources meet all applicable environmental standards and shall verify that [an alternative] a PRESS energy source meets the standards [set forth] specified in section 2.

(c) Cooperation between commission and department.--The commission and the department shall work cooperatively to monitor the performance of all aspects of this act and [will] shall provide an annual report to the chairman and minority chairman of the Environmental Resources and Energy Committee of the Senate and the chairman and minority chairman of the Environmental [Resources and Energy] and Natural Resource Protection Committee of the House of Representatives. The report shall include at a minimum:

(1) The status of the compliance with the provisions of this act by electric distribution companies and electric generation suppliers.

(2) Current costs of [alternative] PRESS energy on a per kilowatt hour basis for all [alternative] PRESS energy technology types.

(3) Costs associated with the [alternative] reliable energy credits program under this act, including the number of alternative compliance payments.

(4) The status of the [alternative] PRESS energy marketplace within this Commonwealth.

(5) Recommendations for program improvements.

Section 4. The act is amended by adding a section to read:

Section 8.1. Zero emissions credits.

(a) Beneficial nuclear facility.--A nuclear reactor that provides benefits to this Commonwealth may apply to the commission for ZECs.

(b) Duty of commission.--After notice and opportunity for a hearing, the commission shall approve or disapprove an application submitted under subsection (a) within nine months after the application is filed, provided that approval may be in whole or in part and may be subject to limitations and qualifications as may be deemed necessary and in the public interest. The limitations shall include, but are not limited to, a cap of 75,000,000 megawatt-hours of ZECs approved each year.

(c) Price of ZEC.--The price of a ZEC shall be the amount by which $9 per MWh exceeds 80% of the difference of the gross receipts of the nuclear reactor for the previous year expressed as a dollar per MWh, and $31 per MWh. The $9 per MWh and $31 per

MWh values in this subsection shall be adjusted annually by the commission to reflect the change in the Consumer Price Index for All Urban Consumers (CPI-U) for the Pennsylvania, New Jersey, Delaware and Maryland area after 2033. The commission shall transmit a notice of the adjustment to the Legislative Reference Bureau for publication in the next available issue of the Pennsylvania Bulletin.

(d) Regulations.--Within 365 days prior to the expiration of the availability of zero-emission nuclear power production credits established under section 45U of the Internal Revenue Code of 1986 (26 U.S.C. § 45U), the commission shall promulgate regulations to implement the requirements of this section. The regulations shall include the following:

(1) Data submission requirements necessary to evaluate projected environmental benefits and to verify annual gross receipts.

(2) Recapture of the allocation of any credit within the previous three years to a beneficial nuclear reactor that permanently terminates operations, except in the case of force majeure.

(e) Ineligibility.--A beneficial nuclear facility shall not be eligible to receive ZECs during any period in which they are receiving zero-emission nuclear power production credits established under section 45U of the Internal Revenue Code of 1986.

(f) Recovery of costs.--If the commission has approved ZECs under subsection (a) it shall allow the public utility to recover all prudent and reasonable costs associated with the credits, provided that the prudent and reasonable costs must be recovered in accordance with appropriate accounting principles.

(g) Expiration.--This section shall expire 10 years after the effective date of the regulations promulgated by the commission under subsection (d).

Section 5. A reference in statute or regulation to "Alternative Energy Portfolio Standards" shall be deemed a reference to "Pennsylvania Reliable Energy Sustainability Standards."

Section 6. This act shall take effect as follows:

(1) The addition of section 3(e)(16)(ii) and (18) of the act shall take effect immediately.

(2) This section shall take effect immediately.

(3) The remainder of this act shall take effect June 1, 2026.

# HOUSE OF REPRESENTATIVES
# DEMOCRATIC COMMITTEE BILL ANALYSIS

| | | | |
|---|---|---|---|
| **Bill No:** | HB0501 PN1478 | **Prepared By:** | Andrew McMenamin<br>(717) 783-4043,6941 |
| **Committee:** | Environmental & Natural Resource Protection | **Executive Director:** | Evan Franzese |
| **Sponsor:** | Otten, Danielle | | |
| **Date:** | 4/25/2025 | | |

### A. <u>Brief Concept</u>

Establishes Pennsylvania Reliable Energy Sustainability Standards (PRESS) and updates existing clean energy standards to provide for 35 percent generation from renewable sources by 2035.

### C. <u>Analysis of the Bill</u>

HB 501 (Otten) replaces Alternative Energy Portfolio Standards (AEPS) with PA Reliable Energy Sustainability Standards (PRESS) and updates renewable energy standards in PA.

## PRESS Targets

Establishes the following minimum requirements for electric energy sold by an electric distribution company (EDC) or electric generation supplier (EGS):

- 35% from Tier I PRESS energy sources by May 31, 2035.
    - Increases to 10.7% beginning June 1, 2026, increasing by 3% per year through 2035.
    - Maintains .5% carveout for solar through May 31, 2031.
- 10% from Tier II PRESS energy sources by May 31, 2035.
    - Reduces to 6% beginning June 1, 2026, increasing by .5% per year through 2035.
- 5% from Tier III PRESS energy sources by June 1, 2032.
    - Establishes 3.8% requirement beginning June 1, 2026, increasing to 4.4% in 2029 and 5% by June 1, 2032 and thereafter.

## PRESS Energy Sources

Tier I PRESS energy sources include electric energy derived from:

- Solar photovoltaic and solar thermal energy.
- Wind power.
- Low-impact hydropower.
- Geothermal energy.
- Advanced nuclear reactors.
- Fusion energy.
- Coal mine fugitive emissions.
- Biogas energy.

Tier II PRESS energy sources include electric energy derived from:

- Natural gas or coal using at least 80% clean hydrogen co-fired blend or equivalent carbon intensity reduction technologies.
- Non-Tier I distributed generation systems.
- Demand-side management.
- Hydropower.
- Fuel cells.
- Biomass energy.

- Storage resources co-located with a Tier I PRESS energy source with 10% nameplate capacity available every hour for a 24-hour period.
- Combined heat and power.
- A tier I PRESS energy source that meets the requirements of section 3(e)(16).

Tier III PRESS energy sources include electric energy derived from:

- Natural gas or coal using 20% clean hydrogen co-fired blend or equivalent carbon reduction technologies.
- Waste coal.
- Municipal solid waste.
- Integrated combined coal gasification technology.
- Generation of electricity utilizing by-products of the pulping process, including bark, wood chips, sawdust and lignin in spent pulping liquors.
- Tier I PRESS energy source that meets the requirements of section 3(e)(16).

### Force Majeure

Requires PUC to determine, upon the request of an EDC/EGS or on their own, whether:

- Energy resources are reasonably available in the marketplace to allow EDCs and EGSs to meet their obligations for the relevant reporting period.
- EDCs/EGSs have made a good-faith effort to meet those obligations. "Good faith effort" includes, but is not limited to:
  - banking reliable energy credits during their transition periods,
  - seeking reliable energy credits through competitive solicitations and
  - seeking to procure reliable energy credits or PRESS energy through long-term contracts.
- Reliable energy credits (either through the Generation Attributes Tracking System or generally) are available in PA and PJM.
- PUC may also require solicitations for reliable energy credits as part of default service before requests of force majeure can be made.

Requires PUC to modify EDC and EGS obligations or recommend to the General Assembly that the underlying obligation be eliminated if the commission determines that PRESS energy resources are not reasonably available in the marketplace to meet EDC and EGS obligations under the act.

- PUC modifications would only be applicable for the relevant compliance period.
- PUC may require EDCs or EGSs to acquire additional reliable energy credits in subsequent years equivalent to the reductions due to the force majeure declaration.

### Reliable Energy Credits

Removes provisions related to exemptions for EDCs during cost recovery periods that are no longer relevant.

Provides that energy used to generate or produce virtual currency is not eligible for renewable energy credits.

Requires generating units with a nameplate capacity over 250 MW to be located in PA or within 15 miles of PA in order to be eligible for renewable energy credits.

- PUC may change the minimum capacity by regulation if necessary to prevent a force majeure event or the ongoing imposition of alternative compliance payments due to lack of available credits.

PRESS energy sources may not be offered to meet compliance requirements of more than one tier unless:

- The energy source is owned/leased by a school district and on school district property to be eligible to meet compliance requirements of more than one Tier. A school district may not offer credits in excess of the school district's electricity requirement in a given year.
- The energy source is co-located with a co-located energy storage resource. The energy storage resource would be eligible for Tier II credits.

Provides for additional in-state geographical requirements for PRESS energy sources in order to be eligible, as follows:

- PRESS energy sources would be required to meet one of the following requirements:
  - directly deliver electricity generated to:
    - a retail customer of an EDC required to comply with the act or
    - a distribution system operated by an EDC required to comply with the act;
  - be directly connected to an electric cooperative or municipal electric system within PA;
  - connect directly to the electric transmission system at a location that is within the service territory of an EDC operating within PA; or
  - generate electricity at generation units subject to and in compliance with permits issued by DEP under the Air Pollution Control Act (Act 787 of 1959) or Solid Waste Management Act (Act 97 of 1980).
- The following apply for the above requirements:
  - Existing contracts as of the effective date for the sale and purchase of energy credits would not be affected until June 1, 2029.
  - These requirements would apply to all energy sources eligible under Tier II, Tier III, and the solar carveout.
  - Tier I sources could be eligible for Tier II and Tier III credits if they meet one of these requirement.
  - For Tier I obligations, 6% of the electric energy sold by an EDC/EGS to retail electric customers in PA shall be generated from sources meeting one of the above requirements, beginning June 1, 2031.
    - The percentage shall increase by 1.333% in subsequent compliance years through June 1, 2036.
    - The percentage shall increase by 0.6% in subsequent compliance years through June 1, 2051.

Allows geothermal heating and cooling systems to sell renewable energy credits.

- Credits would be created based on the amount of energy that is generated by a geothermal system for space heating and cooling or water heating, converted from BTUs to KWhs.
- PUC would be required to determine the form and manner in which the credits are verified.

Allows Tier I and Tier II alternative energy sources to be offered for compliance purposes as a Tier I PRESS energy source, until June 1, 2029, for contracts entered into prior to the effective date.

## Alternative Compliance Payments

Sets the alternative compliance payment as follows, beginning June 1, 2027:

- $45 times the number of additional credits needed to comply with Tier I requirements, except for solar share compliance.
- $35 times the number of additional credits needed to comply with Tier II requirements.
- $15 times the number of additional credits needed to comply with Tier III requirements.

Requires PUC to increase alternative compliance payment amounts based on changes to the energy price index.

Requires funds from alternative compliance payments to be utilized solely for projects that increase the amount of energy generated from certain sources.

- Eligible sources include:
  - geothermal energy;
  - storage resources co-located with a Tier I source; or
  - a Tier I source owned/leased by and located on the grounds of a school district.
- At least 40% of funds would need to be dedicated to projects located in environmental justice areas.

### Zero Emissions Credits (ZECs)

Allows nuclear reactors that benefit the Commonwealth to apply for ZECs.

Requires PUC to decide on applications within 9 months of the application being filed, after notice and opportunity for a hearing.

Caps approvals at 75 million MWh of ZECs per year.

Provides for ZEC prices.

Requires PUC to promulgate regulations within one year prior to expiration of federal zero-emission nuclear power production credits.

- Regulations shall include:
  - data submission requirements to evaluate environmental benefits and verify gross annual receipts.
  - the ability recapture credits within the three previous years for a reactor that permanently terminates operations.
- This section expires 10 years following the effective date of this regulation.

Allows public utilities to recover all prudent and reasonable costs associated with the ZECs, if they have been approved by the PUC.

Prohibits a nuclear facility from receiving ZECs during any period in which they are receiving federal zero-emission nuclear power production credits.

### Miscellaneous

Updates references from alternative energy credits to reliable energy credits throughout the act.

### Definitions

*Demand-side management* means the management of customer consumption of electricity or the demand for electricity through the implementation of:

- energy efficiency technology or practices;
- load management or demand response technology or practices that shift electric load from periods of higher demand to periods of lower demand, including virtual power plants; or
- industrial by-product technologies, including combined heat and power systems and waste-heat-to-power systems.

*Energy price index* means the average of the day-ahead locational marginal prices at the highest PJM pricing node in Pennsylvania for each hour of the three prior years.

*Reliable energy credit* means "a tradable instrument that is used to establish, verify and monitor compliance with this act." One unit of credit equals one MWh of electricity from a PRESS energy source. Credits shall remain the property of the energy system until the credit is voluntarily transferred.

*Virtual currency* means "a type of digital unit that is used as a medium of exchange or a form of digitally stored value", broadly construed to include a digital unit of exchange that:

- has a centralized repository or administrator;
- is decentralized and has no centralized repository or administrator; or
- may be created or obtained by computing or manufacturing effort.

**Effective Date:**

June 1, 2026. The provisions of section 3(e)(16)(ii) and (18) shall take effect immediately.

**G. Relevant Existing Laws**

## Alternative Energy Portfolio Standards

The Alternative Energy Portfolio Standards Act (Act 213 of 2004) provides for alternative energy standards in Pennsylvania. Currently, the requirements for electricity sold to retail electricity customers in Pennsylvania are as follows:

- 8 percent from Tier I sources, including a .5 percent solar carveout.
- 10 percent from Tier II sources.

Tier I alternative energy sources include energy derived from:

- Solar photovoltaic and solar thermal energy.
- Wind power.
- Low-impact hydropower.
- Geothermal energy.
- Biologically derived methane gas.
- Fuel cells.
- Biomass energy.
- Coal mine methane.

Tier II alternative energy sources include energy derived from:

- Waste coal.
- Distributed generation systems.
- Demand-side management.
- Large-scale hydropower.
- Municipal solid waste.
- By-products of the pulping process and wood manufacturing process, including bark, wood chips, sawdust and lignin in spent pulping liquors.
- Integrated combined coal gasification technology.

## Neighboring States

Pennsylvania's neighbors have the following renewable energy goals:

- Delaware: 40 percent by 2035, with a 10 percent solar carveout.
- Maryland: 50 percent by 2030.
- New Jersey: 50 percent by 2030.
- New York: 70 percent by 2030.
- Ohio: 8.5 percent by 2026.
- West Virginia: In 2015, repealed 25 percent by 2025 standard.

**E. Prior Session** (Previous Bill Numbers & House/Senate Votes)

HB 501 was previously introduced as HB 2277 during the 2023-2024 Legislative Session, but received no further consideration. The following updates are included in this session's version of the bill:

- Updates dates to reflect reintroduction.
- Increases size of facilities that must be located in PA from 150 MW to 250 MW, and allows these facilities to be located within 15 miles of the border.
- Allows energy storage co-located with a Tier 1 energy source to be eligible to receive Tier 2 credits.
    - In order to be eligible, the storage resource would need to deliver 10% nameplate capacity of the energy source every hour for a 24-hour period.
    - *Energy storage resource* is defined to mean "a technology, including any electromechanical, thermal and electromechanical technology, or any technology defined as "energy storage technology" in 26 U.S.C. § 48E (relating to clean electricity investment credit) or 26 CFR 1.48E-2(g)(6) (relating to qualified investments in qualified facilities and EST for purposes of section 48E) as of the effective date of this definition that is capable of absorbing and storing electrical energy for use at a later time."
- Updates phase-in of geographic requirements.
- Requires PUC to adjust alternative compliance payment based on changes to the energy price index.
- Defines *energy price index* to mean "the average of the day-ahead locational marginal prices at the highest PJM Interconnection, L.L.C., pricing node in Pennsylvania for each hour of the three prior years."
- Updates definition of fuel cells to include linear generators.
- Adds definition for *lifecycle greenhouse gas emissions* to reference federal law.
- Updates definition for *geothermal energy*.

This document is a summary of proposed legislation and is prepared only as general information for use by the Democratic Members and Staff of the Pennsylvania House of Representatives.The document does not represent the legislative intent of the Pennsylvania House of Representatives and may not be utilized as such.

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# COMPARISON OF THE IMPACT ON GREENHOUSE GAS EMISSIONS BETWEEN UNABATED COAL REFUSE PILES AND RECLAMATION-TO-ENERGY POWER PLANTS

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**Report No. 23-400-01-02**

**EXECUTIVE SUMMARY**

Coal refuse is a legacy of earlier mining in the U.S. Coal refuse is a mixture of low-quality coal and rock that was discarded during the extraction of higher quality coal. A significant amount of this refuse has been deposited in piles that spread across the Appalachian region and are a hazard to the environment. The piles leach acid mine water into Pennsylvania and West Virginia waterways and can also spontaneously combust releasing greenhouse gas (GHG) emissions into the air without proper emission controls. A 2020 inventory of refuse piles kept by the Pennsylvania Department of Environmental Protection (DEP) identified 840 piles throughout Pennsylvania, which are estimated to consist of nearly 443.9 million metric tons of coal refuse, covering approximately 18,170 acres. It has been estimated by the Pennsylvania DEP's Bureau of Abandoned Mine Reclamation (BAMR) that the total cost of coal refuse reclamation would be about $16.1 billion in Pennsylvania alone. One option for abatement of coal refuse piles is "reclamation-to-energy" (RTE) of the waste material in circulating fluidized bed power plants. This option, aligned after the Public Utility Regulatory Policies Act (PURPA) of 1978, has been capable of disposing a total of over 230 million tons of coal refuse and reclaiming more than 7,000 acres of abandoned mine land (AML) in Pennsylvania alone since the startup of these plants. These plants serve the double purpose of processing historic mining waste and cleaning up AML, while producing power.

The combustion process that takes place in these RTE units is of concern in regard to the GHG emissions associated with these plants. However, there are a number of reports that have documented the GHG emissions footprint of coal refuse pile spontaneous combustion, diffused over a large "ill-defined" area and from different vents and fissures in the pile. There are documented specific mass emissions and emission factors for GHG from burning coal refuse piles, impoundments, abandoned mines and outcrops. Calculations were carried out to obtain a comparative assessment on the impact on GHG emissions from unabated coal refuse pile fires vs. the RTE option in the Appalachian region. GHG emissions estimations were carried out for equivalent coal volumes processed by the RTE industry in Pennsylvania and West Virginia in 2019, which if not burned will remain scattered in piles around former coal mine sites, representing a risk to vegetative life and negatively impact human health. Four emissions factors were used in combination with the particular reference case, which is the amount of coal refuse processed by the RTE plants in 2019. Depending on the emission factors selected, the expected GHG emissions equivalent ($CO_{2,eq}$) from unremedied waste piles range from 13,662,919 to 36,239,374 tons for 2019 (see table below). This compares to the corresponding $CO_{2,eq}$ emissions reported by the RTE stations in the region in 2019 at 7,128,113 tons, at a rate of GHG reduction per ton of coal refuse reclaimed by RTE of 1.27 tons $CO_{2,eq}$/ton coal refuse. Thus, each ton of coal refuse is expected to produce GHG emissions between 2.43 and 6.44 tons $CO_{2,eq}$ with a net reduction of between 1.16 and 5.17 tons CO2,eq per ton of coal refuse reclaimed by the coal refuse RTE industry. The calculations suggest that coal refuse pile GHG emissions exceed by a factor that can be between 1.9 to 5.1 larger than the corresponding emissions if burned under controlled conditions in the RTE units. Based upon the four emissions factors used in this study, when the full emissions profile of the coal refuse RTE industry is considered, including the reduction of emissions from reclamation of coal refuse piles, the coal refuse RTE industry produces a net reduction in GHG emissions. For a 20-year global warming potential (GWP) cycle, the total offset amount of carbon dioxide equivalent ($CO_{2,eq}$) is of the order of 0.13 to 0.58 billion tons.

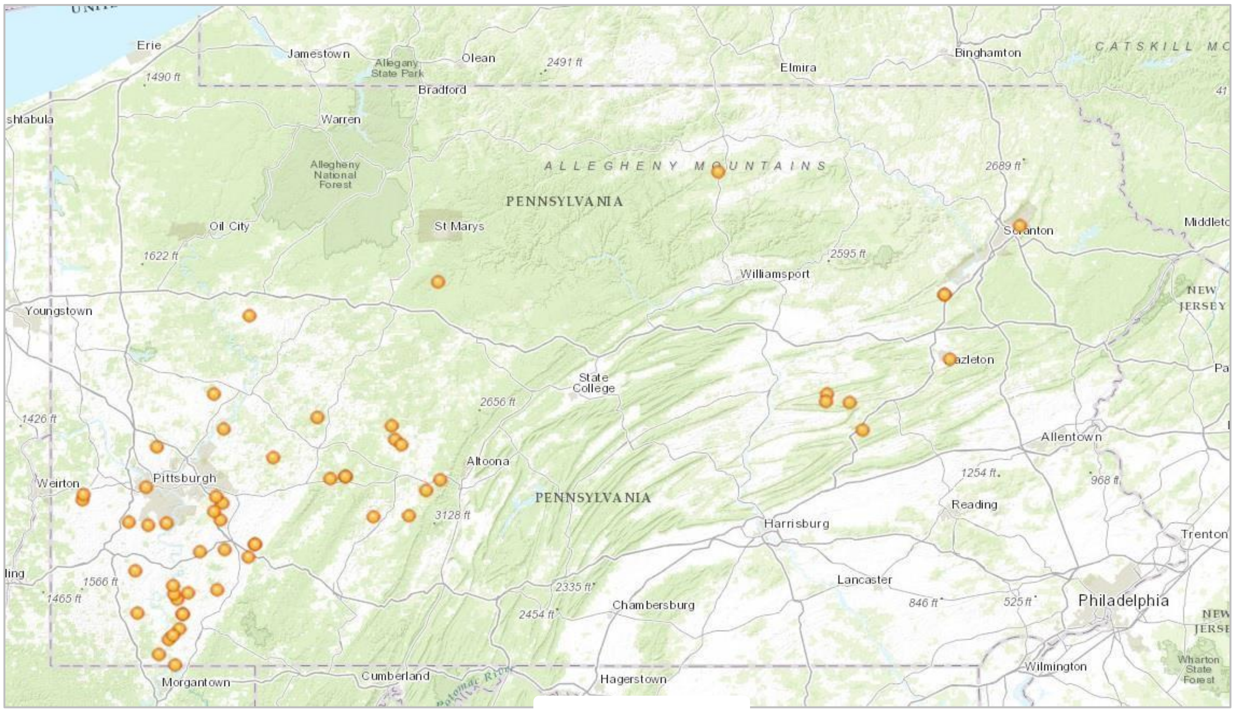
**Comparative Estimate of GHG Emissions from Coal Pile Refuse and RTE Reclamation**

| | CO2 Emissions Factor [kg/t coal] | CH4 Emissions Factor [kg/t coal] | Coal Processed by RTE 2019 [t] | CO2 Emissions [t] | CH4 Emissions [t] | CO2,eq Emissions [t] |
|---|---|---|---|---|---|---|
| Reference 20 | 1,300 | 180 | 5,627,232 | 7,315,402 | 1,012,902 | 35,676,651 |
| Reference 21 | 1,952 | 17 | 5,627,232 | 10,984,357 | 95,663 | 13,662,919 |
| Reference 25 | 2,520 | 101 | 5,627,232 | 14,180,625 | 566,475 | 30,041,916 |
| Reference 28 | 3,500 | 105 | 5,627,232 | 19,695,312 | 590,859 | 36,239,374 |

## BACKGROUND

One important issue related to coal production is coal waste and its remediation. Pennsylvania and West Virginia have been the largest coal-producing states in the nation, after only Wyoming, with still substantial reserves of bituminous coal. Additionally, northeastern Pennsylvania has almost all the nation's anthracite coal reserves and production. In regard to active coal production, the number of coal mines and amount of coal production in Pennsylvania has declined over the years due to the impact of coal conversion on air emissions and climate, and associated coal-fired power plant closures and reduced international coal demand. In 2021, the state's coal production increased by 17%, as demand from the electric power sector increased as a result of higher natural gas prices [1,2]. However, one issue related to coal production is coal waste or refuse, the material left over from mining, which typically represents 40% of the total mined material. Legacy coal refuse consists of low-quality coal mixed with rock, shale, slate, and clay. The refuse materials vary from coarse fragments removed by physical screening to very fine materials removed by flotation and density separation processes.

This coal refuse has been sitting in piles for decades, spread across the Appalachian region on thousands of acres of both permitted and abandoned mine lands (AML), with the associated environmental risk that toxic metals in it can leach out of the piles and drain into surface water streams and contaminate ground water resources. Bituminous piles in particular can leach highly concentrated acid mine drainage (AMD) with acidity values in the thousands of milligrams/liter (mg/L). Refuse piles can also be barren, erosive, produce particulate matter (PM) emissions due to downwind effect, and lead to catastrophic failures impacting nearby communities due to structural instabilities. However, one additional and very important detrimental impact of coal refuse piles is oxidation and spontaneous combustion, which can lead to many of the same types of gaseous emissions that arise from coal combustion in power plants but, since there are no control technologies in place in comparison to highly pollution-controlled power plants, the emission factors are generally higher for spontaneous combustion. The emissions of most concern nowadays are the greenhouse gases (GHG's), carbon dioxide ($CO_2$) and methane ($CH_4$). Carbon monoxide (CO), sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), and mercury and other toxic substances are also of concern. This is not a problem unique to Pennsylvania, neighboring West Virginia, and much of the eastern United States. Spontaneous coal and coal refuse combustion is a significant global problem. It is estimated that the global mass of coal burnt in coal seam and coal waste stockpile fires could vary considerably from 0.5% to 10% of annual global coal production [3]. In Pennsylvania, the Department of Environmental Protection (DEP) reported a total of 52 coal refuse pile fires in 2016 [4]. Figure 1 illustrates the locations of coal refuse pile fires in the state in 2005, connected with the coal geological locations.




Source BAMR (2005)

**Figure 1: Sites of Burning Coal Refuse Piles in Pennsylvania [4]**

While present-day mine sites in Pennsylvania are occasionally abandoned, the Pennsylvania DEP has well-established programs in place to reclaim those sites. However, much of the vast AML problem from pre-1977 mining (in 1977 the federal government enacted the federal Surface Mining Control and Reclamation Act (SMCRA)) still remains. The main reason is the process of reclaiming these piles using conventional environmentally-sound techniques is cost-prohibitive. It requires site stabilization and refuse treatment, land planting and maintenance of a viable plant coverage, and addressing water pollution. Establishment and maintenance of permanent vegetation on refuse is complicated by physical, mineralogical, and chemical factors. As an example, the Simpson Northeast coal refuse bank fire and reclamation project in 2014 cost $2,180,130 for a project area of 17.6 acres, as reported by the Pennsylvania DEP's Bureau of Abandoned Mine Reclamation (BAMR) [5]. It has been estimated by the BAMR that the total cost of coal refuse reclamation would be about $16.1 billion in Pennsylvania alone [4]. There are more than 5,000 abandoned, unreclaimed mine problem areas encompassing more than 185,000 acres in Pennsylvania alone, according to the BAMR. A 2020 inventory of refuse piles kept by the Commonwealth's DEP (which is acknowledged to be noncomprehensive) identified 840 piles throughout Pennsylvania (excluding completed reclamation), which are estimated to consist of nearly 443.9 million tons (*metric ton - equal to 1000 kg - is used in this report, represented by tons or "t"*) of coal refuse and to cover 18,170 acres, equivalent to about 403.6 million cubic yards (308.5 million $m^3$) [4,6,7,8].

Different programs have been funded to address the Appalachian region's AML problem. In Pennsylvania, this includes the Operation Scarlift Program that included mine fire suppression and surface subsidence, and the Growing Greener Program which funds projects that use passive treatment technologies to clean up abandoned mine discharges. However, one option that has provided consistent results to solve the coal refuse accumulation problem is based on the fuel value of the material. Despite its low quality as a fuel, coal refuse has an associated calorific value (since its heating value is about 60% that of coal) that would make it still suited for a disposal solution that involves combustion of the waste material. About 75% of the finer material in refuse coal can be used in fluidized and circulating fluidized bed combustion (FBC and CFB) boilers for power generation. These FBC and CFB boilers are capable of serving a critical environmental mission in the sense that become reclamation power plants, processing historic mining waste to produce power and clean up AML sites. FBC units are environmentally compliant due to its particular design and air pollution control (APC) technology incorporated with the boilers. This includes limestone and amine-based reagent injection for $SO_2$ and $NO_x$ emissions control, respectively, as well as cyclones and fabric filters for PM control. Additionally, FBC units use Maximum Achievable Control Technology (MACT) to mitigate the impact of coal refuse burning on air toxics, such as mercury, and acid gases, such as hydrogen chloride (HCl). Aligned after the Public Utility Regulatory Policies Act (PURPA) of 1978, there have been 15 plants in Pennsylvania, two in West Virginia and one in Virginia over the last three decades capable of coal waste firing, solely or in combination with high-quality coal or other feedstock, like biomass, representing about 2,400 megawatts of electric power capacity ($MW_e$) (see Figure 2 corresponding to the plants in Pennsylvania alone). These plants have been capable of disposing a total of over 230 million tons of coal refuse and reclaiming more than 7,000 acres of AML in Pennsylvania alone since the startup of these plants and represent a "reclamation-to-energy" (RTE) option for abatement of coal refuse piles [8].

In Pennsylvania, 10% of the energy is required to come from the Tier II sources under the Alternative Energy Portfolio Standards Act of 2004, which supports operation of these coal refuse burning plants to promote remediation of coal waste piles. Pennsylvania's Alternative Energy Portfolio Standards (AEPS) program includes waste coal in its "Tier II" category under which facilities collectively received over $2.5 million in subsidies in 2018. Pennsylvania's Coal

Refuse Energy and Reclamation Tax Credit also provides up to $20 million in annual subsidies until 2036 [9].

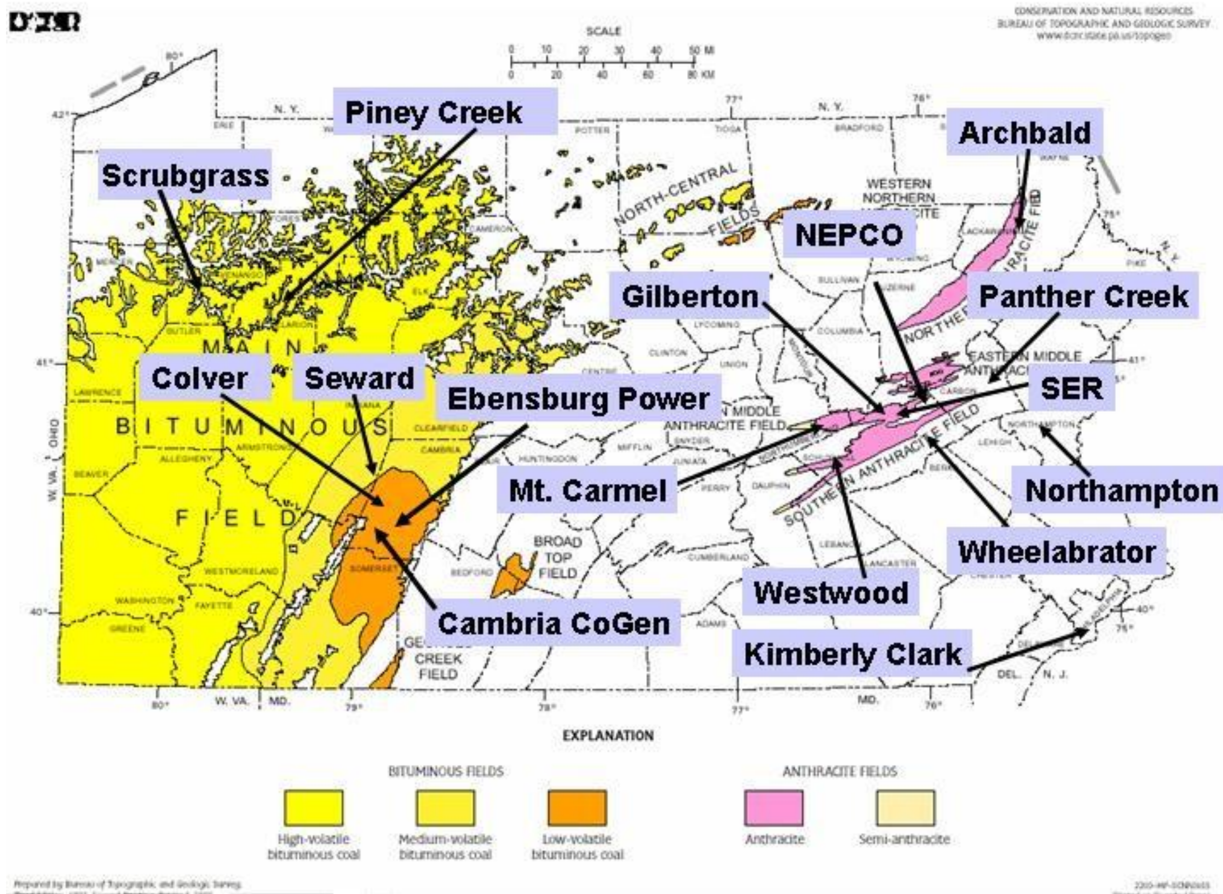



**Figure 2: Distribution of FBC Power Plants in Pennsylvania [5]**

A 2019 inventory of 14 FBC plants in the U.S. indicates that the range in capacity is between 33 and 525 $MW_e$. Currently, there only 11 coal waste reclamation plants in the Appalachian region, 10 in Pennsylvania and one in West Virginia. There is also one hybrid remediation facility in Virginia, the Virginia City Hybrid Energy Center. Based on an inventory of data provided by the Appalachian Region Independent Power Producers Association (ARIPPA) from plants in this region, these coal waste reclamation plants are estimated to consume a total between 5.5 and 9.1 million tons (5,610 short tons) of coal refuse annually (the 9.1 million figure corresponds to the 2010-2014 high electrical power generation period). These plants were reported to operate in 2019 at an average capacity factor of 42% (total 5.85 GWh produced) and average heat rates of about 14,946 kJ/kWh (14,166 Btu/kWh). These plants produced in 2019 approximately 4.55 million tons of ash [8,9]. An additional benefit of current coal refuse processing by FBC plants is the production of highly alkaline ash, which meets state defined beneficial use criteria and has been demonstrated to provide a successful reclamation media for restoration of polluted AML sites.

This report provides a discussion and comparative estimate of the impact on climate change from unabated coal refuse piles vs. disposal of the waste coal in RTE power plants. Appalachian region reclamation plants were targeted. The discussion is based on $CO_2$ and $CH_4$ only, since according to the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, only $CO_2$/$CH_4$ emissions from 'uncontrolled combustion' in coal should be reported in the sub-category 1.B.1.b. – 'Uncontrolled Combustion, and Burning Coal Dumps' (http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html).

## COAL REFUSE GREENHOUSE GAS EMISSIONS ESTIMATION

Although there is a wealth of data on stack emissions from power plants, less consideration has been given to gaseous emissions from coal refuse stockpiles. A good deal of knowledge of gaseous emissions from coal refuse piles has been learned from coal piles. Piled coal refuse undergoes low temperature atmospheric oxidation (known as weathering) during storage in open air. If heat dissipation is insufficient, subsequent autogenous heating of the stored coal will occur. As the temperature in the coal refuse pile increases due to oxidation, gas desorption happens. It is well known that $CO_2$ and $CH_4$, with traces of CO and sulfuric gases, are the main degassed compounds [10]. Together with gas desorption, increased rates of oxidation (the rate of oxidation roughly doubles with an increase of 10°C in ambient temperature) will yield additional and uncontrolled gas emissions and potentially spontaneous combustion [10]. The initial weathering stages involve physical adsorption and chemical absorption of atmospheric oxygen. The next stage is the formation of surface oxide which then decomposes to produce low molecular gases. A parallel reaction occurs during coal refuse oxidation at low temperatures – direct burn-off. The burn-off reaction sequence is suggested to be similar to the direct combustion reactions of solid fuel resulting in the direct formation of additional gaseous products, including CO, $CO_2$ and water [11]. Oxidation of pyritic impurities in coal refuse piles is another supplementary factor that enhances coal combustion. Oxidation of pyrite is a highly exothermic reaction that increases the temperature of the coal and thus enhances its rate of oxidation. This process requires the presence of moisture to proceed. High concentrations of CO and $CO_2$ (~6%) have been reported from coal pile oxidation at a depth of 1.5 m within a stockpile and a dangerous level of CO (400–600 $ppm_v$) above the stockpile (1 m) [12]. Emissions of $CH_4$ have been reported from coal stockpiles weathering, exceeding 75,000 parts per million (ppm) at depths as deep as 4 m [13]. Despite the importance of coal weathering in coal pile combustion, data have suggested that only around 14% of the total GHG emissions (expressed as equivalent $CO_2$, $CO_{2,eq}$) from coal and coal refuse pile fires arise from waste coal oxidation, which was assumed to include some combustion [14]. Due to this low contribution from coal weathering, this contribution was not considered in the estimates of GHG emissions from coal refuse pile fires.

Materials such as coal refuse, which are prone to spontaneous combustion, have a critical temperature of self-heating (SHT). If the temperature of the waste coal in a pile reaches the SHT before any equilibrium is attained (through dissipation of heat) then the oxidation accelerates until combustion occurs. It is not just exposure to air that can cause spontaneous combustion, as water can also have a drastic effect on coal refuse pile combustion. Water will, at first, cause the waste coal to swell as it is absorbed and then shrink as the water evaporates. This exposes more waste coal surface area as the waste coal structure changes and can lead to higher rates of oxidation, self-heating and combustion. Combustion will occur anywhere between 110 and 170°C, and flames will appear around 200°C, with $CH_4$ released at about 240°C [15]. It is generally accepted that lower rank coals and their refuse are more prone to spontaneous combustion than higher rank coals.

Quantifying spontaneous combustion emissions of coal refuse piles is difficult due to the mechanisms that participate in the process, including convective transport through vents and other surface openings and diffusion through the pile material and overburden (see Figure 3) [16]. Figure 3 illustrates the spontaneous combustion emissions resulting from a coal seam; however, the process is similar for coal and coal refuse piles. A study verified that the ratio of the surface to the volume of a coal pile, including coal refuse piles, is one of the main key factors for spontaneous combustion [17]. Unlike stack emissions, emissions from coal refuse pile spontaneous combustion are often diffused over a large “ill-defined” area and from different sources (vents and fissures) in the pile. This makes measurement of all coal refuse pile combustion emissions difficult to measure, requiring selection of sampling points and areas to provide an overall representative indication of the emissions across the burning site.

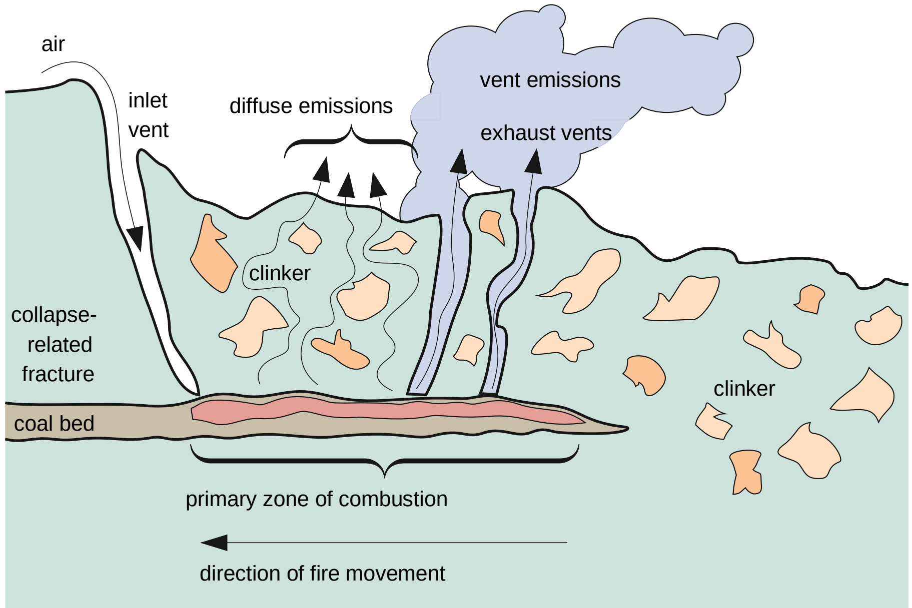



**Figure 3: Conceptual Model of Spontaneous Combustion from Coal Piles [16]**

For sources such as coal-fired power plants, the methods used for reporting emissions to inventories are specified in standards. However, there are no known national or international methods prescribed for quantifying emissions from spontaneous combustion. This is complicated by the fact that coal pile fires are sporadic, not evenly distributed and often underground. Two options are available to quantify GHG emissions from coal pile fires; viz, measurements from site mapping or remote sensing in order to obtain a representative distribution of sampling sites across the entire affected area; or simpler empirical approaches for obtaining pollutant emission rates from spontaneous combustion, where the chemical characteristics of the coal, such as the carbon content, are used to estimate the formation of GHG's.

There are a number of reports that provide site-specific measurement data on a range of waste coal pile scenarios. These data can be used to create emissions factors for coal pile emissions. For example, measurements from different bituminous waste coal pile scenarios in South Africa - rehabilitated pile not on fire, burnt pile and smoking pile-, under different wind conditions, showed $CO_2$ fluxes in the range from 0.2 to 321, to 7,393 kg/m$^2$/y, respectively; which, when accounted for the specific pile area resulted in $CO_2$ emissions from 7 up to 633,915 t/y. The apparent standard deviation of the data was put at ±20% [18]. Another study of $CO_2$ fluxes from the Mulga gob (bituminous coal refuse piles are named gob, while anthracite coal refuse piles are referred as culm) fired in northern Alabama resulted in $CO_2$ fluxes between 876 and 1,606 kg/m$^2$/y, and total $CO_2$ emissions for the 21.5 acres studied at 76,650-137,970 t/y [19].

Temperature measurements showed localized hot spots in the Mulga coal fire, some of which exceed 300°C. When an average emission rate per unit area (approximately 3,800 kg/m$^2$/y) is put in context with respect to the potential acreage that can be subject to spontaneous combustion (18,170 acres of coal refuse in Pennsylvania alone), this gives approximately 280 million t/y of $CO_2$ emissions solely. For comparison, a 500 MW coal-fired power plant can emit around 10,000 t/d (1.8 t/y at a capacity factor of 0.5) of $CO_2$. Power plants would have a capacity factor, while the coal pile fire could burn the entire year. Some of the variability in emissions reported is due to 'breathing cycles' which vary from seconds to minutes, and also coal fire dynamics which vary with the coal and rock within the pile combustion zone. This would include the suppression of fire by waste rock. There is also variability of measurements over time between vents. For example, at one site in the U.S. the $CO_2$ flux varied from 50,458 to over 2,775,168 kg/m$^2$/y, meaning the variability between vents in this one location was over two orders of magnitude [16].

There are also a number of references that report simplistic ways of estimating potential GHG emissions from coal refuse pile spontaneous combustion. For example, they assume that all the carbon in the coal is combusted and multiply this by an assumed amount of coal consumed. However, the kinetics of coal combustion dictate the rate of reactions in the pile, and the degree of full combustion of all carbon (C) in the pile may not be complete, with subsequent partial GHG emissions. One of these simplified approaches exemplifies that incomplete combustion of 1,000 kg of coal with 750 kg of C leads to 1.3 tons (1,300 kg/t) of $CO_2$, and 0.18 tons (180 kg/t) of $CH_4$. It further utilizes a 21:1 $CH_4/CO_2$ greenhouse impact in the atmosphere to provide an emissions factor of 5,100 kg $CO_2$ equivalent ($CO_{2,eq}$) per ton of coal for pile spontaneous combustion [20]. Another similar approach that utilizes a 225:2 molar ratio of GHG ($CO_2$:$CH_4$) and an average carbon content of 54% resulted in 1,952 kg/t for $CO_2$ and 6.2 kg/t for $CH_4$, with a 2,085 kg $CO_{2,eq}$ per ton of coal [21].

Other sources have published results of methods used to establish emissions factors for several broad categories of coal fire sites. As early as 1978, the U.S. Environmental Protection Agency (EPA) published mass emissions and emission factors for a range of pollutants, including $CH_4$ for burning coal refuse piles, impoundments, abandoned mines and outcrops (see Table 1) [22]. The Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia provided emissions factors for sites with obvious combustion and gas venting, sites with combustion but no venting and sites where there is no visible combustion. The GHG emissions factors given for those scenarios are: 29,518, 552 and 107 kg/m$^2$/y for $CO_2$, respectively; and 492, 95 and 0 kg/m$^2$/y for $CH_4$. The coal for these factors was reported to have a total carbon content of 80% [23]. Additionally, a 2015 publication reports emissions characteristics and emission factors for estimation of GHG emissions (in g/t/s, where t is the GHG emission time (in seconds)) from spontaneous coal combustion in China for two types of patterns, spontaneous coal combustion involving mining activities (air leakage patterns called "Pattern A") and coal-gangue-dump spontaneous combustion, coal-piles spontaneous combustion and unexploited-crop spontaneous combustion, which are simply caused by surface wind leakage (air leakage patterns are called "Pattern B") [24]. Values are given for three temperature ranges representative of different stages in the combustion process. Table 2 includes lower, upper, mean and standard deviation of these emissions factors for different combustion stages (corresponding to combustion below 200°C, 200 to 450°C, above 450°C, and above 700°C.) The Norwegian Government follows a simple emissions factor, equivalent to 2,520 kg $CO_2$/t coal combusted [25].

TABLE 1. MASS EMISSIONS, NATIONAL BURDEN, SOURCE SEVERITY AND AFFECTED POPULATION FOR EMISSIONS FROM COAL REFUSE PILES

| Pollutant | Emission factor, kg/hr per metric ton of burning refuse | Representative source emissions, kg/yr | U.S. emissions, metric tons/yr | National burden, % | Source severity | Affected population, persons |
|---|---|---|---|---|---|---|
| Total particulates | $3.4 \times 10^{-7}$ | 1,600 | 190 | 0.001 | 0.0003 | 0 |
| Nitrogen oxides | $6.7 \times 10^{-5}$ | $3.1 \times 10^{5}$ | $3.4 \times 10^{4}$ | 0.16 | 0.18 | 1,000 |
| Sulfur oxides | $7.4 \times 10^{-5}$ | $3.4 \times 10^{5}$ | $3.9 \times 10^{4}$ | 0.14 | 0.05 | 0 |
| Hydrocarbon as $CH_4$ equivalents | $6.7 \times 10^{-5}$ | $3.1 \times 10^{5}$ | $3.4 \times 10^{4}$ | 0.14 | 0.15 | 180 |
| Carbon monoxide | $8.7 \times 10^{-3}$ | $4.1 \times 10^{7}$ | $4.5 \times 10^{6}$ | 4.9 | 0.09 | 0 |
| Hydrogen sulfide | $3.0 \times 10^{-4}$ | $1.4 \times 10^{6}$ | $1.6 \times 10^{5}$ | | 1.5 | 6,700 |
| Ammonia | $4.3 \times 10^{-5}$ | $2.0 \times 10^{5}$ | $2.3 \times 10^{4}$ | | 0.0009 | 0 |
| Mercury | $4.6 \times 10^{-9}$ | 21 | | | 0.01 | 0 |
| Polycyclic organic materials | $1.3 \times 10^{-8}$ | 59 | | | 0.92 | 3,900 |

Note.—Blanks indicate that values are negligible.

**Table 2: GHG Emission Factors Caused by Spontaneous Coal Combustion during Different Combustion Stages**

| | $CO_2$ (g/(t s)) | | | | $CH_4$ (g/(t s)) | | | |
|---|---|---|---|---|---|---|---|---|
| emission factor | mean value | lower | upper | standard deviation | mean value | lower | upper | standard deviation |
| | | | | <200°C | | | | |
| Pattern A | 0.014263 | 0.008500 | 0.022376 | 0.012478 | 0.000989 | 0.000062 | 0.001929 | 0.001509 |
| Pattern B | 0.008206 | 0.006187 | 0.010933 | 0.004177 | 0.000406 | 0.000044 | 0.000876 | 0.000676 |
| | | | | 200−400°C | | | | |
| Pattern A | 0.127233 | 0.034156 | 0.267184 | 0.220010 | 0.006146 | 0.001096 | 0.011970 | 0.009126 |
| Pattern B | 0.025322 | 0.013544 | 0.041629 | 0.023164 | 0.002556 | 0.000216 | 0.005875 | 0.004654 |
| | | | | 400−600°C | | | | |
| Pattern A | 0.555238 | 0.273733 | 0.974278 | 0.568106 | 0.009371 | 0.005551 | 0.013559 | 0.007022 |
| Pattern B | 0.210990 | 0.123727 | 0.308782 | 0.164346 | 0.004812 | 0.001738 | 0.009092 | 0.006476 |
| | | | | ≥600°C | | | | |
| Pattern A | 1.506458 | 1.024472 | 2.114004 | 0.887533 | 0.085777 | 0.060633 | 0.107708 | 0.039530 |
| Pattern B | 0.980497 | 0.691468 | 1.330751 | 0.552235 | 0.045193 | 0.031844 | 0.056829 | 0.021701 |

## RESULTS AND DISCUSSION

Calculations were carried out to obtain a comparative assessment on the impact on GHG emissions from unabated coal refuse pile fires vs. the RTE option in the Appalachian region. RTE plants are under constant scrutiny and pressure due to their tax status and subsidies, power sale competition and environmental performance. Environmental regulations factor in the negative environmental externalities of coal refuse plants; however, they do not consider the AML remediation aspect of these plants, subjecting the industry to an unbalanced regulatory environment. At the core of the regulatory challenges for coal refuse plants is the EPA policy that emissions standards consider only the impact of plant emissions on the environment and health, while disregarding the primary function of these plants, which is beneficiation of coal refuse piles and the associated environmental benefit of pile combustion reductions. Historically, the EPA has acknowledged the environmental benefits of coal refuse-fired plants. In 2011, the EPA reported that “units that burn coal refuse provide multimedia environmental benefits by combining the production of energy with the removal of coal refuse piles and by reclaiming land for productive use.” It also acknowledged that coal refuse burning facilities equipped with circulating fluidized beds (CFBs) meet comparable air emissions targets than most existing pulverized boilers and argued that “because of the unique environmental benefits that coal refuse-fired electric generating units (EGU’s) provide these units warrant special consideration.” However, a subcategory for coal refuse plants does not exist, and they are treated within the same category and standards as conventional coal-fired units [26].

Tables 3 and 4 include data from ARIPPA (transcribed from EPA's Compliance Assurance Monitoring (CAM) inventory) for coal refuse consumption and $CO_2$ emissions in tons for selected available years from 2010 to 2020 [8]. Eleven stations are reported, corresponding to Colver Green Energy, Ebensburg Power Company, Gilberton Power Company, Mt. Carmel Cogen, Northampton Generating Company, Panther Creek Power Operating, Westwood Generation, Schuylkill Energy Resources, Scrubgrass Generating Company and Seward Generation in Pennsylvania, plus Grant Town in West Virginia. The average annual processed refuse coal by all these stations is 7,009,970 tons (ranges from about 5.5 to 9.1 million tons of coal refuse). The average $CO_2$ emissions tonnage is 8,949,666 (ranges from about 6.8 to 11.6 million tons). This represents an average emissions factor of 1,277 kg $CO_2$ per ton of coal refuse burned by the RTE power plants in the Appalachian region.

**Table 3: Coal Refuse Consumption by RTE Plants in Pennsylvania and West Virginia for Selected Years**

| Plant | 2010 | 2012 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Colver Green Energy | 748,094 | 610,361 | 629,004 | 617,146 | 536,867 | 573,999 | 596,392 | 592,514 | 388,966 |
| Ebensburg Power Company | 494,707 | 502,197 | 427,654 | 238,675 | 250,711 | 281,681 | 384,315 | 290,967 | 327,397 |
| Gilberton Power Company | 556,832 | 410,026 | 609,378 | 613,437 | 601,949 | 586,437 | 656,697 | 648,655 | 676,295 |
| Mt. Carmel Cogen | 413,754 | 523,781 | 541,066 | 559,590 | 546,535 | 565,804 | 524,318 | 177,876 | 88,998 |
| Northampton Generating Company | 511,697 | 602,157 | 480,069 | 315,950 | 197,215 | 176,476 | 175,253 | 113,409 | 7,068 |
| Panther Creek Power Operating | 626,410 | 622,799 | 577,953 | 478,182 | 130,290 | 90,195 | 145,145 | 101,419 | 58,358 |
| Westwood Generation | 317,499 | 327,945 | 358,362 | 343,479 | 95,576 | 36,409 | 335,289 | 226,938 | 329,154 |
| Schuylkill Energy Resources | 1,144,273 | 1,361,596 | 1,328,023 | 1,258,446 | 1,340,829 | 1,269,238 | 1,387,820 | 1,185,422 | 1,231,504 |
| Scrubgrass Generating Company | 606,349 | 606,486 | 415,387 | 267,940 | 399,632 | 446,918 | 469,098 | 349,290 | 13,619 |
| Seward Generation | 3,209,684 | 1,567,190 | 2,443,146 | 1,495,538 | 2,203,292 | 1,999,982 | 1,908,056 | 1,450,490 | 1,910,629 |
| Grant Town Power Plant, VW | 416,728 | 551,160 | 434,084 | 434,050 | 419,030 | 521,950 | 523,592 | 490,253 | 455,235 |
| **Industry Total** | 9,046,027 | 7,685,696 | 8,244,126 | 6,622,431 | 6,721,926 | 6,549,089 | 7,105,976 | 5,627,232 | 5,487,224 |

**Table 4: $CO_2$ Emissions from RTE Plants in Pennsylvania and West Virginia for Selected Years**

| Plant | 2010 | 2012 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Colver Green Energy | 942,962 | 967,531 | 1,041,234 | 1,038,955 | 907,763 | 975,334 | 993,160 | 920,699 | 602,775 |
| Ebensburg Power Company | 611,693 | 592,246 | 565,559 | 310,163 | 329,222 | 419,572 | 548,322 | 391,372 | 469,822 |
| Gilberton Power Company | 795,228 | 570,622 | 835,445 | 887,097 | 962,144 | 913,441 | 874,019 | 882,688 | 897,178 |
| Mt. Carmel Cogen | 505,555 | 470,804 | 488,427 | 489,637 | 517,125 | 517,821 | 478,559 | 156,486 | 82,699 |
| Northampton Generating Company | 936,642 | 946,095 | 832,462 | 574,102 | 343,885 | 287,081 | 270,247 | 202,048 | 12,599 |
| Panther Creek Power Operating | 931,469 | 901,835 | 879,383 | 711,547 | 185,668 | 112,383 | 201,920 | 127,885 | 64,506 |
| Westwood Generation | 320,236 | 334,816 | 381,582 | 360,042 | 100,370 | 41,749 | 386,864 | 225,344 | 316,480 |
| Schuylkill Energy Resources | 1,088,633 | 1,231,338 | 1,166,993 | 1,149,145 | 1,158,965 | 1,081,351 | 1,195,451 | 1,126,431 | 1,140,077 |
| Scrubgrass Generating Company | 1,012,118 | 944,754 | 683,518 | 385,776 | 709,989 | 661,183 | 610,827 | 367,813 | 11,497 |
| Seward Generation | 3,748,835 | 1,935,319 | 2,647,888 | 1,761,841 | 2,840,036 | 2,532,856 | 2,609,007 | 1,900,603 | 2,459,035 |
| Grant Town Power Plant, VW | 721,797 | 907,737 | 831,796 | 744,538 | 917,535 | 874,633 | 859,231 | 829,928 | 755,922 |
| **Industry Total** | 11,615,168 | 9,803,098 | 10,354,286 | 8,412,842 | 8,972,701 | 8,417,405 | 9,027,608 | 7,131,296 | 6,812,590 |

For the particular estimations used for comparison of the GHG footprint of both RTE and uncontrolled, unregulated coal refuse pile fires, the 2019 EGrid ARIPPA database was utilized [8]. This year contains GHG data fully documented for 13 FBC plants, including Grant Town

Power Plant in West Virginia. However, only the 11 plants for which coal refuse data is available, as included in Table 3, was used. Detailed performance and emissions data for these plants is included in Table 5. As the data in Table 5 indicate, the reported GHG tonnage for 2019 for all these plants is 7,759,289 for $CO_2$, 836 for $CH_4$ and 126 for nitrous oxide ($N_2O$). In order to estimate the level of $CO_{2,eq}$ for the GHG's, a factor of 28 was used for $CH_4$. Methane is a powerful greenhouse gas with a 100-year global warming potential 28-34 times that of $CO_2$. Measured over a 20-year period, that ratio grows to 84-86 times. The lowest intensity factor was used since it is more aligned with estimations in the environmental community. Releasing 1 kg of $N_2O$ into the atmosphere is about equivalent to releasing roughly 298 kg of $CO_2$. Nitrous oxide persists in the atmosphere for more than a century. Its 20-year and 100-year GWP are basically the same. The $CO_{2,eq}$ for the combined $CO_2$ plus $CH_4$ effect is 7,782,687 tons. When the impact from $N_2O$ is included, the $CO_{2,eq}$ reaches a level of 7,820,176 tons. However, the impact of $N_2O$ was not included in the comparison due to lack of $N_2O$ emission factors for coal refuse pile spontaneous combustion.

**Table 5: 2019 Performance and Emissions Data for RTE Plants in Pennsylvania**

| Plant name | Data Year | State | Plant primary fuel | Plant capacity factor | Plant nameplate capacity (MW) | Plant annual heat input from combustion (MMBtu) | Plant total annual heat input (MMBtu) | Plant annual net generation (MWh) | Plant nominal heat rate (Btu/kWh) | Estimated CO2 (tons) | Estimated CH4 (tons) | Estimated N2O (tons) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cambria Cogen | 2019 | PA | WC | 0.1283 | 98.0 | 1,176,099 | 1,176,099 | 110,109 | 10,681 | 118,214 | 11.7 | 1.6 |
| Colver Green Energy | 2019 | PA | WC | 0.7417 | 118.0 | 9,721,258 | 9,721,258 | 766,678 | 12,680 | 928,541 | 97.0 | 13.2 |
| Ebensburg Power Company | 2019 | PA | WC | 0.4673 | 57.6 | 3,250,711 | 3,250,711 | 235,779 | 13,787 | 321,367 | 35.4 | 5.9 |
| Gilberton Power Company | 2019 | PA | WC | 0.8062 | 88.4 | 8,081,620 | 8,081,620 | 624,307 | 12,945 | 868,287 | 91.6 | 14.7 |
| Mt. Carmel Cogeneration | 2019 | PA | WC | 0.1960 | 47.3 | 1,263,937 | 1,263,937 | 81,195 | 15,567 | 134,962 | 13.2 | 1.7 |
| Northampton Generating Plant | 2019 | PA | WC | 0.1314 | 134.1 | 1,875,877 | 1,875,877 | 154,377 | 12,151 | 201,808 | 26.4 | 3.4 |
| Panther Creek Energy Facility | 2019 | PA | WC | 0.1280 | 94.0 | 1,205,647 | 1,205,647 | 105,383 | 11,441 | 115,159 | 15.9 | 2.2 |
| Scrubgrass Generating Plant | 2019 | PA | WC | 0.2906 | 94.7 | 3,993,649 | 3,993,649 | 241,077 | 16,566 | 367,812 | 39.9 | 5.4 |
| Seward | 2019 | PA | WC | 0.2653 | 803.2 | 20,218,472 | 20,218,472 | 1,866,633 | 10,832 | 1,900,596 | 229.3 | 36.7 |
| St. Nicholas Cogeneration Project | 2019 | PA | WC | 0.6910 | 99.2 | 10,009,713 | 10,009,713 | 600,494 | 16,669 | 1,074,791 | 95.3 | 13.6 |
| Wheelabrator Frackville Energy | 2019 | PA | WC | 0.8046 | 48.0 | 5,246,368 | 5,246,368 | 338,306 | 15,508 | 534,433 | 57.1 | 9.5 |
| WPS Westwood Generation, LLC | 2019 | PA | WC | 0.4039 | 36.0 | 2,602,120 | 2,602,120 | 127,388 | 20,427 | 278,480 | 24.8 | 3.5 |
| Grant Town Power Plant | 2019 | WV | WC | 0.8533 | 80.0 | 8,916,529 | 8,916,529 | 598,016 | 14,910 | 914,839 | 98.1 | 14.3 |
| | | | | | | | | | TOTAL | 7,759,289 | 836 | 126 |

GHG emissions estimations were then carried out for equivalent coal volumes processed by the RTE industry in Pennsylvania in 2019, which if not burned will remain scattered in piles around former coal mine sites, representing a risk to vegetative life and negatively impact human health. The Pennsylvania DEP has estimated that 6.6 million tons of coal refuse burn each year (2016) in unintended, uncontrolled fires – releasing 9 million tons of $CO_2$ and other regulated air pollutants [4]. The environmental footprint of these fires is hard to quantify precisely since the following factors affect emissions from coal refuse piles: oxygen concentration in the pile, particle size distribution, wind speed, type of coal, moisture content of coal and relative humidity, temperature [22]. From a study of the distribution of coal piles, a representative coal pile has been defined by the EPA as containing 100,000 tons of coal, with an average pile height of 5.8 m, located with an annual wind speed of 10 mph [26]. The EPA has also indicated that a representative burning coal pile/impoundment is defined as one with a volume of 1.7 x $10^6$ $m^3$ and an average in situ dry density of 1.5 $t/m^3$, with about 21% of it burning [27]. If the EPA estimates are used, in combination with Pennsylvania's DEP inventory of refuse piles, there will be 100,000 t/pile x 840 piles x 0.21 burn proportion = 17.6 million tons of coal refuse burned in 2020. This estimate mismatches with the 2016 Pennsylvania estimate of 6.6 million tons of coal refuse burnt in a year. The difference is most likely due to the estimated size of the coal pile by EPA (which was developed in 1978) of 2.55 million ton/pile vs. 0.53 million ton/pile reported by the Pennsylvania DEP's inventory (443.9 million tons/840 piles). These calculations illustrate the difficulty in using emissions factors that include pile dimensions.

In order to compute GHG emission estimates for coal refuse piles, emissions factors were used. As it was previously mentioned, emission factors are typically provided in terms of kg (or mg) or ppm per volume of emitted gas ($m^3$), or per area of land ($m^2$), and may have a time factor associated with them ($kg/m^2$/day or year (assuming a full year of burning)). However, information on pile area is very scarce. For example, it has been suggested to use 3,000 t/$CO_2$ per year for each km of affected land [23]. Other emission factors may be provided in units of kg per hour or year, per ton of burning refuse. These factors require an estimate of coal burn rate and are more appropriate for underground mines. Thus, for estimating emissions from large coal piles this would involve multiplying the emission factor prepared for the coal piles by the size of the stockpile and/or the total activity data or coal burnt. For spontaneous combustion, obtaining the activity data is challenging. Estimating the quantities of coal involved in fires it is not simple. One possible option is to use specific visual assessments, or optical, radar or thermal data of the pile(s) fire/changes.

For this particular study, emissions factors (in kg $CO_2$ or $CH_4$/t coal burnt) were used in combination with the particular reference case, which is the amount of coal refuse processed by the RTE plants in 2019 (5,627,232 tons). Four emissions factors were used from the references identified in this review. A fifth reference (Reference 24) provides a very low emission factor that was considered an outlier. Table 6 includes a summary of the calculations to quantify $CO_2$, $CH_4$ and $CO_{2,eq}$ emissions for the four different emission factors. Depending on the emission factors selected, the expected GHG emissions equivalent from unremedied waste piles in the Appalachian region, for a volume of coal refuse adjusted for 2019 for the 11 RTE units reported in Table 5 would range from 13,662,919 to 36,239,374 tons. This compares to the corresponding

$CO_{2,eq}$ emissions reported by the RTE stations in the region in 2019 at 7,128,113 tons, at a rate of GHG reduction per ton of coal refuse reclaimed by RTE of 1.27 tons $CO_{2,eq}$/ton coal refuse. Thus, each ton of coal refuse is expected to produce GHG emissions between 2.43 and 6.44 tons $CO_{2,eq}$ with a net reduction of between 1.16 and 5.17 tons $CO_{2,eq}$ per ton of coal refuse reclaimed by the coal refuse RTE industry. The calculations suggest that coal refuse pile GHG emissions exceed by a factor that can be between 1.9 to 5.1 larger than the corresponding emissions if burned under controlled conditions in the RTE units. Based upon the four emissions factors used in this study, when the full emissions profile of the coal refuse RTE industry is considered, including the reduction of emissions from reclamation of coal refuse piles, the coal refuse RTE industry produces a net reduction in GHG emissions. For a 20-year GWP cycle, the total offset amount of $CO_{2,eq}$ is of the order of 0.13 to 0.58 billion tons.

**Table 6: Comparative Estimate of GHG Emissions from Coal Pile Refuse and RTE Reclamation**

| | CO2 Emissions Factor [kg/t coal] | CH4 Emissions Factor [kg/t coal] | Coal Processed by RTE 2019 [t] | CO2 Emissions [t] | CH4 Emissions [t] | CO2,eq Emissions [t] |
|---|---|---|---|---|---|---|
| Reference 20 | 1,300 | 180 | 5,627,232 | 7,315,402 | 1,012,902 | 35,676,651 |
| Reference 21 | 1,952 | 17 | 5,627,232 | 10,984,357 | 95,663 | 13,662,919 |
| Reference 25 | 2,520 | 101 | 5,627,232 | 14,180,625 | 566,475 | 30,041,916 |
| Reference 28 | 3,500 | 105 | 5,627,232 | 19,695,312 | 590,859 | 36,239,374 |

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**Testimony of**

**Nathan Houtz**

**Deputy Secretary**

**Office of Active and Abandoned Mine Operations**

**Department of Environmental Protection**

**Before the House Environmental and Natural Resources Protection Committee**

**August 11, 2025**

Good morning, Chair Vitali, Chair Rader, and members of the House Environmental and Natural Resource Protection Committee. My name is Nathan Houtz, and I am the Deputy Secretary for Active and Abandoned Mine Operations with the Department of Environmental Protection. I am here to provide testimony on waste coal, or as we refer to it, coal refuse and the different ways to remediate coal refuse piles in Pennsylvania.

Coal refuse is generally low British thermal units (BTU) waste coal, rock, slurry, and related materials which are separated from coal during the mining, cleaning, and preparation of mined coal. While traditional coal is used in a number of ways including power generation, metallurgical uses, and residential heating, coal refuse is a reject material, and its usefulness is limited. According to the Bureau of Abandoned Mine Reclamation (BAMR) abandoned mine land (AML) inventory, there are approximately 1,036 pre-Act unreclaimed refuse piles in Pennsylvania. Pre-Act refers to those abandoned mine land features that existed prior to the adoption of 1977 Federal Surface Mining Control and Reclamation Act (SMCRA) regulations and are therefore the responsibility of the Commonwealth of Pennsylvania to reclaim.

Below is a breakdown of the number of inventoried pre-Act unreclaimed refuse piles, along with the acres covered by these piles and the estimated tonnage of refuse in these piles for both the anthracite and bituminous coal fields of Pennsylvania:

| **Unreclaimed Refuse Piles in Pennsylvania** | | | |
|---|---|---|---|
| | Count | Acres | Estimated Tons |
| Anthracite | 321 | 4,719 | 111,403,921 |
| Bituminous | 715 | 4,687 | 107,132,610 |
| **Total** | **1,036** | **9,406** | **218,536,531** |

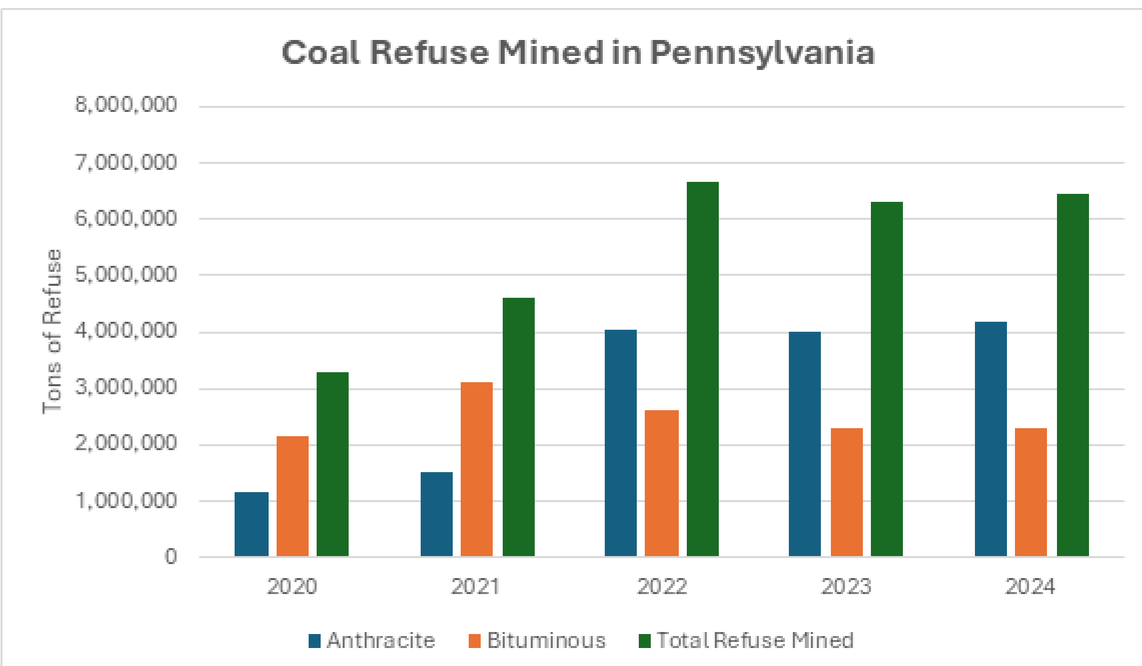
The majority of unreclaimed abandoned mine land features in Pennsylvania are on private property and are not owned by the Commonwealth. With a property owner's consent and Federal approval from the Office of Surface Mining Reclamation and Enforcement (OSMRE), AML Federal funding is utilized to reclaim these features. BAMR utilizes a prioritization scale for reclamation, based on protection of public health and safety. The scale ranges from highest priority, Priority 1 (P1) down to the lowest priority, Priority 3 (P3). Most refuse piles in Pennsylvania fall in the lowest priority, P3 category. The majority of the inventoried unreclaimed P1 and P2 abandoned mine land features are due to mine subsidence from abandoned underground mines and dangerous vertical highwalls left unreclaimed from abandoned surface mines. The reclamation of Priority 1 and 2 abandoned mine land features eliminate an immediate health and safety risk to the public, while reclamation of Priority 3 abandoned mine land features restores the land surface and water resources. Over 78% of the 1,036 inventoried unreclaimed refuse piles are P3 abandoned mine land features.

In order to achieve reclamation of pre-Act coal refuse piles with federal funding, BAMR typically utilizes one of four (4) reclamation strategies through construction contracts with private industry. These refuse reclamation strategies are listed below by lowest to highest cost per ton. The estimated cost ranges are from projects that were contracted through BAMR from 2015 to the present. Additionally, these estimates vary based on hauling distances, revegetation material availability and quality, inflation, contractor availability, and British thermal units (BTU) and sulfur content of burnable refuse if the refuse is to be processed at a fluidized bed combustion (FBC) power plant designed to burn waste coal.

1. For smaller abandoned mine land refuse piles (generally under 20 acres) or portions of larger abandoned mine land refuse sites, remove the coal refuse pile to reclaim the abandoned mine land site and transport the refuse to an FBC power plant to be burned.
    - Reclamation costs of this strategy range from $2 to $6 per ton of refuse when hauling distances are between 10 to 20 miles from the abandoned mine land site and range from $10 to $16 per ton of refuse when hauling distances are over 20 miles from the abandoned mine land site.
2. For abandoned mine land refuse piles located near an abandoned surface mining pit, reclaim the abandoned pit by backfilling with a mixture of coal refuse and alkaline material to reclaim the abandoned mine land site.
    - Reclamation costs of this strategy range from $5 to $10 per ton of refuse.
3. For smaller abandoned mine land refuse piles (generally under 20 acres) or portions of larger abandoned mine land refuse sites, remove the coal refuse pile to reclaim the abandoned mine land site and transport the refuse to a permitted coal refuse disposal facility.
    - Reclamation costs of this strategy range from $10 to $20 per ton of refuse.

4. For remote abandoned mine land refuse piles and larger piles, regrade the outslopes of the refuse pile, cover and cap the refuse with the best available capping material and establish vegetation on the reclaimed slopes to reclaim the abandoned mine land site.
    - Reclamation costs of this strategy range from $20 to $40 per ton of refuse. The wide range in costs is due to the availability and quality of capping materials.

For sites permitted after implementation of 1977 Federal SMCRA through a coal refuse reprocessing permit, the reclamation options are limited. These sites are not eligible for the BAMR AML reclamation program and the only way to reclaim these coal refuse piles is through removal of the pile under the coal refuse reprocessing permit. As the name implies, this permit allows an operator to “remine” these unreclaimed coal refuse piles by hauling the coal refuse to an FBC power plant to be burned thus eliminating both an unsightly pile from the landscape and a possible source of acid mine drainage to waters of the Commonwealth. There are 86 active refuse reprocessing permits in the Commonwealth. The total estimated tonnage mined from these sites for each of the past five years is listed below:




There are also 19 refuse piles that were permitted after the adoption of 1977 Federal SMCRA but have gone through bond forfeiture. These sites are not eligible for reclamation under the BAMR AML reclamation program.

Since 1988 when the Department started tracking annual production of coal refuse reprocessing separately from normal surface coal mining, the average annual amount of coal refuse mined is over 5.6 million tons per year. Over that same time period, more than 208 million tons of unreclaimed coal refuse piles have been eliminated across the Commonwealth. This reclamation has been achieved at no cost to the taxpayers of Pennsylvania.

Originally, sixteen FBC power plants were constructed across Pennsylvania to produce electricity and/or heat from abandoned mine land coal refuse piles. These FBC plants operate by suspending the solid fuel particles in an upward flow of air, creating a turbulent, fluid-like state. The system is highly efficient as the process enhances fuel mixing, improves heat transfer, and ensure more complete combustion. The continuous circulation of solid particles within the furnace allows for a lower combustion temperature than a typical pulverized coal power plant which reduces nitrogen oxide emissions. Along with the coal refuse, crushed limestone is also injected into the bottom of the combustion chamber where the calcium carbonate in the limestone is converted into calcium oxide. The calcium sulfate, formed by the reaction of calcium oxide and sulfur, is an inert substance that in the presence of water becomes gypsum and reduces the sulfur oxide emissions. As of 2025, eleven FBC power plants remain in operation which are being supplied with fuel from the active coal refuse reprocessing permits across the Commonwealth.

Not only are the abandoned mine land coal refuse piles eliminated in the mining process, but many of the remaining FBC power plants in the Anthracite region are located near abandoned surface mining pits that have limited backfill material available for reclamation. These FBC power plants generate coal ash which is used to backfill and reclaim these abandoned pits. The elimination of these abandoned pits restores positive drainage, fills dangerous pits, and restores the site to a useable status. Since 2009, over 110 million tons of coal ash has been beneficially used in mine reclamation throughout Pennsylvania.

Thank you for your invitation, and for the opportunity to provide testimony – I am happy to answer any questions you have.

BEFORE THE PENNSYLVANIA HOUSE OF REPRESENTATIVES
ENVIRONMENTAL & NATURAL RESOURCE PROTECTION COMMITTEE

Testimony of Charles McPhedran, Senior Attorney, Earthjustice
August 11, 2025

Good morning Chair Vitali, Chair Rader, and members of the Committee. My name is Charley McPhedran. I'm an attorney with Earthjustice, located in Philadelphia. Thank you for the opportunity to testify today regarding the remediation of waste coal piles. Earthjustice urges the Legislature to take action to stop subsidizing the practice of burning waste coal.

Earthjustice is a public interest environmental law firm that protects people's health, advances clean energy, and fights climate change. We represent national groups, including Sierra Club and the Natural Resources Defense Council, and statewide groups like PennFuture. On waste coal, we have represented the Scrubgrass Creek Watershed Association in Venango County and have worked with Save Carbon County, among others.

Our site-specific work in Pennsylvania has included two waste coal plants, Scrubgrass and Panther Creek, that benefit from subsidies. These plants burn waste coal, then store or dump the post-combustion ash. Both plants use energy they generate to "mine" cryptocurrency, that is, to run specialized computers that seek financial payments for crypto-related activities. Energy used for on-site cryptocurrency mining at these plants is energy that is not provided to power homes and businesses via the electric grid.

When they burn waste coal, these plants pump carbon dioxide into the atmosphere, as demonstrated by EPA data. In 2022, Scrubgrass emitted over 600,000 tons of carbon dioxide. This is the equivalent of 126,000 gas-powered cars driven for one year. In 2023, Panther Creek reported emissions of over 760,000 tons of carbon dioxide. This equals the pollution from over 160,000 cars. To look at it the opposite way, you would need to take 286,000 cars off the road to offset the combined Scrubgrass and Panther Creek carbon dioxide emissions.

In addition to carbon dioxide, these plants emit a variety of other dangerous air pollutants. They emit nitrogen oxides, which contribute to smog. Several smokestack pollutants at these plants contribute to the formation of downwind fine particles, which are linked with health effects, from emergency room visits to premature deaths.

Regarding carbon dioxide, climate change threatens our planet, and the people who live on it. We are already seeing its effects. Last year had the highest global temperatures in recorded history. Warmer temperatures mean that the atmosphere holds more moisture, intensifying the effects of hurricanes as to rainfall, wind, and flooding. Hotter temperatures also contribute to the Canadian wildfires that affect our air quality here in Pennsylvania.

Pennsylvania has produced a series of Climate Action Plans describing the challenges we face, and our opportunities to respond. The 2024 Climate Action Plan Update describes risks from climate change to the Commonwealth and its citizens. These risks include increases in precipitation that will cause impacts to infrastructure, human health, and agriculture. More frequent heat waves will create health and economic impacts for vulnerable populations, including, among others, the elderly, outdoor workers, and those with cardiovascular conditions. The 2024 Update also details other risks to the Commonwealth from climate including landslides, sea level rise along the Delaware estuary, and severe weather events.

In response to these threats, the 2024 Update includes a wide range of opportunities across our economy to reduce greenhouse gases. In the transportation sector, these include transit improvements and reduced vehicle emissions. For industry, the 2024 Update describes opportunities with efficiency and fuels. The Update also describes additional opportunities in power generation, agriculture, and land and forest management, among others.

Given the urgency of the climate threat, and these efforts to respond, many Pennsylvanians would be astounded to know that our state government pays their tax dollars to waste coal plants to create climate-killing pollution. This is antithetical to the goals of our Climate Plan and what Pennsylvania actually needs, but the Pennsylvania taxpayer subsidizes this combustion.

For example, the Commonwealth provides a Coal Refuse Energy and Reclamation Tax Credit. Following legislation last year, this subsidy now provides a tax credit of $8/ton for burning waste coal used for energy generation. This credit encourages the combustion of waste coal, and the resulting air pollution. The 2024 legislation also increased the total statewide limit for this windfall from $20 million to $55 million per year, subsidizing greenhouse gas pollution.

Additionally, waste coal is considered a Tier II resource under the Alternative Energy Portfolio Standard. Again, many Pennsylvanians would be surprised to learn that waste coal combustion receives favorable treatment, and an effective subsidy of up to $200 million as described in Mr. Schuster's testimony, under a law intended to encourage forms of low carbon energy production like wind and solar power.

Disposal of waste coal through burning is not remediation. It creates harmful air pollution and contributes to climate change. We urge the Legislature to take action to stop subsidizing this harmful practice.

Thank you for the opportunity to testify today.

# State Subsidies = Reliable Energy and Environmental Cleanup of Waste Coal


Vintondale, Cambria County

# What is ARIPPA?

- Appalachian Region Independent Power Producers Association
- ARIPPA is a non-profit trade association representing the coal refuse reclamation to energy industry in Pennsylvania, Virginia, and West Virginia.
- Comprised of mine land reclamation facilities that utilize circulating fluidized bed (CFB) boiler technology to convert coal refuse into highly alkaline "beneficial use ash" utilized in mine land reclamation.
- This process uses coal refuse as a primary fuel to generate electricity which is sold through the wholesale energy market operated by the PJM regional transmission organization (RTO) to provide private funding for mine land reclamation.
- An industry which helps the state turn environmental challenges into economic opportunities.
- The coal refuse plants are not high emitting plants. Nearly all qualify as filterable particulate low emitting electric generating units (LEE) and mercury LEE under MATS. In fact, they were among the plant included in the MACT floor that established the MATS mercury limit for coal plants.

# History of Public-Private Partnerships in PA Energy Policy

Former DEP Secretary Patrick McDonnell once testified that, “waste coal operations and associated generation operations have been one of the most substantial watershed cleanup efforts of the past 30 years.

**Pennsylvania has a strong bipartisan history of supporting waste coal cleanup through legislation and collaboration:**

- **Governor Bob Casey (1980s):** Established the framework that allowed the construction of specialized waste coal-burning power plants using innovative technologies through Power Purchase Agreements (PPAs) and tax-exempt Pennsylvania Economic Development and Finance Authority (PEDFA) loans to construct the facilities.
- **Governor Ed Rendell (2004):** Signed the Alternative Energy Portfolio Standards (AEPS) Act into law, giving waste coal facilities a formal role in the state’s renewable energy strategy.
- **Governor Tom Wolf (2020):** Signed Act 114 to close Pennsylvania’s AEPS borders, preventing out-of-state credits from flooding the market and restoring value to in-state Tier II credits. RGGI included a set aside for waste coal generators.
- **The Pennsylvania Legislature:** Passed and twice increased the Coal Refuse Energy and Reclamation Tax Credit providing vital financial support for operators who clean up toxic piles.
- **The Industry:** Has consistently delivered public benefits—converting environmental liabilities into productive, job-creating assets, while cleaning up polluted land and water.

**Conclusion:** This long-standing public-private partnership has produced results.

# Environmental Groups and Watershed Supporters of Coal Refuse Energy

While some environmentalists lament that the power companies are burning coal, the broader perspective sees the tremendous benefit the public enjoys by removing the waste dumps and restoring the landscape to a more healthy condition. Waste coal-to-power represents a win-win program where private industry performs a tremendous environmental service as they produce the electricity our society needs.

- Jonhn Wenzel, Executive Director, Conemaugh Valley Conservancy

# PA Waste Coal Legacy

- There are approximately 764 coal refuse banks containing nearly 211 million tons of coal refuse and covering 8,001 acres that remain un-reclaimed with 44 of those piles actively burning.
- To date the coal refuse reclamation to energy (RTE) industry has reclaimed 257 million tons of polluting coal refuse, improved 1,200 miles of impaired streams, and restored 8,000 acres of mining affected land.

**Current Coal Refuse Quantities**

764 Coal Refuse Piles in Total

44 Burning Refuse Piles

Covering 8,001 Acres of Land

Weighing 211 million Tons

Source: PA DEP (April 2023)

**Historic Industry Activity**

257 million tons of refuse consumed

206 million tons of beneficial use ash

> 1,210 miles of polluted streams restored

> 8,070 acres of land restored

Source: PA DEP, ARIPPA

# POLLUTION CAUSED BY COAL REFUSE

Under federal law, landowners and companies responsible for abandoning coal refuse piles are no longer liable for remediating them.

This left the cost of remediating this environmental problem to the state and federal government, currently estimated at more than $5 billion in PA alone.

Even Pennsylvania expected to received $244.9 million annually for the next 15 years to reclaim eligible pre-1977 AML and to treat abandoned mine drainage under the bipartisan Infrastructure Investment and Jobs Act of 2021, this amount will be insufficient fund the currently identified AML problems in Pennsylvania.

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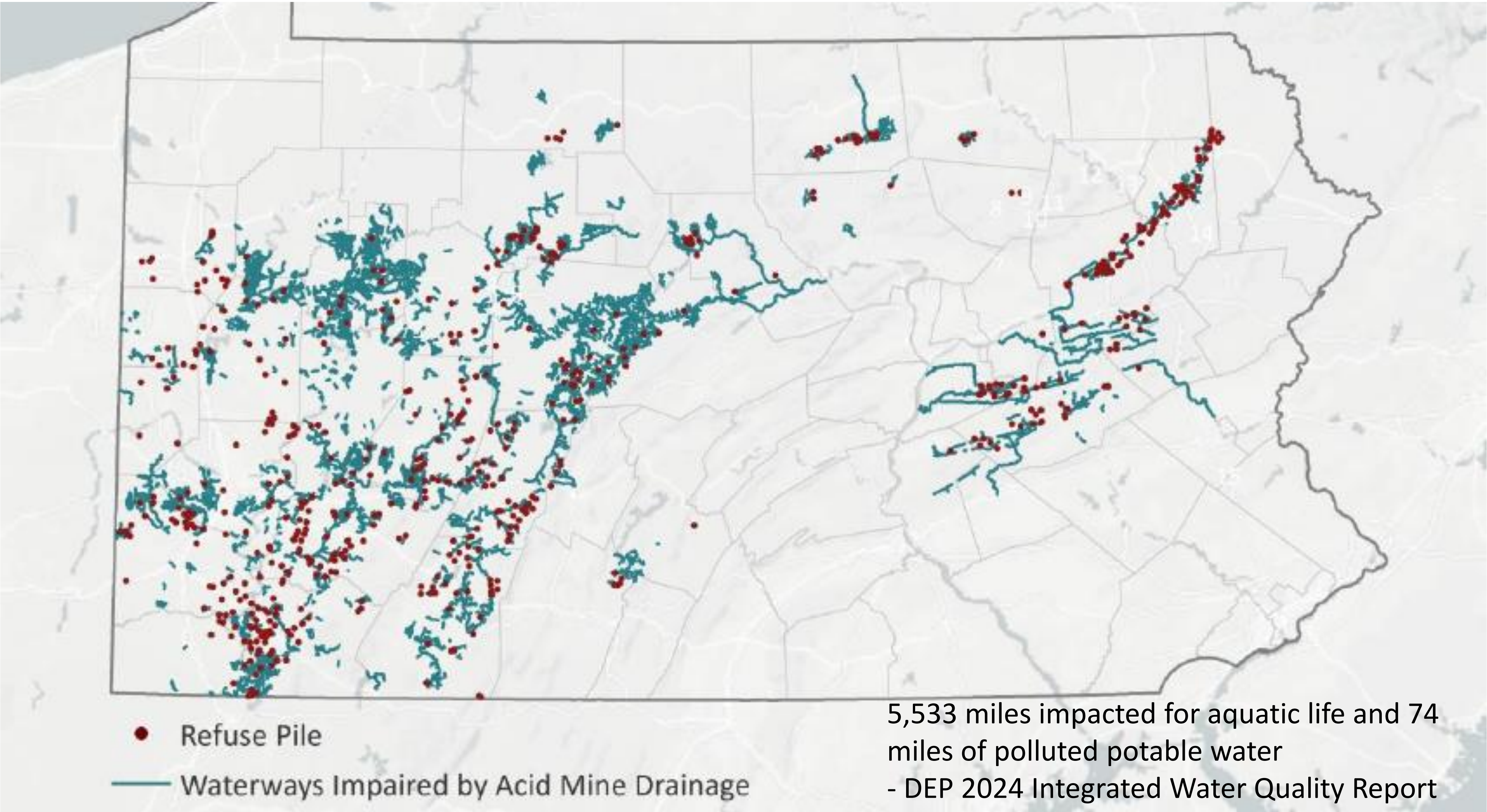



5,533 miles impacted for aquatic life and 74 miles of polluted potable water
- DEP 2024 Integrated Water Quality Report

# Environmental Benefits of Coal Refuse Energy

The environmental benefits of the industry are valued at $62 million annually, totaling $1.2 billion over a 20-year period, including reductions in air emissions ($444 million), elimination of water treatment ($452 million), and enhancements of public health and increased to property values ($350 million).


Public Benefits of the Coal Refuse Energy Industry ($M)

| **Category** | **Effect** | **Year 1** | **Year 10** | **Year 20** | **Total** | **Average (Annualized)** |
|---|---|---|---|---|---|---|
| Air Emissions | One-Time | $22.2 | $22.2 | $22.2 | $444.2 | $22.2 |
| Water Quality | Cumulative | $2.2 | $21.5 | $43.0 | $451.7 | $22.6 |
| Public Health & Safety | Cumulative | $0.9 | $8.8 | $17.5 | $183.9 | $9.2 |
| Land Value | One-Time | $8.1 | $8.1 | $8.1 | $162.4 | $8.1 |
| **Total** | | **$33.3** | **$60.6** | **$90.8** | **$1,242.2** | **$62.1** |

# Avoided Cost "Alternatives"

## Ehrenfeld Project not likely repeatable

- Not really coal refuse as 90-95% was already burned out with little remaining carbon or acidity.
- An already licensed mining site that was just about to be reclaimed by simply pushing dirt used for placement of the material. Site relicensed to receive the material.
- One way trip to placement area about 2 miles.
- Slag from stainless steel production used to neutralize any remaining acidity in the refuse before being placed. (Slag possesses pozzolanic properties like CFB ash)
- There is no liner and there are no water treatment obligations.

## **Capping in Place Not as Environmentally Beneficial**

Capping in place and re-vegetation may improve their aesthetics does not eliminate their air and water quality impacts to the environment. Most coal refuse doesn't lend itself to be covered. It remains and leaches into ground water. While planting abandoned coal refuse piles may reduce impacts from wind-blown dust and rainwater runoff entering downstream soil and surface water, planting or reforestation would not permanently remove the air and water risks.

# "Avoided Costs" for Removal and Secure Landfilling

| Avoided Reclamation Cost Savings to PA Taxpayers | |
|---|---|
| Annual (6.6 million tons) | $290 million |
| Total (211 million tons) | $9.3 billion |

The "avoided cost" savings to the Commonwealth to maintain the recent amount of reclamation done by industry at an equivalent level of reclamation  is approximately $290 million annually, while eliminating all known refuse piles would cost $9.3 billion.

# Economic Impact of the Waste Coal Industry in Pennsylvania

**A Vital Economic Engine in Rural PA**

**Annual Economic Output**: ~$697 million in total activity, including direct, indirect, and induced effects.

**Employment**: Supports approximately 2,200 full-time jobs, including plant operations, transportation, remediation, and support services.

**Labor Income**: Generates over $155 million in annual wages, including highly skilled union labor.

**Tax Revenue**: Contributes nearly $16 million each year in state and local taxes — helping to fund schools, infrastructure, and public services in economically distressed regions.

“We’ve got fish in the water now. People weren’t fishing here before. This is a good news story.”
- Cambria County Commissioner Tom Cherinsky

South Branch Blacklick Creek
Cambria County, Pennsylvania

“This creek was orange and instead of calling it the south branch of the Blacklick, we called it the local sulfur creek.”

- South Branch Fishing Club President Dennis Palko

Fishing Derby on South Branch Blacklick Creek
Nanty Glo, PA
April 23, 2016

In 2017, the DEP studied the reclamation of coal refuse piles along the Blacklick Creek in Cambria County using CFB ash from coal refuse RTE facilities and concluded that the high-alkaline filler neutralizes the acidity of former waste coal sites in the Blacklick Creek Watershed, providing significant reductions in the acidity of acid mine drainage and reducing pollutant loading.

# Air Pollution Caused by Coal Refuse

- Coal Dust
- Weathering
- Spontaneous Combustion
- Open Burning


Northampton Generating – Northampton, PA
Remediated the Loomis Bank Mine Fire

# Lehigh University Coal Refuse GHG Study

The GHG emissions from unremedied waste piles for the amount of coal refuse reclaimed by the industry in 2019 would range from 13,662,919 to 36,239,374 tons, compared to CO2,eq emissions reported by the coal refuse energy plants of 7,128,113 tons, Thus, each ton of coal refuse is expected to produce GHG emissions between 2.43 and 6.44 tons CO2,eq with a net reduction of between 1.16 and 5.17 tons CO2,eq per ton of coal refuse reclaimed by the coal refuse RTE industry.

| | CO2 Emissions Factor [kg/t coal] | CH4 Emissions Factor [kg/t coal] | Coal Processed by RTE 2019 [t] | CO2 Emissions [t] | CH4 Emissions [t] | CO2,eq Emissions [t] |
|---|---|---|---|---|---|---|
| Reference 20 | 1,300 | 180 | 5,627,232 | 7,315,402 | 1,012,902 | 35,676,651 |
| Reference 21 | 1,952 | 17 | 5,627,232 | 10,984,357 | 95,663 | 13,662,919 |
| Reference 25 | 2,520 | 101 | 5,627,232 | 14,180,625 | 566,475 | 30,041,916 |
| Reference 28 | 3,500 | 105 | 5,627,232 | 19,695,312 | 590,859 | 36,239,374 |

Dr. Carlos Romero
Director, Lehigh University Energy Research Center

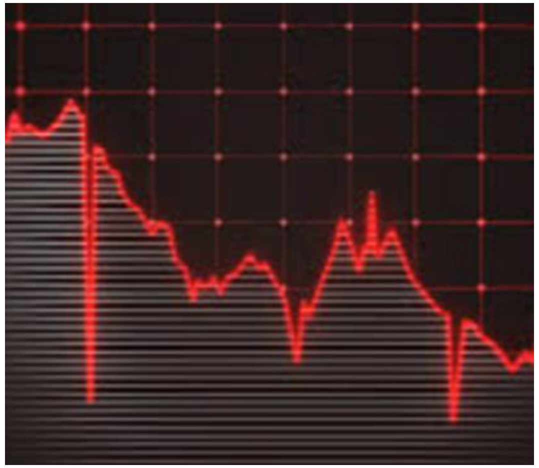
# TRC Study: "Net Air Emission Benefits from the Remediation of Abandoned Coal Refuse Piles"

The coal refuse RTE industry eliminates 3.9 net tons of CO2e emissions for every ton of coal refuse that it permanently eliminates from the environment and converts to useful energy, or 51 net tons of CO2e over a 10-year coal refuse emissions lifecycle.

| Estimated Net Lifecyle GHG Emission Reductions from Permanent Remediation of 5,546,818 tons of Coal Refuse Annually | | | | | |
|---|---|---|---|---|---|
| **Pollutant** | **Unremediated Coal Refuse Estimated Annual Air Emissions (5,546,818 (tons)** | **Unremediated Coal Refuse Estimated Lifecycle Emissions (5,546,818 tons X assumed 10-yrs of continuous air emissions)** | **Coal Reclamation to Energy Industry Emissions to Remediate 5,546,818 tons of coal refuse (tons)** | **Net Lifecycle Emissions from Remediation of 5,546,818 tons of coal refuse (tons)** | **Net Lifecycle Emissions from Remediation of each ton of Coal Refuse by the Reclamation to energy Industry[1] (tons emitted per ton remediated)** |
| $CO_2$ | 6,553,760 | 65,537,596 | 7,587,349 | (57,950,247) | (10.4) |
| $CH_4$ | 906,655 | 9,066,551 | 825 | (9,065,726) | (1.6) |
| $N_20$ | | | | | |
| $CO_2e$ | 29,220,138 | 292,201,380 | 7,607,978 | **(284,593,402)** | **(51)** |

*"When the full emissions profile of the coal refuse RTE industry is considered, including the reduction of emissions from reclamation of coal refuse piles, the coal refuse RTE industry produces a net reduction in GHG emissions."*

# Challenges Facing Coal Refuse Energy Industry



- **Regulatory Misclassification:**
  Waste coal plants are often treated like traditional coal facilities, ignoring their role in environmental remediation and higher operational costs.

- **Cost-Prohibitive Air Regulations:**
  Existing plants already meet stringent emissions standards using best-available technology. New proposed air rules would require unproven, costly retrofits that offer minimal environmental gain — and would force many plants to shut down.

- **PJM Market Volatility:**
  Waste coal plants operate in a highly competitive market with unstable energy and capacity pricing. PJM's capacity auction results and FERC rulings introduce financial uncertainty, especially for baseload units with limited flexibility.

- **Rising Remediation Costs:**
  As nearby waste coal piles are cleaned up, remaining sites are farther away, increasing fuel handling and transportation expenses. Difficulty in finding truck drivers and trucks.

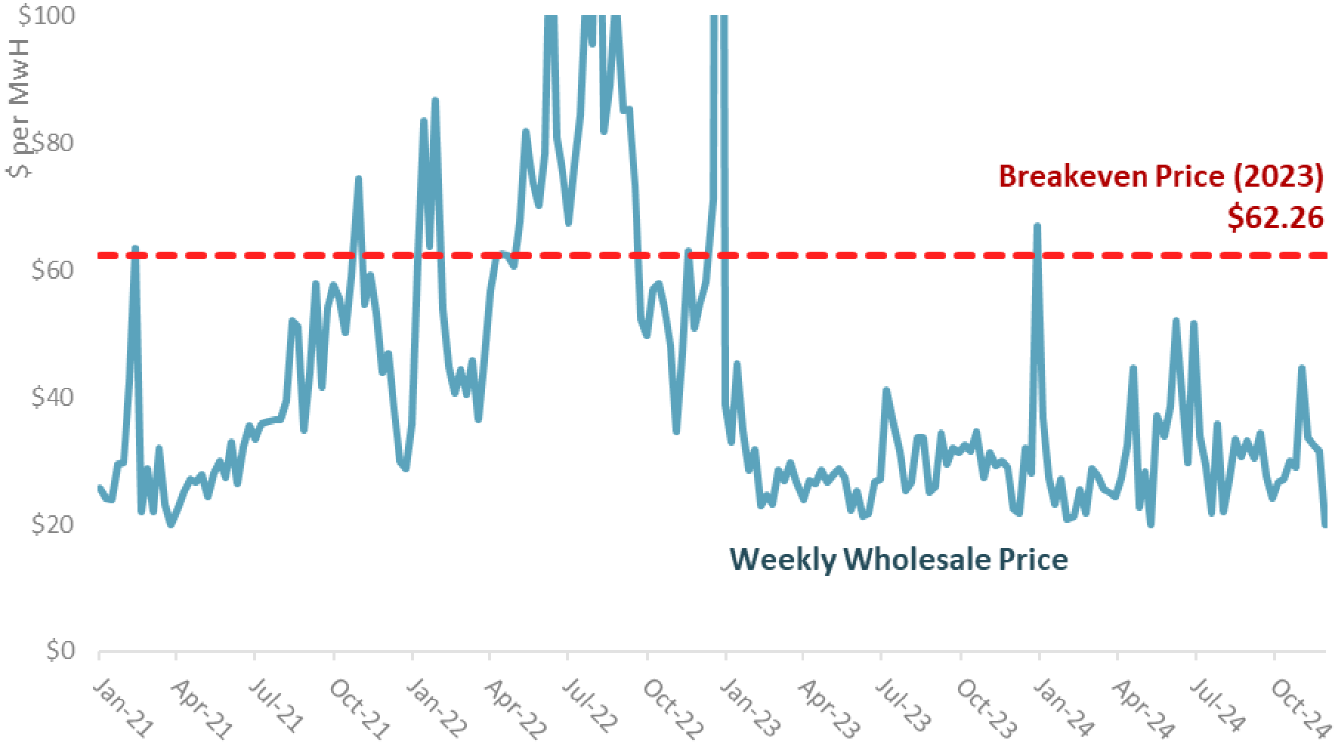
- **Political and Policy Uncertainty:**
  The introduction of new laws or changes to existing laws such as RGGI and HB 501 PRESS, provides for uncertainty in the future of the plants which thwarts investment into critical upgrades in the existing plants or new plants to be built.

- **Investment/Capital Challenges:**
  Due to the war on coal, investors don't want to invest into an environmental clean up company such as these CFB plants since environmental groups don't take into account the environmental benefits of these plants. In addition, anti-fossil fuel environmental groups only focus on the air emissions from the plants and don't into account the air emissions from piles that are left un-reclaimed.

# Economic Reality for RTE Plants?

Based on aggregated data, the ten coal refuse RTE plants barely broke even with estimated revenue of $446 million and total costs of $434 million in 2023.

Lower wholesale energy prices and capacity payments in recent years have increased the importance of additional revenue mechanisms, like AEPS and the CRER tax credit, in keeping plant operations viable in a historically low PJM energy market. Tier II credits accounted for over half of plant revenue in 2023.




Costs of production for coal refuse energy plants grew from $39/MWh in 2019 to a “breakeven price” of $62/MWh in 2023, and continue to rise at an alarming rate, while weekly wholesale energy prices have averaged only $30/MWh during this time providing insufficient revenue to support operations.

# Changes to AEPS via PRESS Implications

The coal refuse energy industry is the only AEPS energy source that provides a tangible, quantifiable environmental benefit to the Commonwealth in terms of air, water, and land remediation.

As proposed, PRESS would cut support for new Tier III sources, including waste coal, rendering this new tier insufficient to support continued operation of these environmentally beneficial facilities.

PRESS Tier III would have an initial 40% credit oversupply, which when taken in conjunction with the two-thirds reduction in the ACP to $15, will produce PRESS Tier III credit prices similar to historic AEPS Tier II credit prices of less than $1 and far below the amount needed to support continued operation of these facilities.

The AEPS program is currently meeting the needs of Pennsylvania Tier II energy sources, such as waste coal, municipal solid waste, blast furnace gas, and hydro power. Why should we change the Tier II program, which from all accounts is accomplishing its goal of supporting continued operation of these sources?

# A picture is worth a thousand words!


## Spangler
Cambria County, Pennsylvania


## Soberdash
Westmoreland County, Pennsylvania

# QUESTIONS?

Jaret A. Gibbons, Esq.
Executive Director
Appalachian Region Independent Power Producers Association (ARIPPA)

**TESTIMONY OF THE NATURAL RESOURCES DEFENSE COUNCIL**

**Robert M. Routh, Esq.**
**Pennsylvania Policy Director**
**Climate & Energy**

**on Pennsylvania Subsidies to Remediate Waste Coal Piles**

**before the House Environmental & Natural Resource Protection Committee**

Harrisburg, Pennsylvania

August 11, 2025

Chair Vitali, Chair Rader, and honorable members of the House Environmental & Natural Resource Protection Committee, thank you for the opportunity to testify today about a specific, longstanding challenge facing Pennsylvania residents and decisionmakers – how to cost-effectively and responsibly address legacy pollution from coal refuse piles. In particular, given rising electricity prices across the region, we should evaluate how and whether to continue the current use of taxpayer and ratepayer subsidies to incentivize burning waste coal for energy production.

My name is Robert Routh, and I am a senior attorney with NRDC (Natural Resources Defense Council), an international non-profit organization with over three million members and online activists. Since 1970, NRDC's lawyers, scientists, and other environmental specialists have worked to protect our natural resources, public health, and climate. In my role as Pennsylvania Policy Director for the Climate & Energy Department, I work to advance decarbonization across all 67 counties in the Commonwealth with most of my attention paid to statewide efforts in Harrisburg. My job is to advocate for laws and policies that will drive a more sustainable, equitable, and prosperous clean energy economy for all in Pennsylvania.

**Background**

Without question, the energy transition is at an inflection point. With electricity demand projected to grow for the first time in decades, poor winter reliability from gas generators, seemingly intractable interconnection queue delays, and transmission planning badly in need of updating to keep pace with a changing grid, 67 million people across the PJM footprint, which includes all of Pennsylvania, are seeing their monthly electric bills go up. Meanwhile, recent changes to federal tax law and energy policy will make it more difficult to build new electric generation in a timely manner and will likely make those generators that do interconnect to the grid more expensive. There is a significant and increasing need to address overlapping goals: supporting rapid electrification and decarbonization while reducing overall costs and ensuring grid reliability. As the largest net electricity exporter in the country, Pennsylvania is uniquely poised to benefit from this opportunity. We must ensure that our existing policy landscape is well understood in order to propose reforms that will expand clean, reliable, affordable energy solutions.

To that end, let's look back. Commercial coal mining began in Pennsylvania in the 18th century, and one of the enduring legacies of this heritage is an unparalleled abandoned mine land (AML) problem. Waste coal piles, a by-product of coal mining operations, are a significant subset of AML sites across the Commonwealth, with hundreds of identified piles covering thousands of acres of land. These piles are scattered across the landscape located next to communities and waterways. They are an unsightly blight posing health and safety risks while also causing environmental damage to our air, land, and water. Remediation is important and, without solvent or known corporate owners, the burden falls on the state and its taxpayers.

In response to petroleum and oil shortages and significant energy price increases during the 1970s, Congress passed the Public Utility Regulatory Policies Act (PURPA) in 1978. This required that electric utility companies buy power produced by facilities that met certain qualifications, such as the use of non-traditional fuels, which was defined to include waste coal. Utilities were required to pay for this electricity at an "avoided cost" rate, thus creating strong financial interest in electricity production using Pennsylvania waste coal.

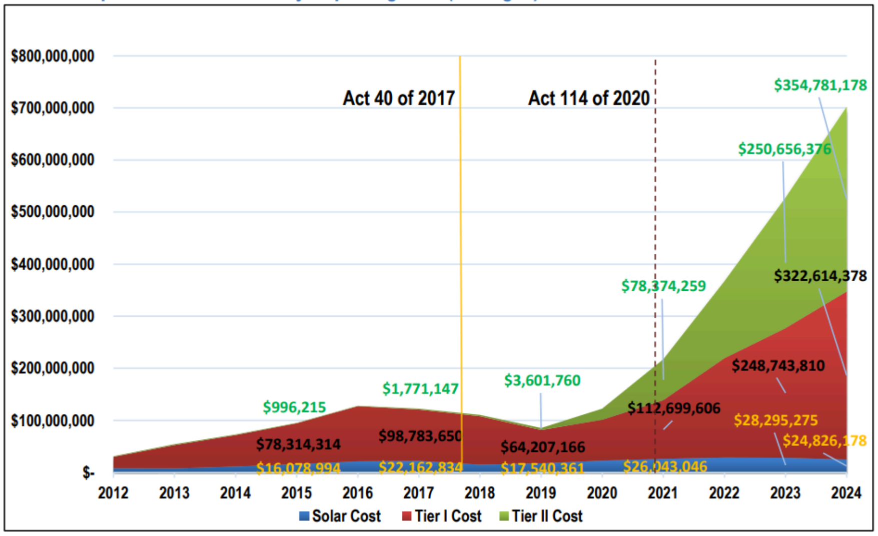
**Current Subsidies**

The Commonwealth has since focused its state support for remediating waste coal piles by further incentivizing combustion for electric generation. The Alternative Energy Portfolio Standards (AEPS) Act of 2004 requires Pennsylvania electric utilities to obtain and retire credits (each credit accounts for one MWh of generation) in quantities equal to a percentage of their total retail sales of electricity; those percentage targets gradually increased through May 2021 and have since flatlined. The statute created two groups or tiers of eligible generation resources and included waste coal in Tier II, alongside other technology types such as large-scale hydropower, municipal solid waste, etc.

- Since 2021, the base obligation for Tier II has been 10% (and will remain so until the law is amended). The most recent AEPS report released by the Public Utility Commission (PUC) shows waste coal generators accounted for 56% of the Tier II credits retired by utilities in the 2024 reporting year with the total cost of those purchased credits reaching nearly $355 million. These compliance costs now exceed those of Tier I credits – a group comprised mostly of clean energy resources – and the increases are driven largely by amendments made to the AEPS by Act 114 of 2020, which "closed the borders" for Tier II. In other words, it effectively restricted the eligibility of Tier II sources to facilities located within Pennsylvania, which has disproportionately benefited waste coal.

- According to the PUC report (see page 16): "the largest source of AEPS compliance costs is being driven by increases in Tier II. With the passage of Act 114 of 2020, Tier II AEC prices have risen from an historic low of roughly $0.25 to more than $30.00. The fact that most of the AEPS compliance obligation must be sourced from Tier II resources, coupled with this meteoric increase in Tier II AEC pricing, has resulted in substantial compliance costs for the AEPS."

*Chart 5: Reported Cost of AECs by Reporting Year (ending in)*




*Source: PA PUC – AEPS Compliance for Reporting Year 2023-24*

- Furthermore, in 2016, Pennsylvania enacted a "Coal Refuse Energy and Reclamation" tax credit that provided a subsidy to electric generators of $4 per ton of waste coal combusted. The total annual amount of tax credits available was initially limited to $7.5 million, then expanded to $10 million beginning in FY 2017-18, then to $20 million in FY 2019-20. Most recently, Act 56 of 2024 doubled the tax credit value to $8 per ton of waste coal burned and nearly tripled the annual limit to $55 million beginning in FY 2024-25.

- Pursuant to Pennsylvania's CO2 Budget Trading Program (or "RGGI Regulation"), which was promulgated in 2022 and is currently subject to an injunction with an appeal pending before the Pennsylvania Supreme Court, waste coal generators would receive an additional item of value in the form of cost-free allowances. The RGGI Regulation would set a market-determined carbon price on electric generators with a capacity of 25 MW or greater and impose a binding, declining cap on carbon pollution from Pennsylvania's fossil fleet (cap plateaus in 2030). The key compliance mechanism in RGGI allows regulated power plants to acquire and retire allowances (think of an "allowance" as a limited license to pollute one ton of carbon dioxide) commensurate with the carbon emissions from their smokestacks. Under Pennsylvania's program, waste coal generators would be eligible for up to 12.8 million free allowances annually in a set-aside account, obviating the need for purchase at auction or on the secondary market. This set-aside account would represent over 18% of Pennsylvania's 2025 base CO2 budget and, with current RGGI allowance clearing prices at $19.63 per ton, would constitute over $251 million in potential savings for waste coal facilities.

Federal regulatory compliance has also been relaxed for waste coal generators this year with the Trump administration granting two-year exemptions to nine of Pennsylvania's 10 plants from the U.S. Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS) rule. The EPA has also proposed a full repeal of all greenhouse gas (GHG) emissions standards for fossil fuel-fired power plants (while further proposing to find that GHG emissions from fossil plants do not contribute significantly to dangerous air pollution).

This occurs at the same time as electric generators that clear PJM's capacity market will be receiving major windfalls with auction prices settling at record highs. PJM's capacity market is set up to ensure there is enough electricity to meet demand on the hottest and coldest days of the year. Capacity auctions are designed to occur annually to procure sufficient power supply for three years in the future, including a healthy reserve margin for reliability. Power plants are paid to commit to be available whether their electricity is ultimately needed or not; those power plants are also paid when they do sell their electricity to the grid. The July 2025 auction saw a clearing price of $329.17/MW-day, resulting in total costs of $16.1 billion that will be spread across the region beginning in June 2026. This broke the record set by last year's auction, which had a total price tag of nearly $14.7 billion (compared to just $2.2 billion at the preceding auction).

For a sense of scale, Pennsylvania currently has 10 waste coal power plants in operation with a combined nameplate capacity around 1.3 gigawatts (GW), but these facilities only have an average capacity factor around 50%. They do not contribute a meaningful share of our electric generation mix but do receive a meaningful share of state subsidies with a fuel source that has a higher carbon intensity than burning traditional coal and that, pound-for-pound, emits more mercury and metal-containing particulate matter. These pollutants pose significant health risks to Pennsylvania families and communities.

**Policy Reform**

Given this background, there is a relevant policy proposal on the table worth highlighting – House Bill 501 – which would amend and update the 2004 AEPS Act. It would establish the Pennsylvania Reliable Energy Sustainability Standards ("PRESS"), ramping up targets through 2035 while providing eligibility for additional generation resources and creating a new "Tier III." NRDC's 2024 modeling analysis showed that, overall, PRESS would: (1) protect and grow clean energy jobs; (2) result in increased clean electricity generation and capacity; and (3) see Pennsylvania become an even more dominant electricity exporter. Recent changes to federal law notwithstanding, these projections remain consistent.

For purposes of this hearing, if PRESS (as reported by this committee on June 2) became law, waste coal generators would shift from Tier II of AEPS to the new Tier III along with municipal solid waste, coal gasification technology, and (newly added) fossil plants that use at least "20% clean hydrogen cofired blend or equivalent carbon reduction technologies." Pennsylvania utilities would be required to retire Tier III credits equivalent to 3.8% of retail electric sales starting in 2026-27 with that target increasing in stages to 5% by 2032. The alternative compliance payment (ACP) level, which functions as an effective cap on credit prices, would be set at $15 for Tier III under PRESS. The established ACP for Tier I and Tier II under the AEPS is currently $45, and the weighted average Tier II credit price last year was $26.47.

This legislation would mark a shift in the state's treatment of waste coal generators but would do so as part of a comprehensive plan that incentivizes 21 diverse types of energy, sending a strong market signal that Pennsylvania is committed to clean, reliable, and affordable power. Notably, HB 501 would update Tier I targets to ramp to 35% by 2035, serving as a key economic development driver. This would bring billions of dollars in new energy investments to Pennsylvania while creating and sustaining thousands of good-paying energy sector jobs.

**Conclusion**

Pennsylvanians will be confronting higher energy costs as a result of recent federal policy decisions, unprecedented load growth, and hurdles caused both by PJM and at the local permitting level to timely interconnect new, clean electricity to the grid. Under these circumstances, we must diligently use taxpayer and ratepayer dollars in a manner that effectively reduces costs and improves quality-of-life. There is a balance to be struck in approaching the unique challenge of remediating waste coal piles in Pennsylvania, and NRDC is eager to advance solutions.

Thank you for the opportunity to testify.

Robert M. Routh
Pennsylvania Policy Director
Climate & Energy
rrouth@nrdc.org

8/11/2025

Testimony of Thomas D Schuster
Director of the Sierra Club Pennsylvania Chapter
To the House Environmental & Natural Resource Protection Committee

Re: Impacts of and Alternatives to the Combustion of Coal Refuse at Power Plants

## Introduction

Good morning Chair Vitali, Chair Rader, and members of the House Environmental & Natural Resource Protection Committee, and thank you for the opportunity to testify today. My name is Tom Schuster, and I am the Director of the Sierra Club Pennsylvania Chapter, and speaking today on behalf of our nearly 25,000 members across the Commonwealth. Many of them are impacted by the legacy of abandoned mines and coal refuse, as well as the electric generation facilities that burn this refuse. I live in Johnstown, which has a long history of coal mining, including mine abandonment with no reclamation, and also within twenty miles of half of Pennsylvania's waste coal generating capacity, so I am personally very familiar with this issue.

The Sierra Club recognizes the harm that abandoned coal refuse piles pose to our water quality and aquatic and terrestrial ecosystems, and supports their responsible remediation. However, we find that the negative environmental impacts of burning coal refuse often outweigh the positives,[1] and that waste coal power generators are already over-subsidized, at the expense of other remediation alternatives that may better serve Pennsylvanians.

While we acknowledge that there have been a number of land reclamation success stories associated with waste coal combustion, we stress that there must be a full accounting for the environmental costs of these plants and better oversight to ensure that they actually deliver on their remediation promises over the long run. We recommend any subsidies for waste coal reclamation be more performance based; tied to the successful remediation of land and not to people's electricity bills.

## Coal Refuse Problem, Subsidies for Power Plants, and Funding for Reclamation Alternatives

Coal refuse from abandoned mines is undeniably a problem in Pennsylvania, causing water pollution, occasionally catching fire, and negatively impacting the economy and quality of life in the vicinity. According to an inventory maintained by the Bureau of Abandoned Mine Reclamation (BAMR), there are roughly 730 piles of abandoned coal refuse remaining, which

[1] ECONorthwest. 2009. Economic Analysis of Alternative Programs for Managing Waste Coal in Central Appalachia.

we estimate cover roughly 7,000 acres and somewhere between 20 million and 170 million tons of material. To date, approximately 400 refuse piles have been reclaimed, in part due to coal refuse burning generators, because historically public funding for other methods of reclamation has been very limited.

There are currently ten generating stations that primarily or exclusively burn waste coal in Pennsylvania, totaling roughly 1200 megawatts (MW) of capacity. These plants benefit from multiple explicit taxpayer and ratepayer subsidies:

- They enjoy a state tax credit of $8 per ton of refuse processed, up to a total amount of $55 million per year.
- They qualify as a Tier II resource under the Alternative Energy Portfolio Standard (AEPS). In the 2024 reporting year, these credits had a value of $26.47 per megawatt-hour, resulting in a payment by electric ratepayers to waste coal generators of nearly $200 million. Based on an average of 1.13 tons/MWh (a rate that varies significantly by plant and quality of refuse) this means waste electricity customers paid waste coal power plants about $23.35 for each ton of coal refuse burned, nearly 4 times the value of the state tax credit.

**The total cost to the public of just these two programs in 2024 was over $30/ton of coal refuse reclaimed, and nearly $255 million total. This is comparable to, and by some measures more expensive than, the cost of coal refuse reclamation by over methods, and yet combustion comes with significant environmental drawbacks.**

<u>Environmental Impacts of Waste Coal Combustion</u>

*Air Pollution*
Waste coal power plants are major sources of air pollution, and in many ways are more polluting than conventional coal plants because the lower energy density of the fuel requires more of it to be burned per unit of energy produced. For example:

- Waste coal produces approximately 50% more climate-disrupting carbon dioxide pollution per megawatt-hour (MWh) than regular coal.[2]
- Fluidized bed boilers emit higher levels of polycyclic aromatic hydrocarbons (PAH's) than other types of generation. PAH's are suspected to cause cancer, birth defects, and other health problems in humans.[3]
- Many waste coal power plants claim to be unable to comply with the acid gas provisions of the federal Mercury and Air Toxics Standard, and in 2020 the EPA created a special more lenient standard for these plants. A comparison of Circulating fluidized bed (CFB) boilers like the ones used in PA power plants burning waste coal found that CFB boilers

[2] Based on comparison of CO2 emission rates of Scrubgrass, Gilberton, and Conemaugh power plants in 2018
[3] http://www.energyjustice.net/coal/pah/

produce about 16 times the hydrogen fluoride (HF) and hydrogen cyanide (HCN), and 65-71 times the hydrogen chloride (HCl) as conventional pulverized coal boilers.[4]

- This year, the EPA granted a two to four year exemption to four waste coal plants in Pennsylvania to a separate provision in the Mercury and Air Toxics Standard pertaining to emissions of fine particulate matter or soot.
- Waste coal plants are subject to presumptive limits on nitrogen oxide (NOx) emissions that are nearly twice that of conventional coal plants on an equivalent heat input basis. NOx is a precursor to ground level ozone or smog.
- In December, the EPA finalized a designation of nonattainment for the Clean Act Act's sulfur dioxide (SO2) standard for portions of Cambria and Westmoreland County[5] that include the popular Laurel Highlands Hiking Trail, Laurel Ridge State Park, and Charles F Lewis Natural Area. The primary contributor to this nonattainment area is the Seward waste coal plant.
- Some coal refuse should be deemed too toxic to burn. In 2015, the Northampton Generating Station requested, and was ultimately granted, a twenty-fold increase in its allowable hourly lead emissions, despite the fact that the surrounding area was already close to violating the Clean Air Act's standards for ambient lead levels. Documents in their permit application indicated that the request was due to several prospective source piles that had much higher lead concentration in samples than other piles in the region.

*Fugitive Dust and Sediment Pollution During Refuse Extraction*

In some cases, the reclamation process itself has been conducted without effective controls to reduce fugitive dust and pollution from stormwater runoff. In the Mahanoy Creek watershed, a coal refuse reclamation project has been underway for many years, with the fuel feeding the Gilberton (aka John B Rich Memorial) and Schuylkill Energy Resources (aka St. Nicholas Cogen) power plants, which were placed in service in 1988 and 1990, respectively.

We have received complaints and photographic evidence from members documenting orange dust blowing off coal ash piles (Figure 1) and coating properties and roadways in the valley where coal ash of the same color was being deposited. After nearly every rain event, Mahanoy Creek will turn either a cloudy orange, or a thick gray to black (Figure 2), likely because patterns of runoff change each time coal refuse is excavated and the resulting ash is deposited, and neither activity utilizes adequate stormwater management controls. In fact, ravines are often visible in the coal ash piles at the same time the creek turns a matching orange color.

Admittedly, Mahanoy Creek is an impaired stream to begin with due in large part to the abandoned minelands that surround it. However, the so-called reclamation activity seems to be significantly increasing pollution. Figure 3 shows clear water taken from the creek near Mahanoy High School, immediately upstream of the most intense re-mining activity, compared to opaque, black water from the creek downstream near Mahonoy Plane. If this were a short

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[4] Ratafia-Brown, J.A., L.M. Manfredo, J.W. Hoffman, M. Ramezan, and G.J. Stiegel. 2002. "An Environmental Assessment of IGCC Power Systems." Presented at the Nineteenth Annual Pittsburgh Coal Conference, September 23-27, 2002 (as cited in ECONorthwest 2009)

[5] Federal Register / Vol. 89, No. 242 / Tuesday, December 17, 2024 / Rules and Regulations

term project, it might be an acceptable price to pay for reclamation in the area, but this has been going on for decades now.

Figure 1. Photo of coal ash dust blowing in the wind, taken from Gilberton Road on 5/25/2025.

Figure 2. Examples of sediment pollution in Mahonoy Creek that usually follow rain events. At left, the result of erosion of fine coal particles on May 16, 2025 turn the creek gray to black. At right, erosion from the uncovered, unmitigated coal ash pile on May 7, 2025 turn the creek orange. Both photos were taken from the same bridge.


Figure 3. Water samples taken from Mahanoy Creek in February 2018 both upstream (left) and downstream (right) of coal refuse reclamation activity. Sediments in water are mostly coal fines.

*Leaching of Toxins Post-Reclamation*

We also have concerns and questions about the core benefit the industry claims it provides, which is the elimination of polluted runoff from refuse piles. After the coal refuse is burned, the ash is typically returned to the site from which it was extracted, with the tonnage having been reduced by only about 15-25%. Coal ash contains a wide range of heavy metals and other toxic substances including Arsenic, Chromium, Lead, Mercury, Radium, and Selenium, which are variously neurotoxic, carcinogenic, and otherwise harmful to people and aquatic life. An analysis by Earthjustice and the Environmental Integrity Project found that fully 91 percent of coal-fired power plants in the US use coal ash impoundments that are causing unsafe levels of groundwater contamination.[6] Federal regulations require new or expanded coal ash impoundments to be built with lined landfills, but these rules do not apply to reclamation projects and no liner is installed before returning ash from coal refuse burning.

Waste coal plants are allowed to deposit this ash without any liner as part of a beneficial use permit. Part of the reclamation permit requires monitoring before, during, and after the reclamation, but unfortunately, data from this monitoring are not easily accessible and it is not clear whether they are analyzed in any systematic way. The only analysis we could find was completed in 2017 by the DEP[7] and looked at five sites in the Blacklick Creek watershed in

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[6] For a more detailed summary of common coal ash contaminants and their impacts, see p12-13 of a 2022 report by the Environmental Integrity Project and Earthjustice titled, Poisonous Coverup: The Widespread Failure of the Power Industry to Clean Up Coal Ash Dumps, available at: https://earthjustice.org/wp-content/uploads/coal-ash-report_poisonous-coverup_earthjustice.pdf

[7] Undated presentation entitled Reclamation of Refuse Piles using Fluidized Bed Combustion Ash

Cambria County. While there is no question that sites reclaimed by converting coal refuse to coal ash have consistently lower pollutant loads for some types of pollution that cause visible acid mine drainage - notably acidity, iron, aluminum, manganese, and sulfate. However, the study also showed that most sites actually had higher discharges of potassium, calcium, sodium, and chloride post-reclamation, and suggested that some sites had increased levels of more concerning pollutants like Selenium, Arsenic, or Lead.

We had some additional questions that the DEP presentation did not address, so we requested the underlying monitoring data from the sites in question, including additional data through 2023. Analysis of the data by Downstream Strategies found that:

1. Several of the monitoring wells recorded concentrations of Arsenic, Lead, and Selenium that were higher post-reclamation than they were pre-reclamation;
2. There were many instances where recorded concentrations of Arsenic, Lead, and Selenium exceeded relevant water quality criteria established in federal and state law;
3. For 11 of 15 monitoring wells studies, there were instances where the minimum detection limit of the test used was higher than the relevant water quality criteria, meaning that we don't actually know whether the concentrations of lead and selenium entering the waterways exceed legal health-based standards.

The salient lessons from this exercise are:

1. The ash from these plants is not the same as "clean fill" despite the "beneficial" designation, and it does release pollutants of concern;
2. Despite a requirement for 10 years of monitoring of unlined ash deposits post-reclamation, to our knowledge the data from only 5 of the hundreds of reclaimed sites have actually been analyzed in a systematic way; and
3. In many instances the tests being run on the samples are not even sensitive enough to determine if water quality criteria are being exceeded.

This illustrates the need for more oversight and accountability before we can take at face value the claim that the waste coal power industry is truly fixing the water quality problems caused by abandoned coal refuse.

<u>Alternatives to Combustion and Their Costs</u>

For many years, the waste coal power industry has argued that they are providing a necessary service by reclaiming land that the public cannot afford to maintain. But current facts don't support that narrative. Not only are ratepayer and taxpayer subsidies for waste coal generation much higher than ever before, there is more money than ever available for non-combustion remediation. Due to the passage of the Infrastructure Investment and Jobs Act in 2021, **Pennsylvania is eligible for more than $3 billion in funding for abandoned mine reclamation through 2036, and the $322 million annually we are set to receive in that time**

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in the Blacklick Creek Watershed, Pennsylvania, by Gregory Aaron, Rock Martin, and Gregory Greenfield, available at:
https://blacklickcreekwatershed2.files.wordpress.com/2018/11/reclamation-of-refuse-piles-using-fluidized-bed-combustion-ash.pdf

**frame is over 5.5 times more than 2020 funding levels.** This funding could greatly expand the number of acres and tons of coal refuse that can be remediated and go a long way toward permanently solving the problem.

The main alternatives to coal refuse burning are:

- Excavating and hauling to a landfill or other DEP-approved and permitted disposal area (such as a surface mining operation) where future runoff can be minimized. An example of this was the Ehrenfeld project in Cambria County, which reclaimed 70 acres, and removed 3.2 million tons of refuse (which was not suitable for energy generation), at a cost of $35.3 million.
- Capping in place, which usually involves neutralization with alkali, regrading, covering with soil, and revegetating. The Mather project in Greene County is an example of this, costing $9.5 million, and reclaiming 70 acres with 6.4 million tons of material neutralized.
- Hybrid techniques, in which some material is hauled away, some capped in place, and some even burned when the energy content is high enough. The Stineman project along the Path of the Flood Trail near my hometown is an example of this approach, which cost just over $2 million, reclaimed 27 acres, and removed and burned just under 200,000 tons out of a total of 550,459 tons remediated.

A study released by the waste coal industry group ARRIPA in 2019 indicated that "the industry consumes 8 million tons of coal refuse and remediates 240 acres of land per year."[8] Given the current level of annual state subsidy of $255 million for waste coal combustion, this equates to $1.1 million per acre, or $32 per ton remediated. Compared to the Ehrenfled cost of $504,285/acre and $11/ton, or the Mather cost of $135,714/acre and $1.50/ton, waste coal power is actually significantly more expensive now than other remediation alternatives. Put another way, **if we had redirected the $255 million in subsidies that waste coal power plants received last year into projects like Mather, we could have reclaimed 1,879 acres - nearly 8 times the land area that ARRIPA says that it remediates on an annual basis.**

A More Strategic Way to Pay for Reclamation

The Alternative Energy Portfolio Standard incentivizes the burning of waste coal, not the reclamation of land. Under the AEPS, waste coal generators have the incentive to burn the refuse that is most profitable to them, i.e., higher energy content and lower transportation and excavation costs, but not necessarily the refuse that poses the greatest environmental, economic, or safety threats. **In fact, the AEPS doesn't even require the waste coal to be abandoned to claim the credit.** Act 213 of 2004 includes in its Tier II credit eligibility definitions "waste coal … disposed or abandoned prior to July 31, 1982, *or disposed of thereafter in a permitted coal refuse disposal site regardless of when disposed of*, and used to generate electricity" If we are going to subsidize this practice, the payments need to be targeted to address the issues we say we want to address, and there have to be more robust performance criteria.

[8] https://arippa.org/wp-content/uploads/2019/07/ARIPPA-Report-FINAL-June-2019.pdf, see page 4.

The influx of federal reclamation money over the next 15 years is a game-changer, and reduces our reliance on waste coal combustion facilities as the primary drivers of coal refuse reclamation. The appropriation in the IIJA by itself is not enough to solve the problem, as it also has to fund remediation of acid mine drainage from underground mines, which is a much more expensive problem. But we believe that a portion of this funding in combination with a more targeted, time-limited, and environmentally accountable use of waste coal generation will actually get us very close to the end goal of eliminating abandoned coal refuse piles across the Commonwealth.

**To be sufficiently targeted, at minimum we need to phase out the subsidies paid by electric ratepayers under the AEPS (or successor policies like PRESS), and instead tie incentives to metrics based on environmental remediation priorities.**

In order to be environmentally accountable, we need to eliminate exemptions from air pollution regulations that waste coal generators enjoy, prevent pollution during the reclamation process to the greatest extent possible, and actually analyze the monitoring data collected as part of beneficial use permits, and require additional remediation by the permittee if biologically significant pollution levels are present.

I appreciate the opportunity to speak with you today. I’d like to acknowledge Eric Dixon and the Ohio River Valley Institute for conducting a significant amount of research that informed this testimony. This concludes my remarks.

PennFuture

Testimony of Robert Altenburg
Senior Director for Energy and Climate, PennFuture
Before the PA House Environmental Committee
August 11, 2025

This legislature has often said that when it comes to energy production, it doesn't pick winners and losers. However, when it comes to waste coal, and despite being a very minor component of our generation, the legislature has provided enormous and unwarranted financial incentives to the exclusion of other alternatives or innovations. The owners of the waste coal are the winners, and Pennsylvanians are the losers. It shouldn't be this way.

In 2021, the then-owner of the Scrubgrass and Panther Creek waste coal plants filed an S-1 report with the Securities and Exchange Commission (SEC) in preparation for an initial public offering. In that report, they noted their net cost of power for the second half of 2021. They reported that Scrubgrass' base cost of power was reduced from $37/MWh to $17/MWh after various incentives.[1] In other words, they claimed more than 70 percent of their generation costs were being paid through our taxes and electric bills. Since that time, those subsidies have exploded.

*AEPS Waste Coal Subsidy*

Pennsylvania's Alternative Energy Portfolio Standards (AEPS) Act[2] requires that ten percent of the energy sold come from Tier II resources, which include waste coal. Generators create one Tier II Alternative Energy Credit for each megawatt hour of qualifying generation and sell those credits to electric distribution companies and electric generation service providers. These costs are, in turn, passed on to consumers.

In 2019, the weighted average Tier II credit price was 31¢, and waste coal generators, in total, received a little more than $1.7 million.[3]

A law passed in late 2020 amended AEPS to restrict most Tier II credits to in-state resources.[4] As a result, 2021 credit prices increased more than eighteenfold to $5.76.

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[1] Stronghold Digital Mining Inc., Registration Statement (Form S-1), at 107 (filed Sept. 22, 2021).
[2] Act 213 of 2004, 73 Pa. Stat. Ann. § 1648.1 et seq.
[3] Pa. Pub. Util. Comm'n, Alternative Energy Portfolio Standards Act of 2004: 2019 Annual Report (Sept. 2020).
[4] Act of Nov. 25, 2020, No. 114, 2020 Pa. Laws 114.

Waste coal represented 52.4% of the Tier II credits used that year and received over $41 million, considerably more than was received by solar generation.[5]

Those increases have only continued. By 2024, the Tier II credit prices had further soared to $26.47, with more money being spent on Tier II credits than on Tier I or Solar credits. Waste coal represented 56% of the Tier II credits used in 2024, and those facilities received over $198 million. This isn't just a matter of inflation. While average electricity prices across the nation increased by 30.8% over the period 2019 through 2024,[6] the subsidies received by waste coal facilities through AEPS alone increased at a rate more than 273 times higher than the inflation rate.

*Coal Refuse and Energy Reclamation Subsidy*

Act 84 of 2016 established a Coal Refuse and Energy Reclamation (CRR) tax credit of $4 per ton of coal waste processed up to a cap of $10 million. The cap was raised to $20 million at the end of 2019, and as of last year, the legislature doubled the credit to $8 per ton and more than doubled the cap to $55 million per year up to a maximum of over $14 million per facility.[7]

To qualify, a facility is only required to ensure that 75% of the BTUs generated come from waste coal. This allows facilities like the Panther Creek plant in Carbon County to burn refuse like waste tires and still qualify for the tax credit. Also, like the AEPS credits, there is no provision in the legislation to prioritize the removal of the most dangerous or highest risk coal piles.

*Capacity Revenue*

In addition to direct subsidies for burning waste coal, these plants may also see a windfall because of the market failures in the PJM capacity market. Under this program, companies receive guaranteed payments in the future year, whether they are called upon to deliver energy or not. This system is intended to send a market signal and encourage additional generation to come online, when necessary, but because of extreme backlogs in PJM's interconnection queue—where thousands of new generation projects are currently stuck—

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[5] Pa. Pub. Util. Comm'n, Alternative Energy Portfolio Standards Act of 2004: 2021 Annual Report (Mar. 8, 2022).
[6] EIA, Retail electricity prices closely tracked inflation over the last 10 years, (Sept 11, 2024), https://www.eia.gov/todayinenergy/detail.php?id=63064.
[7] Act of July 11, 2024, No. 56, (codified as amended in various sections of the Tax Reform Code of 1971).

it's simply not possible for new generation to respond to this price signal. Every project type in the PJM queue—solar, wind, gas, nuclear, and storage—has more capacity waiting to join than all of Pennsylvania's waste coal plants combined. As a result of this and other issues, capacity prices have been soaring.

In 2021, a facility the size of Scrubgrass could have received more than $4.8 million in capacity payments. Today, that plant could receive over $9.3 million, and next year, that could increase to over $11.3 million.[8]

Waste coal facilities, in total, could receive over $135 million in capacity payments next year while these plants remain a very minor contributor to actual generation, representing less than half a percent of total generation in PJM states.[9] This low generation reflects the relatively small size of the generating facilities and the fact that they have, on average, only been generating at about half of their designed capacity.

*Conclusion*

Despite not wanting to "pick winners and losers," the legislature has effectively decided that burning waste coal and moving the pollution from the land to the air is the only acceptable solution.

With as much as $388 million being paid in subsidies for a handful of small waste coal facilities, we are already seeing increases in electricity bills and people's tax payments being diverted from other priorities. There is no sign that this situation will get better. On the contrary, there are indications that the efficiency of these plants has been declining. This could result from plants resorting to even lower-quality fuel or the degrading infrastructure at plants that are already exceeding their typical lifespan. In either case, the likely result is the industry asking for even more subsidies. It doesn't have to be that way.

It is past time we take a hard look at whether this is a cost-effective use of people's money. If the goal is to reduce electricity bills, the current situation results in high costs with little to no return for Pennsylvanians. If our goal is to improve the health and safety of communities by cleaning up piles of waste coal, then some alternatives would ensure we are achieving that goal in the most efficient way possible.

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[8] PJM Interconnection, 206/2027 Base Residual Auction Report, (July 22, 2025).

[9] U.S. Energy Info. Admin., *Form EIA-923 Detailed Data: 2023 Electric Power Monthly and Annual Generation, Fuel Consumption, and Environmental Data* (Jan. 23, 2025), https://www.eia.gov/electricity/data/eia923/.

For example, rather than the current path, we could adopt a revenue-neutral market-based solution by directly appropriating the $250 million that people will spend between AEPS and the Coal Refuse Tax Credit and making that available to whoever can most efficiently and effectively address the environmental impact of waste coal piles. Doing that would encourage innovative solutions that target the waste coal piles that represent the highest risk while keeping spending under control.

The Commonwealth has a fiduciary duty to conserve and maintain public natural resources for the benefit of all the people.[10] In keeping with that duty, it's time we take a hard look at this spending on waste coal and ask if it's justified.

[10] Pa. Const. art. I, § 27.

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# Testimony to the House Environmental & Natural Resource Protection Committee on State Support for the Remediation of Waste Coal Piles

On behalf of the
Appalachian Region Independent Power Producers Association
(ARIPPA)

Presented by:
Jaret A. Gibbons, Esq.
Executive Director

Monday, August 11, 2025 - 10:00 a.m.

Room G-50 Irvis Office Building

**EXECUTIVE SUMMARY**

- There are approximately 764 coal refuse banks containing nearly 211 million tons of coal refuse and covering 8,001 acres that remain unreclaimed with 44 of those piles actively burning.
- To date the coal refuse reclamation to energy (RTE) industry has reclaimed 257 million tons of polluting coal refuse, improved 1,200 miles of impaired streams, and restored 8,000 acres of mining affected land.
- According to a study by TRC, the coal refuse RTE industry eliminates 3.9 net tons of carbon dioxide equivalent ($CO_2e$) emissions for every ton of coal refuse that it permanently eliminates from the environment and converts to useful energy, or 51 net tons of $CO_2e$ over a 10-year coal refuse emissions lifecycle.
- Similarly, a study by Lehigh University found each ton of coal refuse reclaimed by the industry produces a net reduction of between 1.16 and 5.17 tons $CO_2e$. For a 20-year global warming potential cycle, the total greenhouse gas (GHG) emissions reduction by the industry is of the order of 0.13 to 0.58 billion tons $CO_2e$.
- While the combustion of coal refuse does emit the greenhouse gas carbon dioxide ($CO_2$), doing so avoids the ongoing emissions of the potent greenhouse gas methane that would otherwise have been emitted during its extended lifecycle from that same amount of abandoned coal refuse in piles.
- Very simply, when the full emissions profile of the coal refuse RTE industry is considered, including the reduction of emissions from reclamation of coal refuse piles, the coal refuse RTE industry produces a net reduction in GHG emissions.
- The coal refuse RTE industry is a decades long public-private partnership with the Commonwealth providing a cost-effective, environmentally beneficial solution for cleaning up Pennsylvania's historic coal mining waste while producing reliable electricity.
- Since the 1980s, state support has included power purchase agreements (PPA) mandated by the Pennsylvania Public Utility Commission (PUC), tax-exempt Pennsylvania Economic Development and Finance Authority (PEDFA) loans to construct coal refuse RTE facilities, the inclusion of waste coal energy in Tier II of the 2004 Alternative Energy Portfolio Standards (AEPS) program, the Coal Refuse Energy and Reclamation (CRER) Tax Credit, and the coal refuse set aside in Pennsylvania's proposed Regional Greenhouse Gas Initiative (RGGI) program.
- The industry is supported by local watershed groups, county conservations districts, and environmental organizations such as Earth Conservancy, Foundation for Pennsylvania Watersheds, the Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR), and the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), some of whom have provided written testimony to the committee.
- The environmental benefits of the industry are valued at $62 million annually, totaling $1.2 billion over a 20-year period, including reductions in air emissions ($444 million), elimination of water treatment ($452 million), and enhancements of public health and increased property values ($350 million).

- The “avoided cost” savings to the Commonwealth to maintain the current reclamation done by the industry is approximately $290 million annually, while eliminating all known refuse piles would cost $9.3 billion.
- Circulating fluidized bed (CFB) ash from coal refuse RTE plants is approved by the Pennsylvania Department of Environmental Protection (DEP) for beneficial use as a soil amendment or fill material to remediate abandoned mine land (AML) sites due to its highly alkaline and pozzolonic (cementitious) characteristics which cause it to harden and encapsulate the refuse material, as well as any heavy metals and other pollutants that may be present in the ash, when utilized in the mine land reclamation process.
- In 2017, the DEP studied the reclamation of coal refuse piles along the Blacklick Creek in Cambria County using CFB ash from coal refuse RTE facilities and concluded that the high-alkaline filler neutralizes the acidity of former waste coal sites in the Blacklick Creek Watershed, providing significant reductions in the acidity of acid mine drainage and reducing pollutant loadings.
- The industry generates annual economic benefits of $697 million, direct expenditures of $389 million, and $15.9 million in state taxes and fees. It supports nearly 2,200 family-sustaining jobs with just over half of those direct positions with average salaries above $81,000 and total earnings of $155 million.
- Some plants are victims of their own success as distances to retrieve fuel and related transportation costs have increased as piles adjacent to the plants have already been successfully remediated by the industry. Many facilities must travel farther and farther away from the energy facilities to site and permit coal refuse piles for reclamation and ship the beneficial ash back to remediate mining sites.
- Costs of production for coal refuse RTE plants grew from $39/megawatt hour (MWh) in 2019 to a “breakeven price” of $62/MWh in 2023 and continue to rise at an alarming rate due to increases in cost inputs, while weekly wholesale energy prices have averaged only $30/MWh during this time providing insufficient revenue to support operations.
- Based on aggregated data, the ten coal refuse RTE plants in Pennsylvania barely broke even with estimated revenue of $446 million and total costs of $434 million in 2023.
- Lower wholesale energy prices and capacity payments in recent years have increased the importance of additional revenue mechanisms, like AEPS and the CRER tax credit, in keeping plant operations viable in a historically low PJM energy market. Tier II credits accounted for over half of plant revenue in 2023.
- The coal refuse RTE industry is the only AEPS energy source that provides a tangible, quantifiable environmental benefit to the Commonwealth in terms of air, water, and land remediation.
- As proposed, the Pennsylvania Reliable Energy Sustainability Standard (PRESS) would cut support for new Tier III sources, including waste coal, rendering this new tier insufficient to support continued operation of these environmentally beneficial facilities.
- PRESS Tier III would have an initial 40% credit oversupply, which when taken in conjunction with the two-thirds reduction in the Alternative Compliance Payment (ACP) to $15, will produce PRESS Tier III credit prices similar to historic AEPS Tier II credit prices of less than $1 and far below the amount needed to support continued operation of these facilities.

**INTRODUCTION**

On behalf of ARIPPA, I thank the House Environmental & Natural Resource Protection (ENRP) Committee for inviting us to discuss the ways that the state should support the remediation of polluting coal refuse piles across Pennsylvania (PA). Organized in 1989, ARIPPA is a nonprofit trade association based in Camp Hill, PA, representing independent electric power producers, environmental remediators, and service providers that reclaim polluting waste coal piles often on AML sites to produce alternative energy. ARIPPA represents 10 environmentally beneficial mine land reclamation facilities in Pennsylvania (six in the anthracite region of northeastern PA and four in the western bituminous region) that utilize CFB boiler technology to convert historic coal refuse into highly alkaline beneficial use ash. This process uses coal refuse as a primary fuel to generate electricity, sold through the PJM Interconnection regional transmission organization (RTO) wholesale energy market, injecting private funding into mine land reclamation. Most coal refuse RTE plants were constructed as Qualifying Facilities (QFs) under the Public Utility Regulatory Policies Act of 1978 (PURPA) with a net capacity of 1,197 megawatts (MW).

Since the late 1980s, the coal refuse RTE industry has been a public-private partnership with the Commonwealth providing a cost-effective, environmentally beneficial solution for cleaning up Pennsylvania's historic coal mining waste while producing reliable electricity injecting private funds to support this environmental mission. State support has included PPAs mandated by the PA PUC, tax-exempt PEDFA loans to construct coal refuse RTE facilities, the inclusion of waste coal energy in Tier II of the 2004 AEPS program, the CRER Tax Credit, and the coal refuse set aside in Pennsylvania's proposed RGGI program, ensuring continued environmental benefits.

Given limited state and federal funding for reclamation and remediation of mining-affected lands, and the magnitude of coal mining's legacy in Pennsylvania, ARIPPA facilities utilize coal refuse from historic mining activities that remain in Pennsylvania communities producing acid mine discharges into surface waters and groundwater and causing uncontrolled air pollution from internal combustion, fugitive coal dust, and coal refuse pile fires. By removing coal refuse piles without shifting the full cost to public resources, the industry reduces the burden on Pennsylvania taxpayers. Without this industry, taxpayers would bear the full remediation cost.

In 2020 testimony to the Joint Legislative Air & Water Pollution Control & Conservation Committee, former PADEP Secretary Patrick McDonnell explained that, "waste coal operations and associated generation operations have been one of the most substantial watershed cleanup efforts of the past 30 years, and this sector continues to play a critical role in terms of pollution prevention, environmental cleanup, and land reclamation in Pennsylvania – that would otherwise remain for future generations."[1]

The use of legacy coal refuse for power generation provides significant environmental and health benefits by reducing reliance on newly extracted coal and natural gas for electricity production and eliminating harmful sources of air and water pollution associated with coal refuse pile fires and acid mine drainage. Unfortunately, lack of understanding that these coal refuse RTE facilities operate to address legacy environmental damage has become confused with the environmental movement to shutter utility-scale coal-fired generating plants that extract new coal from mining for the purpose of generating electricity. Lost in the translation is the unique environmental role, including important net reductions in air pollutants and GHG emissions provided by the coal refuse RTE industry. While the industry continues to help reverse coal refuse pile runoff pollution to water and soil, it is now incumbent to also reevaluate this industry in the context of its net GHG emissions.

In 2022, the DEP completed a rulemaking to cut $CO_2$ emissions from fossil fuel-fired electric generating units (EGUs) in Pennsylvania by enabling participation in the Regional Greenhouse Gas Initiative. The DEP included a "waste coal set aside" to provide $CO_2$ allowances for all coal refuse-fired units. DEP recognized that "waste coal-fired units provide an environmental benefit of reducing the amount of waste coal piles in this Commonwealth." The DEP acknowledged in its RGGI regulation that "reducing waste coal piles is a significant environmental issue…because waste coal piles cause air and water pollution, as well as safety concerns. Waste coal-fired units burn waste coal to generate electricity, thereby reducing the size, number and impacts of these piles otherwise abandoned and allowed to mobilize and negatively impact air and water quality in this Commonwealth."[2]

ARIPPA plants work closely with state and federal environmental officials, local watershed groups, and environmental organizations such as Earth Conservancy, Foundation for Pennsylvania Watersheds, WPCAMR, and EPCAMR, some of whom have provided written testimony to the committee, to reclaim AML sites and convert polluted streams into clean and usable waterways. These facilities represent a public-private partnership with the state to eliminate the pollution in the Commonwealth. In addition to state support, operators of coal refuse RTE facilities are currently spending private money to remediate AML sites that, if this industry is unable to continue reclamation on these and other sites, the responsibility and cost would revert to DEP to carry out this remediation work at a significant cost to Pennsylvania taxpayers. Without this industry, DEP would bear significant remediation costs.

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[1] *Prepared Testimony of Patrick McDonnell, Secretary, Pennsylvania Department of Environmental Protection*, Before the Joint Legislative Air and Water Pollution Control and Conservation Committee (February 3, 2020).
[2] *$CO_2$ Budget Trading Program*, 52 Pa.B. 2471 (April 23, 2022).

The coal refuse RTE industry generates substantial environmental and economic benefits for Pennsylvania that extend far beyond the direct financial returns from electricity generation. It is a market-based, alternative energy solution that if preserved can save the state over $9 billion in environmental remediation costs. Without reclamation by this industry, these piles will persist indefinitely. Understanding this distinction between market revenues and broader societal benefits is crucial for evaluating the industry's role and the rationale for public policy support.

## WHAT IS COAL REFUSE?

Coal refuse is a legacy of the pre-1970s coal mining industry that currently scars the land and pollutes waterways across Pennsylvania. It consists of low-quality coal mixed with rock, shale, slate, clay and other material. Also known as waste coal, culm, gob and boney, it was discarded as a "waste" during the original coal extraction process and randomly disposed in piles near the mine sites. These piles pose public health and safety hazards, as they can spontaneously combust or catch fire from lightning strikes, leach acid mine water and other hazardous substances, and are major sources of ground, air, and water pollution.

Due to the costs of remediation and limited public funding, the air and water pollution, human health and safety threats posed by these piles are often ignored until they become an immediate threat to nearby residents. Before CFB technology in the 1980s, there was no productive use for coal refuse and no technology available for the disposal or remediation of these piles. As a result, these hazardous piles have littered the local landscapes and polluted nearby land and water for decades.

Since its inception, the coal refuse RTE industry in Pennsylvania has removed and consumed as fuel more than 257 million tons of coal refuse, improved more than 1,200 miles of impaired streams and reclaimed more than 8,000 acres of previously polluted mining-affected land. At full capacity, it can remove over 10 million tons of coal refuse from the environment and reclaim approximately 200 acres of mining-affected land in Pennsylvania each year. However, due to economic headwinds, deferred plant maintenance issues, and low PJM energy prices, between 2022 and 2024 the industry has reclaimed just over 6 million tons per year or 60% of its historic reclamation capacity. The surrounding communities, lands, and streams have experienced vast environmental and economic improvements due mainly to the decades of hard work and dedication the workers in the coal refuse to energy industry have provided, in addition to the downstream environmental benefit of improved water quality provided to the Delaware, Susquehanna, and Ohio River Watersheds. Despite the efforts of the coal refuse to energy industry, the volume of remaining coal refuse across the Commonwealth is daunting.

According to the most recently available DEP coal refuse pile inventory, in 2023 there were approximately 764 coal refuse banks covering 8,001 acres that remain unreclaimed with 44 of those piles actively burning thereby producing uncontrolled, ground level air emissions. The estimated amount of coal refuse in these banks is nearly 211 million tons of material which may potentially be suitable for reclamation by coal refuse RTE facilities. The DEP acknowledges that this inventory is incomplete, and other studies have projected the amount of coal refuse placed on lands in the anthracite and bituminous coal fields of Pennsylvania approaches 1-2 billion tons.

**ENVIRONMENTAL AND PUBLIC BENEFITS OF THE COAL REFUSE RECLAMATION TO ENERGY INDUSTRY**

The primary benefits to the Commonwealth from the coal refuse reclamation to energy industry come from the environmental and social impacts of removal and remediation of coal refuse piles. This can be analyzed and quantified by considering both the social benefit from removing coal refuse piles, including better water quality, reduced air emissions, improved public safety, and increased land values, and the avoided public cost if the Commonwealth were to perform remediation at the same volume and level of quality as the industry. These frameworks demonstrate that while market revenues may not fully sustain the industry, the broader benefits justify policies supporting the viability of these plants so that the Commonwealth can capture these environmental and public benefits.

One method to value the impact of the coal refuse RTE industry is to quantify the environmental and social benefits of improvements in air quality, water quality, public health and safety, and land value. These benefits are largely “positive externalities” that accrue to individuals or society at large rather than to the plants themselves. At an annualized average of $62 million, the environmental and social benefits of the industry are valued at more than $1.2 billion over a 20-year period. Reductions in air emissions generate over $444 million in value to society while the elimination of water treatment services saves the Commonwealth nearly $452 million. Enhancements of public health and increases to property values are estimated to create approximately $350 million in added value.

Alternately, industry activity can be valued based on an “avoided cost” for the Commonwealth to directly undertake removal to the same volume of coal refuse and to the same standard of remediation. In lieu of the coal refuse RTE industry’s continued operations, the Commonwealth would have to explore other options to address legacy coal refuse piles and their associated environmental liabilities. DEP could commission the removal of piles, disposal of refuse, and remediation of waste coal sites to the same standard as the remediation performed by the industry. The cost associated with these efforts represents the “avoided cost” to the Commonwealth that is currently undertaken by the coal refuse RTE industry.

***And, all of this occurs by an industry that has a net reduction in the release of greenhouse gases!***

The reclamation and energy generation cycle is a cost-effective way to address coal refuse sites due to structural advantages:

- The refuse is repurposed as a fuel source, eliminating landfill costs.
- The energy generation process creates revenue to offset costs of operation, unlike state remediation.
- The industry addresses water quality impacts at the source, avoiding costly water treatment.

Project bids from recent AML reclamation projects can provide a basis to estimate the avoided cost from other removal, disposal, and remediation efforts by the Commonwealth that are currently undertaken by the industry. In 2016, the DEP requested bids for removal, disposal, and remediation of a coal refuse pile in Ehrenfeld totaling 2.7 million tons of coal refuse and 62 acres. The contract was awarded to Rosebud Mining Company with a total project cost of $26.2 million, including coal refuse removal and disposal, as well as site rehabilitation costs. This total project cost was based on minimal disposal cost because Rosebud was able to relocate and repurpose the refuse in strip mining pits, and due to its ownership of and proximity to these strip mining pits, transportation and storage costs for the coal refuse were greatly reduced. Upon accepting this proposal, the DEP noted that previous bids they had received in 2013 were cost prohibitive. Rosebud Mining Company was able to submit their competitive bid due to favorable circumstances that are not replicable for most other remediation efforts in the Commonwealth.

The Rosebud proposal is used as an illustrative example of a low-end cost remediation solution, and one that may be accessible to DEP based on limited funding, though it does not remediate waste coal to the same environmental standard as a more permanent remediation solution offered by the coal refuse RTE industry. High-end estimates for removal, disposal, and remediation of the Ehrenfeld site ranging from $59-98 million offer a solution that is more equivalent to the level of remediation offered by the industry, but these estimates are often cost prohibitive. While lower cost estimate proposals are sometimes available based on extenuating circumstances, these scenarios are rare and potentially less environmentally sound than higher end cost estimates.

Based on recent bids adjusted for inflation, the estimated cost of removal and disposal is $43 per ton with rehabilitation costs of $30,000 per acre. To match the industry's 2023 activity of 6.6 million tons of coal refuse consumed and 203 acres of land remediated, the costs to the Commonwealth would be at least $290 million annually. Fully eliminating all currently identified refuse piles would cost upwards of $9.3 billion.

## WATER QUALITY IMPROVEMENTS AND BENEFICIAL USE ASH

These plants play a critical role in removing coal refuse piles, remediating mining-affected lands, and reducing or even eliminating surface and groundwater pollution caused by acid mine drainage (AMD) from coal refuse piles. By converting coal refuse into alternative energy, ARIPPA members remove one of the principal sources of contamination to surface water and groundwater in Pennsylvania. DEP's 2024 biennial Integrated Water Quality Report found that 34% of Pennsylvania's rivers and streams do not meet water quality standards for water supply, aquatic life, recreation, or fish consumption. It lists 28,820 miles of Pennsylvania waters as being harmed by pollution with abandoned mine runoff representing the second largest pollutant at 5,533 miles impacted for aquatic life and 74 miles of polluted potable water supply.

Beneficial use ash from coal refuse RTE plants, a byproduct of this energy generation process, is often used as a soil amendment or fill material to remediate mining sites. A common mistake made by critics of the industry is to confuse the risks associated with coal ash from traditional coal power plants with the beneficial use ash produced by coal refuse RTE plants. Ash from traditional coal-fired power plants contains toxic components and heavy metals that can potentially leach out to contaminate groundwater, drinking water, and surface water, leading to various health problems and ecological damage. This is not true of CFB ash produced by coal refuse RTE plants.

Due to the limestone injected into the CFB boiler as part of the emissions control process, coal refuse RTE ash is highly alkaline and has pozzolonic (cementitious) characteristics, which cause it to harden and encapsulate the refuse material, as well as any heavy metals and other pollutants that may be present in the ash, when utilized in the mine land reclamation process. Before coal refuse RTE ash can be qualified as beneficial use and placed on a site, it must receive certification from the DEP. The certification process involves running the Synthetic Precipitation Leachate Procedure (SPLP) on samples of fresh ash to determine what constituents in the ash may be mobilized once the ash comes into contact with precipitation water. Additionally, monitoring wells must be installed to evaluate the groundwater and are required for ten years after the date of the last ash placement on a refuse reprocessing site.

In 2017, the DEP studied the reclamation of coal refuse piles along the Blacklick Creek in Cambria County using ash from coal refuse RTE facilities and concluded that the high-alkaline filler neutralizes the acidity of former waste coal sites in the Blacklick Creek Watershed, providing significant reductions in the acidity of acid mine drainage and reducing pollutant loadings. There was no degradation of the baseline groundwater quality observed after reclamation began. As the refuse piles were reclaimed the pH of Blacklick Creek below the reclaimed sites reached parity with the pH upstream of the piles.[3]

This fuel cycle approach changed the economic structure of coal refuse pile reclamation by generating revenue to offset removal and transportation costs, generating a byproduct for use in remediation, and alleviating the need for the costly disposal of unused coal refuse. Academic research

[3] "Reclamation of Refuse Piles Using Fluidized Bed Combustion Ash on the Blacklick Creek Watershed," Pennsylvania, PADEP Cambria District Mining Office (2017). *Available at* https://www.asrs.us/wp-content/uploads/2021/10/04-14-Martin-Slides.pdf

supports the cost savings of this particular energy reclamation process. In examining the Grant Town Power Plant in West Virginia, Dr. Paul Ziemkiewicz measured the impact of both elements of the reclamation process by estimating the magnitude of acidity reduction for coal refuse removal and beneficial ash replacement.[4] At its current levels and coal removal (6.6 million tons) and beneficial use ash produced (5.1 million tons), it is estimated that the coal refuse RTE industry eliminates over 3,600 metric tons of acid loadings per year. Assuming that industry activity continues at the same level, it will eliminate additional water treatment services with an average annualized cost savings to the Commonwealth of $22.6 million.

**AIR BENEFITS AND EMISSIONS REDUCTIONS**

Coal refuse piles pose a number of threats to public health and safety, including air quality impacts. It has long been recognized that the enormous inventory of coal refuse piles abandoned by the legacy coal mining industry represents an ongoing ecological threat to the environment. While adverse environmental impacts to soil, stormwater runoff, surface water, and groundwater by these un-remediated, abandoned environmental hazards are well documented, comparatively fewer examinations of the adverse air quality and $CO_2$e GHG emissions impacts of un-remediated and abandoned refuse piles have been identified.

As measured in terms of $CO_2$e, annual GHG emissions due to legacy coal refuse piles can no longer be ignored simply because the companies that deposited this waste as much as a century or more ago are long gone, leaving behind only a lasting legacy of pollution. The inventory of abandoned coal refuse represents a substantial ongoing source of uncontrolled air emissions, including planet warming greenhouse gases and other fugitive air pollutants. Coal dust from piles is swept up in the wind and deposited across nearby communities. Coal refuse piles can ignite spontaneously or through human intervention. Once ignited, fires often continue to burn for decades, since the coal refuse provides a nearly inexhaustible fuel supply. Further, "methods to extinguish or control AML fires…are generally expensive and have a low probability of success" according to a report from the U.S. Bureau of Mines, which terms these fires "a serious health, safety and environmental hazard."

Many of the environmental problems associated with coal refuse occur as a result of pyrite oxidation and the production of acidity. One of the most well-known and noticeable environmental impacts of coal refuse piles is that they create acidic runoff, meaning that precipitation picks up pollutants that leach into surface and ground waters – a process known as AMD. Often overlooked is that this pyrite oxidation is an exothermic, or heat-producing, reaction.

[4] Ziemkiewicz, P., "Acid Load Reduction Resulting from Operation of the American Bituminous Power Partners, L.P. Grant Town Power Plant." April 28, 2016.

Abandoned coal refuse piles are a significant existing source of $CO_2e$, hazardous air pollutants (HAPs), and Clean Air Act (CAA) regulated criteria air pollutants simply due to their continued existence. It is well documented that abandoned coal refuse piles are subject to a natural oxidation process leading to spontaneous combustion, which releases fine particulate and products of incomplete combustion including $CO_2$ and methane to the atmosphere. Fugitive air emissions from abandoned coal refuse piles affect air quality locally, as well as GHG emissions globally. The gradual emission of GHGs, particularly methane and $CO_2$, from the natural process of partial oxidation of existing abandoned coal refuse piles, if unabated, will remain virtually "forever emitters" of GHGs and other air pollutants.

The primary source of polluting air emissions from coal refuse piles is a result of weathering and spontaneous combustion eventually resulting in pyrolysis and surface emissions of products of incomplete combustion. It is well documented that all coal, including coal refuse, decays in carbon content when left for long periods exposed to the weather (sunlight, wind, oxygen and acid precipitation) and that a continuing process of slow oxidation occurs within abandoned refuse piles that inevitably leads to spontaneous combustion. During low temperature gradual oxidation, the carbon atoms that give coal refuse its heating value as a hydrocarbon fuel gradually oxidize to the greenhouse gases methane and carbon dioxide, which will continue to be emitted along with other fuel-bound air pollutants and fine particulates until there is no carbon left to be oxidized – perhaps over hundreds of years given the massive total inventory of coal refuse abandoned in Appalachia. While slow oxidation may not be noticeable to the naked eye, when thousands of acres of coal refuse are exposed to the open air, weathering of coal refuse becomes a significant source of air and methane pollution in addition to open smoldering.

The slow oxidation, known as weathering, generates heat within the pile eventually leading to the runaway chemical reaction of increasing temperature, unlimited hydrocarbon fuel and partial oxygen, causing the phenomenon known as spontaneous combustion. Spontaneous combustion occurs first within the interior of coal refuse piles themselves because formerly crushed coal refuse contains voids, known as interstices, between the discreet broken coal fragments whose surfaces are exposed to oxygen between particles. Temperature rise is most pronounced in the interior of the piles since the inner layers are not subjected to radiational or rainwater cooling as at the surface. Thus, heat from the gradual oxidation process results in increasing internal temperatures, culminating in partial, incomplete combustion as evidenced by smoke being emitted from a pile. The occurrence of this internal combustion within coal refuse piles is often not outwardly visible, but as this slow combustion of the burnable material occurs within the pile it may produce a reddish-brown slate called "red dog." The presence of red dog, a nonvolatile combustion product of the oxidation of coal refuse provides visual evidence of a history of uncontrolled burning of coal refuse in many older coal refuse piles

One-time and permanent removal of the root cause of $CO_2e$ emissions from abandoned coal refuse by the coal refuse RTE industry is the only known forever remediation process that is both permanent, proven over many years of operation, already in place, and economically sustainable. While some alternatives may have aesthetic and acid run-off merits, they cannot avoid the passive GHG emission legacy of the potent GHG methane.

Studies of potential alternatives to prevent emissions from coal refuse piles suggest that every pile would need to be permanently and anaerobically sealed from the air and that methane collection systems or padding with an inert gas such as nitrogen would need to be continuously maintained to preclude the possibility of future spontaneous combustion and surface emissions. A simple field of beach grass growing on top of a coal refuse pile could not materially eliminate the ability of the pile to spontaneously combust or vent products of incomplete combustion to the surface from deep within.

Only permanent removal of the coal refuse itself or impermeable capping with methane collection systems is capable of eliminating forever air emissions of gaseous methane resulting from oxidation and incomplete combustion of coal refuse piles. As with municipal waste landfills, once collected the most environmentally responsible solution is to reduce its global warming potential by 25-28 times by simply combusting it to $CO_2$ in a highly controlled manner. Of course, this is exactly what the coal refuse RTE industry has already been doing, at significant savings to taxpayers for over thirty years.

When considering the unmitigated air emissions of legacy coal refuse piles, it is meaningful to contrast them with the coal refuse RTE industry. Unlike controlled combustion in a CFB boiler where the coal refuse is efficiently burned out to water and $CO_2$, a smoldering coal refuse pile is only partially converted to $CO_2$ along with the far more potent greenhouse gas methane. These “pop-up” air emission sources will continue every year for as long as abandoned coal refuse piles are allowed to persist. However, when a ton of coal refuse is forever neutralized via useful energy recovery, it can never again emit air pollutants or greenhouse gases, let alone contribute to acidification of soil and water resources.

The emissions of methane from abandoned coal refuse piles, based on measurements by the U.S. Environmental Protection Agency (EPA), are many times more potent GHG emissions than the $CO_2$ emitted from controlled combustion of coal refuse for remediation. The net climate change benefit of the coal refuse RTE industry is that converting hydrocarbons directly and efficiently to $CO_2$ avoids the emissions of methane, which would otherwise be continuously emitted from coal refuse piles over many more years. Elimination of methane in favor of $CO_2$ has a much more important benefit in terms of reversing climate change now, as it is estimated to persist in the atmosphere for only about 20 years compared with the 100-year life of $CO_2$. Methane is considered to be about 81 times more potent in terms of warming the climate over the first 20 years after its release, and when normalized over 100 years for direct comparison to $CO_2$ is considered by the

EPA to be about 25-28 times more potent of a greenhouse gas long-term. The reduction of methane emissions in nature from existing coal refuse piles has a much greater benefit to reversing global climate change than one-time emissions from the combustion of coal refuse to $CO_2$ and useful energy.

Coal refuse RTE facilities also operate very responsibly, are aggressively regulated, and operate in continuous compliance with all applicable state and federal air quality regulations and standards. The plants use limestone injection to control acid gas and fabric filter systems to reduce filterable particulate matter (fPM) emissions. In addition, these plants have made considerable investments to meet ever-evolving state and federal emissions standards. The industry as a whole maintains a near flawless compliance record, with all coal refuse plants historically qualifying under the Mercury and Air Toxics Standards (MATS) regulations as low emitters of fPM and non-mercury HAP metals.

While some air pollutants and GHGs are emitted at once during controlled combustion in a CFB boiler, those boilers incorporate best available control technology (BACT), are designed to achieve complete combustion of hydrocarbons, and are highly regulated by both state and federal air emissions requirements. Air emissions from abandoned coal refuse piles are not. Societal goals such as net zero GHG emissions will be frustrated by this manmade source of nearly continuous "forever" emissions of methane unless abandoned coal refuse piles are also permanently remediated by then.

State and federal environmental regulatory authorities monitor these facilities to ensure that they do not cause or contribute to a "condition of air pollution," while conversely air emissions from abandoned coal refuse piles are unregulated and accepted as if "naturally occurring" sources of air emissions. Uncontrolled air emissions from the surface of un-remediated abandoned coal refuse piles are emitted without the benefit of controlled oxidation, any emission control, any regulated health-based air concentration standards, or any EPA or state oversight and regulation. Low level emissions from these piles can be observed from the smoke wafting from the piles and the odor of sulfur compounds impacting nearby populations. Abandoned coal refuse piles throughout Appalachia present a clear and present danger to ambient air quality. Their polluting emissions over enormous surface areas constitute a source of ground-level anthropogenic air emissions that should be evaluated through the lens of impacts to environmental justice communities in the abandoned coal field regions.

Emissions from the coal refuse RTE industry are often inappropriately compared to traditional coal-fired EGUs; however, the coal refuse RTE industry produces fundamentally different benefits than coal-fired EGUs because they primarily provide mine land reclamation services while co-producing useful energy. Those pulverized coal-fired generating units are not capable of remediating abandoned coal refuse to clean up the environment in the same manner as CFB boiler technology. Coal that is mined to produce power in these facilities has been effectively sequestering carbon beneath the earth for millions of years.

The environmental community has focused on phasing out extraction of fossil fuel from its sequestered state within the earth, however abandoned coal refuse has already been extracted and then discarded – it can never be returned to a naturally occurring underground coal seam. Mining, processing, and combustion of that sequestered carbon of newly mined coal indeed re-emits this long dormant $CO_2$. Abandoned refuse piles, however, have already been mined and are now an abandoned environmental legacy pollutant, free to continue emitting greenhouse gases and other harmful air emissions without any further human intervention over hundreds of years.

The Appalachian region has relied for years on the coal refuse RTE industry to permanently remediate abandoned coal mining waste, which represents a cost-effective and permanent solution to this significant environmental problem. However, to understand the full emissions profile of these facilities, it is necessary to numerically compare air quality and GHG emissions reductions from remediation of coal refuse by the industry to the ongoing, uncontrolled air emissions from allowing existing coal refuse piles to remain in situ.

Until recently, direct study on the comparative environmental impact of using coal refuse for energy instead of leaving refuse coal in situ was largely unavailable. However, recent research provides compelling evidence that the operation of coal refuse RTE facilities results in net improvements in air quality. Two quantitative studies were conducted to study the emissions from coal refuse RTE industry operations at 11 facilities in Pennsylvania and West Virginia (Northern Appalachia) as compared in the projected emissions from an equivalent amount of coal refuse piles combusted in nature to produce a net emissions profile for the full fuel cycle operations of this industry.

The first study, "Net Air Emission Benefits from the Remediation of Abandoned Coal Refuse Piles," (TRC Study) was performed by Robert G. Fraser, QEP, and Patrick Fennell, PE, of TRC Environmental Inc., a global engineering and consulting company that provides environmental services for regulatory compliance, development and implementation of remediation and reuse strategies, and protection and restoration of natural resources services. The second study titled "Comparison of the Impact on Greenhouse Gas Emissions Between Unabated Coal Refuse Piles and Reclamation-to-Energy Power Plants" (Lehigh Study) was conducted by Dr. Carlos Romero of the Energy Research Center at Lehigh University in Bethlehem, PA. The final reports from these studies are attached to these comments and incorporated herein.

Quantifying emissions of coal refuse piles is difficult due to the mechanisms that participate in the process, including convective transport through vents and other surface openings and diffusion through the pile material and overburden. A prior study verified that the ratio of the surface to the volume of a coal pile, including coal refuse piles, is one of the key factors affecting spontaneous combustion. Unlike stack emissions, emissions from coal refuse pile spontaneous combustion are often diffused over a large "ill-defined" area and from different sources, such as vents and fissures in the pile. This makes measurement of all coal refuse pile combustion emissions difficult to measure, requiring selection of sampling points and areas to provide an overall representative indication of the emissions across the burning site. There are multiple reports providing site-specific measurement data on a range of coal refuse pile scenarios. These data can be used to create emissions factors for coal refuse pile emissions.

In the TRC Study, the authors found that summing the estimated annual air emissions from doing nothing about these piles suggests that they represent an impediment to achieving net zero GHG emissions in the region, states, U.S. and globally. They relied on existing studies and the state AML inventories of PA and West Virginia (WV) to calculate that 2.5 million tons of coal refuse are actively burning at any given time in Northern Appalachia and applied published emission factors for GHG pollutants, as well as criteria and hazardous air pollutants, to determine that existing coal refuse piles in these states produce over 15 million tons of $CO_2e$ per year due to spontaneous combustion. When the estimated annual air emissions from both weathering and spontaneous combustion are summed to identify the full magnitude of the continuous contribution of air pollutants from these legacy coal refuse piles, the estimated $CO_2e$ emissions total more than 16.4 million tons per year, frustrating the progress being made elsewhere in improvements to air quality and climate change.

TABLE 1: TRC Study

| Estimated Air Emissions from Existing Coal Refuse Piles in Northern Appalachia due to Weathering plus Spontaneous Combustion | | | |
|---|---|---|---|
| Pollutant | Annual Emissions (tons) | | |
| | Coal Refuse Weathering In-situ; tpy | Coal Refuse Smoldering or Burning In-situ; tpy | Total Estimated Air Emissions, Weathering plus Smoldering or burning in-situ; tpy |
| $NO_x$ | | 86 | 86 |
| CO | | 278,662 | 278,662 |
| $PM_{10}$ | | 1,293 | 1,293 |
| $SO_2$ | | 95,084 | 95,084 |
| $CO_2$ | 204,168 | 3,391,053 | 3,595,221 |
| $CH_4$ | 45,504 | 469,530 | 515,034 |
| $N_20$ | | | |
| $H_2S$ | | 1,752 | 1,752 |
| Hg | | 1.1 | 1.1 |
| $CO_2e$ | 1,341,768 | 15,129,314 | 16,471,082 |

Using industry data from calendar year 2020, coal refuse facilities in PA and WV permanently remediated at least 5.5 million tons of abandoned coal refuse. The TRC Study authors then compared the actual annual emissions from the facilities remediating this amount of the coal refuse with the projected annual and lifecycle emissions that would have been released from the same amount of un-remediated coal refuse if allowed to simply remain in situ. That comparison provides a summary of the net GHG and criteria pollutant impacts of permanent remediation through controlled energy recovery in any single year. The study found that in 2020, the 11 coal refuse RTE facilities in PA and WV produced direct emissions of 7.6 million tons of $CO_2e$. In situ emissions from that same amount of coal refuse in nature would have produced annual $CO_2e$ emissions of more than 29 million tons per year. Additionally, these in situ emissions would otherwise continue to be released into the environment over the entire coal refuse emission lifecycle (in this case estimated to be at least ten continuous years of $CO_2e$ emissions) producing lifecycle emissions of 292 million tons over a ten-year period.

As shown in the TRC Study, when the avoided emissions from permanent remediation of existing abandoned coal refuse in Northern Appalachia are compared to annual emissions from the 11 coal refuse RTE facilities in PA and WV in calendar year 2020, the net emissions reduction from operation of this industry is over 20 million tons of $CO_2e$ in a single year with a net ten-year (lifecycle) reduction of over 284 million tons of $CO_2e$ for the same amount of coal refuse that was consumed by the industry in that year. Therefore, the coal refuse RTE industry was found to eliminate 3.9 net tons of $CO_2e$ emissions in one year for every ton of Appalachian coal refuse that it permanently eliminates from the environment and converts to useful energy, or 51 net tons of $CO_2e$ over a 10-year coal refuse emissions lifecycle. This net reduction in GHG emissions would increase as coal refuse RTE facilities operate at a higher capacity.

As demonstrated in the TRC Study, in situ combustion of the same quantity of coal refuse permanently remediated by the coal refuse RTE industry in 2020 (5,546,818 tons) results in a net $CO_2e$ reduction of over a quarter billion net tons of lifecycle $CO_2e$ emissions. Very simply, while the combustion of coal refuse does emit the greenhouse gas $CO_2$, doing so avoids the ongoing emissions of the potent greenhouse gas methane that would otherwise have been emitted during its extended lifecycle from that same amount of abandoned coal refuse in piles. It is very challenging to think of another economically viable and environmentally beneficial technology of any kind that could come close to providing a net $CO_2e$ benefit of this magnitude, while eliminating the environmental problems created by coal refuse piles, as part of a national strategy to achieve net zero GHG emissions.

TABLE 2: TRC Study

| Estimated Net Lifecycle GHG Emission Reductions from Permanent Remediation of 5,546,818 tons of Coal Refuse Annually | | | | | |
|---|---|---|---|---|---|
| **Pollutant** | **Unremediated Coal Refuse Estimated Annual Air Emissions (5,546,818 (tons)** | **Unremediated Coal Refuse Estimated Lifecycle Emissions (5,546,818 tons X assumed 10-yrs of continuous air emissions)** | **Coal Reclamation to Energy Industry Emissions to Remediate 5,546,818 tons of coal refuse (tons)** | **Net Lifecycle Emissions from Remediation of 5,546,818 tons of coal refuse (tons)** | **Net Lifecycle Emissions from Remediation of each ton of Coal Refuse by the Reclamation to energy Industry[1] (tons emitted per ton remediated)** |
| $CO_2$ | 6,553,760 | 65,537,596 | 7,587,349 | (57,950,247) | (10.4) |
| $CH_4$ | 906,655 | 9,066,551 | 825 | (9,065,726) | (1.6) |
| $N_20$ | | | | | |
| $CO_2e$ | 29,220,138 | 292,201,380 | 7,607,978 | **(284,593,402)** | **(51)** |

The Lehigh Study built upon this by comparing a range of emission factors to determine a high and low range of emissions reductions from the coal refuse RTE industry. For this study, four emissions factors were used in combination with the particular reference case, which is the amount of coal refuse processed by the RTE plants in 2019 (5,627,232 tons). While recognizing the combustion process that takes place in these RTE units is of concern in regard to the $CO_2$, the author recognized that there are a number of reports that have documented the GHG emissions footprint of coal refuse pile spontaneous combustion, diffused over a large "ill-defined" area and from different vents and fissures in the pile. Calculations were carried out to obtain a comparative assessment on the impact on GHG emissions from unabated coal refuse pile fires vs. the RTE option in the Appalachian region.

In the Lehigh Study, GHG emissions estimations were carried out for equivalent coal refuse volumes processed by the RTE industry in PA and WV in 2019, which if not burned would remain scattered in piles around former coal mine sites representing a risk to vegetative life and negatively impact human health. Depending on the emission factors selected, the expected GHG emissions equivalent, or $CO_2e$, from unremedied coal refuse piles in the Northern Appalachian region, for a volume of coal refuse adjusted for 2019 for the 11 RTE units, would range from 13,662,919 to 36,239,374 tons. This compares to the corresponding $CO_2e$ emissions reported by the coal refuse RTE plants in the region in 2019 at 7,128,113 tons, or 1.27 tons $CO_2e$ per ton of coal refuse reclaimed by RTE facilities.

TABLE 3: Lehigh Study

**Comparative Estimate of GHG Emissions from Coal Pile Refuse and RTE Reclamation**

| | CO2 Emissions Factor [kg/t coal] | CH4 Emissions Factor [kg/t coal] | Coal Processed by RTE 2019 [t] | CO2 Emissions [t] | CH4 Emissions [t] | CO2,eq Emissions [t] |
|---|---|---|---|---|---|---|
| Reference 20 | 1,300 | 180 | 5,627,232 | 7,315,402 | 1,012,902 | 35,676,651 |
| Reference 21 | 1,952 | 17 | 5,627,232 | 10,984,357 | 95,663 | 13,662,919 |
| Reference 25 | 2,520 | 101 | 5,627,232 | 14,180,625 | 566,475 | 30,041,916 |
| Reference 28 | 3,500 | 105 | 5,627,232 | 19,695,312 | 590,859 | 36,239,374 |

Each ton of coal refuse consumed in nature is expected to produce GHG emissions between 2.43 and 6.44 tons $CO_2e$, meaning a net reduction of between 1.16 and 5.17 tons $CO_2e$ per ton of coal refuse reclaimed by the coal refuse RTE industry. The calculations suggest that coal refuse pile GHG emissions are between 1.9 to 5.1 times larger than the corresponding emissions if burned under controlled conditions in the RTE units. Based upon the four emissions factors used in this study, when the full emissions profile of the coal refuse RTE industry is considered, including the reduction of emissions from reclamation of coal refuse piles, the coal refuse RTE industry produces a net reduction in GHG emissions. For a 20-year global warming potential cycle, the total offset amount of $CO_2e$ is of the order of 0.13 to 0.58 billion tons.

Both studies provide empirical evidence that the controlled combustion of coal refuse in properly equipped facilities represents an environmentally superior alternative to the uncontrolled, unregulated emissions that continue from abandoned coal refuse piles throughout the Appalachian region. Econsult Solutions, Inc. (ESI) used this research as a basis to develop a monetized estimate for the net reduction in air emissions achieved through the use of coal refuse for energy. Following from the structure of the 2023 TRC research, they assume that any in situ refuse coal has a realistic risk of combusting. To value this avoided risk, this study compares the emissions produced from using coal refuse for energy to the emissions produced if that coal were to combust in situ.

Using information from the TRC study on the rate of coal refuse burning in situ, it is estimated that combusted waste coal will burn over 20 years, and the surface of the coal piles will generate additional emissions through weathering and oxidation. Applying this framework to the annual amount of coal refuse remediated by the industry in 2023 (6,578,086 tons) results in a net lifetime savings of 26.1 million tons of carbon dioxide equivalent. This result is in line with the results of the Lehigh University study, which estimated net lifetime savings between 13 million and 58 million tons of carbon dioxide equivalent. To valuate this impact, a conservative $CO_2$ equivalent value of $23 per ton was used. A 3% discount rate was used to compare the upfront immediate value of coal refuse burned for energy to the impact over time of leaving that coal refuse in situ. This framework results in a net present value of $22.2 million in avoided lifetime $CO_2$ equivalent emissions resulting from the 6.6 million tons of coal refuse remediated by the industry in 2023. This is expressed as a "one-time" benefit because it captures the lifetime value of emissions savings for each quantity remediated; however, if an equivalent quantity of coal refuse was removed in the subsequent year, this level of value would compound for the emissions savings associated with the removal of this set of piles.

## ECONOMIC BENEFITS OF THE COAL REFUSE RECLAMATION TO ENERGY INDUSTRY

The coal refuse RTE industry represents a unique paradigm for mine land reclamation in which environmental and economic objectives overlap. The Commonwealth is typically forced to address the environmental impacts of coal refuse piles on a reactive, rather than proactive basis, due in part to the cost structure of remediation for the state government relative to the coal refuse RTE industry. The industry, on the other hand, has developed a comprehensive fuel cycle approach to the problem.

The coal refuse is removed from these blighted areas and transported to the facilities where it is used to produce energy – offsetting mining and transportation costs – and beneficial use ash is then returned to mining sites for remediation and restoration. The Commonwealth, by contrast, cannot generate energy and attendant revenue with coal refuse, does not have beneficial ash available for reclamation, and most crucially, must pay to safely remove, transport, and dispose of the coal refuse to a new location. As a result, the remediation activities of the industry are far more cost effective than those of the Commonwealth and result in a greater volume of environmental remediation.

The coal refuse RTE industry is a critical driver of economic opportunity throughout rural communities in Pennsylvania. Industry plants are significant employers as well as significant purchasers for other suppliers. The direct expenditures by the plants on their payroll and supply chains create downstream opportunities for related industries including mining, transportation, and environmental remediation that further support jobs and opportunities in rural Pennsylvania.

Not only has the coal refuse RTE industry saved the Commonwealth millions of dollars in environmental clean-up costs, but it is also an economic engine generating annual benefits to Pennsylvania of $697 million, direct expenditures of $389 million, and generating $15.9 million in state taxes and fees. This economic activity supports family-sustaining jobs, which yield average salaries for direct industry employees above $81,000 per year according to a recent ESI study. The study found the industry directly and indirectly supported nearly 2,200 full-time equivalent jobs, with just over half of those jobs representing direct positions within the plants, and total industry earnings of $155 million.

This data aligns with a report released in January 2022 by the Independent Fiscal Office (IFO) estimating 930 total direct jobs and total wages paid of $80.2 million in 2021, as industry operations and employment have increased in recent years due in large part to increased state support. These high value family and community sustaining jobs relate to every facet of the fuel cycle, ranging from mining, transportation, plant operations and management to environmental remediation. Not to be overlooked is the fact that these benefits are primarily concentrated in financially distressed rural communities of Pennsylvania, which are not only disproportionately burdened by the environmental legacy of past mining, but also struggle to create new economic opportunities.

## COAL REFUSE ENERGY AND RECLAMATION TAX CREDIT

The CRER Tax Credit was created by Act 84 of 2016 and is available to facilities that utilize coal refuse and beneficially use ash to restore lands degraded by legacy coal refuse piles and abandoned mines. While the credit was originally equal to $4 per ton of coal refuse used to generate electricity by an eligible facility, due to a tax credit cap that was originally $7.5 million, subsequently raised to $10 million for FY 2017-18 and to $20 million for FY 2019-20 through FY 2023-24, in most years eligible facilities received less than the full tax credit amount. In 2024, the Pennsylvania legislature and Governor Josh Shapiro agreed to increase the CRER Tax credit to $8 per ton of coal refuse with a program cap of $55 million to further support the industry amidst rising operating costs and decreasing energy revenue.

The 2022 IFO report assessed whether the tax credit has achieved its goals and purpose. For this review, the IFO analyzed the program's goals to enhance revenue stability and predictability for electric generation facilities that use fluidized bed combustion and emission control equipment to burn coal refuse, incentivize the use of coal refuse in the generation of electric power, and incentivize the use of treated ash byproduct in the reclamation of mining-affected sites. The analysis established the program purpose as reducing or eliminating the environmental impact and various negative externalities imposed on communities by coal refuse piles and AML sites. The IFO report concluded that "the CRER Tax Credit has achieved its intended goals and purpose."

## ALTERNATIVE ENERGY PORTFOLIO STANDARDS

The coal refuse RTE industry is the only AEPS energy source that provides a tangible, quantifiable environmental benefit to the Commonwealth in terms of air, water, and land remediation. The AEPS program was implemented over a period of years culminating in 2021 with a requirement of 8% of energy from Tier I sources, including a 0.5% carveout from solar, and 10% from Tier II sources including waste coal, municipal solid waste, blast furnace gas, hydro power, energy efficiency, and distributed generation. In 2017, legislation was passed requiring alternative energy credits (AECs) meeting the solar carveout come from resources located in Pennsylvania, and again in 2020 the same requirement was added for Tier II AECs with the goal of increasing credit pricing while ensuring that the program supported in-state electric generation facilities and jobs.

Historically, Tier II AECs offered minimal financial support to eligible facilities with an average weighted price per credit of only $0.25 from 2008 through 2019. However, since Act 114 of 2020 restricted eligibility to Tier II generation sources located in Pennsylvania, effectively closing the program to out of state generators, the value of Tier II credits has increased significantly. According to the PUC AEPS Historical Pricing, Tier II credit pricing reached an average weighted price of $26.47 in 2024. This increased funding for Tier II resources came at a critical time for coal refuse RTE facilities that were struggling to operate at a time of historically low prices in the PJM energy and capacity markets. In fact, four coal refuse RTE facilities closed between 2018-2020. However, since the passage of Act 114 of 2020, there have been no additional facility closures.

Since 2020, AEPS Tier II credits have been essential to the continued viability of Pennsylvania coal refuse RTE facilities. Prior to Act 114 of 2020, absent significant improvement in electricity pricing, Pennsylvania coal refuse generators were expected to continue to retire and eventually depart the market altogether. The state would therefore lose all environmental avoided cost benefits, along with the associated economic benefits, while Tier II AEC prices would rise to support out of state resources.

According to a 2020 study by Thorndike Landing,[5] by closing the borders on Tier II, AEC prices were initially expected to rise up to $16, while preserving the economic and environmental benefits of the coal refuse resources and focusing Tier II spending on in-state resources, rather than resources in other parts of PJM. While these initial estimates were accurate, Tier II AECs have since reached prices as high as $30 per credit as noted in the 2022-2023 AEPS Annual Report issued by the PUC. This increase can be attributed to market forces produced by inflationary costs and persistently low PJM wholesale energy and capacity revenues, along with price competition from other states such as New Jersey Renewable Portfolio Standards Class 2 where some Pennsylvania AEPS Tier II sources remain eligible.

Following the 2020 AEPS Tier II border closure, the amount of in-state Tier II AEC retirements has steadily climbed with 97% of retired Tier II credits coming from Pennsylvania sources in the 2023-24

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[5] *See* Comments – ARIPPA to the Pennsylvania Public Utility Commission, Docket Number M-2020-3023323 *Implementation of Act 114 of 2020*, submitted on March 2, 2021, *available at* https://www.puc.pa.gov/docket/M-2020-3023323.

compliance year. In the 2023-24 AEPS compliance report, the PUC reported that the total compliance costs for all AEPS tiers was approximately $702 million, of which $354 million was for Tier II compliance. Waste coal accounted for 56% of the credits retired for Tier II compliance, or 7,501,309 credits. At a weighted average credit price of $26.47, waste coal generators would have received approximately $198 million in revenue support for credits retired for Tier II compliance in the 2023-24 compliance year. While 97% of the Tier II credits were produced by Pennsylvania generation, 70% of the credits retired for Tier I compliance were produced by facilities outside of Pennsylvania. Thus, while the AEPS program injected $343 million into supporting all Tier II electric generation sources located in Pennsylvania, only $96 million of the $322 million paid by Pennsylvania ratepayers for Tier I compliance supported electric generation located in the state.

While the weighted average price of AEPS Tier II credits has increased by $20.71 since the 2020-21 compliance year, the first year following the Tier II border closure, the AEPS Tier I credit price has experienced a similar increase ($20.39) from $10.62 in the 2020-21 compliance year to $31.01 in the 2023-24 compliance year. The increase in renewable energy credit (REC) prices is not restricted to Pennsylvania, as PJM Tier 1 REC prices rose significantly starting in 2021. The PJM Tier 1 average price for the 10 years leading up to 2021 was $8.74/MWh, but began a steady upward trend in 2021 and reached $30/MWh by the end of 2023 similar to the AEPS prices. This increase in price is due to increasing demand for RECs driven by changes to various state Renewable Portfolio Standards programs, a tighter supply of RECs due to various factors, and higher demand for electricity generally.

The AEPS program is currently meeting the needs of Pennsylvania Tier II energy sources, such as waste coal, municipal solid waste, blast furnace gas, and hydro power. Why should we change the Tier II program, which from all accounts is accomplishing its goal of supporting continued operation of these sources?

**PENNSYLVANIA RELIABLE ENERGY SUSTAINBILITY STANDARD**

As proposed in House Bill 501, the PRESS legislation would add several new resource types, create a third tier, and increase the amount of energy required to come from the three tiers to 50%, as well as create a new Zero Emissions Credit (ZEC) program for nuclear generation. Most importantly for ARIPPA's members, PRESS would create a new Tier III consisting of waste coal, municipal solid waste, and integrated combined coal gasification technology (all currently AEPS Tier II resources), generation of electricity utilizing byproducts of the pulping process and wood manufacturing process (an AEPS Tier I resource), and adds natural gas or coal using clean hydrogen (20%) co-fired blend or equivalent carbon intensity reduction. While ARIPPA and our members appreciate that waste coal is retained in the new PRESS program, the structure of this new Tier III like AEPS Tier II before the 2020 border closure would be support in name only. As proposed, PRESS would significantly cut support for Tier III sources, including waste coal, rendering this new tier insufficient to adequately support continued operation of these environmentally beneficial facilities.

First, PRESS would reduce the Alternative Compliance Payment to $15 for the new Tier III from the current $45 for AEPS Tier I and II resources. The ACP serves as a de facto price cap on the AEC market. Thus, a cut by two-thirds in the ACP will result in an equivalent or greater reduction in the value of AECs that currently support AEPS Tier II resources. A reduction in the ACP would be a disincentive for sources in this tier, particularly those sources already in the AEPS program, to construct new facilities or continue operating existing facilities in the state. These resources will be less competitive with surrounding states and less viable to continue their operations, particularly in a PJM energy market with historically low prices.

Additionally, the proposed legislation calls for 3.8% of Pennsylvania's energy to come from PRESS Tier III resources in 2026 rising to 5% in 2032. However, since at least 2020, the proposed PRESS Tier III resources that are currently producing AECs in Pennsylvania (waste coal, municipal waste, wood pulping byproducts) have annually generated in excess of 5% of Pennsylvania's energy usage. Therefore, even with no new resources or increases in generation, PRESS Tier III would have an initial 40% credit oversupply. Taken in conjunction with the two-thirds reduction in the ACP to $15, this oversupply will produce PRESS Tier III credit prices similar to historic Tier II AEPS credit prices of less than $1 and far below the amount needed to support continued operation of these facilities.

| Historic Amounts of Proposed PRESS Tier III Credits Created | | | | |
|---|---|---|---|---|
| PRESS Tier III Sources | 2020 | 2021 | 2022 | 2023 |
| Wood pulping by-products | 323,481 | 379,802 | 391,932 | 304,669 |
| Municipal Solid Waste | 1,732,914 | 1,610,136 | 1,554,757 | 1,626,412 |
| Waste Coal | 5,199,621 | 5,242,271 | 5,676,664 | 5,541,020 |
| Total | 7,256,016 | 7,232,209 | 7,623,353 | 7,472,101 |
| | | | | |
| PA Total MWh Consumed | 136,458,735 | 136,669,240 | 139,111,166 | 135,967,418 |
| % Proposed Tier III Credits | 5.32% | 5.29% | 5.48% | 5.50% |
| 3.8% Tier III Requirement | 5,185,432 | 5,193,431 | 5,286,224 | 5,166,762 |
| Excess Credits @ 3.8% | 2,070,584 | 2,038,778 | 2,337,129 | 2,305,339 |
| % of Excess Tier III Credits | 39.9% | 39.3% | 44.2% | 44.6% |

*Source: PJM Generation Attribute Tracking System (GATS) and PAPUC AEPS Compliance Reports 2020-2023

A cut in state support for these environmentally beneficial energy resources of the magnitude proposed in House Bill 501 would force many of the facilities to idle or permanently close thereby forgoing their economic and environmental benefits. Should that happen, what you will end up with is a useless PRESS Tier III that fails to support any of these environmentally beneficial energy sources and leaves the state with no realistic means to clean up more than 200 million tons of polluting waste coal. If you are going to revise the AEPS and create the new PRESS, shouldn't it be structured in a way that will actually work and provide the support these facilities critically need?

House Bill 501's revisions to AEPS Tier II energy sources risk reducing incentives for critical electricity providers, including coal refuse RTE plants, steel manufacturers that repurpose coke oven gas for on-site electricity generation, and facilities that divert municipal solid waste from landfills to create renewable energy. These facilities are critical to Pennsylvania's economy, supporting thousands of jobs and contributing to grid reliability. In addition to their environmental benefits, Tier II resources are some the most resilient and reliable electricity sources in the AEPS program, particularly during peak winter demand when intermittent resources are generally unavailable. Reducing support for these facilities' incentives could jeopardize some of the most reliable and environmentally beneficial energy sources in the state.

Instead of altering Tier II and reducing incentives provided therein, the legislature should consider expanding the eligible sources and closing the border for AEPS Tier I, as over 70% of Tier I credits purchased by Pennsylvania's electric distribution companies fund projects outside the Commonwealth thereby limiting in-state economic benefits. Pennsylvania ratepayers deserve to see their investments support local jobs and infrastructure. If a new Tier III is created, this would be the more reasonable place to include promising new technologies like advanced nuclear (e.g., small modular reactors), fusion and grid-scale storage. This approach preserves existing jobs and environmental benefits while promoting investment and reliability in Pennsylvania's energy generation.

**ECONOMIC CHALLENGES FACING THE COAL REFUSE RECLAMATION TO ENERGY INDUSTRY**

These plants face unique challenges that jeopardize their financial viability as employers, taxpayers, and environmental remediators. The problem simply is that a variety of economic forces have recently conspired to undermine the economic fundamentals of the industry. As the industry struggles, the amount of environmental remediation that can be accomplished declines. Between 2018 and 2020, four Pennsylvania coal refuse RTE plants permanently closed, taking with them hundreds of jobs and millions of tons of potential coal refuse reclamation.

Many coal refuse facilities are today a victim of their own success. Distances to retrieve fuel, and related transportation costs, have increased as piles adjacent to the plants have already been successfully removed and remediated by the industry. Thus, they must travel farther and farther afield, away from the energy facilities to site and permit coal refuse piles for reclamation. Similarly, the rising cost to ship the beneficial ash back to remediate mining sites has increased operating costs. These are reflected in the fuel cycle reclamation costs which represent, on average, about 70% of the operating costs of these facilities.

The viability of the coal refuse RTE industry has also been adversely affected by a bevy of burdensome environmental regulations at both the federal and state level. Furthermore, the traditional fossil fuel regulatory scheme undervalues coal refuse electricity generation because it fails to recognize its positive externalities, the inherent environmental value of remediating abandoned refuse sites, and the manifest environmental benefits attendant to this industry. Federal and state environmental regulatory requirements, reclamation bonding expenses, and the corresponding capital, operating and maintenance costs represent an escalating expense threatening the facilities' survival.

Energy production is a cost-intensive industry, with a range of skilled personnel and investments required for operations. Fixed costs that do not directly vary with the level of energy production such as personnel, equipment, and administration represent the largest investments, supporting an average salary in excess of $81,000. Variable costs associated with each unit of energy production have rapidly increased with transportation being a major component of the cost structure for the coal refuse RTE industry directly impacted by the price of diesel being higher in Pennsylvania relative to neighboring states as plants have remediated the sites closest to their location and now must go further afield to find new sources of coal refuse. Capital costs to maintain and enhance the functionality of the plant and equipment have been increasing due to inflation, supply chain constraints, and deferred maintenance. Finally, taxes paid by the plants are vital to local communities. Based on aggregated data from a member survey, the ten member plants in Pennsylvania were estimated to have total costs of $434 million in 2023.

Relative to most other energy producers, coal refuse plants are labor intensive and have an expensive environmental reclamation fuel cycle with several components. Both coal refuse and limestone must be transported to plants, and the resulting beneficial use ash is then transported back to the mining sites for use in environmental remediation. This series of steps and the attendant cost structure relative to decreasing energy and capacity prices in the PJM market have created major marketplace challenges for the industry.

Pennsylvania coal refuse plants participate in the PJM RTO that runs the wholesale electricity market for most of Pennsylvania and all or part of 12 other states and the District of Columbia. Participation in competitive energy markets, for which these facilities were not designed, has in recent years been challenging due to persistently low energy and capacity market pricing. While remediation of coal refuse piles produces a broad range of environmental and social benefits, individual RTE plants are private businesses that operate as merchant power generators responsive to the financial conditions in the PJM marketplace.

Like all power generating companies, they rely on two primary market-based revenue sources: wholesale energy sales to energy suppliers who deliver power to consumers and capacity payments received in exchange for a guarantee to supply adequate quantities during periods of peak consumer demand. Unfortunately, recent conditions in the PJM market serving Pennsylvania do not provide sufficient revenue to cover operating costs for coal refuse plants. Weekly wholesale energy prices averaged around $30/MWh in 2023 and 2024. Meanwhile, estimated "breakeven prices" to recover costs of production for plants grew from $39/MWh in 2019 to $62/MWh in 2023 and continue to rise at an alarming rate due to increases in cost inputs.

Capacity payments have also been below typical levels in recent years with the price per MW-day from 2023 to 2025 of $50 representing the lowest price in the past 10 years. Pricing increased to $270 this year, representing a 28% increase in real terms above the pre-COVID high, and will notably stay above the recent depressed price levels over the next two auction periods due to a capacity payment "collar" negotiated by Governor Shapiro with a floor of $175/MW-day and a cap of $325/MW-day. When wholesale prices fail to meet production costs, continued operation relies more heavily on capacity payments and governmental interventions, such as tax credits and other subsidies.

A recent study by ESI found that variability in pricing and lower price levels for both wholesale energy sales and capacity payments in recent years have increased the importance of additional revenue mechanisms, like AEPS and the CRER tax credit, in keeping plant operations viable. With market revenue lessened, Tier II AECs accounted for more than half of plant revenue in 2023. Industry operations would not have been viable without this revenue source. Reviewing the comparison of industry costs and revenues provides context for the role of the AEPS program and CRER tax credits in the economic viability of the coal refuse RTE plants.

Based on aggregated data, the ten plants in Pennsylvania barely broke even with estimated revenue of $446 million and total costs of $434 million in 2023. This shows that the industry's environmental reclamation and energy operations would not have been viable without the vital state support from the AEPS and CRER tax credit programs. Comparing revenues and costs, the revenue generated per unit of energy of $64 marginally cleared the total cost of $62.26 per energy unit in 2023. This represents a profit margin of just under 3%, or an aggregated profit of $12 million across all ten plants. Since 2023, operating costs have continued to increase at rates exceeding inflation, while market revenues remain low by historic measure with a 2024 average Locational Marginal Price in PJM, weighted by load, of $33.74/MWh.

**PJM GRID IMPACT**

The closure of the coal refuse RTE industry in Pennsylvania would remove 1,200 MW of reliable, alternative energy from the PJM electric grid. The cost to ratepayers to replace these MW will be significantly greater than the amount of subsidy Pennsylvania currently provides to the coal refuse RTE industry to remediate polluting coal refuse piles. To replace the coal refuse RTE units with 1,200 MW of natural gas generation capacity would cost upward of $3 billion dollars. The capacity price needed to support such development would be in excess of $500 per MW-day. This does not include the added cost to Pennsylvania taxpayers for replicating the mine land reclamation and the loss of economic benefits from coal refuse RTE plant operations.

Pennsylvania has historically been a net electricity exporting state. In 2023, the generators in state produced 235,924,937 MWh while consumers used 138,710,993 MWh producing a net surplus of 97,213,944 that was exported to surrounding states. However, PJM is currently facing growing resource adequacy concerns due to factors like load growth, generator retirements, and delays in new generation projects. Since early 2023, PJM has been warning of the potential for an imbalance in electricity supply and demand that will affect future grid reliability. PJM has stated that "a capacity shortage may affect the PJM system as early as the 2026/2027 Delivery Year, when the 2025 Long-Term Load Forecast is taken into account."

Electric costs have risen recently because supply is decreasing while demand is growing. A primary reason for this imbalance is power plants that generate electricity are retiring – often due to decarbonization policies or economic pressures – while demand is increasing due to the growth of artificial intelligence, data centers, electrification, and a resurgence in U.S. manufacturing. When generation resources are shuttered and more are needed, prices naturally rise to encourage construction of new generation. This dynamic is national, but some states like Pennsylvania where older resources are being retired without enough new supply coming online are feeling the effects more acutely.

## CONCLUSION

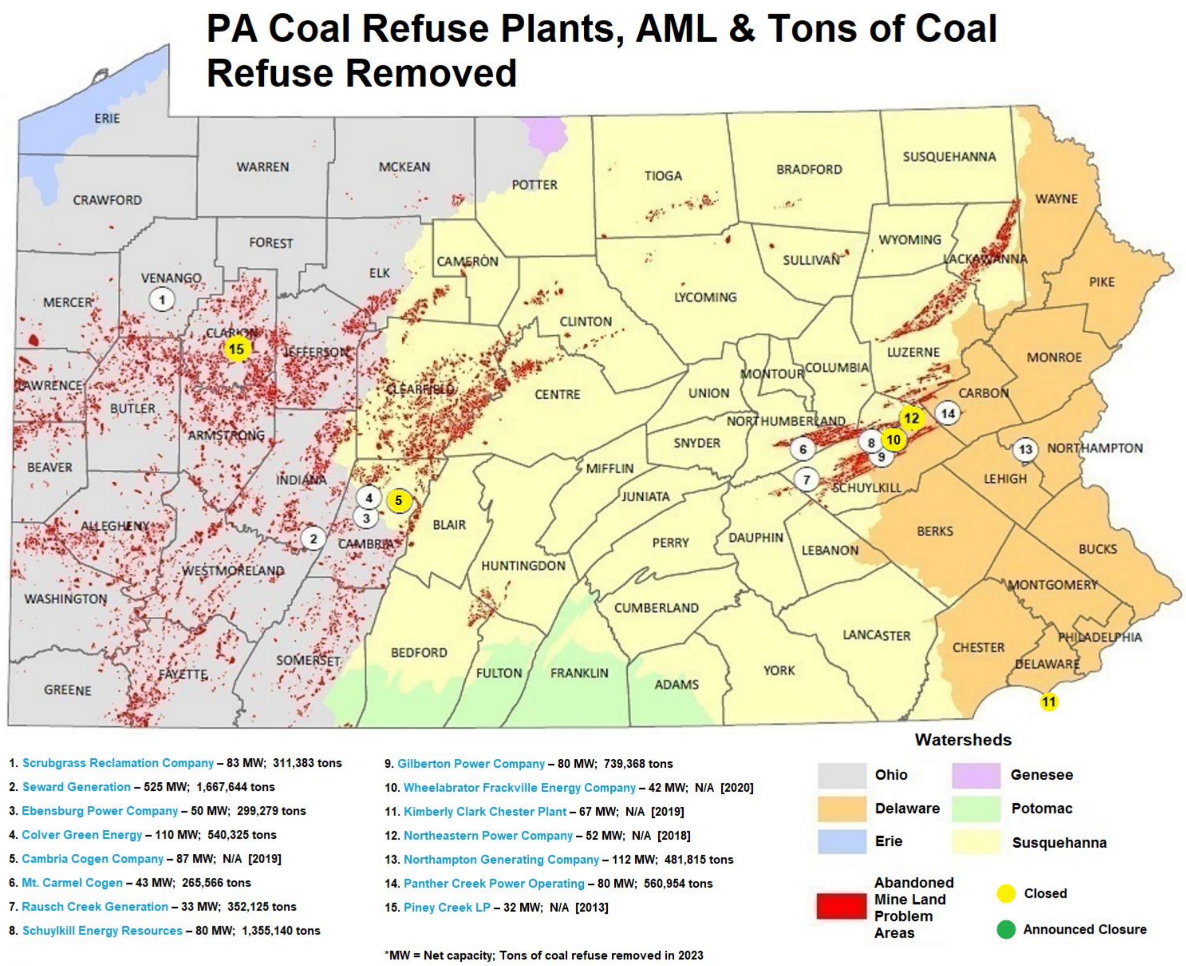
The coal refuse RTE industry is a unique private-public partnership that allows these facilities to generate electricity and at the same time restore the environment of the Commonwealth. As public funding for AML remediation continues to be insufficient, ARIPPA and our members hope to continue partnering with the Commonwealth to promote the values of AML reclamation and find ways to secure funding that will sustain and increase the current level of AML reclamation activities. The industry is historically the most effective and prolific actor in the remediation of coal refuse piles across the Commonwealth. No one but the coal refuse RTE industry can remove abandoned coal refuse piles and address the attendant environmental and safety hazards in a holistic, efficient, and permanent manner.

The industry is appreciative of the Commonwealth's continued support as plants continue to struggle in the face of costly regulations and low energy prices. By partnering with private industry, the Commonwealth receives environmental remediation of these polluted sites at a reduced cost were it to be performed by a state agency or subcontractor. If the state does not continue to partner in the environmentally beneficial efforts of these facilities and ensure that they remain open, not only will family sustaining jobs be lost, but the massive environmental problem of abandoned coal refuse piles and pits will continue to scar our land and pollute our air and waterways for generations to come.

We urge the House Environmental & Natural Resource Protection Committee to recognize the vital role these facilities play in restoring and reclaiming AML sites and the environmental and economic benefits of this work as the Committee evaluates how Pennsylvania should subsidize the remediation of waste coal piles and considers legislation, such as the PRESS bill, that could impact the coal refuse RTE industry.

## ARIPPA Plants by County

| **County** | **Plant** | **Net Operating Capacity (MW)** | **Fuel Type** |
|---|---|---|---|
| Cambria | Colver Power Project | 111 | Bituminous |
| Cambria | Ebensburg Power Company | 50 | Bituminous |
| Schuylkill | Gilberton Power Company | 80 | Anthracite |
| Northumberland | Mt. Carmel Cogen | 43 | Anthracite |
| Northampton | Northampton Generating Company | 112 | Anthracite |
| Carbon | Panther Creek Power Operating | 80 | Anthracite |
| Schuylkill | Westwood Generation | 33 | Anthracite |
| Schuylkill | Schuylkill Energy Resources | 80 | Anthracite |
| Venango | Scrubgrass Generating | 83 | Bituminous |
| Indiana | Seward Generation | 525 | Bituminous |
| | **Total** | **1197** | |




## Pollution Caused by Coal Refuse Piles

# Examples of Reclamation by the Coal Refuse RTE Industry

**Northampton Generating – Loomis Bank Mine Fire, Luzerne County**

**Northampton Generating – Loomis Bank Site, Luzerne County**

# Barnes Watkins
Cambria County, Pennsylvania


# Coalpit Run
Cambria County, Pennsylvania

# Cooney #3

Cambria County, Pennsylvania


# Soberdash

Westmoreland County, Pennsylvania

# South Branch Blacklick Creek

Cambria County, Pennsylvania

# Spangler

Cambria County, Pennsylvania

# Stineman
Cambria County, Pennsylvania


# Vintondale
Cambria County, Pennsylvania