

PENNSYLVANIA

COAL REFUSE ENERGY AND RECLAMATION TAX CREDIT

An Evaluation of Program Performance



January 2022

**COMMONWEALTH OF PENNSYLVANIA
INDEPENDENT FISCAL OFFICE**

Independent Fiscal Office

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INDEPENDENT FISCAL OFFICE

January 24, 2022

The Honorable Members of the Performance-Based Budget Board and Chairs of the House and Senate Finance Committees:

Act 48 of 2017 requires the Independent Fiscal Office (IFO) to review various state tax credits over a five-year period. For the fourth year, the IFO reviewed four tax credits: the Educational, Coal Refuse Energy and Reclamation, Brewers' and Mixed-Use Development Tax Credits. The act requires the IFO to submit tax credit reviews to the Performance-Based Budget Board and the Chairs of the House and Senate Finance Committees and to make reports available to the public on the IFO website.

This report contains the tax credit review for the Coal Refuse Energy and Reclamation (CRER) Tax Credit. The IFO reviewed studies on the coal refuse to energy and reclamation industry, held discussions with various stakeholders and met with agency staff who administer the tax credit. Based on that research, the IFO submits this report to fulfill the requirements contained in Act 48.

No other state offers a tax credit to firms that burn coal refuse to produce electricity, and 2020 data from the U.S. Energy Information Administration show that 11 of the 16 waste coal facilities in operation that year were located in Pennsylvania. Most states receive federal Abandoned Mine Land (AML) grants that fund environmental cleanup projects on lands affected by legacy coal mining activities. In federal fiscal year 2021, Pennsylvania received \$27.4 million in AML grants, the second largest share, behind Wyoming.

The IFO welcomes all questions and comments on the contents of this report. Questions and comments can be sent to contact@ifo.state.pa.us.

Sincerely,

A handwritten signature in blue ink that reads "Matthew J. Knittel".

Dr. Matthew J. Knittel
Director

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General Findings and Recommendations

The Coal Refuse Energy and Reclamation (CRER) Tax Credit was created by Act 84 of 2016 and is available to electric power generation facilities that burn coal refuse and use ash to restore lands degraded by legacy coal refuse piles and abandoned mines. The credit is equal to \$4.00 per ton of coal refuse used to generate electricity by an eligible facility. The original tax credit cap was \$7.5 million but was subsequently raised to \$10.0 million for FY 2017-18 and to \$20.0 million for FY 2019-20 and thereafter.

The **general findings** of this report are as follows:

- Pennsylvania is the only state that provides a tax credit to incentivize the burning of coal refuse in the generation of electricity and the reclamation of abandoned mine lands. For 2020, data from the U.S. Energy Information Administration show that 11 of the 16 waste coal generators in operation were located in Pennsylvania.
- Other states primarily rely on federal Abandoned Mine Land (AML) grants to fund environmental cleanup projects on lands affected by legacy coal mining. For federal fiscal year 2021, Pennsylvania received \$27.4 million in AML grants, the second highest allocation behind Wyoming.
- From 2016 to 2020, coal refuse to energy facilities burned 36.8 million tons of coal refuse and produced 28.0 million tons of beneficial use ash. Refuse piles closer to generators have been remediated so that refuse must now be transported over longer distances. Higher transport costs, excess capacity and robust growth of natural gas production have contributed to facility closures.
- For 2019, the average CRER Tax Credit issued was \$1.7 million. The effective credit rate was \$2.70 per ton of coal refuse burned due to the 22.2% per firm cap on credit awards and roughly 15% leakage due to sales discounts and transfer fees. Prior to the increase of the CRER Tax Credit cap to \$20 million, the effective credit rate ranged from \$0.85 to \$1.17 per ton, as the lower credit amount caused all awards to be prorated.
- For 2018 and 2019, nearly all CRER Tax Credits were sold for an average of 85 cents per tax credit dollar. The residual 15 cents was retained by the purchaser and third-party facilitator.

The **recommendations** of this report are as follows. A more complete discussion can be found in the final section of this report.

- Consideration should be given to moving the application deadline to March 1, the same day as the Air Information Management System (AIMS) report required for the application.
- Annual credit awards could be tied to an average monthly wholesale electricity price. Credits not awarded under the \$20 million cap could be rolled forward for award in future years if prices are unusually low and more credits are needed to maintain operations. This adjustment provides more revenue stability and maintains incentives.
- To maximize the environmental benefits to the Commonwealth, CRER Tax Credits could be prioritized or targeted to refuse piles that inflict greater environmental harm. The credit could be converted into a grant program to facilitate prioritization and eliminate inefficient leakage due tax credit sales discounts and transfer fees.

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Introduction

Act 48 of 2017 requires the Independent Fiscal Office (IFO) to review various state tax credits over a five-year period.¹ For the fourth year, the IFO reviewed four tax credits: the Educational, Coal Refuse Energy and Reclamation, Brewers' and Mixed-Use Development Tax Credits. The act requires the IFO to submit tax credit reviews to the Performance-Based Budget Board and the Chairs of the House and Senate Finance Committees and to make reports available to the public on the IFO website.

The act specifies that tax credit reviews shall contain the following content:

- The purpose for which the tax credit was created.
- Whether the tax credit is accomplishing its legislative intent.
- Whether the tax credit could be more efficiently implemented through other methods.
- Any alternative methods which would make the tax credit more efficient.
- The costs to provide the tax credit, including the administrative costs to the Commonwealth and local government entities within this Commonwealth.

The act also specifies that the IFO shall develop a tax credit plan for all tax credits subject to review. The plans should include performance measures, and where applicable, the measures should reflect outcome-based measures (including efficiency measures), measures of status improvements of recipient populations, and economic outcomes or performance benchmarks against similar state programs or similar programs of other states or jurisdictions. The IFO submits this report to fulfill these requirements.

This review contains five additional sections. **Section 2** discusses the administration of the tax credit and presents historical award data. **Section 3** provides background on the coal refuse to energy industry. **Section 4** contains an overview of government policies that impact the industry. **Section 5** provides an overview of the economic and environmental impact of the tax credit. **Section 6** concludes with the tax credit plan, as required by Act 48. A complete list of reports and data sources used for this review can be found in the **Appendix**. If submitted, written comments provided by stakeholders and affected agencies are also included in the Appendix.

¹ Act 48 of 2017 is also known as the Performance-Based Budgeting and Tax Credit Efficiency Act. See the Appendix for the Tax Credit Review Schedule.

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CRER Tax Credit Overview

Article XVII-J of the Tax Reform Code of 1971 (Act 84 of 2016) created the Coal Refuse Energy and Reclamation (CRER) Tax Credit. The CRER Tax Credit is available to eligible facilities that use qualified coal refuse to generate electricity. Qualified coal refuse is waste coal, rock, shale, slurry, culm, gob, boney, slate, clay and related materials that were removed from the ground during mining. An eligible facility (i.e., power plant) must have been in service prior to July 2016 and consist of one or more units that generate electricity located on the same property. Additionally, the facility must (1) combust qualified coal refuse or fuel composed of at least 75% qualified coal refuse, (2) utilize some type of circulating fluidized bed combustion unit equipped with a limestone injection system to control for acid gases and a fabric filter particulate control system to control for emissions and (3) use at least 50% of the ash produced from the coal refuse to reclaim mining-impacted sites.

The CRER Tax Credit is equal to \$4.00 per ton of coal refuse used to generate electricity. The credit is capped at \$20.0 million annually.² The maximum amount of credit awarded to each eligible facility is 22.2% of the total annual program cap (currently \$4.44 million). If the credit is oversubscribed, then the amount awarded to each facility is prorated.

Tax credits may be utilized against Pennsylvania personal income, corporate net income, bank and trust company shares, title insurance company shares, insurance premiums, gross receipts and mutual thrift institutions taxes for the tax year in which the credit is issued. Credits not used in the tax year issued may be carried forward an additional 15 years. The credit is non-refundable and may not be carried back to preceding tax years. The credit may be sold, assigned or transferred but must be used within the year of sale, assignment or transfer.

This section begins with a statement of the goals and purpose of the tax credit. It then discusses the application process, administration of the tax credit and concludes with a presentation of program data.

Goals and Purpose

Act 48 of 2017 requires that all tax credit reviews published by the IFO shall discuss (1) the purpose for which the tax credit was created and (2) whether the tax credit is accomplishing its legislative intent. For this credit, the IFO reviewed the stated intent of the authorizing legislation and documentation provided by the Department of Community and Economic Development (DCED). For this review, the IFO established the specific and quantifiable goals and general purpose of the CRER Tax Credit as follows:

Goals

- 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.

² Act 13 of 2019 increased the annual program cap from \$10.0 million to \$20.0 million.

- Incentivize the use of treated ash byproduct in the reclamation of mining-affected sites.

Purpose

- Reduce or eliminate the environmental impact and various negative externalities imposed on communities by coal refuse piles and abandoned mine lands.

Administration

DCED administers the tax credit and reviews applications. Applicants for the CRER Tax Credit must provide a complete CRER Tax Credit Application that includes the following:

- General applicant and facility information including name, address and appropriate taxpayer identification number.
- Various Department of Environmental Protection (DEP) permits and approvals for mining, air emissions and the use of ash byproducts to reclaim sites.
- Amount (in tons) of qualified coal refuse burned at each site.
- Beneficial use ash generated (in tons), the amount used in reclamation and where (site location) the ash was utilized as backfill.
- Amount of coal refuse and other fuels burned.
- Amount of tax credits requested based on coal refuse utilized.
- Signature, Verification and Submission Statement.

Applications for the CRER Tax Credit are due each year by February 1 and are reviewed and approved by DCED by March 20. The application review process includes consultation with DEP to verify (1) the facility's eligibility, (2) the amount of qualified coal refuse burned and (3) that the facility meets all regulatory requirements. DCED notifies the Department of Revenue (DOR) of credit eligibility, and DOR conducts a compliance check, after which DCED issues the tax credit certificate. Tax credits are submitted to DOR for application against the recipient's Pennsylvania state tax liability.

By October 1 of each year, DCED must submit a report to the chair and minority chair of the Appropriations and Finance Committees of the Pennsylvania House and Senate that includes the taxpayers' awarded credits and credit amounts approved, utilized, sold or assigned. The report must also provide data on the benefits to the state from the program and the volume of ash generated and used to reclaim land impacted by legacy coal activities.³

The estimated annual staff time and cost to administer the CRER Tax Credit is as follows: 0.10 full-time equivalent (FTE) DOR staff (\$14,100); 0.10 FTE DCED staff (\$25,000); and nominal time and costs for DEP staff.

³ To date, these reports have not been submitted.

Historical Data

Table 2.1 provides detail on CRER Tax Credits issued, the amount of coal refuse burned and total ash produced for award years 2016 to 2020. Notable trends include the following:

- Since 2018, the number of recipients awarded CRER Tax Credits has decreased due to facility closures.
- The average CRER Tax Credit award was \$1.6 million in the most recent year.
- Credits awarded are less than credits requested because each facility is limited to 22.2% of total tax credits available. After application of the per firm cap, if requested credits still exceed credits available for award, then all awarded credits are prorated down by the same percentage.
- Prior to 2019, awards ranged from 91 cents to \$1.25 per ton of coal refuse burned. Since the cap increased to \$20.0 million in 2019, the subsidy rate exceeds \$3.00 per ton. This excludes any reductions due to sales discounts or transfer fees (roughly 15% of awards).

	Award Year				
	2016	2017	2018	2019	2020
Number of Recipients	13	13	13	12	11
Total Coal Refuse Burned¹	8.3	8.0	8.6	6.3	5.6
Total Ash Produced ¹	6.5	6.3	6.4	4.6	4.2
Credits Requested	\$33.1	\$32.1	\$34.3	\$25.2	\$22.5
Credits Awarded	\$7.5	\$10.0	\$10.0	\$20.0	\$17.5
Average Award	\$0.6	\$0.8	\$0.8	\$1.7	\$1.6
Effective Credit Rate	\$0.91	\$1.25	\$1.17	\$3.17	\$3.12

Note: Dollar amounts in millions. Act 13 of 2019 increased the annual program cap from \$10.0 to \$20.0 million.
¹ Amounts in millions of tons.
 Source: Pennsylvania Department of Community and Economic Development.

Eligible facilities must generate at least 75% of their electricity from coal refuse. **Table 2.2** shows the types of fuel burned at CRER Tax Credit facilities and the heat content of those fuels as measured in MMBtus (million British thermal units). Coal refuse is the primary fuel source for applicant facilities, in all years comprising 98% to 99% of fuel heat content. Coal, tire derived fuel, oil and gas make up minor shares of the non-refuse coal fuel sources.

Table 2.2
Fuel Heat Content Reported by Applicants (MMBtu)

	Award Year				
	2016	2017	2018	2019	2020
Coal Refuse	90.56	87.70	91.21	66.60	58.95
Coal	0.74	1.30	2.06	0.72	0.32
Tire Derived Fuel	0.64	0.64	0.66	0.44	0.10
Oil	0.26	0.11	0.30	0.23	0.22
Gas	0.04	0.05	0.09	0.09	0.04
All Other	<u>0.32</u>	<u>0.12</u>	<u>0.03</u>	<u>0.06</u>	<u>0.01</u>
Total	92.56	89.92	94.36	68.12	59.65

Note: Amounts in millions.

Source: Pennsylvania Department of Community and Economic Development.

Table 2.3 displays tons of coal refuse burned based on county location of the tax credit applicant (i.e., the generator). It should be noted that counties may not reflect the location of coal refuse piles reclaimed because coal refuse may be transported across county lines to a particular facility. Initially, generation facilities used coal refuse from local sites. As those locations have been remediated, facilities must transport coal refuse over longer distances. This trend will continue and produce additional cost pressures for coal refuse generators.

Table 2.3
Coal Refuse Burned by County

County	Award Year				
	2016	2017	2018	2019	2020
Schuylkill	2,985	2,914	3,401	2,808	2,548
Indiana	2,429	2,205	2,103	1,599	2,106
Cambria	1,454	1,500	1,618	1,076	790
Northumberland	602	624	578	196	98
Venango	441	493	517	385	15
Northampton	217	195	193	125	8
Carbon	<u>144</u>	<u>99</u>	<u>160</u>	<u>112</u>	<u>64</u>
Total	8,271	8,029	8,571	6,301	5,629

Note: Thousands of tons.

Source: Pennsylvania Department of Community and Economic Development.

Due to higher industry concentration and a larger credit cap, the average dollar award has increased since the program's inception. **Table 2.4** displays credits issued for award years 2016 and 2020. For 2020, two firms each received awards greater than \$3.0 million and comprised one half of total dollar awards. By contrast, five small firms received a credit less than \$500,000 and comprised roughly 6% of total credit awards.

Table 2.4
CRER Tax Credits Issued by Size

Credit Award	Award Year 2016			Award Year 2020		
	Number	Amount	Share	Number	Amount	Share
\$0 to \$499k	6	\$1.4	18.9%	5	\$1.1	6.1%
\$500k to \$1.49m	6	4.4	58.9	2	2.9	16.5
\$1.50m to \$1.99m	1	1.7	22.2	1	1.7	9.8
\$2.00m to \$2.99m	0	0.0	0.0	1	3.0	17.0
\$3.00m+	<u>0</u>	<u>0.0</u>	<u>0.0</u>	<u>2</u>	<u>8.9</u>	<u>50.6</u>
Total	13	7.5	100.0	11	17.5	100.0

Note: Dollar amounts in millions. Act 13 of 2019 increased the annual program cap from \$10.0 to \$20.0 million.
Source: Pennsylvania Department of Community and Economic Development.

Nearly all awarded CRER Tax Credits are sold because recipients do not generate sufficient tax liability to fully absorb the credits. **Table 2.5** displays the amount of credit sold, the price paid by the purchaser and any transfer or brokerage fees paid to third-party facilitators for the transaction. As shown by the Share of Credits Awarded line, the residual actual value of tax credit awards decreased from 94 cents to 91 cents per tax credit award dollar. Over that same period, transaction fees more than tripled, even though fewer firms received tax credits. For 2019, the \$3.1 million (15.4%) of awarded tax credits lost to sales discounts (\$2.8 million) or transfer fees (\$340,000) are leakages from the program and do not incentivize the burning of coal refuse or reclamation of lands. While shown, data for 2020 are not used in the analysis because tax credit sales are preliminary, and more credits will likely be sold.

Table 2.5
CRER Tax Credit Sales by Award Year

	2016	2017	2018	2019	2020
Credits Awarded	\$7.5	\$10.0	\$10.0	\$20.0	\$17.5
Credits Sold	\$6.3	\$8.6	\$9.4	\$19.7	\$16.8
Purchase Price	\$5.9	\$8.1	\$8.3	\$16.9	\$15.4
Transfer Fees	<u>-\$0.1</u>	<u>-\$0.2</u>	<u>-\$0.2</u>	<u>-\$0.3</u>	<u>-\$0.3</u>
Net Value to Recipients	\$7.1	\$9.4	\$8.7	\$16.9	\$15.9
Share of Credits Awarded	94.1%	93.6%	87.1%	84.6%	90.7%

Note: Amounts in millions. Act 13 of 2019 increased the annual program cap from \$10.0 to \$20.0 million.
Source: Pennsylvania Department of Community and Economic Development.

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Industry Background

This section presents history and background for the coal refuse to energy industry to provide context for the CRER Tax Credit. The section provides only a high-level discussion and disregards many developments and technical details to maintain brevity.

Establishment of Coal Refuse to Energy Industry

In 1977, due to nationwide concern over the environmental effects from legacy coal mining operations, the federal government passed the Surface Mining Control and Reclamation Act (SMCRA), which created the Office of Surface Mining Reclamation and Enforcement (OSMRE) in the U.S. Department of the Interior. OSMRE is responsible for (1) the regulation of active coal mines and (2) the reclamation of abandoned mine lands, including coal refuse piles. A key outcome of SMCRA was to shift responsibility to reclaim lands that had been abandoned by private, legacy coal companies to government entities, primarily state governments.⁴

In response to economic stress from nationwide oil shocks, the U.S. Congress sought to diversify the electric generation market and enacted the Public Utility Regulatory Policies Act (PURPA) in November 1978. The stated goals of the act were to (1) conserve electric energy and natural gas, (2) improve the reliability and equity of U.S. domestic electricity and (3) provide for the development of crude oil transportation systems, hydroelectric power and other alternative energy sources.⁵ The final goal was implemented by the requirement that electric utility companies purchase wholesale power from certain alternative energy producers, and coal refuse to energy facilities were included in that category. To maintain low prices, electricity purchased from those facilities was subsidized by the federal government at an avoided cost rate to meet consumer demand. The subsidy created favorable market conditions for non-utility power producers (i.e., small power production facilities and alternative energy producers).⁶ At the same time, innovations in circulating fluidized bed (CFB) combustion technology allowed electricity generation from coal refuse to become a financially viable option.

PURPA allowed the first coal refuse to energy power plants utilizing CFB technology to be established in Pennsylvania during the 1980s and continued to provide subsidies to the industry to incentivize the burning of coal refuse over two decades. The Energy Policy Act of 2005 amended PURPA to terminate mandatory purchase requirements, forcing coal refuse to energy facilities to compete on an open market.⁷ Without PURPA support, higher electricity prices were generally required to maintain the long-term financial viability of coal refuse generators.

⁴ P.L. 95-87, 91 Stat. 445 (August 3, 1977).

⁵ P.L. 95-617, 92 Stat. 3117 (November 9, 1978).

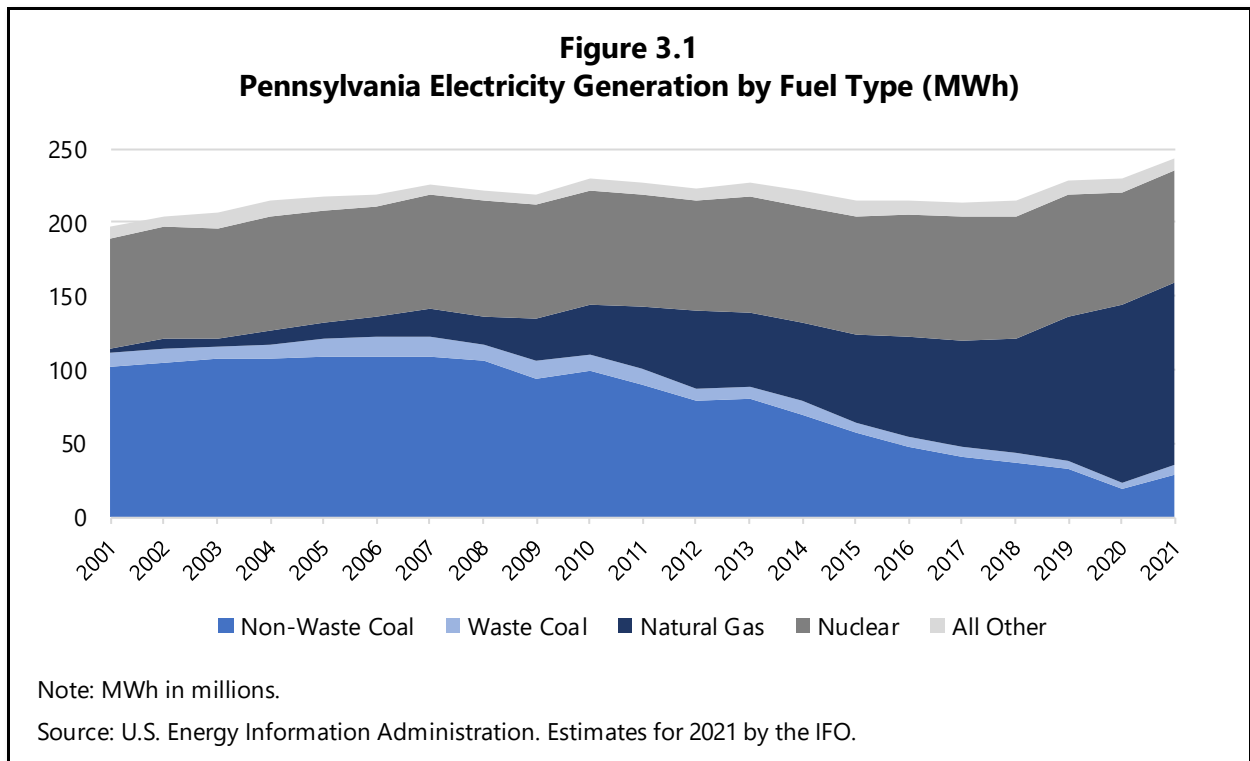
⁶ PURPA defines "small power production facilities" as having a power production capacity of 80 megawatts or less.

⁷ P.L. 109-58, 119 Stat. 962 (August 8, 2005).

Despite these changes, generators continued to burn many tons of coal refuse in the decade that followed. For 2005, the final year of PURPA mandatory purchase requirements, 10.6 million tons of coal refuse were burned. By 2010, coal refuse burned increased to 11.7 million tons, and then declined to 7.9 million tons by 2015, the final year prior to the CRER Tax Credit. Since then, the primary change to the market has been the rapid expansion of natural gas production due to more efficient fracking technology. By 2021, coal refuse burned fell to 7.0 million tons (IFO estimate), and natural gas comprised 51% of power generation in the state, as proximity to the Marcellus Shale provided an abundant fuel source at a relatively low cost. Other fuel sources used to generate electricity include nuclear power (31%), all types of coal (14%) and solar, wind and hydroelectric (4%).

Power Generation in Pennsylvania

Figure 3.1 displays Pennsylvania electric power generation (million megawatt hours) and generation from facilities that use natural gas, nuclear, waste coal (i.e., coal refuse), non-waste coal and all other (wind, solar, hydro) energy sources from 2001 to 2021. For 2001, all forms of coal comprised 56.9% of total power generated, and coal refuse comprised 8.8% of generation from all forms of coal. By 2011, those shares were 44.3% and 10.3%. The latest data for 2021 show that all coal sources comprised 14.3% of total generation and coal refuse was 16.7% of all coal. The historical data illustrate the clear trend from coal to natural gas.



During the past decade, the robust growth of natural gas production from the Marcellus Shale restrained wholesale electricity prices on the PJM Interconnection.⁸ Low electricity prices directly affect coal refuse power plants because it reduces profit margins. (Average wholesale price data are presented in the Economic Impact section.) Wholesale electricity prices also affect the timing and duration of plant operations. Electricity demand is highly seasonal, and prices fluctuate throughout the year. If wholesale prices are too low, coal refuse plants may temporarily close to avoid incurring variable costs (i.e., transportation and wages). During these periods, plants do not generate electricity or engage in reclamation activities. This reduces the amount of coal refuse burned and generally slows work performed at reclamation sites.

Environmental Regulation

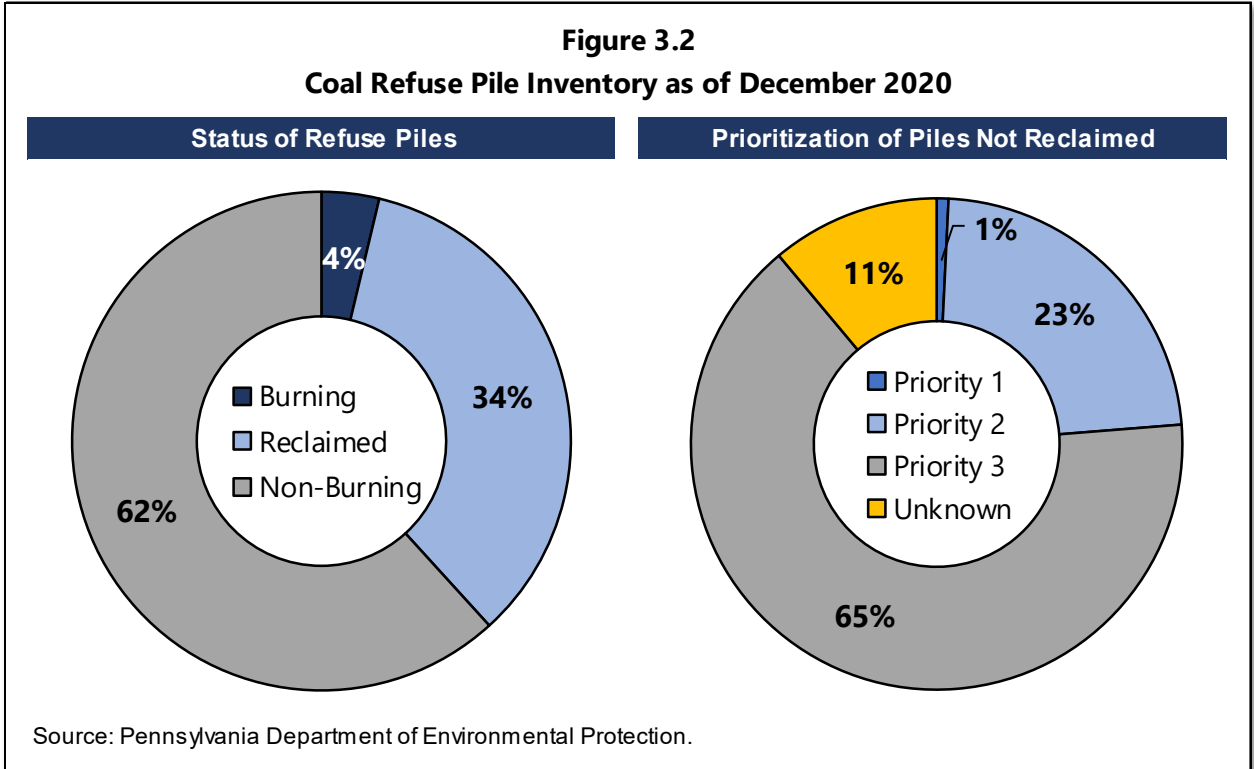
The mining of coal refuse and subsequent remediation of land is a surface mining activity regulated by DEP.⁹ A permit must be obtained prior to extraction of coal refuse from a specific site. The permit covers an area inclusive of the mining site, facilities and roads and is renewed every five years. Permit requirements include the licensure of the site operator, a National Pollution Discharge Elimination System (NPDES) permit and a bond posted with the department.

The bond provides assurance that site operations will not further degrade the environment, including water, soil and air, and is based on rates reviewed and set annually by DEP to reflect anticipated costs to restore the site should the operator violate the terms of the bond and cause environmental damage. The site receives an initial inspection by DEP staff to measure pollution outflow prior to any mining activity and is monitored on a quarterly or annual basis after operations begin, depending on permit requirements. Additional monitoring takes place each year for up to ten years after reclamation is complete. Studies undertaken by DEP in the last two decades find relatively high compliance with regulatory requirements.¹⁰

⁸ The PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia.

⁹ In addition to removal of coal refuse, site remediation includes controlling for erosion through revegetation and reducing acid mine drainage.

¹⁰ See "Reclamation of Refuse Piles Using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania" (2017) for an example: <https://wvmdtaskforce.files.wordpress.com/2017/05/2017-aaron-martin-wed-salon-c-1100.pdf>.



As part of its regulatory duties, DEP maintains an inventory of known coal refuse piles across the state. **Figure 3.2** illustrates that 34% of the approximately 1,200 coal refuse piles tracked by DEP have been reclaimed through December 2020. Piles are assigned priority categories as defined by OSMRE:

- Priority 1 and Priority 2 piles represent danger to health, safety and property and include concerns such as hazardous or explosive gases and industrial waste. Of the roughly 400 sites reclaimed, 26% (105) were Priority 1 or 2. The chart shows that few known Priority 1 piles (1%) remain.
- Priority 3 piles affect the environment but do not directly impact human health and safety in the near term (although there can be longer-term implications). A little over 500 of all known piles that have yet to be reclaimed (65%) are categorized as Priority 3.

Federal and State Programs

This section describes state and national programs that have similar goals as the CRER Tax Credit. Because no other state offers a tax credit or grant program comparable to the CRER Tax Credit, this section does not include an interstate comparison.

Abandoned Mine Land Reclamation Program

The 1977 SMCRA created the Abandoned Mine Land (AML) Reclamation Program to fund reclamation projects for lands impacted by legacy coal mining via fees assessed on present-day coal mining companies. Since 2013, the fee has been 28 cents per ton of coal mined by surface coal mining and 12 cents per ton of coal mined by underground mining.¹¹ The federal OSMRE administers the program and distributes grants to states and tribes to use for reclamation projects, such as permitting, environmental assessments and site surveys, as well as operational costs once a project commences. From 2016 to 2021, DEP data show that AML and other government funding sources were used to remediate 23 coal refuse sites across the state at an overall cost of \$41.0 million.

The Tax Relief and Health Care Act of 2006 requires AML grants to be distributed to states and territories in annual payments based on fees collected during the previous fiscal year. The fund is allocated into three categories for distribution: (1) states and tribes, (2) historic coal and (3) federal expense. OSMRE allocates historical coal grants based on each state's share of coal tonnage produced prior to 1977 so that states with large numbers of abandoned mines but little present-day coal production are still allocated funds for reclamation. Funds allocated to the federal expense category are used to fund Minimum Program Make-Up grants. These grants (1) ensure states receive at least \$3.0 million a year or the amount necessary to reclaim remaining high priority AML areas, whichever is lower; and (2) fund operations, emergency projects and other efforts led by OSMRE.

Table 4.1 shows the distribution of AML grants to states for federal fiscal year 2021.¹² Grants totaled \$151.3 million, and 50.0% of that amount was allocated to the historic coal fund category. Pennsylvania received the highest allocation of AML funds (\$27.4 million) among non-certified states, and over 95% of that amount was from the historic coal portion. Wyoming was the only state to exceed the Commonwealth's grant amount (\$33.0 million) due in part to its status as a certified state.

¹¹ 30 U.S.C. 1232 – Reclamation Fee.

¹² AML distributions for 2021 were impacted by sequestration reductions under the Balanced Budget and Emergency Deficit Control Act. As a result, some states received less than the \$3.0 million minimum distribution.

**Table 4.1
State Comparison of AML Grant Allocations (Federal Fiscal Year 2021)**

	State Share Distribution		Historic Coal Fund		Total AML Funding ¹	
	Dollar	Share	Dollar	Share	Dollar	Share
Wyoming ²	\$0.0	0.0%	\$0.0	0.0%	\$33.0	21.8%
Pennsylvania	2.8	14.3	26.2	34.7	27.4	18.1
West Virginia	5.0	25.3	15.1	19.9	18.9	12.5
Illinois	2.2	11.0	8.1	10.7	9.7	6.4
Kentucky	1.9	9.5	8.0	10.5	9.3	6.1
Ohio	0.4	1.9	5.0	6.6	5.0	3.3
Indiana	2.0	10.4	2.6	3.5	4.4	2.9
Virginia	0.8	3.9	2.4	3.2	3.0	2.0
Montana ²	0.0	0.0	0.0	0.0	2.9	1.9
Alabama	0.8	3.8	2.2	2.9	2.8	1.9
Alaska	0.1	0.7	0.0	0.0	2.8	1.9
Arkansas	0.0	0.0	0.2	0.2	2.8	1.9
Colorado	0.9	4.7	1.1	1.4	2.8	1.9
Iowa	0.0	0.0	0.6	0.8	2.8	1.9
Kansas	0.0	0.0	0.5	0.7	2.8	1.9
Maryland	0.1	0.7	0.5	0.7	2.8	1.9
Missouri	0.0	0.1	0.6	0.8	2.8	1.9
New Mexico	0.8	4.3	0.3	0.3	2.8	1.9
North Dakota	1.1	5.3	0.3	0.4	2.8	1.9
Oklahoma	0.0	0.0	0.4	0.5	2.8	1.9
Tennessee	0.0	0.1	0.9	1.2	2.8	1.9
Utah	0.8	4.0	0.6	0.8	2.8	1.9
Texas ²	0.0	0.0	0.0	0.0	0.8	0.5
Mississippi ²	0.0	0.0	0.0	0.0	0.1	0.1
Louisiana ²	0.0	0.0	0.0	0.0	0.0	0.0
State Total	19.7	100.0	75.7	100.0	151.3	100.0

Note: Dollar amounts in millions.

1 Includes funds from U.S. Treasury to certified states and Minimum Program Make-Up grants.

2 Certified state that receives a special allocation from the U.S. Treasury's General Fund.

Source: U.S. Department of the Interior.

Alternative Energy Portfolio Standards

Act 213 of 2004 created Pennsylvania’s Alternative Energy Portfolio Standards (AEPS). Under these standards, alternative energy suppliers (designated as Tier I and Tier II) earn Alternative Energy Credits (AECs) for each MWh of electricity generated from alternative sources. Electric distribution companies and electric generation suppliers must purchase AECs based on a predetermined share of MWhs of electricity sold to Pennsylvania retail electricity customers. The share of AECs required increases over time based on a schedule set forth by the act (later amended by Act 35 of 2007). For reporting year 2020 (ends May 2020), energy from Tier II sources (waste coal, hydroelectric and other) had to comprise 8.2% of total sales.¹³ Currently, the percentages are 0.5% for Tier I and solar photovoltaic resources and 10.0% for Tier II resources.¹⁴ Alternative energy credits are tracked by PJM, and the Pennsylvania Public Utility Commission confirms that utilities are compliant with published regulations. Coal refuse to energy facilities sell credits they generate from the production of electricity at prices determined by market conditions.

Table 4.2 displays revenues from the sale of AECs from 2016 to 2020. In 2016, solar credits were sold for \$62.06 per credit, Tier I sources at \$14.56 per credit and Tier II at \$0.10 per credit. Total sales revenues were \$128.3 million, and those amounts flow to generators that consume alternative energy sources, and thereby supplement revenues received from regular electricity sales. For reporting year 2020, prices were \$37.00 for solar, \$7.87 for Tier I and \$1.92 for Tier II sources. For that year, \$21.3 million of Tier II AEC revenues were generated and roughly half flowed to generators that use coal refuse as an energy source.¹⁵ For reporting year 2021, the Pennsylvania PUC projects that Tier II AECs will sell for \$3.00 and generate \$42.3 million in revenues.

	Reporting Year				
	2016	2017	2018	2019	2020
Solar	\$21.5	\$22.2	\$15.0	\$17.5	\$22.6
Tier I	105.8	98.8	92.9	64.2	78.7
Tier II	<u>1.0</u>	<u>1.8</u>	<u>2.5</u>	<u>3.6</u>	<u>21.3</u>
Total Credits	128.3	122.7	110.5	85.3	122.5

Note: Dollar amounts in millions.
Source: Pennsylvania Public Utility Commission.

¹³ To satisfy these requirements, power can be purchased by Tier II suppliers located out of state. For reporting year 2020, 48% of Tier II AECs were from waste coal, 36% from hydroelectric and 16% from other sources. Across all Tier II sources, roughly 60% came from Pennsylvania sources and 24% came from Virginia.

¹⁴ In addition, qualified energy efficiency projects can create credits for each megawatt hour of electricity saved. These credits can be utilized by the generation facility to either (1) satisfy AEPS requirements for itself or (2) sell or trade the credit to another entity.

¹⁵ “Alternative Energy Portfolio Standards Act: Compliance for Reporting Year 2020,” Pennsylvania Public Utility Commission (February 2021).

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Economic Impact

This section provides additional background on the coal refuse energy and reclamation (CRER) industry and the larger fossil fuel electric generation sector in which it resides. The final two subsections contain an economic analysis of the CRER Tax Credit and a discussion of avoided costs and environmental impacts. Unless noted otherwise, all data in this section are from the U.S. Energy Information Administration (EIA), U.S. Bureau of Labor Statistics (BLS), the Pennsylvania Department of Labor and Industry (DLI) or Pennsylvania Department of Environmental Protection (DEP).

Industry Inputs, Output and Capacity Utilization

Table 5.1 presents data for the CRER industry, some which appeared in previous sections. In 2015, 14 generation plants converted coal refuse into electricity. Since then, three plants retired, and one converted to natural gas. Coal refuse burned peaked at 8.6 million tons in 2018 and declined to 5.6 million tons in 2020. For 2021, preliminary EIA generation data suggest that coal refuse burned increased to 7.0 million tons. Megawatt hours (MWh) generated followed the same pattern. The ratio of MWh generated to tons of coal burned reflects the general heat content of coal refuse. That ratio typically ranges from 0.82 to 0.84 and suggests that heat content has not degraded materially over time. Prior to burning, plants test coal refuse and generally target piles with greater potential heat content (i.e., British thermal units) to facilitate the most cost-effective generation.

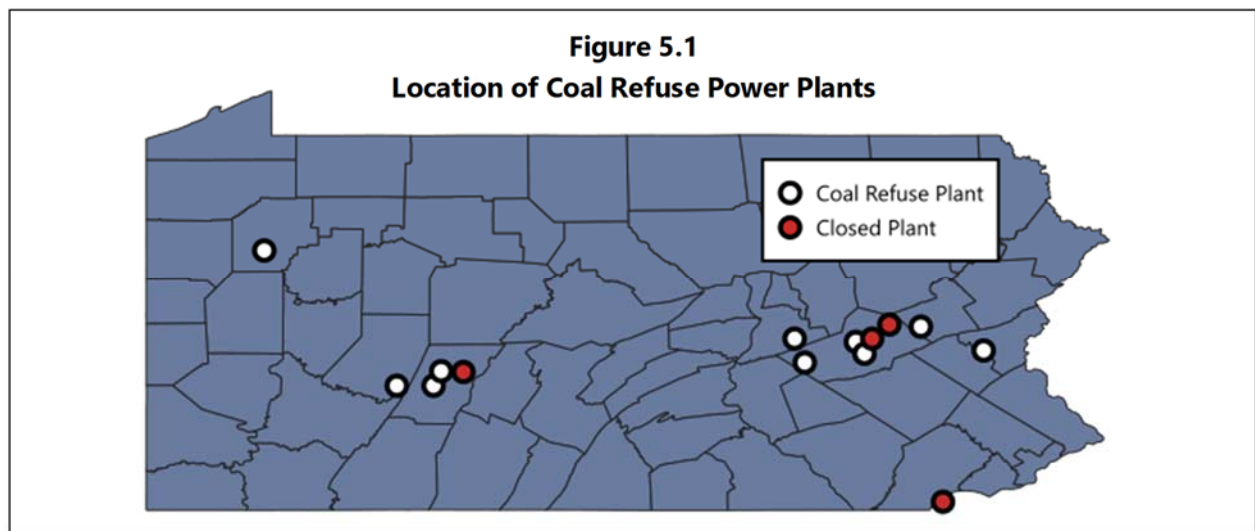
	2015	2016	2017	2018	2019	2020	2021
Number of Generators	14	14	14	14	13	11	10
Coal Burned (million tons)	7.9	8.3	8.0	8.6	6.3	5.6	7.0
MWh Generated (millions)	6.6	7.0	6.7	7.0	5.2	4.6	5.8
MWh Generated / Coal Burned	0.83	0.85	0.83	0.81	0.82	0.82	0.83
Average PJM Price (MWh)	\$46.9	\$36.0	\$36.4	\$43.7	\$33.5	\$25.4	\$49.0
Capacity (million MWh)	12.7	12.7	12.7	12.7	12.3	10.9	10.5
Capacity Utilization	51%	55%	52%	55%	42%	42%	55%
Credits Requested (\$ millions)	--	\$33.1	\$32.1	\$34.3	\$25.2	\$22.5	\$28.0
Credits Awarded (\$ millions)	--	\$7.5	\$10.0	\$10.0	\$20.0	\$17.5	\$20.0
Credit Per Ton	--	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00	\$4.00
Effective Credit Per Ton	--	\$0.91	\$1.25	\$1.17	\$3.17	\$3.12	\$2.86
Less: Transfer Costs	--	\$0.85	\$1.17	\$1.02	\$2.70	\$2.65	\$2.43
Value per MWh Generated	--	\$0.73	\$1.00	\$0.87	\$2.32	\$2.28	\$2.09

Source: Pennsylvania Department of Community and Economic Development, U.S. Energy Information Administration and PJM Environmental Information Services. Calculations by IFO.

The long-term viability of the industry depends in part on the wholesale price of electricity and the availability of other Tier II sources of energy (necessary to meet AEPS requirements). Generators are part of the regional PJM grid that coordinates the movement of wholesale electricity across 13 states and the District of Columbia. The annual average PJM wholesale price (based on average daily prices and further weighted by the share of annual volume) ranged from \$25.42 per MWh (2020) to \$48.97 (2021).¹⁶

The middle of the table lists generation capacity for plants in operation during the year and the share of capacity utilized based on generation reported to the EIA. Across all years, 42% to 55% of industry-wide capacity was used by plants that were operational during the year. The number of generators has contracted over time, which coincided with the growth of natural gas production and falling natural gas prices. Geographic proximity may have also contributed to industry contraction. As shown by **Figure 5.1**, some plants are in close proximity to others. Plants sell a standardized commodity into a competitive market and cost structures are similar across plants, so that industry contraction is not unexpected. In the long-term, higher quality coal refuse (i.e., higher heat content) will be further removed from generators, thereby increasing transportation costs, both to (coal refuse) and from (ash) generation facilities.

The bottom of the table computes the effective value of the tax credit. For 2021, the IFO projects that the effective (i.e., pro-rated based on requests) tax credit per ton of coal will be \$2.86. If an average discount and transfer fee of 15% is deducted, then the effective credit falls to \$2.43 per ton. Translating that per ton subsidy to heat content and then megawatts generated implies a subsidy of \$2.09 per MWh sold. That is, the credit reduces the cost to generate a MWh by that dollar amount and reduces the effective price that generators must receive to break even.



¹⁶ PJM wholesale prices can be found here: <https://www.eia.gov/electricity/wholesale/>.

Industry Concentration

Table 5.2 displays generation for each plant ranked by generation for 2020. Data for 2021 are preliminary and for larger firms are based on published EIA data for the first three quarters of the year. By 2021, four plants had ceased operations: Wheelabrator Frackville Energy, Cambria Cogen, Kimberly Clark Chester (converted to natural gas only) and Northeastern Power.

Although output declined in 2020, that outcome was largely due to the retirement of smaller plants. For the top five, generation increased and preliminary data suggest further expansion in 2021. The bottom rows of the table display data for the top five plants in 2020. In 2016, those plants comprised 71% of total output and utilized 67% of capacity. For 2021, the projected figures are 86% and 67%. While certain plants operated near capacity (Schuylkill, John B. Rich), others have significant excess capacity (Seward, Colver Green).

	Generation From Waste Coal (MWh 000s)						
	2015	2016	2017	2018	2019	2020	2021
Seward	1,676	2,787	2,450	2,571	1,858	2,202	2,750
Schuylkill Energy Resources	656	653	619	616	598	653	685
John B Rich Memorial Power Station	628	628	634	607	623	634	660
Colver Green Energy	825	731	811	812	767	487	560
Ebensburg Power	196	195	249	325	235	290	330
Rausch Creek Generation	201	53	21	189	126	190	210
Panther Creek Energy Facility	470	130	90	151	105	60	150
Wheelabrator Frackville Energy	256	0	0	0	304	45	0
Foster Wheeler Mt Carmel Cogen	293	305	314	263	77	39	50
Northampton Generating Company LP	369	222	188	177	131	8	20
Scrubgrass Generating Plant	258	416	433	424	239	5	400
Cambria Cogen	602	684	625	644	110	0	0
Kimberly Clark Chester	120	108	84	43	22	0	0
Northeastern Power	<u>0</u>	<u>124</u>	<u>147</u>	<u>129</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	6,551	7,037	6,664	6,953	5,195	4,613	5,815
<u>Top Five Plants</u>							
MWh Generated	3,981	4,994	4,763	4,931	4,081	4,266	4,985
Share MWh Generated	61%	71%	71%	71%	79%	92%	86%
Capacity Utilization	54%	67%	64%	66%	55%	57%	67%
Note: 2021 is an estimate based on data through 2021 Q3 for large plants.							
Source: U.S. Energy Information Administration and PJM Environmental Information Services. Calculations and estimates for 2021 by the IFO.							

Fossil Fuel Generation Sector

Table 5.3 expands the scope of the analysis and includes the entire fossil fuel generation sector which includes all generators that use any type of coal and/or natural gas (as well as other miscellaneous fossil fuels). Similar to the CRER industry, the Pennsylvania fossil fuel generation sector has contracted. From 2015 to 2020 (latest data available), full and part-time jobs declined from 3,308 to 2,367 (-28.4%) and total wages paid declined from \$402 million to \$339 million (-15.7%). Total generation also contracted moderately through 2018 but has rebounded since then. For 2021, preliminary EIA data through October show a strong rebound in total coal generation (+48.2%) from the prior year.

In 2015, generation from all coal sources comprised roughly 52% of total fossil fuel generation, and coal refuse comprised 5.2% of the total. By 2021, preliminary data suggest those shares declined to 21.8% and 3.7%. Despite an uptick in 2021, analysts project that coal's share of fossil fuel generation will continue its long-term decline as natural gas production from the Marcellus Shale expands.

The final row displays the ratio of megawatt hours (thousands) generated to sector jobs. Because natural gas generation is much less labor intensive, the ratio has increased every year since 2015.

	2015	2016	2017	2018	2019	2020	2021
Employees	3,308	3,030	2,805	2,742	2,599	2,367	--
Establishments	66	63	71	72	73	73	--
Wages Paid (\$ millions)	\$402	\$384	\$373	\$385	\$376	\$339	--
Megawatt Hours	<u>125.2</u>	<u>123.6</u>	<u>120.9</u>	<u>121.6</u>	<u>136.6</u>	<u>144.9</u>	<u>159.3</u>
Natural Gas	59.5	68.0	72.5	76.4	98.0	120.8	123.9
Regular Coal	58.1	47.6	41.0	37.1	32.7	18.8	28.9
Refuse Coal	6.6	7.0	6.7	7.0	5.2	4.6	5.8
Other Fossil Fuel	1.1	0.9	0.8	1.2	0.7	0.6	0.6
All Coal Share	51.6%	44.2%	39.4%	36.2%	27.8%	16.2%	21.8%
Refuse Coal Share	5.2%	5.7%	5.5%	5.7%	3.8%	3.2%	3.7%
MWh Generated per Job	37.9	40.8	43.1	44.4	52.6	61.2	--
Note: Data for 2021 based on generation through October 2021. Megawatt hours in millions. MWh Generated per Job in thousands.							
Sources: U.S. Bureau of Labor Statistics and Energy Information Administration.							

Industry Employment and Wages

Table 5.4 displays employment (part- and full-time, no adjustment made to convert to full-time equivalent jobs) and wage data for the CRER industry. Industry employment can be subdivided into three groups: (1) site operators (mining, transportation and reclamation), (2) generation and (3) third-party contractors that provide transportation services not included elsewhere. It is noted that (1) overlap or duplication likely exists across the data sources used to inform the first two employment categories, and (2) the third category that provides transportation services not reported elsewhere are placeholders because published data do not exist.¹⁷

	2018	2019	2020	2021
<u>Site Operators</u>				
Employment	352	394	365	390
Wages Paid	\$20.8	\$24.0	\$22.8	\$25.0
<u>Generators</u>				
Employment	485	450	360	390
Wages Paid	\$43.5	\$39.7	\$39.2	\$44.6
<u>Third Party Contractors</u>				
Employment	150	125	125	150
Wages Paid	\$9.8	\$8.4	\$8.6	\$10.7
<u>Total Industry</u>				
Employment	987	969	850	930
Wages Paid	\$74.1	\$72.0	\$70.6	\$80.2
Coal Burned (million tons)	8.6	6.3	5.6	7.0
Jobs per Million Tons	115	154	151	133
<p>Note: Wages Paid in millions of dollars. Employment is both part- and full-time jobs. Generators include jobs at plant and transportation jobs to bring refuse coal to plant and residual ash back to site. Third Party contractors that provide transportation from site to plant and ash from plant to site is unknown. Site operators and generators also perform those services.</p> <p>Source: Site Operator data from PA Department of Environmental Protection. Generator jobs and income data from PA Department of Labor and Industry.</p>				

Estimates for site operator employment are based on forms filed with DEP. Firms engaged in mining coal refuse (i.e., site operators) must report the number of employees engaged in those operations either directly or through contracts. Those employees may or may not reflect all transportation services provided to mine and transport coal and ash, as well as reclamation activities. For 2020, firms claiming the CRER Tax Credit reported 365 part- and full-time employees of site operators. Firms do not report wages paid, and the analysis assumes an average wage that ranges from \$74,000 (2018, full-time basis) to \$80,000 (2021). Based on that assumption, total wages paid are \$22.8 million for 2020 using a factor of 0.8 to convert the reported part- and full-time jobs to an average annual wage for both types of employees. All data for 2021 are estimates by the IFO based on generation.

¹⁷ The IFO also contacted the Appalachian Region Independent Power Producers Association (ARIPPA) to obtain industry jobs data. For 2021, the representative estimated 866 direct jobs at plants or engaged in mining/reclamation activities or transportation services. It was noted that the figure does not include other contract employees, which could not be estimated.

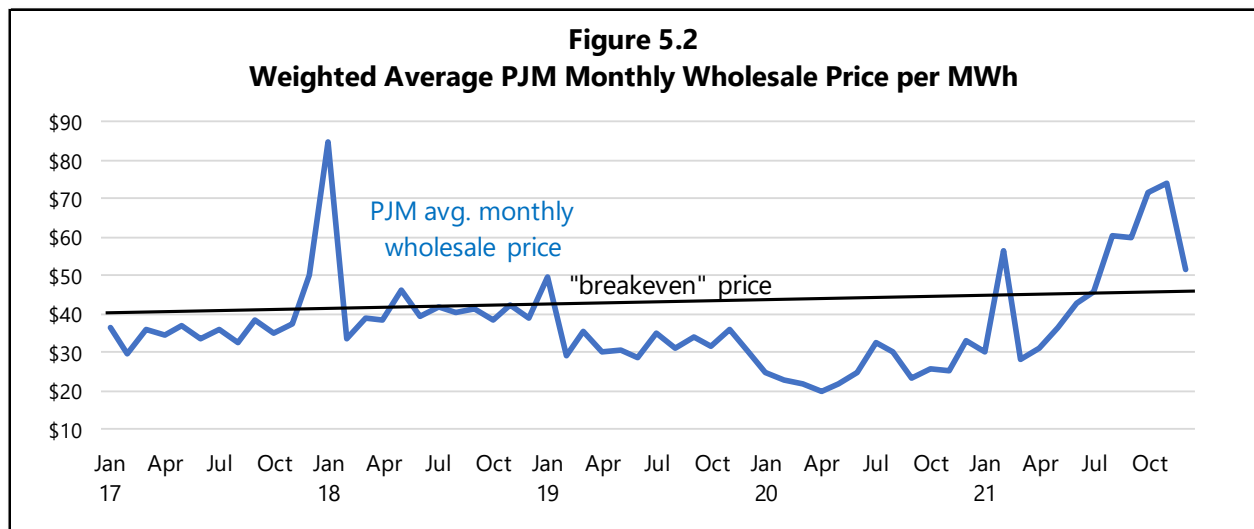
Estimates for employment at generators use quarterly data reported by firms subject to state unemployment insurance reporting requirements. The IFO requested that the Department of Labor and Industry (DLI) provide aggregate employment tabulations for all coal refuse generators in the state and provided a list of firms based on published EIA data. For 2020, those data show 360 part- and full-time employees and total wages paid of \$39.2 million. As with site operators, an unknown number of employees will be engaged in the transport of coal from the site to the plant, and ash back to the site.

Estimates for third-party contractors that provide transportation services not reported in the first two categories could be higher or lower because those services are also partly included with site operators and generators, and data are not published that itemizes firms providing those services. For those jobs, the analysis assumes an average annual wage of \$65,000 (2018) to \$71,000 (2021).

Based on these data and assumptions, the analysis estimates 930 total direct jobs for 2021 and total wages paid of \$80.2 million. For each million ton of coal burned, 120 to 150 direct jobs were supported. For 2021, the analysis estimates jobs based on the fact that preliminary generation data suggest that roughly 7.0 million tons of coal refuse was burned. Assuming that each million ton supports 133 direct jobs implies total direct employment of 930 part- and full-time jobs.

Average and Breakeven Prices

The long-term viability of the industry is dependent, in part, on the average wholesale price of electricity. **Figure 5.2** displays the average monthly PJM wholesale price from January 2017 to December 2021.¹⁸ There is considerable variation, with a notable reduction in 2020 that coincided with the onset of COVID-19 and related mitigation efforts. Wholesale prices temporarily spiked in February 2021 due to two days when the weighted average daily price exceeded \$130. Since March 2021, average wholesale prices increased dramatically due to a sharp rebound in demand, limited increase in supply and strong growth of natural gas prices. The latest data for December 2021 reveal a strong reversion to historical averages.



¹⁸ The computed price is a weighted average price for the month based on the (1) published weighted average daily price and (2) the share of monthly megawatt volume traded for the day. See <https://www.eia.gov/electricity/whole-sale/>.

The black line represents the “breakeven price” as supplied by the Appalachian Region Independent Power Producers Association (ARIPPA). The breakeven price is the price required for generators to recover all variable and fixed costs, but not a return on investment.¹⁹ Breakeven prices have increased due to higher wage and transportation costs. Those costs comprise the majority of costs for generators since they are not generally charged for coal refuse, only transportation from the site to the plant and back.

In addition to revenues from sales of electricity, coal refuse generators receive other revenues that effectively reduce the wholesale breakeven price. Conversely, other factors effectively increase it. They are as follows:

- State tax credits. For 2021, the analysis computes that the effective value of the \$4.00 per ton tax credit is \$2.09 per MWh (see Table 5.1). Assuming that (1) amounts lost to sales discounts and transfer fees (15%) do not change and (2) the credit is pro-rated by the same proportion due to requests that exceed the credit cap, that value should not change materially, and the effective value of the tax credit would remain \$2.09 per MWh regardless of the market price.
- Capacity payments. Generators receive a fixed payment based on capacity so that utilities may request additional output as needed.²⁰ For 2020-21, PJM data show a capacity auction price of \$77, so that a generator with 80 MW of capacity would receive \$2.2 million in capacity payments ($\$77 * 80 * 365$).²¹ For 2021-22, the amount increased to \$140 and for 2022-23 it declined to \$50. Capacity payments effectively reduce the wholesale breakeven price per MWh. These payments can comprise a material portion of total revenues, especially if generators operate far below full capacity in response to low wholesale prices.
- Alternative Energy Portfolio Standards (AEPS) credits. For reporting year 2021 (ends May 30, 2021), AEPS requires that 10% of all electricity sold at retail must be sourced from a Tier II provider (described earlier). Data from the PUC show that waste coal generators supply roughly one half of that source. For reporting year 2020, credit certificates were sold at a weighted average price of \$1.92 and generated \$21.3 million for Tier II generators.²² AEPS provides direct support to CRER-sourced energy due to the requirement that 10% of electricity sold must be from a Tier II source. The IFO expects that revenues from the sale of credits will increase as the Tier II requirement increases from 8.2% (reporting year 2020) to 10.0% (2021).²³ The exact amount will depend on market conditions, but the requirement provides indirect support to coal refuse generation, assuming that other Tier II sources such as power from hydroelectricity cannot significantly increase short-term output.

¹⁹ Variable costs include mining, reclamation, transportation, limestone and maintenance. Labor costs are both fixed and variable. For further detail, see “Economic and Environmental Analysis of Pennsylvania’s Coal Refuse Industry,” Econsult Solutions, Inc. (September 2016).

²⁰ Under these agreements, the generator stands ready throughout the year to supply power to PJM if called upon.

²¹ Years represent delivery years that reference the auction that procures capacity from June to May. For data, see <https://pjm.com/markets-and-operations/rpm.aspx>.

²² See Appendix Table 2, “AEPS Act Compliance Reporting for 2020,” Pennsylvania Public Utility Commission (February 2021).

²³ The PUC may override the 10% requirement under certain conditions. See Section 3 (a) (2) of the Alternative Energy Portfolio Standards Act (Act 213 of 2004).

- Cryptocurrency mining. The process to mine cryptocurrency requires a significant and reliable power source. A recent industry article estimated that approximately 100 to 150 megawatt hours were needed to produce a single currency unit.²⁴ In 2021, two CRER Tax Credit generators (Scrubgrass and Panther Creek) were acquired by a cryptocurrency mining company that utilizes electricity generated from coal refuse to mine Bitcoin.²⁵ These operations provide a predictable and stable flow of revenues that are largely independent of the real-time wholesale market price. At this juncture, the impact of Bitcoin revenues for long-term viability is unclear, but revenues from those operations (e.g., power purchase agreements and hosting) would reduce the effective wholesale price needed to break even.
- Line losses and congestion. For Pennsylvania, data from EIA show that roughly 3.5% to 4.0% of gross generation is characterized as “estimated losses” which is energy lost due to the transmission and distribution of power.²⁶ The transmission portion that impacts generators would likely comprise roughly one-third of the total.²⁷ Congestion occurs when there is insufficient transmission capacity to deliver lower-cost generation resources to final consumers. As a result, marginal locational prices increase, which are passed on to final consumers. For 2020, total congestion costs for PJM were \$529 million, relative to total PJM billing of \$33.6 billion (1.6%).²⁸ Based on these data, the combination of line losses and congestion could increase costs, or reduce the effective price received, by roughly 5% to 6%. The dollar value of line loss and congestion should be proportional to the real-time market price so that a 5% reduction at \$40 per MWh is worth \$2.00, but falls to \$1.50 if the market price is \$30.

On net, these factors reduce the required breakeven wholesale price. The exact dollar or percentage reduction will depend on many factors, and some factors will vary based on the wholesale price (line losses) while others largely do not (tax credit). Overall, a net reduction of three to five dollars per MWh or an 8% to 12% reduction in the wholesale price is reasonable given historical data. Because they cannot yet be valued, the computation excludes potential revenues from Bitcoin operations.

Historical price and generation trends also provide general insight into industry dynamics and sensitivity to average wholesale prices. Generation should be positively correlated with wholesale prices, but data for 2020 suggest limited sensitivity. Due to the pandemic and related mitigation efforts, the weighted average PJM monthly price per MWh ranged from \$19.70 (April 2020) to \$32.89 (December 2020) and the weighted average annual price was \$25.42, down \$8.09 (-24.2%) from 2019. For 2020, coal refuse generation declined 11.2%, less than one-half the decline in the average wholesale price. Moreover, much of the contraction was driven by the retirement of small plants (see Table 5.1), and the largest five plants increased generation in 2020 relative to 2019 (+4.5%) despite the significant reduction in wholesale prices.

²⁴ Tan, Eli. “Stronghold Digital Mining Acquires Second Power Plant,” CoinDesk (August 3, 2021).

²⁵ See “A waste coal-burning, crypto-mining pirate ship sets sail,” Pittsburgh Post Gazette (July 29, 2021). Also see the latest filing with the SEC that discusses operations: <https://sec.report/Document/0001628280-21-024237/>.

²⁶ See <https://www.eia.gov/tools/faqs/faq.php?id=105&t=3>.

²⁷ See <http://insideenergy.org/2015/11/06/lost-in-transmission-how-much-electricity-disappears-between-a-power-plant-and-your-plug/>.

²⁸ See “2020 State of the Market Report for PJM,” Monitoring Analytics (March 29, 2021, slide 7).

Economic Impact of CRER Tax Credit

Table 5.5 displays the analysis of the economic impact from the CRER Tax Credit. For this purpose, the analysis uses the following assumptions:

- Because the tax credit was enacted in July 2016, it did not materially impact coal burned in that year.
- From 2017 to 2021, the volume of coal burned would have declined by 0.25 million tons each year (1.25 million tons by 2021) without the tax credit.²⁹ As noted, the \$4.00 per ton credit for 2021 is equivalent to a cost reduction of \$2.09 per MWh sold.
- There are 140 direct jobs (part- and full-time) supported for each million ton of coal burned. Although there are fewer workers, the average wage of workers is the same in the counterfactual scenario without the tax credit (average wage of \$75,000 in 2016 and grows to \$80,000 by 2021).
- If the tax credit did not exist, an existing natural gas generator would increase output to offset any decline in megawatt hours generated by the CRER industry, and it would not be necessary to increase employment for the marginal increase in generation.

The key issue for the analysis is: what tonnage of coal would have been burned without the tax credit subsidy? Given that the tax credit yields a modest reduction in the effective price required to breakeven, alternative revenue streams (e.g., capacity payments) and AEPS requirements, the analysis assumes that the credit increases the amount of coal burned by 1.25 million tons (+18%) by 2021. Therefore, at the margin, the analysis assumes that the \$20 million credit incentivized an additional 1.25 million tons of coal burned that would not have otherwise occurred. Due to significant variation across refuse piles, the additional coal refuse piles eliminated and acres remediated due to the tax credit cannot be determined.³⁰ Due to the (historically) high wholesale price in 2021, the amount of coal burned in that year that was incentivized by the tax credit could be much lower. But the analysis assumes that higher prices cannot be maintained going forward, so that the 1.25 million ton impact would be more representative of a wholesale price that ranged from \$40 to \$45 per megawatt hour.

Table 5.5 shows the differential between historical data and the counterfactual scenario without the tax credit. Direct employment increases by 175 part- and full-time jobs and total wages paid increase by \$14 million. The analysis applies the Pennsylvania RIMS Type II multiplier published by the U.S. Bureau of Economic Analysis for coal mining to derive the impact on indirect and induced jobs. Indirect jobs represent jobs in the supply chain and induced jobs are jobs supported by the spending of workers directly employed by the industry. The net impact is an increase of 366 jobs. The earnings multiplier for that sector is also applied to derive an increase in total earnings of \$35 million.

²⁹ For any given year, it is noted that the incentivized share of coal refuse burned could be higher or lower based on the real-time market price of electricity. The assumptions made to facilitate this analysis are meant to reflect general market conditions and the impact of other factors discussed in this report.

³⁰ However, a 2019 report by Econsult estimated that 30 acres of land would be remediated for each million ton of coal refuse burned. See "The Coal Refuse Reclamation to Energy Industry," Econsult Solutions, Inc. (June 2019).

Based on these projections, the analysis estimates that roughly \$1.9 million of additional sales, personal income and miscellaneous other state tax revenue would be generated through the additional jobs and spending attributable to the tax credit. (Excludes local taxes and any fees remitted.) For this review, the analysis did not compute the tax revenues that would have been generated from the alternative use of tax credit monies (e.g., spending on education or healthcare, tax cuts) or the return on investment (net additional state tax revenues divided by total tax credits, or the share of tax credit monies recouped through incremental economic activity) because economic development is not a primary goal of the tax credit. If these counterfactual computations had been done, then much of the jobs, income and tax gains would be offset.

Table 5.5
Economic Impact of the CRER Tax Credit

	2016	2017	2018	2019	2020	2021
With Credit						
Coal Burned (million tons)	8.3	8.0	8.6	6.3	5.6	7.0
Generation (million MWh)	7.0	6.7	7.0	5.2	4.6	5.8
All Direct Jobs	1,158	1,124	1,200	882	788	978
Wages Paid (\$ millions)	\$87	\$85	\$92	\$69	\$62	\$78
Without Credit						
Coal Burned (million tons)	8.3	7.8	8.1	5.6	4.6	5.7
Generation (million MWh)	7.0	6.5	6.5	4.6	3.8	4.8
All Direct Jobs	1,158	1,089	1,130	777	648	803
Wages Paid (\$ millions)	\$87	\$83	\$87	\$61	\$51	\$64
Differential						
Coal Burned (million tons)	0.0	0.3	0.5	0.8	1.0	1.3
Generation (million MWh)	0.0	0.2	0.4	0.6	0.8	1.0
All Direct Jobs	0	35	70	105	140	175
Wages Paid (\$ millions)	\$0	\$3	\$5	\$8	\$11	\$14
Credits Awarded (\$ millions)	\$7.5	\$10.0	\$10.0	\$20.0	\$17.5	\$20.0
Change Employment	0	73	146	219	293	366
Change Wages (\$ millions)	\$0.0	\$6.6	\$13.4	\$20.4	\$27.5	\$34.9

Note: For any given year, the incentivized share of coal refuse burned could be higher or lower based on the real-time market price of electricity. The assumptions made to facilitate this analysis are meant to reflect general market conditions and the impact of other factors discussed in this report.

Avoided Costs and Unrecognized Positive Externalities

A recent report on the CRER industry includes an avoided cost computation to eliminate coal refuse piles and remediate land.³¹ The avoided cost computation estimates the cost to the state if the state had contracted to eliminate 8 million tons of coal refuse burned each year. Because there is no statutory schedule that mandates a specific amount of coal refuse that must be eliminated and land remediated each year, this analysis does not undertake a similar computation. The analysis in the prior subsection assumes that most burning of coal refuse would take place regardless of the tax credit, and the remediation that would occur is likely sufficient to address long-term concerns that refuse piles are remediated in a timely fashion. In this manner, the tax credit largely accelerates activity that would have otherwise occurred.

The analysis does not attempt to quantify the environmental benefits from remediation. Industry studies have found that reclaiming abandoned mine lands, including coal refuse piles, reduces abandoned mine drainage into local waterways and potential emissions caused by accidental or spontaneous combustion.³² Iron, manganese, aluminum and other metals are discharged into waters via acid mine drainage and harm marine life and aquatic vegetation. Case studies undertaken by DEP have also found improvement in groundwater quality.^{33, 34}

It should be noted that current mining regulations do not require that pollution metrics improve over time, only that sites are monitored to ensure that reclamation efforts do not exacerbate environmental contamination. Data are not currently compiled in a manner that facilitates an assessment of whether or not pollution levels declined due to the elimination of coal refuse piles and reclamation. DEP does note that removal of coal refuse piles controls for erosion and sedimentation, provides revegetation and reduces the potential for abandoned mine drainage. Current regulations also do not require that facilities reclaim high-priority piles (i.e., Priority 1 or 2), which would capture the largest positive environmental externalities.

Although facilities reduce water and ground pollution by burning coal refuse that might otherwise catch fire or leech, the process produces air pollution, including sulfur dioxide (SO₂), carbon dioxide (CO₂) and nitrogen oxide (NO_x). The filter system utilized by CRER facilities reduces emissions and certain pollutant output compared to traditional coal power plants. However, some environmental groups note that various by-product pollutants (i.e., higher concentrations of mercury) cause more environmental harm when coal refuse is burned.³⁵

³¹ See "The Coal Refuse Reclamation to Energy Industry," Econsult Solutions, Inc. (June 2019).

³² Ibid.

³³ "Coal Ash Beneficial Use in Mine Reclamation and Mine Drainage Remediation in Pennsylvania," Pennsylvania Department of Environmental Protection (2004).

³⁴ "Reclamation of Refuse Piles Using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania," Pennsylvania Department of Environmental Protection (2017).

³⁵ Singer, E. "Report: Coal Refuse Energy Producers," Sierra Club (April 25, 2017).

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Tax Credit Plan

Act 48 of 2017 directs the IFO to review tax credits and develop a tax credit plan for all credits subject to review. The act states that tax credit plans should include performance metrics for each credit. The act does not specify any other elements of the tax credit plan. For this review, the IFO defined the tax credit plan more broadly to include the following elements: (1) the general findings of the review, (2) specific recommendations, including performance metrics and (3) key decision points for policymakers to consider.

General Findings

For the purpose of this report, the IFO reviewed CRER Tax Credit data and spoke with multiple stakeholders and met with agencies that administer the tax credit. The following bullet points summarize the main findings of this research:

- Pennsylvania is the only state that provides a tax credit to incentivize the burning of coal refuse in the generation of electricity and the reclamation of abandoned mine lands. For 2020, data from the U.S. Energy Information Administration show that 11 of the 16 waste coal generators in operation were located in Pennsylvania.
- Other states primarily rely on federal Abandoned Mine Land (AML) grants to fund environmental cleanup projects on lands affected by legacy coal mining. For federal fiscal year 2021, Pennsylvania received \$27.4 million in AML grants, the second highest allocation behind Wyoming.
- From 2016 to 2020, coal refuse to energy facilities burned 36.8 million tons of coal refuse and produced 28.0 million tons of beneficial use ash. Refuse piles closer to generators have been remediated so that refuse must now be transported over longer distances. Higher transport costs, excess capacity and robust growth of natural gas production have contributed to facility closures.
- For 2019, the average CRER Tax Credit issued was \$1.7 million. The effective credit rate was \$2.70 per ton of coal refuse burned due to the 22.2% per firm cap on credit awards and roughly 15% leakage due to sales discounts and transfer fees. Prior to the increase of the CRER Tax Credit cap to \$20 million, the effective credit rate ranged from \$0.85 to \$1.17 per ton, as the lower credit amount caused all awards to be prorated.
- For 2018 and 2019, nearly all CRER Tax Credits were sold for an average of 85 cents per tax credit dollar. The residual 15 cents was retained by the purchaser and third-party facilitator.

Specific Recommendations

Based on these general findings, the IFO submits the following recommendations to enhance the efficiency of the tax credit and improve its ability to achieve its goals and purpose.

Consideration should be given to moving the application deadline to March 1.

Stakeholders noted that the current application deadline of February 1 is earlier than the due date for the Air Information Management System (AIMS) report (March 1) that must be submitted as part of the CRER Tax Credit application.

The CRER Tax Credit program does not incentivize reclamation activities at higher priority piles which results in reduced environmental benefits to the Commonwealth.

The current program does not incentivize applicants to remediate priority coal refuse piles, which are piles that represent a danger to health, safety and property. Research and discussions with stakeholders suggest that reclaiming Priority 3 piles does not maximize the environmental benefit of the program because those piles do not directly impact human health and safety. CRER Tax Credits could be awarded at a higher amount for priority piles (e.g., \$5 or \$6 per ton of coal refuse burned) or targeted to high priority piles.

Convert the tax credit to a grant program administered by DEP for the reclamation of coal refuse piles.

DEP could solicit bids for the remediation of high priority coal refuse piles with projects awarded to firms that require the lowest amount of grant funding to complete the work. This allows DEP to target the credit to sites that will maximize benefits to local communities.

Awards could be based on average wholesale prices for the calendar year.

When wholesale electricity prices are high (such as 2021), the tax credit likely incentivizes little or no incremental activity. Conversely, if prices are low, generators require additional assistance to cover costs. A mechanism could be implemented so that final credit awards are based on the average wholesale price. For example, if the average wholesale price ranged from \$45 to \$50, then only 50% of available credits would be awarded and the remainder would be rolled forward to the next year and available for award. In that year, if prices are very low, then all \$30 million would be available for award. This sliding scale awards credits when they are most needed, dampens revenue volatility and enhances long-term operations. The trade off is that firms have less certainty regarding actual tax credit amounts they might receive for the entire year. However, the average wholesale price will become clearer each month and firms will likely have a general sense of the average wholesale price if bands are set at \$4 to \$5 increments such as \$35 to \$40 per megawatt hour.

If the current tax credit program is retained, the credit should be made fully or partially refundable.

Data show that nearly all CRER Tax Credits are transferred or sold to entities other than the original recipient. For recent years, sellers received roughly 85 cents per award dollar issued with the remaining 10 cents retained by the purchaser and 5 cents retained by the third-party facilitator. These transactions represent leakage that do not incentivize the reclamation of legacy coal refuse piles. This change also simplifies administration.³⁶

³⁶ A refundable tax credit or tax credit that is sold represents taxable income and taxpayers would need to weigh tradeoffs if opting for that treatment.

Key Decision Points

In addition to the specific recommendations above, policymakers should also consider other issues that merit discussion if the CRER Tax Credit is amended. These issues are strategic and will be related to the overall goals and purpose of the tax credit as envisioned by policymakers:

- At what point does diminishing environmental returns make the tax credit no longer viable? As more high priority coal refuse piles are reclaimed, the marginal benefits to the Commonwealth are reduced.
- Would a grant program better incentivize the reclamation of coal refuse piles and abandoned mine lands? A grant program could provide targeted reclamation to sites that pose the greatest risk to public health and safety.
- Should DEP be required to undertake an analysis that would further prioritize piles and provide higher credit amounts to piles deemed to have greater negative environmental impact?

Conclusion

Act 48 requires that the IFO make a determination regarding whether the tax credit has achieved its goals and purpose. For this review, the analysis establishes the program goals as:

- 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.
- Incentivize the use of treated ash byproduct in the reclamation of mining-affected sites.

The analysis establishes the program purpose as:

- Reduce or eliminate the environmental impact and various negative externalities imposed on communities by coal refuse piles and abandoned mine lands.

DEP collects environmental data from coal refuse sites before, during and for ten years after reclamation to ensure that pollution does not increase as a result of the activity. Unfortunately, these data are not stored in a manner that allows for aggregation or analysis. In 2017, DEP did undertake a special analysis of data from five coal refuse sites located in the Blacklick Creek Watershed and found a significant reduction in pollutants post-reclamation.³⁷ Based on DEP's limited analysis, the IFO finds that the CRER Tax Credit has achieved its intended goals and purpose. However, two caveats are noted. First, it is likely that the tax credit actually incentivizes only a moderate share of total coal refuse burned in most years. Second, it is unclear to what extent the tax credit will continue to meet the intent of the legislation as any positive impact on the environment will diminish now that the largest and most hazardous coal refuse piles have been reclaimed.

³⁷ See <https://wvmdtaskforce.files.wordpress.com/2017/05/2017-aaron-martin-wed-salon-c-1100.pdf>.

Appendix

Performance-Based Budgeting and Tax Credit Review Schedule

Year		Performance-Based Budgets				
1	Corrections	Board of Probation and Parole	PA Commission on Crime & Delinquency	Juvenile Court Judges' Commission	Banking and Securities	General Services
2	Economic & Community Development	Human Services – Part 1	Health	Environmental Protection	PA Emergency Management Agency	State
3	PennDOT	Human Services – Part 2	State Police	Military & Veterans Affairs		
4	Education	Human Services – Part 3	Aging	PA Historical & Museum Commission	Agriculture	Labor and Industry
5	Drug and Alcohol Programs	Insurance	Revenue	Executive Offices	Environmental Hearing Board	Conservation and Natural Resources
Year		Tax Credits				
1	Film Production	New Jobs	Historic Preservation Incentive			
2	Research and Development	Keystone Innovation Zones	Mobile Telecom and Broadband	Organ and Bone Marrow		
3	Neighborhood Assistance	Resource Enhancement and Protection (REAP)	Entertainment Economic Enhancement Program	Video Game Production	Keystone Special Development Zones	
4	Educational Tax Credits	Coal Refuse and Reclamation	Mixed-Use Development	Brewers'		
5	Resource Manufacturing	Manufacturing and Investment	Waterfront Development	Rural Jobs and Investment		

 Independent Fiscal Office

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"Capacity Market (RPM)," PJM Interconnection (various years).

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Stakeholder Feedback



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Comments to the Pennsylvania Independent Fiscal Office (IFO) Coal Refuse Energy and Reclamation Tax Credit

Thank you for the opportunity to provide comments on the Coal Refuse Energy and Reclamation Tax Credit. The Appalachian Region Independent Power Producers Association (ARIPPA) appreciates the Commonwealth's relentless support of the coal refuse reclamation to energy industry. The long-term public-private partnership between the Commonwealth and the industry has produced some of the most significant abandoned mine land (AML) remediation in the state. With this continued support, the industry can continue to reclaim waste coal piles and abate the associated air and water pollution for years to come.

ARIPPA represents 10 unique environmentally beneficial coal refuse reclamation to energy facilities located in Pennsylvania that utilize circulating fluidized bed boiler technology to convert coal refuse into highly alkaline, beneficial use ash utilized in the mine land reclamation. This process uses coal refuse as a primary fuel to generate electricity that is sold through the wholesale energy market operated by PJM Interconnection to provide private funding for mine land reclamation.

When the coal refuse reclamation to energy industry was initially created, most facilities operated under state-mandated power purchase agreements (PPAs) that guaranteed revenue to finance and operate the plants. As the PPAs have expired over the past decade and PJM wholesale electricity prices dropped due to cheap natural gas and subsidized renewable resources, five coal refuse reclamation to energy facilities have closed. The industry needed to renew its partnership with the Commonwealth to survive and from that desire came the Coal Refuse Energy and Reclamation Tax Credit. This tax credit program is unlike most as it is not premised on job creation or economic growth, but rather is a performance-based environmental program to incentivize private investment in removal of polluting waste coal piles and remediation of AML sites that would otherwise fall to the state.

Since its inception, the industry has removed over 225 million tons of coal refuse, reclaimed at least 7,200 acres of land, and restored over 1,200 miles of polluted streams. Meanwhile, 770 identified coal refuse piles covering 8,300 acres and containing more than 220 million tons remain unaddressed. The environmental and public benefits produced by the industry are estimated at an annual value of \$37 million. Replicating the work of the industry would cost the state up to \$267 million annually, while addressing all identified piles across the state would cost up to \$7.4 billion. In addition to its environmental impact, the industry's annual economic impact is \$615 million, supporting nearly 3,000 jobs and generating \$18 million in state taxes and fees. Direct expenditures are estimated at \$363 million annually, and industry employees earn an average salary of greater than \$75,000. Benefits are concentrated in Pennsylvania's historic coal communities that face persistent challenges in generating economic opportunities for residents. For a thorough review of the economic and environmental benefits delivered to the Commonwealth by this industry, we refer you to two independent studies performed by Econsult Solutions that are available at www.arippa.org.

The tax credit has mechanically worked well to increase coal refuse reclamation and support these facilities; however, the funding cap has limited the ability to maximize AML reclamation. The initial program cap of \$7.5 million in year one and \$10 million thereafter led to per ton credits of less than half of the \$4 per ton program goal. While a production decline due to falling energy prices and increasing the program cap to \$20 million improved the actual per ton credit, the program still has not provided full funding to all facilities. Along with recent changes in the Alternative Energy Portfolio Standards program, where these facilities qualify as Tier II producers, and projected increases in wholesale energy prices, the tax credit remains a vital component of allowing these facilities to maximize their positive environmental impact potential.

ARIPPA recommends several changes to the program. First, increasing the program cap closer to the original \$45 million request would allow full funding of the \$4 per ton tax credit and permit removal of the 22.2 percent facility cap. An increase in the per ton credit amount would also incentivize additional AML remediation. Understanding that budgetary constraints may limit the state's ability to increase the program cap or per ton credit amount, making the tax credit fully refundable could further support reclamation as most facilities currently transfer their tax credits at a 5-10 percent funding loss. Finally, expediting the review of tax credit and transfer applications by the Department of Community and Economic Development and Department of Revenue would increase the realized value of the tax credit to recipients who often wait several months for approvals.



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RE: Coal Refuse and Energy Reclamation Tax Credit

Aug 20, 2021

Thank you for this opportunity to provide this statement regarding Pennsylvania's Coal Refuse and Reclamation (CRR) Tax Credit. While pollution of land and water caused by decades of unregulated disposal of coal waste continues to cause significant environmental damage, burning such waste for fuel creates significant risks to public health and exacerbates the climate crisis.

Pennsylvania currently provides a subsidy of \$4 per ton of waste burnt, up to a limit of \$20,000,000. This, the industry claimed, was necessary because the prior limit of \$10 million was "insufficient to close the gap between industry production costs and revenues."¹ In their own words, the industry can't make a profit without government handouts. But, this is not the only handout the industry receives. In a recent filing with the Securities and Exchange Commission, one company reported subsidies accounting for 60 percent of their operating costs² and claimed this made them among the lowest cost generation available.

These subsidies included capacity payments from PJM Interconnection, the CRR tax credit, and payments for Tier II alternative energy credits under Pennsylvania's Alternative Energy Portfolio Standards. Together these represented \$26/megawatt-hour in tax expenditures and direct payments, but there are additional public health costs from emissions of hundreds of tons of sulfur dioxide, oxides of nitrogen, hydrochloric acid, carbon monoxide, and more than a dozen other air pollutants including neurotoxins, carcinogens, and smog-forming compounds. Beyond that, in 2019 alone, waste coal polluters emitted 7,000,156 tons of CO₂, or 1.1 tons of carbon pollution for each ton of waste burnt. Reflecting environmental damage as a dollar value hides the very real human costs of increased air pollution, but this could easily be over \$259 million or more than \$40 for each ton of waste coal burnt.³

The industry's own report claims the cost to remove and properly dispose of this coal instead of burning it "can run up to \$33 per ton."⁴ As that is already less expensive than the existing subsidies and negative externalities, PennFuture recommends that the state focuses on safe and proper disposal and management of this waste instead of buying more pollution.

Thank you,

A handwritten signature in black ink that reads "Robert C. Altenburg".

Robert Altenburg
Senior Director for Climate and Energy
Citizens for Pennsylvania's Future (PennFuture)

¹ ARIPPA, The Coal Refuse Reclamation Energy Industry (June, 2019)
<https://arippa.org/wp-content/uploads/2019/07/ARIPPA-Report-FINAL-June-2019.pdf>

² Stronghold Digital Mining, Inc., Form S-1, pg. 100 (July 27, 2021)

³ See Northaus, C. *Revisiting the Social Cost of Carbon*, Proceedings of the National Academy of Sciences, 1518-1523 (Feb. 14, 2017). <https://www.pnas.org/content/114/7/1518>

⁴ ARIPPA, 2019



Comments Submitted to Independent Fiscal Office (IFO)
Regarding the Coal Refuse Energy and Reclamation Tax Credit

Thank you very much for taking the time to meet with us and discuss the benefits of the Pennsylvania Coal Refuse Tax Credit Program. We are the owners and operators of the Panther Creek and Northampton Generating Coal Refuse to Energy Facilities and a partner in the Scrubgrass Generating facility. We would like to underscore a few key elements of the program and its success since its inception:

This tax credit was crafted to support existing Pennsylvania public policy encouraging environmental restoration of the abandoned mine lands of the Commonwealth through the continued operation of Pennsylvania's unique coal refuse energy and reclamation facilities.

Legislatively, it was designed to be entirely accountable and measurable in its legislative construction and its practical application. As such, it is a performance-based credit, which must be earned, and is awarded only after the identified task has been accomplished. Thus, Plants receive a coal refuse tax credit of up to \$4.00 per ton of coal refuse removed, but only if the coal refuse is remediated and reclaimed as regulated by PADEP. We believe that as a consequence of its design and safeguards, this is a very cost effective credit program that is working as intended by the General Assembly.

While the facilities and their remediation operations are already subject to state regulations that enhance and are more strict than federal guidelines. Certain key environmental and operating requirements are embedded in the legislation. Thus, 75% of the fuel used by these facilities must be comprised of qualified coal refuse, plant design must include circulating fluidized bed technology, utilizing limestone injection and a fabric filter for particulate emissions control, and finally ash produced by the facilities must be put to beneficial use as defined by PADEP and at least 50% of that ash must be used to reclaim mining affected sites.

The legislation is designed as an "avoided cost" mechanism that directly benefits the communities and environment of the Commonwealth. The facilities perform the reclamation of coal refuse piles that would otherwise require expenditures by state and federal agencies at up to ten times the value of the PA Tax Credit each year.

This public private partnership delivers significant economic benefits to the mine affected regions of PA, including avoided Abandoned Mine Land (AML) and Acid Mine Drainage (AMD) treatment and remediation costs, avoided costs relating to reduction in harmful air emissions, avoided adverse health and safety impacts, and avoided local, county and state emergency response and excavation costs in the event of fires or subsidence risks. These activities have been valued at between \$93 million and \$267 million in annual avoided cost benefits to the Commonwealth. Furthermore, at operating capacity, the industry supports 3000+ direct and indirect jobs and over \$615 million in annual economic impact to the Commonwealth of PA.

Noting the important role of this tax credit program in support of the Commonwealth's AML reclamation efforts, we would recommend a few enhancements. First, an increase of the program cap from \$20mm to the originally requested \$45mm per year would achieve the intended incentive of \$4.00 per ton. Secondly, revised liquidity options should include a refundability mechanism to avoid the inefficiency of brokerage fees. Finally, identify ways to enhance the efficiency of the application process and coordination between DCED and Revenue to achieve accelerated realization of the tax credit values.

Despite adverse energy market conditions, including, during 2020, the impact of Covid19, and despite the fact that a program cap has prevented the credit from achieving its legislatively intended cap of \$4.00 per ton, the tax credit has produced the following results in Pennsylvania since its adoption:

Table with 3 columns: Year, Average Price Per Ton, Total Annual Tonnage Removed. Rows include years 2016-2020 and a 2016-2020 total row.

For a thorough review of the economic and environmental benefits delivered to the Commonwealth by these facilities, we refer you to the two Econsult studies performed for ARIPPA. They are available at: https://arippa.org/wp-content/uploads/2019/07/ARIPPA-Report-FINAL-June-2019.pdf and https://arippa.org/wp-content/uploads/2019/08/ARIPPA-Economic-and-Environmental-Impact-Analysis-FINAL-9-8-16.pdf

Additionally the bipartisan PA Joint Legislative Conservation Committee recently studied the environmental and economic benefits of the coal refuse reclamation to energy industry: https://arippa.org/wp-content/uploads/2021/04/JLCC-Coal-Refuse-Reclamation-Report-2020.pdf

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