

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

IN THE MATTER OF)
)
IMPLEMENTATION OF ACT 114 OF 2020) DOCKET NO. M-2020-3023323
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)

COMMENTS OF THE APPALACHIAN REGION INDEPENDENT
POWER PRODUCERS ASSOCIATION (ARIPPA) ON COMMISSION’S
TENTATIVE IMPLEMENTATION ORDER

Introduction

The Appalachian Region Independent Power Producers Association (“ARIPPA”), on behalf of its member companies, appreciates the opportunity to provide comments on the Tentative Implementation Order (“TIO”)¹ adopted by the Pennsylvania Public Utility Commission (“PUC” or “Commission”) at its meeting on January 14, 2021, which seeks to implement Sections 10 and 14 of Act 114 of 2020² (the “Fiscal Code”).

Act 114, which was signed into law by Governor Tom Wolf on November 23, 2020, includes provisions in Section 14 that amend the Pennsylvania Fiscal Code³ to limit the eligibility of Tier II generation facilities to meet the Commonwealth’s alternative energy requirements under the Alternative Energy Portfolio Standards (“AEPS”) Act⁴ to those facilities located in Pennsylvania. ARIPPA supports the TIO, particularly as it relates to Section 14 of Act 114, and urges the Commission to adopt the TIO as a Final Implementation Order (“FIO”) in this matter without change or amendment.

When the AEPS Act was originally enacted in 2004, the General Assembly established two distinct categories of alternative energy sources as qualifying for the AEPS program. Tier I resources include solar photovoltaic (PV) and solar thermal⁵ energy, wind power, low-impact hydropower,⁶ geothermal energy, biologically derived methane gas, fuel cells, biomass energy,⁷ and coal mine methane. Tier II resources are limited to waste coal, distributed generation systems, demand-side management, large-scale hydropower, municipal solid waste, integrated combined coal gasification

¹ 51 Pa.B. 667.

² House Bill 2536 of 2020.

³ 72 P.S. §§ 1 et seq.

⁴ 73 P.S. §§ 1648.1 et seq. (Act 213 of 2004).

⁵ Added by Act 35 of 2007.

⁶ 66 Pa.C.S.A. § 2814. Additional resources added by Act 129 of 2009.

⁷ *Id.* Act 129 of 2009 provided that biomass includes the generation of electricity utilizing by-products of the pulping process and wood manufacturing process generated inside this Commonwealth.

technology, and generation of electricity utilizing by-products of the pulping process and wood manufacturing. The AEPS Act requires that 8 percent of the electricity supplied by Pennsylvania’s electric distribution companies (“EDCs”) and electric generation suppliers (“EGSs”) come from Tier I alternative energy sources (“AESs”), including at least 0.5 percent from solar PV sources, and another 10 percent of electricity from Tier II AESs by 2021.

ARIPPA supports the goal of the AEPS program in promoting alternative electric generation in the Commonwealth with provisions that concurrently recognize the need to address abandoned mine land (“AML”) pollution from the Commonwealth’s historic mining operations and ensuring an adequate and reliable supply of electricity to power our homes and businesses. The coal refuse reclamation to energy industry operates as a vital partner with the state and federal governments to accomplish these monumental tasks. The industry has a long history of working with the Pennsylvania Department of Environmental Protection (“DEP” or “Department”) to address AML priorities.

Unfortunately, oversupply in the Tier II market has historically produced Alternative Energy Credit (“AEC”) prices too low to support plant operations or to influence investment decisions – all at a time that certain Tier II projects have been closing due to market dislocation. Coal refuse reclamation to energy plants have been retiring due to persistently low wholesale energy and AEC prices. Other Tier II AESs including municipal solid waste to energy facilities and industrial cogeneration facilities have faced similar market constraints. Some units might have continued to operate for a few years, but under recent power market conditions none were likely to survive long-term in the absence of Act 114 due to a power market that fails to recognize and value a variety of environmental benefits (e.g., reclamation of abandoned mine lands and correction of associated pollution) that are important to Pennsylvania.

Following the precedent established by Act 40 of 2017 for the Tier I solar PV carveout,⁸ the General Assembly enacted Act 114 of 2020 to limit eligibility for Tier II of the AEPS program to AECs created by resources located in Pennsylvania. The goal was an investment of financial resources in Pennsylvania energy generation projects in a manner that provides ongoing tangible benefits to Pennsylvania in the form of energy production, job creation, and environmental reclamation.

Since 2018, four Pennsylvania coal refuse energy facilities have permanently closed. These small independent reclamation plants operate at extremely thin margins due to the high cost of operating with a challenging fuel source (coal refuse) and remediating waste coal piles. The majority of the facilities that have continued to operate in recent years have done so at significantly reduced capacity levels. However, with sufficient economic support from the AEPS program, these facilities should be capable of completing mine land reclamation and electricity production at a level equal to historic industry operating capacity. Adequate AEC prices will help these plants continue to operate and thus clean up the environment. These Pennsylvania coal refuse reclamation to energy facilities are more than capable of responding to an increased demand for in-state Tier II AEC

⁸ House Bill 118 of 2017.

production following implementation of Act 114 to meet future Tier II AEC requirements under the AEPS program.

Background

Organized in 1989, ARIPPA is a nonprofit trade association based in Camp Hill, Pennsylvania, comprised of independent electric power producers, environmental remediators, and service providers that remediate polluting waste coal piles, often located on abandoned mine lands, to produce alternative energy. The association represents ten unique environmentally beneficial coal refuse reclamation to energy facilities located in Pennsylvania that utilize circulating fluidized bed (“CFB”) boiler technology to convert coal refuse (waste coal) 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.

Today, there are a total of 13 CFB plants that convert coal mining refuse into alternative energy in Pennsylvania, West Virginia, Montana, and Utah. Ten of those 13 alternative energy plants are located in Pennsylvania. Most of the ARIPPA coal refuse reclamation to alternative energy plants were originally constructed as Qualifying Facilities (“QFs”), subject to size restrictions pursuant to the Public Utility Regulatory Policy Act⁹ (“PURPA”) of 1978. As a result, these facilities are relatively small in size, with all but one facility between 33 to 112 megawatts (“MW”) net operating capacity and a combined generation capacity just over 1,200 MW located in Pennsylvania.

ARIPPA member facilities provide a unique environmental benefit by utilizing state-of-the-art CFB technology to convert coal refuse into alternative energy. The industry achieves both economic and environmental benefits through a complete “fuel cycle,” utilizing coal refuse to produce and sell energy, and producing “beneficial use ash” as part of the energy generation process. This beneficial use ash is subject to regular testing to meet rigorous DEP guidelines prior to use in remediating and reclaiming mining-affected lands or otherwise being beneficially applied pursuant to DEP guidelines. This approach produces documented environmental restoration benefits, produces economic activity and employment across the fuel cycle, and addresses coal refuse piles without the need for costly landfills or other environmentally inferior disposal methods.

Since the late 1980s, the facilities that comprise the coal refuse reclamation to energy industry have removed at least 230 million tons of waste coal and remediated over 7,200 acres of land thereby improving more than 1,200 miles of Pennsylvania waterways.¹⁰ However, according to the 2019 DEP inventory, there remains at least 220 million tons of polluting waste coal located on more than

⁹ 16 U.S. Code § 2601 et seq.

¹⁰ *The Coal Refuse Reclamation to Energy Industry: A Public Benefit in Jeopardy*, Econsult Solutions (June 2019), available at <https://arippa.org/wp-content/uploads/2019/07/ARIPPA-Report-FINAL-June-2019.pdf>. (“Econsult Study”).

770 identified sites covering 8,300 acres.¹¹ At least 1.4 million Pennsylvanians live within one mile of an AML site which directly impact 44 of Pennsylvania's 67 counties. The estimated cleanup cost of all AML issues is at least \$15 billion, while the scope of the problem continues to outpace available and dwindling mine land reclamation resources.

The coal refuse reclamation to energy industry is a market-based, alternative energy solution to this problem that if preserved can save the state over \$5 billion in environmental remediation costs.¹² As the Commonwealth's energy priorities continue to shift away from traditional fossil-fuel sources, we must deal with the legacy from historic mining operations that powered our country during the previous century. Coal mining companies continue to struggle and close, many in bankruptcy, while funds available for reclamation regularly prove insufficient to adequately reclaim former mining sites.

The coal refuse reclamation to energy facilities play a critical role in environmental remediation in the coal regions where they are located by removing coal refuse piles, reclaiming mining-affected lands and reducing or even eliminating surface and groundwater pollution caused by acid mine drainage ("AMD") from coal refuse piles. At full capacity, this industry can remove about 10 million tons of coal refuse from the environment and reclaim approximately 200 acres of mining affected land in Pennsylvania each year. The reclamation work by these facilities provides \$37 million per year in environmental and public use benefits while saving the state up to \$267 million annually in avoided environmental cleanup costs.¹³

Waste coal piles negatively impact local economies by destroying recreational opportunities, lowering land values, ruining sites for further residential, forestry, commercial or agricultural uses, and threatening the health and safety of people living in historic coal mining communities. The mine land reclamation to energy industry represents a major source of economic activity and family-sustaining employment in these communities. Meanwhile, the reclamation of these polluting coal refuse sites can add to the economy by creating jobs, increasing community pride, increasing property values, decreasing stress-related costs through stream-based recreation, restoring the health of the environment, and providing future sites for commercial or industrial endeavors.

The industry produces \$615 million in annual economic benefits, employing nearly 3,000 people directly or indirectly in Pennsylvania that live, along with their children, families, and extended families, in communities within close proximity of the alternative energy ARIPPA plants.¹⁴ The surrounding communities, lands, and streams have experienced vast environmental and economic improvements due mainly to the decades of hard work and dedication these workers and the ARIPPA plants have provided. Without these plants, most of these polluting waste coal piles will not be removed due to limited alternative AML reclamation processes and funding.

¹¹ *Id.*

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*

By converting coal refuse into alternative energy, ARIPPA members are removing one of the principal sources of contamination to surface water and groundwater in coal mining regions and downstream communities of Pennsylvania. AMD is the second largest source of water pollution in the Commonwealth, responsible for a significant percentage of those streams identified by DEP as being “degraded.” Coal refuse piles degrade water quality through acid mine drainage, where precipitation picks up pollutants that then leach into ground and surface waters. The iron-sulfide minerals found in coal refuse piles are oxidized and discharge iron, manganese, aluminum, and other metals and minerals into water flows. These discharges increase the acid level and silt content of local waterways, causing streams to turn orange in color and harming their ability to sustain marine and plant life.

Historic abandoned mine land hazards in Pennsylvania include mountains of black waste, scarred landscapes, acidic drainages polluting more than 5,500 miles of our streams and other hazards threatening human health and safety and depressing local economies. When considering the limited federal dollars available 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 would otherwise remain in communities throughout the Commonwealth producing acid mine water discharges to surface waters and groundwater and prevent uncontrolled air pollution caused by fugitive coal dust and coal refuse pile fires. ARIPPA plants work closely with state and federal environmental agency officials, various local watershed groups, and environmental groups such as Earth Conservancy, Foundation for Pennsylvania Watersheds, Western Pennsylvania Coalition for Abandoned Mine Reclamation (WPCAMR), and Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), to reclaim abandoned mine lands and convert polluted streams into clean and usable waterways.

Unlike water treatment systems, the elimination of coal refuse piles and reclamation of sites removes the source of AMD and its associated environmental consequences. After coal refuse is removed from a site for use as an energy source, the alkaline ash byproduct is typically used to stabilize the site, neutralizing the acidity of any remaining unusable coal refuse. The reclamation process also diverts water runoff from reclaimed areas thereby reducing the concentration of metals in local waterways. Annual removal of 8 million tons of coal refuse produces a reduction of more than 3,100 metric tons of acid loadings annually. Further, the deployment of 6 million tons of beneficial use ash annually produces a reduction of nearly 2,500 metric tons of acid loadings each year.¹⁵

The removal of coal refuse piles also improves air quality through the elimination of potential and uncontrolled emissions from burning coal refuse piles and by eliminating coal refuse sites as sources of fugitive dust which will continue until these sites are reclaimed and the land restored to a productive use or covered with vegetation. Additionally, vegetation and soil profiles on reclaimed sites provide carbon sequestration. This would not be achievable without the ability to dispose of the polluting coal refuse in waste coal-fired units and reclaim sites with alkaline beneficial use ash

¹⁵ *Id.*

produced in the fuel cycle of the mine land reclamation to energy facilities.

While electricity sales inject private funding into mine land reclamation, the AEPS Act recognizes the industry's multimedia focus beyond electricity production through which the industry subsidizes the reclamation of polluting coal refuse piles that would otherwise require significant taxpayer funding to remediate. The coal refuse to alternative energy industry provides an option for removing coal refuse piles from the environment without shifting the full significant cost to public resources, thereby reducing the cost on Pennsylvania taxpayers. Should that option become unavailable, the entire cost for removal and remediation would fall on Pennsylvania taxpayers.

This work produces quantifiable improvements to the land, air, and water of the local communities where the reclamation work occurs, as well as downstream communities impacted by acid mine water runoff from these sites. The acid mine water runoff from these historic mining areas flow downstream to pollute water sources for major population centers in the Delaware, Susquehanna, and Ohio River Basins and the Chesapeake Bay, including the cities of Pittsburgh, Harrisburg, and Philadelphia. The environmental benefits of these facilities that remove polluting coal refuse, use it as fuel to create electricity, and then remediate and reclaim mining-affected land and streams using the beneficial ash created by the process are widely recognized and documented.

Energy production from waste coal was included in the AEPS from its inception in recognition of the tangible and significant environmental benefits this industry provides the Commonwealth. Under the AEPS Act, waste coal is defined as "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."¹⁶ However, not all electricity generated from combustion of waste coal was included in the AEPS program. The AEPS Act ensures additional environmental compliance by limiting eligibility to waste coal consumed at facilities "that use at a minimum a combined fluidized bed boiler and be outfitted with a limestone injection system and a fabric filter particulate removal system."¹⁷

Limiting eligibility under the AEPS Act to coal refuse energy facilities that utilize CFB boiler technology to perform AML reclamation work appropriately recognizes the manifest benefits of the industry. The positive environmental benefits from their unique fuel cycle, which functions in many ways more like a waste disposal facility, distinguishes these facilities from any traditional fossil fuel-fired power plant. It is clearly in best interests of the Commonwealth and its citizenry that coal refuse reclamation to energy facilities continue to play a vital role in the removal of coal refuse and reclamation mining-affected lands through the creation of alternative energy in Pennsylvania.

¹⁶ 73 P.S. § 1648.2.

¹⁷ *Id.*

Comments

Comment 1 – Limiting the eligibility of AEPS Tier II as reflected in Act 114 of 2020 and proposed in the TIO is consistent with prior legislative actions by Pennsylvania and neighboring states to encourage domestic alternative energy production and economic development.

The AEPS Act has contained geographic restrictions on the eligibility of AESs to create AECs under the Pennsylvania AEPS program since it was passed in 2004. As originally enacted, the AEPS Act limited eligibility in the AEPS program to generation located within Pennsylvania or within the footprint of an RTO that provides transmission service to a part of Pennsylvania, such as PJM Interconnection L.L.C..¹⁸ This regional geographic restriction continues to exist for many parts of the AEPS program; however, the legislature has made several amendments regarding eligibility of certain AESs for the various program tiers based on in-state generation and delivery criteria.

With the passage of Act 129 of 2008,¹⁹ the General Assembly created the first new geographic limitation under the AEPS program which distinguishes between in-state and out-of-state generation from wood pulping and manufacturing byproducts. The AEPS Act lists “electricity utilizing by-products of the pulping process and wood manufacturing process, including bark, wood chips, sawdust and lignin in spent pulping liquors” as a qualifying Tier II resource. However, Act 129 of 2008 amended the definition of biomass, which is a Tier I source, under the AEPS Act to include generation from these resources when “generated inside this Commonwealth.”²⁰ This allowed in-state generation from wood pulping and manufacturing byproducts to qualify as Tier I AESs while out-of-state generation remained eligible as a Tier II source.

In 2017, the General Assembly again created additional in-state locational requirements for certain Solar PV resources participating in the AEPS program. Act 40 of 2017 limited eligibility for the Solar PV carveout in Tier I of the AEPS Act to AESs located in Pennsylvania, or directly connected to a Pennsylvania electric distribution system.²¹ On April 19, 2018, the Commission adopted the FIO for Act 40 of 2017, which “establishes geographical limits on solar photovoltaic (solar PV) systems that qualify for the solar PV share requirement of the Alternative Energy Portfolio Standards (AEPS) Act,” effectively “closing the border” for this portion of Pennsylvania’s AEPS program.²²

On November 23, 2020, Governor Wolf signed House Bill 2536 (Act 114 of 2020) which amended the Fiscal Code to include Section 1799.10-E limiting eligibility in Tier II of the AEPS program to AECs created by AESs located in the Commonwealth.²³ This language is modeled after Section 2804 of the Administrative Code (amended by Act 40 of 2017), which excluded out-of-state resources from

¹⁸ 73 P.S. § 1648.4.

¹⁹ House Bill 2200 of 2008

²⁰ 66 Pa.C.S.A. § 2814(b).

²¹ 72 P.S. § 1799.10-E(a)(2). (Act 40 of 2017).

²² 48 Pa.B. 3054. (“Act 40 FIO”).

²³ 72 P.S. § 1799.10-E.

being eligible for the Solar Photovoltaic (PV) Carveout in Tier I of the AEPS program.²⁴ The result is an investment of over \$100 million per year in Pennsylvania from funds paid by Pennsylvania electric customers, focused on providing both significant economic and environmental benefits to Pennsylvania.

An AEC represents a megawatt hour (“MWh”) of generation, is valid for three years after the date it was generated, and prior to these changes could originate within Pennsylvania or the PJM RTO. Consistent with the intent of the AEPS program, Act 114 of 2020 will allow Pennsylvania to direct the investment of Pennsylvania ratepayer dollars to in-state alternative energy resources. In this regard, Pennsylvania is far from the first or only state to focus its program in this manner. States such as Massachusetts, Connecticut, Virginia, Maryland, and Illinois have all changed their renewable portfolio standards programs to favor in-state generation by closing their alternative energy credit or portfolio markets to out of state resources and pushing certain types of generation (e.g., hydro pumped-storage) into the AEPS market.

Comment 2 – The TIO implementing Section 14 as adopted by the Commission is consistent with PUC precedent and the legislative intent of Act 114 of 2020.

PUC Precedent

The matter before the Commission regarding implementation of Section 14 of Act 114 of 2020 is not a novel question. In 2017, the Commission was tasked with implementing Section 11.1 of Act 40 of 2017 amending the Administrative Code which added Section 2804 establishing geographical limits on the eligibility of solar PV systems under the AEPS Act. Section 14 of Act 114 of 2020, which amends the Fiscal Code at Article XVII-E by adding Section 1799.10-E, establishes similar geographical limits on eligibility of AESs to qualify as Tier II resources under the AEPS Act. With limited exceptions, the language of these sections is nearly identical.

Fiscal Code §§ 1799.10-E(a)(1)(i)-(iii), which are identical to Section 2804(1) of Act 40 of 2017, modify the AEPS Act to require qualifying Tier II resources to meet one of the following:

- Deliver the electricity it generates directly to either a retail customer of an EDC or the EDC itself, provided in both instances that this EDC is operating in Pennsylvania and required to meet the AEPS Act requirements;
- Be directly connected to an electric cooperative or municipal electrical system operating within Pennsylvania; or
- Be directly connected to an electric transmission system at a point within the service territory of an EDC operating within Pennsylvania.

Section 1799.10-E(a)(1)(iv) adds an additional qualification for Tier II resources, allowing for AEPS

²⁴ 71 P.S. § 714.

inclusion of those facilities whose construction and operation is subject to and complies with permits issued by the Pennsylvania Department of Environmental Protection.

Similar to Section 2804(2) of Act 40 of 2017, Fiscal Code § 1799.10-E(a)(2) further goes on to qualify that nothing in Section 1799.10-E or Section 4 of the AEPS Act shall affect “any certification originating within the geographical boundaries of this commonwealth granted prior to the effective date of this section” of a Tier II source as a qualifying alternative energy source eligible to meet the compliance requirements for Tier II shares under the AEPS Act. Also excluded from the effects of the amendments in Section 1799.10-E are the certifications of any Tier II system with an existing, binding written contract for the sale and purchase of alternative energy credits which was entered into prior to November 23, 2020, with added specification under Section 1799.10-E(a)(2)(ii) that this exclusion is limited “until the current term of the contract terminates.” Finally, Section 1799.10-E(b) is identical to Section 2804(3) of Act 40 of 2017 in that the eligibility provisions of Section 1799.10-E(a) are applicable to any contract either “entered into or renewed” on or after November 23, 2020. Out-of-state credits created prior to November 23, 2020 or sold under existing contracts as of that date will continue to be eligible for the remaining term of the contract.

The Commission’s actions in implementing the provisions of Section 14 of Act 114 of 2020 are therefore appropriately guided by its Final Implementation Order for Act 40 of 2017. The intent of Section 14 was similarly to limit eligibility for Tier II AESs consistent with those in Act 40 for solar PV systems following the design utilized by a number of our neighboring states to promote economic development.

Legislative Intent

Legislative intent was critical in the Commission’s final implementation of Act 40 of 2017. When the Commission determined certain sections of Act 40 were unclear, comments from members of the General Assembly were instructive as they are “uniquely qualified to provide the Commission with information regarding the intent of the statute.”²⁵ Likewise, legislative intent, as shown through the actions and documents of the General Assembly, is again instructive in guiding the Commission’s implementation of Act 114 of 2020.

While Section 14 of Act 114 of 2020 was adopted as part of the Fiscal Code, it was the result of bipartisan legislative proposals introduced in both chambers of the General Assembly and reviewed by a bipartisan joint legislative committee. The Joint Legislative Air and Water Pollution Control and Conservation Committee (JLCC), comprised of both House and Senate members, conducted hearings on the mine land reclamation to energy industry in 2020. In June of that year, the JLCC issued a report titled “The Coal Refuse Reclamation to Energy Industry and Carbon Trading Markets,” which recommended “limiting participation in Tier II of the [AEPS] program to in-state resources to increase credit value.”²⁶

²⁵ Act 40 FIO at 17.

²⁶ *The Coal Refuse Reclamation to Energy Industry and Carbon Trading Markets*, JLCC (June 2020).

The language in Section 14 of Act 114 of 2020 is substantially the same as Senate Bill 1305²⁷ introduced by Senators Dave Argall and Lisa Boscola and House Bill 2633²⁸ introduced by Representatives Doyle Heffley and Frank Burns. These bills were introduced with the intent “to limit participation in Tier II of the Pennsylvania Alternative Energy Portfolio Standards (AEPS) program to energy sources originating in Pennsylvania.”²⁹ In enacting Act 114 of 2020, the General Assembly was clearly aware of the Commission’s order implementing Act 40 of 2017. The co-sponsorship memorandum for Senate Bill 1305 specifically cites that, “a similar effort was undertaken in 2017 with the passage of Act 40.”³⁰

Comment 3 – There are sufficient Tier II generation resources located in Pennsylvania to produce the AECs necessary for all EDCs and EGSs to comply with the current and future AEPS Tier II requirements.

In 2004, Pennsylvania enacted the AEPS program to offer energy-related economic development opportunities in the Commonwealth by requiring Pennsylvania’s EDCs and EGSs to offer 8 percent of their electricity supply from Tier I alternative energy sources and 10 percent of their supply from Tier II alternative energy sources by 2021. Tier II sources are limited to waste coal, pumped-storage hydro, conventional hydro, municipal solid waste (“MSW”), wood pulping byproducts, blast furnace gas, and other sources including distributed generation and demand-side management. The 2009 Pennsylvania Climate Change Action Plan (“CAP”) issued by the DEP stated: “We already know that sufficient credits from waste coal have been generated to meet the entire Tier II requirements though at least 2021.”³¹

Unfortunately, oversupply in the Tier II market has historically produced AEC prices too low to support plant operations or influence investment decisions – all at a time that certain Tier II projects have been closing due to market dislocation. For the initial 2007-2008 compliance period, the weighted-average Tier II AEC traded for \$0.66. As noted in the 2009 CAP report: “This amount is

<http://jcc.legis.state.pa.us/resources/ftp/documents/Reports/JLCC%20-%20Coal%20Refuse%20Reclamation%20Report%20-%202020.pdf>

²⁷ Senate Bill 1305 of 2020,

<https://www.legis.state.pa.us/cfdocs/billInfo/billInfo.cfm?sYear=2019&sInd=0&body=s&type=b&bn=1305>.

²⁸ House Bill 2633 of 2020,

<https://www.legis.state.pa.us/cfdocs/billInfo/billInfo.cfm?sYear=2019&sInd=0&body=h&type=b&bn=2633>

²⁹ Sens. Argall & Boscola, Senate Co-Sponsorship Memorandum, Closing AEPS Tier II Border (June 25, 2020).

<https://www.legis.state.pa.us/cfdocs/Legis/CSM/showMemoPublic.cfm?chamber=S&SPick=20190&cosponId=32031>

and Reps. Heffley & Burns, House Co-Sponsorship Memorandum, Investing in Pennsylvania Energy and Environment: Close AEPS Tier II Border (May 28, 2020)

<https://www.legis.state.pa.us/cfdocs/Legis/CSM/showMemoPublic.cfm?chamber=H&SPick=20190&cosponId=31874>.

³⁰ Sens. Argall & Boscola, Senate Co-Sponsorship Memorandum, Closing AEPS Tier II Border (June 25, 2020).

³¹ *Pennsylvania Final Climate Change Action Plan* (December 18, 2009).

<http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=4504&DocName=0%20PENNSYLVANIA%20CLIMATE%20CHANGE%20ACTION%20PLAN.PDF%20>

too small to affect plant investment decisions.”³² By the 2015-2016 compliance period the Tier II price had reached a historic low of \$0.10 per credit.³³ The average Tier II AEC traded around \$0.25 over the life of the AEPS program due to this massive surplus of registered out-of-state capacity. In 2020, there were 6,678.4 MW of Tier II generation facilities located outside of the Commonwealth registered under the AEPS program, and only 4,067 MW of facilities located in Pennsylvania were similarly registered.

The Pennsylvania market for Tier II AECs has been dominated by 2 fuel types—waste coal and pumped-storage hydro. Most Tier II eligible resources, other than waste coal and pumped-storage hydro, have historically been eligible for renewable portfolio standards (“RPS”) programs in other states. For instance, conventional hydro facilities are typically eligible to participate in Maryland, New Jersey, Illinois and Ohio RPS programs. Likewise, municipal solid waste facilities are generally eligible in New Jersey Tier 2 or Maryland Tier 1 programs. As prices move between markets—whether due to policy changes or supply and demand dynamics—relative prices can change and resources eligible in more than one market have historically been free to arbitrage between these markets, moving to the more lucrative venue.³⁴

According to an independent study performed for ARIPPA by Thorndike Landing, there will be sufficient in-state resources to meet estimated Tier II AEC demand after border closure as pumped-storage hydro facilities increase dispatch, while conventional hydro and MSW facilities begin selling their AECs into the Pennsylvania Tier II market instead of the Maryland Tier 1 and New Jersey Tier 2 markets. According to Thorndike Landing, the biggest market change will be the necessity for waste coal energy facilities to operate at capacity factors between 80 percent and 90 percent in the near future.³⁵

Prior to the passage of Act 114 of 2020, waste coal energy producers faced significant economic headwinds due to persistently low power prices and Tier II AEC prices. Market and regulatory challenges, including low-cost natural gas supply from the Marcellus Shale formation and other regulatory and policy initiatives, have altered the economics of the industry. In addition to broader commodity market drivers, in the various PJM states legislative initiatives have been enacted that have the effect of also suppressing wholesale market prices. Tier II AEC prices will have to clear at a price necessary to provide sufficient economic incentive for the waste coal sector to have a generation weighted average capacity factor of at least 80 percent. Based on current forward energy prices, recent default services prices, and estimated cost structure of the waste coal sector as a whole, this price is estimated to be \$12-16/MWh.³⁶

The value of the Tier II AECs is the equilibrium price at which sufficient resources are pulled into the

³² *Id.*

³³ *PA AEPS Historical Pricing* available at <https://pennaeps.com/reports/>

³⁴ Thorndike Landing, LLC, Memorandum re: Pennsylvania Tier 2 Renewable Energy Credit (REC) Pricing, dated October 20, 2020 (the “Thorndike Landing Report”). See Attachment 1.

³⁵ *Id.*

³⁶ *Id.*

market to meet demand. With eligibility for AEPS Tier II participation restricted to resources within Pennsylvania under Act 114 of 2020, in order to meet projected Tier II AEC demand, eligible resources would need to be pulled in from MSW facilities located in Pennsylvania but currently serving New Jersey Tier 2, incremental in-state pumped-storage hydro, conventional hydro currently serving Maryland Tier 1, and additional waste coal dispatch equivalent to an 80 percent sector-wide capacity factor.

It is unlikely that any significant new Tier II resources enter the supply mix below. While additional energy efficiency or distributed generation could enter the market, this would not be in sufficient scale to set pricing. Meanwhile, more scalable technologies like hydroelectric, municipal solid waste, hydro pumped-storage, and new waste coal facilities are unlikely to be built for a variety of reasons. Most technologies have a levelized cost of energy well in excess of the current energy pricing and would need AEC pricing far above the existing alternative compliance payment (“ACP”) for new entry. Since AECs cannot trade above ACP, new entry for these technologies is not economically viable.³⁷ There is the potential for a small amount of additional cogeneration capacity coming online, such as a future pollution control project proposed by U.S. Steel at the Mon Valley Works to expand reuse of the by-product gases from the coke and steelmaking activities to help power their manufacturing facilities.³⁸

All but one of the waste coal-fired facilities located in the Commonwealth originally operated under a power purchase agreement (PPA), which during the PPA term financially supported and encouraged these plants to operate at their maximum capacity. However, all of these PPAs expired over the past decade or more with the final PPA for the Colver facility expiring last year. Since these PPAs expired, the majority of these plants have struggled to compete in the competitive energy market that fails to recognize the positive externalities of these facilities.

Wholesale energy prices have often been below the “breakeven” point required for coal refuse reclamation to energy plants to simply recover their cost of production. Other than a spike in prices in January 2018 due to unusually high gas prices during the winter heating season, locational marginal prices for waste coal units have been low—and have trended downward recently. In addition, capacity payments received by plants for the year commencing June 2019 fell significantly and will remain well below recent levels for a two-year period.³⁹

Recent years have been marked by a reduction in operations by certain waste coal-fired facilities due to the failure of the PJM market to recognize and value the environmental externalities embodied in the removal, remediation and reclamation activities conducted by these facilities. The mismatch between energy market revenue and operating costs has previously led to the closure of 5 of the total 15 Pennsylvania coal refuse reclamation to energy plants to date and, in recent years to seasonal idling for others, resulting in a significant decline in operations and annual economic

³⁷ *Id.*

³⁸ *United States Steel to invest a billion dollars in new plant*, ASM International (May 07, 2019), https://www.asminternational.org/home/-/journal_content/56/10180/37207635/NEWS

³⁹ Thorndike Landing Report.

and environmental benefits to the Commonwealth. Most notably, in the past three years Pennsylvania has witnessed the permanent closure and demolition of the Cambria Cogen, Wheelabrator Frackville Energy Company, and Northeastern Power Company (NEPCO) facilities as evidence of the recent downturn.⁴⁰ That environmental removal, remediation, and reclamation capacity is forever lost to Pennsylvania.

The remaining 10 facilities still operating today have a combined net operating capacity of 1205.1 MW.⁴¹ Certain of these facilities have adopted innovative and cost saving measures in order to continue to operate at substantially lower levels and persevere in their environmental benefits leading to a dramatic decline in production from waste coal facilities has in recent years. Due to in large part to these changes, during the recent 3-year period of 2017-2019, Pennsylvania's coal refuse reclamation to energy operated at an annual capacity rate not exceeding 58.1 percent. Meanwhile, only four facilities exceeded an 80 percent operating capacity rate during this timeframe with half of the facilities averaging less than 50 percent capacity and two operating at less than 21 percent capacity in their highest operating year.⁴²

Due to reduced operations during the period between 2017-2019, the ten currently operating coal refuse reclamation to energy facilities only produced an average annual net generation of 5,567,912 MWh while operating at only a 52.7 percent capacity rate.⁴³ Recent generation data may typically seem a reasonable method to anticipate future production – under similar market conditions – but looking at this recent period when those facilities have been operating at reduced levels while fighting for survival as the metric for future generation is not reflective of their full capacity. The changes to Tier II of the AEPS program under Act 114 of 2020, which if implemented as proposed under this TIO, are expected to improve future market conditions for these facilities and provide sufficient AEC prices to incentivize these facilities to operate at higher capacity rates moving forward. Therefore, this recent generation data no longer represents an accurate projection of expected future generation from these facilities.

A better indicator of future generation by Pennsylvania's coal refuse reclamation to energy industry would be to consider historical operating rates during a time when these facilities were financially incentivized to produce at their maximum generation capacity. In 2010 and prior, nearly all of the coal refuse reclamation to energy facilities regularly operated at over 80-90 percent capacity.⁴⁴ During this earlier timeframe, most of these facilities were operating under PPAs which guaranteed sufficient revenue to incentivize baseload operation. For facilities without PPAs, wholesale electricity prices also supported higher operations during this time prior to the price suppressive impact of low-cost natural gas from the Marcellus shale formation entering the market in recent years.

⁴⁰ ARIPPA 2020 Plant Map. *See* Attachment 2.

⁴¹ Net Generation Spreadsheet. *See* Attachment 3.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.*

Looking at historical operating data over the past 20 years, every currently operating coal refuse energy facility produced at over a 70 percent capacity rate with four of them exceeding a 90 percent capacity factor.⁴⁵ These facilities have the ability going forward to again operate at these higher levels due to the financial support from an increased AEC price. The Tier II AEC price necessary to achieve this result is estimated to be between \$12-16, which represents the amount above current forward energy prices necessary to keep in-state waste coal generators operating at these high capacity factors.⁴⁶

Operating at their maximum net operating capacity, these facilities could produce up to 10,556,676 MWh annually, while operating at an 80-90 percent net capacity rate can produce annual generation between 8,445,341 MWh and 9,501,008 MWh. This would produce a net increase of 2,877,429 MWh to 3,933,097 MWh per year above the recent three-year average output. If each of these coal refuse energy facilities were incentivized to operate at its historic maximum net operating capacity, they would produce 8,604,477 MWh, or an increase of 3,036,566 MWh over their recent three-year average output.⁴⁷ According to the Thorndike Landing study, this amount alone would provide sufficient Tier II AECs to meet future compliance obligations under the AEPS Act.⁴⁸

Conclusion

ARIPPA appreciates the opportunity to provide comments on the proposed TIO for Section 14 of Act 114 of 2020. The Commonwealth has repeatedly emphasized the importance of the mine land reclamation work performed by coal refuse reclamation to energy facilities by enacting legislation and establishing programs supporting its continued operation in the Commonwealth. In considering the legacy environmental challenges of mine land reclamation, the inclusion of waste coal in the AEPS Act properly accounts for the positive environmental benefits to land, air, and water provided by the industry, as well as the economic benefits of sustaining the operation of these facilities. ARIPPA appreciates the Commonwealth's continuation of that strong and unwaivering support for the coal refuse reclamation to energy industry and other in-state Tier II AESs by enacting Act 114 of 2020.

The TIO is consistent with prior AEPS legislation and Commission precedent interpreting these enactments while fulfilling the legislative intent of Act 114 of 2020 to support in-state Tier II alternative energy generation and economic development. Notwithstanding the in-state eligibility requirement for Tier II resources, sufficient AECs will be produced to meet current and future Tier II compliance obligations under the AEPS Act. The long-term public-private partnership between the Commonwealth and the coal refuse reclamation to energy industry as part of the Commonwealth's mine land reclamation efforts has produced some of the most significant AML

⁴⁵ *Id.*

⁴⁶ Thorndike Landing Study

⁴⁷ *Supra* note 41.

⁴⁸ Thorndike Landing Study.

remediation in the Commonwealth over the past three decades. With the long-term sustainability of the remaining ten coal refuse reclamation to energy facilities significantly improved by the enactment of Act 114 of 2020, along with other state and federal legislative and regulatory programs supporting the industry, the industry looks forward to continuing its partnerships with the Commonwealth and environmental organizations to eliminate the remaining ground, air, and water pollution from the legacy of coal mining in Pennsylvania.

Therefore, ARIPPA encourages the Commission to adopt a final order in this docket implementing Act 114 of 2020 based upon the TIO as issued on January 14, 2021, without any changes. If the Commission has any questions about these comments, please contact me at 717-763-7635 or the address set forth below.

Respectfully submitted,

A handwritten signature in black ink that reads "Jaret A. Gibbons". The signature is written in a cursive, flowing style.

Jaret A. Gibbons, Esq.
Executive Director
ARIPPA
2015 Chestnut Street
Camp Hill, PA 17011
Phone: 717-763-7635
jgibbons@arippa.org

cc: Tom Roberts, ARIPPA President

Attachment 1

Thorndike Landing

Date: October 20, 2020

From: Thorndike Landing, LLC

To: Appalachian Region Independent Power Producers Association (ARIPPA)

Re: Pennsylvania Tier 2 Renewable Energy Credit (REC) Pricing

This memorandum summarizes our approach, assumptions and findings based on our assessment of the Pennsylvania Tier 2 renewable energy credit (“REC”) market which arises under Pennsylvania’s Alternative Energy Portfolio Standard (“AEPS”) program. We considered a range of scenarios including: (a) a “Business As Usual” case and (b) an assumed revision to the Pennsylvania Tier 2 market structure that would restrict participation to in-state resources (“In-State Only” case).

Executive Summary

Due to persistent low wholesale energy prices in the region, caused in part by various state legislative market intervention and recent demand destruction from the global pandemic, Pennsylvania waste coal generators, key Tier 2 resources in Pennsylvania’s AEPS, are facing significant economic headwinds. Without improvement in energy and/or Tier 2 REC prices, waste coal generators will continue to shut down and/or permanently switch to seasonal operation, thereby decreasing supply of Tier 2 RECs and dramatically reducing the amount of waste coal consumed, resulting in diminished removal, remediation and reclamation activities, which are a primary purpose of those plants. Over the past 2 years, five of the 16 waste coal facilities supplying the Pennsylvania Tier 2 market have permanently retired. Additionally, four of the 16 plants have not generated any power / RECs since 2019.

If, in the long-term, the economics for waste coal generators do not improve and the remaining generators are forced to retire, we find that:

- There would be sufficient Tier 2 generation to meet expected Tier 2 REC demand upon full phase-in of Tier 2 REC requirement of 10.0% of load.
- However, PA Tier 2 RECs would have to be priced at +/- \$12 to provide sufficient incentive for generators to dispatch more and/or sell into the PA Tier 2 market instead of other PJM REC markets (i.e., New Jersey Tier 2 or Ohio).
- The state would lose the environmental avoided cost benefits (estimated by Econsult Solutions, Inc. to be approximately \$93 – 267 million annually) and associated economic benefits of existing waste coal facilities.
- Of the approximately 13.7 million Tier 2 RECs that are expected to be needed, approximately 8.6 million or 63% are expected to come from out of state resources at a cost to Pennsylvania ratepayers of approximately \$103 million. Of these out-of-state resources, approximately 3.7 million or 26% are expected to be sourced from pumped hydro facilities that are owned by rate-regulated investor owned utilities.

If the Pennsylvania Tier 2 program is instead revised, as proposed, to limit eligibility to in-state resources only:

- There would be sufficient resources in the state to meet estimated Tier 2 REC demand, provided: (a) pumped hydro facilities increase dispatch as result of higher peak/offpeak spreads resulting from higher REC pricing, (b) conventional hydro and municipal solid waste facilities sell RECs in the Pennsylvania Tier 2 market instead of Maryland Tier 1 and New Jersey Tier 2 markets, respectively and (c) waste coal resources dispatch at capacity factors of +/-80%.
- The Tier 2 REC price necessary to meet estimated Tier 2 REC demand using in-state Pennsylvania resources is estimated to be \$12-16, the amount above current forward energy prices necessary to keep in-state waste coal generators operating at high capacity factors.

Background

Pennsylvania's Senate Bill 1030, enacted on November 30, 2004, created Pennsylvania's Alternative Energy Portfolio Standard. Under the AEPS, each electric distribution company and electric generation supplier to retail electric customers in Pennsylvania is required to supply 18% of its electricity using alternative energy resources by 2020. Included in this total is 10.0% of energy from "Tier 2" resources by 2021. The Tier 2 requirement is phased in over 14 years from 4.2% in 2007 to 8.2% currently to 10.0% in 2021 and beyond. The table below summarizes historical Tier 2 demand.

Table 1: Summary of Tier 2 Requirements

Compliance Year	Tier 2 Requirement (% of Load)	Tier 2 RECs Retired	Implied Load
2017	8.2%	11,604,562	141,519,049
2018	8.2%	11,624,278	141,759,488
2019	8.2%	11,645,974	142,024,073
2020	8.2%	11,203,559	136,628,768
2021	10.0%		

Under the AEPS, Tier 2 renewable resources include the following: new and existing waste coal, distributed generation ("DG") systems less than 5 MW, demand-side management, large-scale hydro, municipal solid waste, wood pulping and manufacturing byproducts from energy resources located outside the state, useful thermal energy and integrated gasification combined cycle ("IGCC") coal technology. Eligible resources must originate within the PJM regional transmission organization ("RTO"), which encompasses all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia.

Resources currently eligible for Pennsylvania Tier 2 participation are summarized in the table below.

Table 2: Summary of Tier 2 Resource Capacity (MW)ⁱ

Fuel Type	In-State	Out-of-State	Total
Pumped storage	1,540.0	4,042.0	5,582.0
Waste coal	1,503.4	681.0	2,184.4
Conventional hydro	712.3	1,191.8	1,904.1
Black liquor	-	367.9	367.9
Municipal solid waste	149.7	202.2	351.9
Blast furnace gas	55.5	67.0	122.5
Other	<u>106.1</u>	<u>126.5</u>	<u>232.6</u>
Total	4,067.0	6,678.4	10,745.4

In terms of Tier 2 RECs generated / retired, the Pennsylvania Tier 2 market has been dominated by 2 fuel types—waste coal (“WC”) and pumped storage hydro (“PS”). The out-of-state PS capacity consists entirely of 4 facilities owned by regulated electric utilities—3 in Virginia and 1 in New Jersey. Over the last 3 years, WC and PS resources have represented between 88% and 94% of Tier 2 RECs retired annually. We note that the waste coal capacity shown above includes the 585 MW Virginia City Hybrid Energy Center, however, per review of fuel usage for 2017-2020, the facility does not burn waste coal and, therefore, has not historically participated in the Pennsylvania Tier 2 market and is unlikely to contribute to the market in the future.

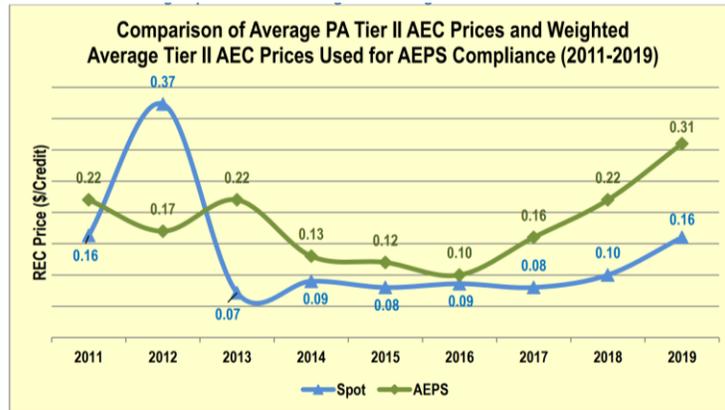
Table 3: Historical Tier 2 Participation by Resource Type

Year	WC Total Generation (MWh)	PS Total Generation (MWh)	Combined WC, PS Generation	% of RECs Retired		
				WC	PS	Other
2017	8,290,749	5,693,869	13,984,618	61.4%	29.8%	6.5%
2018	7,952,159	6,423,730	14,375,889	63.7%	29.8%	6.5%
2019	8,041,806	6,144,136	14,185,942	49.1%	38.6%	12.0%
2020	5,241,945	5,269,953	10,511,898	N/A		

Most Tier 2 eligible resources, other than waste coal and pumped storage hydro, have historically been eligible in other state RPS compliance markets. For instance, conventional hydro facilities are typically eligible to participate in Maryland (Tier 1 or Tier 2), New Jersey Tier 2, Illinois and/or Ohio programs. Likewise, municipal solid waste (“MSW”) facilities are generally eligible in New Jersey Tier 2 or Maryland Tier 1. As prices move between markets—whether due to structural / rules changes or supply and demand dynamics—relative prices can change and resources eligible in more than one market have historically been free to arbitrage between these markets, moving to the more lucrative venue.

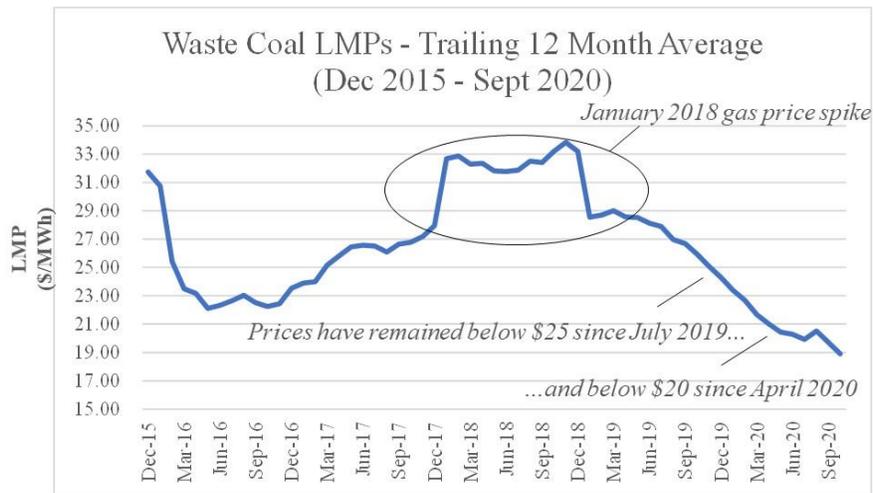
The market for Tier 2 resources has historically been oversupplied. As shown in the table above, combined waste coal and pumped storage hydro have historically been +/- 14 million MWh, far in excess of the annual requirement shown in **Table 1: Summary of Tier 2 Requirements**. This oversupply has been reflected in average realized pricing of \$0.10 to \$0.22 per REC, as compared to Tier 1 pricing (not shown) of approximately \$10 to \$15 per REC.

Table 4: Summary of Tier 2 Historical Pricingⁱⁱ



However, production from waste coal has declined dramatically in recent years. Due to persistently low power prices and Tier 2 REC prices, waste coal producers have faced significant economic headwinds. As shown in the table below, other than a spike in prices in January 2018 due to unusually high gas prices during the winter heating season, locational marginal prices (“LMP”) for waste coal units have been low—and have trended downward recently.

Table 5: Historical Waste Coal LMP Prices (\$/MWh)¹



In addition to broader commodity market drivers, in the various PJM states legislative initiatives have been enacted that have the effect of also suppressing wholesale market prices. For instance, Public Service Enterprise Group (“PSEG”) recently filed an application with the New Jersey Board of Public Utilities to retain \$300 million in ratepayer subsidies (originally awarded in 2018) to subsidize its Hope Creek and Salem nuclear facilities. Combined, these nuclear units contributed 18.8 million MWh of baseload generation into the market in 2019 whereas, without these subsidies, those units would be retired.

¹ LMPs based on MetEd LMP, adjusted for calculated -2.5% waste coal generator discount to MetEd zonal prices.

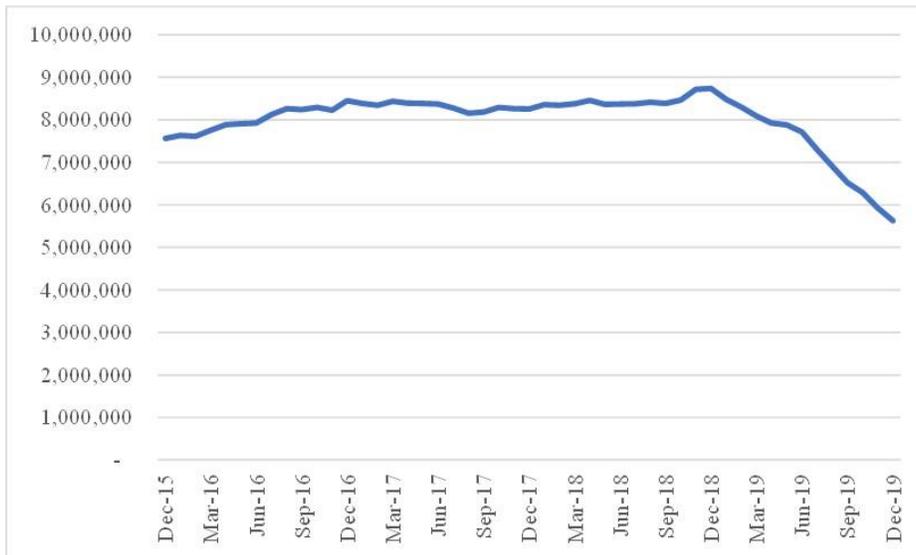
Due to sustained low wholesale market prices, over the past 2 years, five of the 16 waste coal facilities supplying the Pennsylvania Tier 2 market have retired and four additional plants have not generated any power / RECs since 2019. As a result, the amount of waste coal-generated RECs being retired under the Tier 2 system have declined by more than 35% from the trailing 12 month highs over the last 2 years.

Table 6: Waste Coal Generation (MWh) – Trailing 12 Months (Dec 2015 – Dec 2019)



As shown in the table below, the consumption of waste coal for these facilities has shown a similar decline.

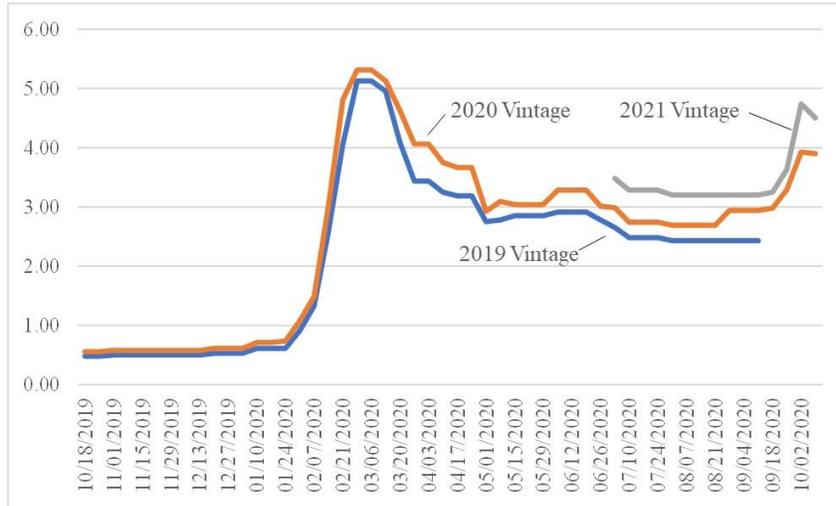
Table 7: Waste Coal Consumption (Tons) – Trailing 12 Months (Dec 2015 – Dec 2019)



As of December 2019, consumption of waste coal has declined more than 35% from trailing 12 month highs over the last 2 years.

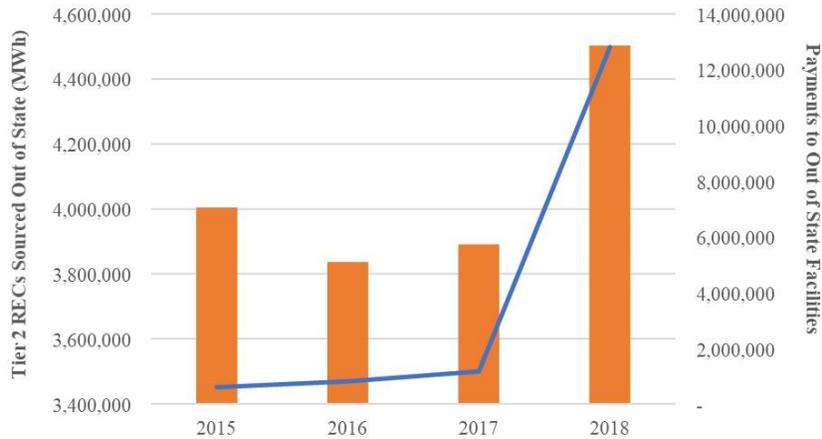
The combination of shrinking waste coal supply and increasing REC demand due to phase-in to 10.0% Tier 2 requirement has put upward pressure on prices. As noted in **Table 4: Summary of Tier 2 Historical Pricing**, weighted average Tier 2 prices under the RPS have ranged from \$0.08 to \$0.22. However, recent prices for 2019 – 2021 RECs have increased to approximately \$4.00-4.25.

Table 8: Tier 2 REC Values – Oct 2019 – Oct 2020



The combination of a reduction in waste coal generation and an increase in REC pricing has resulted in significantly higher payments to out-of-state resources.

Table 9: Total Tier 2 RECs Purchased and Payments Made to Out of State Providers



Note that the annual report for the plan year ended May 31, 2020 has not yet been released. For purposes of the graph above, we assumed an average 2019/2020 of \$2.85, which was the 2019 vintage REC value as of the end of the plan year.

Approach / Assumptions

We examined the likely impact of developments in the Pennsylvania Tier 2 market with a “Business As Usual” case and other potential scenarios as discussed below.

We estimated future total Tier 2 REC demand based on follows:

• 2018 actual demand (million MWh):	141.7 ⁱⁱ
• Estimated impact of COVID-19 demand destruction:	96%
• 2020 estimated demand	136.1
• 2021 estimated demand (at 0.5% growth)	136.7
• 2021 Tier 2 requirement(%)	10%
• 2021 Tier 2 requirement (million MWh)	13.7

For Tier 2 supply (and associated REC pricing), we assessed the likely supply for Tier 2 compliance based on: (a) resource eligibility, (b) historical / expected dispatch, (c) current pricing of competing markets for hydro, MSW and other resources, etc. based on 2 scenarios:

1. “Business As Usual”: Under the status quo, waste coal facilities continue to retire over the long-term due to economic pressures in a low power price and low Tier 2 REC price environment.
2. Tier 2 eligibility limited to in-state resources only: Pennsylvania follows the lead of other states and restricts resource eligibility to in-state resources only.

Primary resources participating in the Tier 2 market include the following:

*Table 10: Summary of Tier 2 Resource Supply*ⁱⁱⁱ

Fuel Type	Capacity (MW)			Estimated Production (GWh)	Notes
	In-State	Out-of-State	Total		
Pumped storage	1,540.0	4,042.0	5,582.0	5,331	Dispatch based on peak/ offpeak spreads. Baseline production based on 2019 actuals, reflecting most recent peak/offpeak price dynamics. Amount of production is assumed to increase with higher REC prices (i.e., higher peak/offpeak spreads). Assumed cap of ~4 hours daily dispatch (~16% capacity factor).
Waste coal	1,503.4	681.0	2,184.4	6,456	Production based on: (1) historical average or (2) seasonal production based on individual assets. Amount of production varies by scenario. Assumed maximum capacity factor of ~85% based on availability.
Conventional hydro	712.3	1,191.8	1,904.1	6,414	Price takers; not dispatchable. Based on historical average production. Most volumes are sold into other REC (MD, NJ, OH, etc.) markets
Black liquor	-	367.9	367.9	2,382	Price takers; energy production is byproduct of wood process. Based on historical average production. Most volumes sold into other (MD, DE, IL) REC markets
Municipal solid waste	149.7	202.2	351.9	1,814	Based on historical actuals per EIA. Most volumes sold into MD, NJ REC markets
Blast furnace gas	55.5	67.0	122.5	480	Based on historical actuals per EIA
Other	<u>106.1</u>	<u>126.5</u>	<u>232.6</u>		
Total	4,067.0	6,678.4	10,745.4		

Under each of the scenarios, the available/eligible REC supply is applied to meet the estimated demand as follows:

- All resources that are not eligible in other REC markets (i.e., waste coal, pumped storage, blast furnace/other gases) are assumed to sell into Pennsylvania Tier 2 at baseline generation as shown in **Table 10: Summary of Tier 2 Resource Supply**
- All resources that are only also eligible in Maryland Tier 2 and/or Virginia are then assumed to serve Pennsylvania Tier 2 demand. The Maryland Tier 2 (large hydro) terminates at the end of 2020. The Virginia RPS program defines “renewables” very broadly, allowing for significant oversupply and nominal REC values.
- Additional pumped storage dispatch was added as additional REC value was needed to pull in additional supply. As the value of the Tier 2 REC increases, the spread between peak and offpeak prices—and therefore economic incentive for additional pumped storage dispatch—increases. We analyzed the additional dispatch per dollar of REC value by analyzing the 2019 PJM West LMPs. We performed a backcast of pumped storage dispatch given actual dispatch / capacity factors. We then estimated the additional dispatch that would have occurred with additional REC values.
- Finally, we layered in additional resources that currently sell into other REC markets by adding those that can serve progressively more valuable alternative REC markets (i.e., cheaper substitutes added first).

The value of the Tier 2 REC is the equilibrium price at which sufficient resources are pulled into the market to meet Tier 2 demand. Note that we do not assume any new resources in the supply mix below. We believe that additional energy efficiency or distributed generation could enter the market but not in sufficient scale to set pricing. We further note that the more scalable technologies are unlikely to be built for a variety of reasons:

- Waste coal: (1) Permitting a new coal refuse reclamation facility would be extremely difficult and (2) the combination of high capital costs, low gas prices and environmental headwinds/risks make such an investment highly unlikely.
- Hydroelectric: We consider new conventional hydro to be unlikely due to the following: (1) unavailability of viable dams/locations for new hydro given prior development, (2) low likelihood of permitting at any undeveloped sites and (3) poor project economics in a low gas price environment. No new, unregulated conventional hydro has been constructed in PJM in the last 7 years. The only new, unregulated hydro capacity of scale built in the last 15 years was a 130 MW expansion of the existing Holtwood facility in 2013, when natural gas prices were approximately 80% higher than those over the last 12 months^{iv}.
- Other: Levelized costs of energy for other technologies would, given current energy and capacity prices, imply a REC value far in excess of the alternate compliance payment (“ACP”) which is effectively a cap for REC values.

Table 11: Summary of Levelized Cost of Energy (LCOE) for Tier 2 Technologies

Technology	Simple Avg LCOE (\$/MWh)	Source
Hydroelectric	52.79	EIA Annual Energy Outlook 2020
Biomass	94.83	EIA Annual Energy Outlook 2020
Municipal solid waste	94.83	Assumed to be consistent with biomass
Pumped storage	95.36	Not in EIA AEO. Calc'd based on hydro (above) adjusted for previously-issued EIA capital cost differences

As shown above, most technologies have a levelized cost of energy (“LCOE”) well in excess of the current energy pricing (24x7 PJM West 2022 energy forwards are \$28.07/MWh as of 9/14/2020). Assuming ~\$6/MWh for capacity (based on FirstEnergy default service auction results and baseload operation), most technologies would need REC pricing or +/- \$61 (LCOE of ~\$95/MWh less revenues for energy (\$28/MWh) and capacity (\$6/MWh)) for new entry, which is far above existing ACP. Since RECs cannot trade above ACP, new entry for these technologies is not economically viable. Conventional hydro is also unlikely to be viable for the reasons cited above. We do note that there is the potential for additional blast furnace gas capacity coming online. For instance, a future pollution control project proposed by U.S. Steel would provide approximately 400,000 MWhs of baseload renewables into the market. However, the timing of this project is uncertain.

Scenario 1: Business as Usual / Status Quo

In the current “Business as Usual” (status quo) scenario, waste coal operators—over the long-run—are forced to retire due to persisting low gas/REC prices. Due to the recent low gas price environment, a number of waste coal facilities have already retired. Although some of the larger, more efficient units could potentially continue to operate for a few years, even these are unlikely to survive over the longer-term if low gas/power/REC prices persist. In this case, the Pennsylvania

Tier 2 load is then served by both resources currently serving the market (i.e., pumped storage) as well as other resources that would otherwise sell into higher-priced REC markets.

Table 12: Summary of Resources Serving Tier 2 Demand – No Waste Coal Scenario

Resource Added	Incremental	Cumulative
	GWhs	GWhs
Pumped storage	5,331	5,331
Conventional hydro likely participants	5,154	10,485
BFG	480	10,965
Industrial gases	141	11,107
BLQ	-	11,107
EE	10	11,116
DG	4	11,121
MSW	231	11,351
Woody biomass (under BLQ)	-	11,351
Add'l RECs from "switching" resources:		
MSW if PA tier 2 > NJ tier 2 (\$7.50)	934	12,285
Incremental pumped storage at \$8 REC	1,222	13,507
Hydro if PA tier 2 > OH (~\$8.25)	920	14,426

To meet the 13.7 million REC demand, eligible resources would need to be pulled in from: (1) New Jersey Tier 2 (priced at \$7.50 for 2022), (2) incremental pumped storage dispatch from higher REC prices and (3) conventional hydro that would otherwise serve the Ohio RPS market (priced at \$8.25 for 2022). This suggests a Pennsylvania Tier 2 clearing price of ~\$8.00 – 8.25. We note, however, that pulling supply from these markets (as well as Maryland Tier 1 as discussed in Scenario 2 below) could put upward pressure on pricing in those markets resulting in higher Pennsylvania Tier 2 clearing prices.

We first looked at New Jersey Tier 2 which is defined as “electricity generated by hydropower facilities larger than 3 megawatts (MW) and less than 30 MW, and resource-recovery facilities (i.e., municipal solid waste or MSW) located in New Jersey approved by the DEP. Electricity generated by a resource recovery facility outside New Jersey qualifies as “Class II” renewable energy if the facility is located in a state with retail electric competition and the facility is approved by the DEP”. As noted in the table below, for RPS plan years 2018 and 2019, if the facilities identified in our analysis were not available to the New Jersey Tier 2 market (and instead sold into Pennsylvania Tier 2 market), there would be sufficient available supply. However, New Jersey Tier 2 would then need to pull from other states’ (i.e., Maryland and Pennsylvania) Tier 1 supply.

Table 13: Summary of Resources Serving Tier 2 Demand – No Waste Coal Scenario²

REC Source	2018	2019
Retired - RPS NJ tier II	1,758,180	1,835,664
Available	403,558	493,567
Retired in other markets:		
MD I hydro	426,496	502,512
PA I hydro	164,529	180,783
Other	128,594	42,932
Total NJ II available	2,881,357	3,055,458
MSW that could switch to PA II:		
York County Resource Recovery	165,966	255,058
Wheelabrator Falls	316,470	293,267
Lancaster County Resource Recov	196,992	196,396
Harrisburg Facility	101,559	111,378
Wheelabrator Gloucester LP (NJ)	84,911	82,810
	865,898	938,909
Adjusted NJ II available	2,015,459	2,116,549
Adjusted excess	257,279	280,885

In order to pull from other states' Tier 1 programs, New Jersey Tier 2 prices would have to rise. Prices in most PJM Tier 1 markets (i.e., Maryland, New Jersey and Pennsylvania) in 2022/2023 are approximately \$10.50 – 11.00. Pulling resources from these markets would, in theory, put upward pressure on prices. However, pricing in these markets are limited to the lower of: (a) ACP in the respective markets and (b) the REC value needed to provide sufficient incentives for new entry.

The marginal new entry resource for PJM Tier 1 markets is assumed to be wind. Wind resources now account for approximately 47%, 43% and 83% of retired RECs in Pennsylvania, Maryland and New Jersey Tier 1 markets, respectively. The Tier 1 fundamental REC values in PJM markets was estimated as follows:

Technology	COD	Unit	Simple Avg. LCOE per EIA	CF %	Simple Avg 2025\$	2022 Energy - 24x7	Capacity (\$/MW-day)	RPM (\$/MWh)	Energy + Capacity Revenue (\$/MWh)	Implied REC Value
Onshore wind	2025	2019\$	39.95	40%	44.99	28.07	114.89	4.79	32.86	12.13

(i) - Levelized cost of onshore wind in PJM is based on EIA 2020 Annual Energy Outlook's simple average for units entering service in 2025.

Price per EIA in 2019\$ was escalated at 2% annually to reflect 2025 COD.

(ii) - Energy prices based on current 2022 forwards

(iii) - RPM prices based on most recent FirstEnergy default service auction results (given suspension of PJM RPM auctions)

(iv) - Implied REC value calculated as: LCOE - energy - capacity

The fundamental value of PJM Tier 1 RECs was estimated to be \$12.13. This suggests that Tier 1 PJM market prices—and, by extension NJ Tier 2 and PA Tier 2—should be fairly consistent with current PJM Tier 1 prices of \$10.50 – 11.00 in this scenario.

Historically, approximately 60-67% of RECs in Pennsylvania were sourced from in-state resources. Payments for out-of-state resources in compliance year 2019 totaled approximately \$850K. Under this scenario, approximately 8.6 million Tier 2 RECs would be sourced from other states. Assuming

² Source: PJM GATS, EIA, Thorndike analysis

a \$12 REC, the payments to out-of-state resources from Pennsylvania ratepayers under the Business as Usual scenario, in which the coal refuse reclamation to energy facilities are allowed to continue to decline and decommission would total approximately \$103 million.

In addition, based on a \$12 REC value, we note that payments from Pennsylvania ratepayers to regulated utilities which sell Tier 2 RECs from out-of-state pumped storage facilities would be approximately \$43 million.

Scenario 2: In-State Only

In this scenario, eligibility for Pennsylvania Tier 2 participation is restricted to resources within the Commonwealth of Pennsylvania.

As shown in the table below, to meet the 13.7 million Tier 2 target, additional resources would need to be pulled in from: (a) MSW facilities located in Pennsylvania but currently serving New Jersey Tier 2 (\$7.50 in 2022), (b) incremental in-state pumped storage at \$10 REC price, (c) conventional hydro currently serving Maryland Tier 1 (\$10.50) and (d) additional waste coal dispatch (in addition to assumed baseline dispatch as described above) equivalent to an 80% sector-wide capacity factor.

Table 14: Summary of Resources Serving Tier 2 Demand – In-State Only Scenario

Incremental Resource	Incremental	Cumulative
	GWhs	GWhs
Normalized WC in-state production	5,826.4	5,826.4
In-state pumped storage	1,756.2	7,582.6
In-state conventional hydro likely participants	2,080.1	9,662.7
BFG and other gases	478.8	10,141.6
BLQ	-	10,141.6
EE	9.7	10,151.3
DG	4.4	10,155.7
MSW	-	10,155.7
Additional RECs from "switching" resources:		
In-state MSW if > NJ tier 2 (\$7.50)	848.1	11,003.8
Incremental in-state pumped storage dispatch at \$10 REC	382.8	11,386.6
Add'l conventional hydro if prices > MD tier 1 (\$10.50)	252.3	11,638.9
2021 est'd demand		13,702.5
Shortfall		(2,063.6)
Add'l WC generation at capacity factors of:		
	70%	1,525.8
	80%	2,051.0
	90%	2,576.2

As noted under Scenario 1 above, withdrawing supply from New Jersey Tier 2 and Maryland Tier 1 markets would put upward pressure on prices in those markets. New Jersey Tier 2 would have to pull supply from other PJM Tier 1 markets. Thus, Pennsylvania Tier 2 REC pricing would have to provide sufficient incentive to build new renewable resources or bring existing resources back up to historic baseload operating levels. The theoretical REC value required for new entry was

calculated to be approximately \$12, or consistent with current pricing for 2022/2023 Tier 1 RECs in PJM markets.

Based on the above, Pennsylvania Tier 2 clearing prices would also have to clear at the price necessary to provide sufficient economic incentive for the waste coal sector to have a generation weighted average capacity factor of 80%. Based on: (a) current forward energy prices, (b) recent FirstEnergy default services prices (\$114.89/MW-day), and (c) estimated cost structure of the waste coal sector as a whole, this price is estimated to be \$12-16/MWh.

Conclusion

Under a “Business as Usual” scenario, absent significant improvement in commodity (i.e., power and gas) pricing, waste coal generators are expected to continue to retire and eventually depart the market altogether. The state would therefore lose all environmental avoided cost benefits (estimated by Econsult Solutions, Inc.) to be \$93 – 267 million annually), along with the associated economic benefits while Tier 2 REC prices rise to +/- \$12. Alternatively, under the “In State Only” close-the-borders scenario, the tier 2 prices rise to \$12-16, while preserving the economic and environmental benefits of the waste coal resources and focusing Tier 2-related spending on in-state resources, rather than resources in other parts of PJM.

If you would like to have any additional discussion related to this analysis, please let us know.

Regards,

Duane A. Clark
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ⁱ According to the Qualified Facilities Report per PJM-GATS.

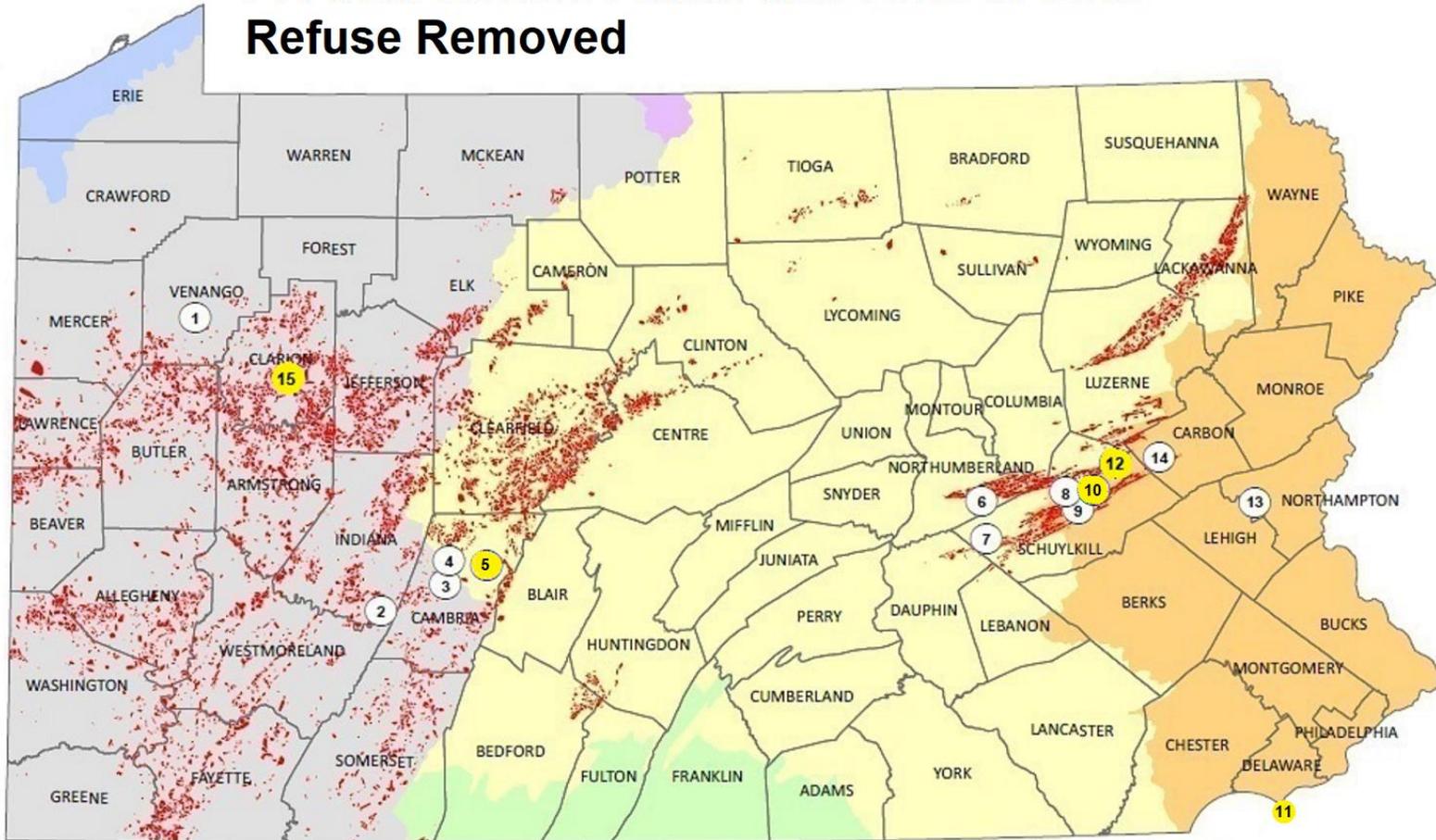
ⁱⁱ According to the Pennsylvania Department of Environmental Protection AEPS Compliance for Reporting Year 2018.

ⁱⁱⁱ Source: Qualified Facilities Report per PJM-GATS, EIA.

^{iv} Based on historical EIA Henry Hub gas price data.

Attachment 2

PA Coal Refuse Plants and Tons of Coal Refuse Removed



1. Scrubgrass Generating - 83 MW; 517,092 tons
2. Seward Generation - 521 MW; 2,103,272 tons
3. Ebensburg Power Company - 50 MW; 423,635 tons
4. Colver Power Project - 111 MW; 657,410 tons
5. Cambria Cogen Company - 87 MW; 536,977 tons [2019]
6. Mt. Carmel Cogen - 43 MW; 577,962 tons
7. Rausch Creek Generation - 33 MW; 369,593 tons
8. Schuylkill Energy Resources - 80 MW; 1,529,810 tons

9. Gilberton Power Company - 80 MW; 723,885 tons
10. Wheelabrator Frackville Energy Company - 42 MW; 521,062 tons [2020]
11. Kimberly Clark Chester Plant - 67 MW; N/A [2019]
12. Northeastern Power Company - 52 MW; 256,878 tons [2018]
13. Northampton Generating Company - 112 MW; 193,183 tons
14. Panther Creek Energy - 80 MW; 159,995 tons
15. Piney Creek LP - 32 MW; N/A [2013]

Watersheds

- | | | | |
|---|-----------------------------------|---|-------------------|
|  | Ohio |  | Genesee |
|  | Delaware |  | Potomac |
|  | Erie |  | Susquehanna |
|  | Abandoned Mine Land Problem Areas |  | Closed |
| | |  | Announced Closure |

*MW = Net capacity; Tons of coal refuse removed in 2018

Attachment 3

Plant	Net Generation (MWh)				Potential Net Generation (MWh)					Historic Maximum Net Potential Annual Output				
	2017	2018	2019	3-Yr. Avg.	Net Nameplate Capacity	Maximum Net Potential Annual Output	80% Net Potential Annual Output	90% Net Potential Annual Output						
Colver Green Energy	811,447	812,020	766,676	796,714	110.0	963,600	770,880	867,240	834,478					
Ebensburg Power Company	248,728	324,850	235,297	269,625	50.0	438,000	350,400	394,200	406,508					
Gilberton Power Company	633,515	607,399	623,354	621,423	80.0	700,800	560,640	630,720	654,127					
Mt. Carmel Cogen	313,963	263,357	77,303	218,207	43.0	376,680	301,344	339,012	333,136					
Northampton Generating Company	188,029	176,949	130,644	165,207	112.0	981,120	784,896	883,008	886,834					
Panther Creek Power Operating	89,707	151,469	104,608	115,261	83.0	727,080	581,664	654,372	654,299					
Westwood Generation	21,087	189,238	126,089	112,138	30.0	262,800	210,240	236,520	194,866					
Schuylkill Energy Resources	619,272	615,972	597,852	611,032	86.0	753,360	602,688	678,024	643,520					
Scrubgrass Generating Company	432,864	423,961	239,191	365,339	86.1	754,236	603,389	678,812	653,696					
Seward Generation	2,449,685	2,571,215	1,857,998	2,292,966	525.0	4,599,000	3,679,200	4,139,100	3,343,013					
Industry Total	5,808,296	6,136,430	4,759,009	5,567,912	1,205.1	10,556,676	8,445,341	9,501,008	8,604,477					
				Potential Incremental Increase		4,988,764	2,877,429	3,933,097	3,036,566					
	Capacity Rate (%):				Capacity Factors, as Provided via US EPA's eGRID Database (*Net Generation/Gross Capacity)									
	Net Generation / Maximum Net Potential Output				eGRID 2002	eGRID2005	eGRID2006	eGRID2009	eGRID2010	eGRID2012	eGRID2014	eGRID2016	eGRID2018	
Plant	2017	2018	2019	3-Yr. Avg.										
Colver Green Energy	84.2%	84.3%	79.6%	82.7%	63.7%	78.1%	71.8%	86.6%	85.8%	84.8%	81.8%	70.7%	78.6%	
Ebensburg Power Company	56.8%	74.2%	53.7%	61.6%	84.6%	87.0%	92.8%	87.3%	87.0%	85.2%	71.9%	38.7%	64.6%	
Gilberton Power Company	90.4%	86.7%	88.9%	88.7%	89.5%	85.4%	93.3%	72.1%	75.6%	54.2%	80.3%	81.5%	79.0%	
Mt. Carmel Cogen	83.4%	69.9%	20.5%	57.9%	88.4%	81.3%	81.3%	70.7%	72.8%	68.9%	67.4%	74.2%	64.3%	
Northampton Generating Company	19.2%	18.0%	13.3%	16.8%	90.4%	77.8%	69.6%	81.2%	77.8%	80.9%	56.6%	23.4%	18.3%	
Panther Creek Power Operating	12.3%	20.8%	14.4%	15.9%	90.0%	78.3%	80.2%	82.1%	82.2%	80.3%	72.3%	16.0%	18.5%	
Westwood Generation	8.0%	72.0%	48.0%	42.7%	70.3%	74.2%	67.7%	73.0%	59.8%	63.8%	67.7%	17.1%	60.3%	
Schuylkill Energy Resources	82.2%	81.8%	79.4%	81.1%	65.1%	85.4%	71.4%	74.0%	76.4%	81.3%	78.7%	75.6%	71.5%	
Scrubgrass Generating Company	57.4%	56.2%	31.7%	48.4%	84.8%	79.1%	80.8%	86.7%	84.0%	82.4%	60.8%	50.3%	51.3%	
Seward Generation	53.3%	55.9%	40.4%	49.9%		54.8%	6.7%	66.6%	72.7%	34.8%	53.8%	54.6%	50.2%	
Industry Total	55.0%	58.1%	45.1%	52.7%	80.8%	78.1%	71.6%	78.0%	77.4%	71.7%	69.1%	50.2%	55.7%	
Sources:														
EIA-923 Reports, U.S. Energy Information Administration, https://www.eia.gov/electricity/data/eia923/														
Electric Power Outlook for Pennsylvania 2015-2020, PA PUC, http://www.puc.state.pa.us/General/publications_reports/pdf/EPO_2016.pdf														
EPA eGRID, U.S. Environmental Protection Agency, https://www.epa.gov/eGRID														