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Via eComments

Environmental Quality Board

P.O Box 8477

Harrisburg, PA 17105-8477

Subject: Proposed Rulemaking – CO2 Budget Trading Program (50 Pa.B. 6212, Saturday, November 7, 2020)

Introduction

The Appalachian Region Independent Power Producers Association (“ARIPPA”), on behalf of its member companies, hereby provides comment on the subject proposal to amend Chapter 145 (relating to interstate pollution transport reduction) to add Subchapter E (relating to CO2 budget trading program) to establish a program to limit the emissions of carbon dioxide (CO2) from fossil fuel-fired electric generating units (EGU) located in this Commonwealth, with a nameplate capacity equal to or greater than 25 megawatts (MW). This proposed rulemaking would establish a CO2 Budget Trading Program for the Commonwealth which is capable of linking with similar regulations in states participating in the Regional Greenhouse Gas Initiative (RGGI), a regional CO2 Budget Trading Program. These independently promulgated and implemented CO2 Budget Trading Program regulations together make up the regional CO2 Budget Trading Program or RGGI.

The stated goal of this proposed rulemaking is to reduce CO2 emissions from fossil fuel-fired sources within the Commonwealth and establish Pennsylvania’s participation in RGGI. While the proposed rulemaking adopts the main program elements of the RGGI Model Rule, the Environmental Quality Board (EQB) has opted to exercise its independent rulemaking authority to account for the unique environmental, energy and economic intricacies of this Commonwealth. Specifically, they propose to establish a Waste Coal Set Aside Account (“set aside”) in the proposed RGGI rule. The proposed rule will allocate CO2 allowances to a set aside account for each allocation year from the Pennsylvania CO2 Budget Trading Program base budget.

ARIPPA recognizes the goal of addressing CO2 emissions from the electric generating sector while at the same time prioritizing 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 mine land 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.

We support the EQB’s recognition of the environmental benefits this industry provides the Commonwealth by providing a set aside in the proposed RGGI rule. The inclusion of this set aside for mine land reclamation to energy facilities performing AML reclamation work appropriately recognizes the positive externalities of the industry. 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 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. For example, see *Reclamation of Refuse Piles using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania*, DEP (2018) at <https://blacklickcreekwatershed2.files.wordpress.com/2018/11/reclamation-of-refuse-piles-using-fluidized-bed-combustion-ash.pdf>

We appreciate the changes already made during the process of developing this rule to extend the lookback period for legacy emissions considering recent market trends and provide greater regulatory certainty to individual plants. Having a guaranteed allocation of allowances from the waste coal set aside account for each facility is critical for allowing waste coal operators to adequately plan for future operations. However, ARIPPA believes that the current proposed rule provides an insufficient amount of allowances in the waste coal set aside to adequately account for the CO2 emissions from the projected future operations by this industry. In light of recent statutory changes to the Pennsylvania Alternative Energy Portfolio Standards (AEPS) program, demand for in-state energy production from waste coal within the Commonwealth is expected to increase in order to meet future Tier II alternative energy credit (AEC) requirements under the AEPS program.

While electricity sales inject private funding into mine land reclamation, the proposed RGGI rule recognizes the industry’s multimedia focus beyond electricity production through which the industry subsidizes the remediation of polluting coal refuse piles that would otherwise require significant taxpayer funding to reclaim. An adequate set aside will help these plants continue to operate and thus clean up the environment. These small, mostly family-owned independent reclamation plants operate at extremely thin margins due to the high cost of remediating waste coal piles.

These mine land reclamation facilities may also appropriately be excluded from the proposed rule as the positive environmental benefits from their unique fuel cycle, which functions in many ways more like a waste disposal facility, make them significantly distinct from any traditional fossil fuel-fired power plant. As market-based providers of electricity, they would not be able to economically continue their positive environmental work if subject to the proposed CO2 Budget Trading Program. While additional work still needs to be done, ARIPPA looks forward to continuing our partnership with the DEP moving forward to ensure our mutual goal that this industry be held harmless through

this rulemaking process. It is in all of our best interest that the vital environmental remediation work performed by these facilities for the Commonwealth and its residents continues unabated.

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 10 unique environmentally beneficial mine land reclamation to energy facilities located in Pennsylvania that utilize circulating fluidized bed (CFB) 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 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; however, 10 of the 13 alternative energy plants are located in Pennsylvania. Most of the ARIPPA mine land reclamation to alternative energy plants were originally constructed as Qualifying Facilities (QFs), subject to size restrictions pursuant to the Public Utility Regulatory Policy Act (PURPA). As a result, these facilities are relatively small in size, with all but one facility between 33 to 112 MW net operating capacity with a combined generation capacity just over 1,200 MW.

These plants play a critical role in environmental remediation in the coal regions where they are located by removing coal refuse piles, remediating, and reclaiming mining affected lands and reducing or even eliminating surface and groundwater pollution caused by acid mine drainage (AMD) from coal refuse piles. By converting coal refuse into alternative energy, ARIPPA members are removing one of the principal sources of contamination to surface water and groundwater in coal mining regions of Pennsylvania. In addition, 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.

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 mine land 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.

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 will 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. The 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.

Comments

Comment – ARIPPA supports the creation of a Waste Coal Set Aside Account in the proposed RGGI rule to invest in mine land reclamation and recognize the positive environmental benefits of this alternative energy industry.

RGGI is a "cap and trade" program that sets a limit on CO2 emissions from fossil fuel-fired EGUs and permits trading of CO2 allowances to achieve cost efficient compliance with the regulatory limit. Each participating state's regulation provides for the distribution of CO2 allowances from its CO2 allowance budget. While the majority of CO2 allowances are distributed at auction returning proceeds from the sale to that state to invest in a variety of state energy and environmental priorities, some states have designated a portion of CO2 allowances to be "set aside" in designated accounts and distributed to advance individual state policy goals and objectives. This provides the flexibility to limit CO2 emissions in a way that aligns with the other participating states, while allowing the state to tailor a program to address its unique energy market.

Under §145.342, Pennsylvania's proposed rule will allocate CO2 allowances to a waste coal set aside account for each allocation year from the CO2 Budget Trading Program base budget to support mine land reclamation in the Commonwealth. As stated in the proposed rule, "The Board is establishing this waste coal set-aside in this proposed rulemaking because waste coal-fired units provide an environmental benefit of reducing the amount of waste coal piles in this Commonwealth. Reducing waste coal piles is a significant environmental issue in this Commonwealth, because waste coal piles cause air and water pollution, as well as safety concerns. Waste coal-fired units burn waste coal to generate electricity thereby reducing the size, number and impacts of these piles otherwise abandoned and allowed to mobilize and negatively impact air and water quality in this Commonwealth."

Waste coal-fired is defined in the proposed rule as, "The combustion of waste coal or, if in combination with any other fuel, waste coal comprises 75% or greater of the annual heat input on a Btu basis. Facilities combusting waste coal shall use at a minimum a circulating fluidized bed boiler and be outfitted with a limestone injection system and a fabric filter particulate removal system." This is consistent with the definition provided in both the Pennsylvania Alternative Energy Portfolio

Standards Act of 2004 and the Coal Refuse Energy and Reclamation Tax Credit program.

Under the proposed rule, waste coal is defined as, “The coal disposed or abandoned prior to July 31, 1982, or disposed of thereafter in a permitted coal refuse disposal site regardless of when disposed of and used to generate electricity, as defined under section 2 of the Alternative Energy Portfolio Standards Act (73 P.S. § 1648.2).” While this definition should sufficiently encompass the primary sources of fuel utilized by waste coal facilities, it is critical to maintain a definition that allows for the disposal of multiple types of coal refuse from various types of locations. On site storage and blending requirements to achieve necessary fuel quality input raise significant obstacles for tracking coal refuse from various sites should eligibility be further restricted under this or other programs.

Regardless of the source of coal refuse, the environmental hazards from waste coal remain. As mining operations continue to shutter, the reclamation liabilities of bankrupt mining companies with insufficient bonding to complete reclamation of these sites could again leave the Commonwealth responsible for significant new mine land reclamation liabilities. Mine land reclamation to energy facilities should continue to play a vital role in the disposal and reclamation of all coal refuse and mining-affected lands in the Commonwealth.

The Joint Legislative Air and Water Pollution Control and Conservation Committee (JLCC) conducted hearings on the mine land reclamation to energy industry in 2020, and in June of that year issued a report titled “The Coal Refuse Reclamation to Energy Industry and Carbon Trading Markets.” The committee found the industry “represents a small section of the GHGs generated in Pennsylvania.” These facilities are “the only way to extract value from coal refuse” piles that otherwise “represent a future cost to taxpayers either via pollutants or tax dollars used to remediate them.”

While recognizing that “with the current trajectory of lowering GHGs, sustaining fossil-fuel fired plants seems counter-intuitive,” the JLCC found that “beyond removing coal refuse, there are climate benefits to supporting the industry.” As an example, they cited the “40 coal refuse piles that Pennsylvania is aware of having ignited and continuously burn, representing an uncontrolled release of CO₂ and toxic compounds” and the fact that if left unaddressed “more [coal refuse piles] will likely combust and continue releasing GHGs and pollutants.” Therefore, this bipartisan, bicameral legislative committee recommended that “[c]reating an exception for this small subset in exchange for remediating legacy coal piles at significantly lower cost to the taxpayer could be a sensible move.” See, *The Coal Refuse Reclamation to Energy Industry and Carbon Trading Markets*, Joint Legislative Conservation Committee (June 2020) at

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

On April 29, 2019, the Department issued a Pennsylvania Climate Action Plan that identified reducing the overall carbon intensity of the electricity generated in this Commonwealth as one of the most critical strategies for reducing greenhouse gas (GHG) emissions. According to the Climate Action Plan, one of the most cost-effective emissions reduction strategies is to limit CO₂ emissions

through an electricity sector cap and trade program. To quantify the cost and effects of this action, the Climate Action Plan modeled a cap and trade program that requires a carbon cap equal to a 30% reduction from 2020 CO2 emissions levels by 2030, which is equivalent to RGGI stringency, while recognizing that the post-2030 emissions cap would lead to a phase out of most remaining higher emissions sources of generation other than waste coal by 2050.

As the EQB recognizes, “While the Commonwealth's participation in RGGI will have tangible health, environmental and economic benefits, the inclusion of the waste coal set-aside has the additional benefit of avoiding unintended impacts to this generation sector, so that the environmental benefits of continuing to remediate this Commonwealth's legacy waste coal piles may continue.” Based upon a 2019 study by Econsult Solutions, since the late 1980s these facilities that comprise the mine land 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. However, according to the Department’s own estimates, there remains at least 220 million tons of polluting waste coal located on more than 770 identified sites covering 8,300 acres. See, *The Coal Refuse Reclamation to Energy Industry: A Public Benefit in Jeopardy*, Econsult Solutions (June 2019) at <https://arippa.org/wp-content/uploads/2019/07/ARIPPA-Report-FINAL-June-2019.pdf>.

The Surface Mining Control and Reclamation Act (SMCRA) was sweeping federal legislation regulating coal mining in the U.S. However, prior to its original passage in 1977, the coal mining industry was largely unregulated, especially with regard to the environment. Over a century of environmentally insensitive mining practices took a huge toll on the land and water where mining occurred across the bituminous and anthracite regions of the Commonwealth.

Historic AML 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. 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 mine land reclamation resources. As noted in the proposed rule, “This legacy environmental issue from this Commonwealth's long history of coal mining further underscores why it is vital to not leave additional environmental issues, like climate change, for future generations to solve.”

ARIPPA 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, which is then used to remediate and reclaim mining-affected lands. 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 disposal methods.

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 according to the 2019 study by Econsult Solutions.

The removal of coal refuse piles improves air quality through the elimination of or the potential from uncontrolled emissions from burning coal refuse piles and 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 produced in the fuel cycle of the mine land reclamation to energy facilities.

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. AMD is the second biggest water pollutant in the Commonwealth. Together, abandoned mine issues, including coal refuse piles, impact nearly 5,000 miles of Pennsylvania streams.

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 reducing the concentration of metals in local waterways. According to the Econsult study, annual removal of 8 million tons of coal refuse produces a reduction of more than 3,100 metric tons of acid loadings annually (based on a 100-year drainage lifespan). 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.

“Given the environmental benefit provided, the Board determined that it is necessary to assist owners or operators of waste coal-fired units with meeting their compliance obligation under this proposed rulemaking.” For the same reason, DEP, the U.S. Environmental Protection Agency (EPA), the Office of Surface Mining Reclamation and Enforcement (OSMRE), and other organizations have long recognized the environmental benefits of the combustion of coal refuse for energy and reclamation. EPA in a variety of rule makings regarding emissions from coal refuse-fired sources have stated:

“...Coal refuse piles are an environmental concern because of acid seepage and leachate production, spontaneous combustion, and low soil fertility. Units that burn coal refuse provide multimedia environmental benefits by combining the production of energy with

the removal of coal refuse piles and by reclaiming land for productive use. Consequently, because of the unique environmental benefits that coal refuse-fired EGUs provide, these units warrant special consideration ...”

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 human 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, 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. 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 industry 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.

The reclamation work these facilities perform often occurs in low-income, rural environmental justice areas (EJA) as identified by the Commonwealth that are disproportionately impacted by historic mining operations and the decline of industry throughout northeastern and western Pennsylvania. The industry has completed more than 70 mine land reclamation projects in EJA across at least a dozen Pennsylvania counties, including 25 acres reclaimed at the Seanor Site in Westmoreland County and the Loomis Bank Site and Mine Fire in Luzerne County. (See Attachment 1). Additionally, 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.

Comment – Colver Green Energy should be included in any calculation of the Waste Coal Set Aside Account.

The proposed RGGI rule provides that DEP will establish a waste coal set aside account for the allocation of CO₂ allowances in an amount sufficient to provide CO₂ allowances equal to the legacy emissions from all waste coal-fired units under § 145.342(i). Legacy emissions are defined in the proposed rule as “the amount of CO₂ emissions in tons equal to the highest year of CO₂ emissions from a waste coal-fired unit during the 5-year period beginning January 1, 2015, through December 31, 2019, as determined by the Department.”

According to § 145.342(i)(3), “the Department has determined that the total amount of legacy

emissions for waste coal-fired units equal 9,300,000 tons.” This amount takes into account emissions from nine Pennsylvania mine land reclamation to energy facilities. However, there are currently ten of these facilities with waste coal-fired units which would potentially be subject to the CO2 Budget Trading Program requirements under § 145.304 and meet the applicability provisions to be eligible for the set aside under § 145.342(i).

The coal refuse-fired units at the Colver facility were originally excluded from the legacy emissions calculation used to establish the set aside account amount as at the time of initial drafting of the proposed rule this facility had filed for deactivation with PJM. While excluding these units may have been understandable at that time, the deactivation of these units was withdrawn on July 29, 2020 as per the PJM website. <https://www.pjm.com/planning/services-requests/gen-deactivations.aspx>

On August 19, 2020, Generation Holdings, LP announced it had agreed to purchase the 110 MW Colver Power Project in Colver, Pennsylvania and five related mine reclamation sites from interests associated with Northern Star Generation. Colver Green Energy LLC, a generation company formed by the owners of Robindale Energy Services, Inc. of Latrobe, Pennsylvania, will continue to operate the facility which generates electricity from waste coal in Pennsylvania to be sold in the PJM market. Reopening this plant will bring back 70 family sustaining fulltime jobs related to operating the plant and supplying fuel and limestone. (See Attachment 2).

Considering that Colver is now expected to be operating in 2022 or at such other times in the future as this proposed rule is anticipated to be effective, the emissions from the waste coal-fired units at this facility should be included in the calculation of legacy emissions under the proposed rule. The proposed rule defines legacy emissions as, “The amount of CO2 emissions in tons equal to the highest year of CO2 emissions from a waste coal-fired unit during the 5-year period beginning January 1, 2015 through December 31, 2019, as determined by the Department.” Based upon the current proposed definition of legacy emissions, the total amount of credit in the set aside under §145.342(i) would be equal to 10,400,000 tons. (See Attachment 3).

Comment – The Waste Coal Set Aside Account should be adjusted to account for the higher operating capacity of these facilities that will be required to meet new in-state credit restrictions under Tier II of the AEPS program.

Under §145.342(i), the proposed rule would set aside CO2 allowances at the beginning of each year for waste coal-fired units located in this Commonwealth based upon their legacy emissions. Subsection (i) proposes to establish the process for the waste coal set aside allocation, including the establishment of a general account, allowance transfers, compliance allocation, an exception or exceedance of legacy emissions during a calendar year, and the set aside termination. This proposed subsection applies to waste coal-fired units located in the Commonwealth that commenced operation on or before the effective date of this proposed rulemaking that are subject to the CO2 Budget Trading Program requirements. Waste coal-fired units must still comply with the other components of the regulation, including incorporating the CO2 budget trading programs into

their permits.

Each year, DEP will allocate the CO2 set aside allowances directly to the compliance accounts of the waste coal-fired units equal to the unit's actual emissions. However, if the waste coal-fired units emit over the CO2 legacy emissions amount sector-wide in any year, then the units which exceeded their legacy emissions must acquire the remaining CO2 allowances needed to satisfy their compliance obligation. These excess emissions represent the amount of CO2 emissions, in tons, emitted by a CO2 budget source during a control period that exceeds the CO2 legacy emissions limitation for the source. Owners or operators of waste coal-fired units will only need to purchase CO2 allowances if the sector-wide set aside amount is exceeded. This would result in an increase in the cost of plant operations for a facility that exceeds its legacy emissions.

After identifying the highest annual CO2 emissions total for each waste coal-fired unit during the 5-year period from 2015-2019, the proposed rule provides legacy emissions in the waste coal set aside account equal to the sum of the highest annual emissions from each of these units during this legacy emissions period. Thus, the Department proposes to set aside 9,300,000 CO2 allowances annually in the waste coal set aside account. According to the proposed rule, "Since the Department will allocate CO2 allowances to waste coal-fired units each year...waste coal-fired units will incur minimal compliance costs."

All but one of the mine land reclamation to energy facilities in the Commonwealth originally operated under a power purchase agreement (PPA), which financially supported and encouraged these plants to operate at their maximum capacity. Most of these PPAs began to expire a decade or more ago with the final PPA for the Colver facility expiring this past year. Since these PPAs expired, the majority of these plants have struggled to compete in the competitive energy market.

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. 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. 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. The mismatch between revenue and costs has previously led to the closure of 5 of the total 15 Pennsylvania mine land reclamation to energy plants to date and to seasonal idling for others in recent years, resulting in a significant decline in operations and annual benefits to the Commonwealth.

ARIPPA supports this set aside concept and the goal of holding the mine land reclamation to energy industry harmless under the proposed RGGI rule, but the amount of allowances in the proposed set aside must be increased to sufficiently meet the needs of all of these facilities based upon current projections for the future operating capacity of these facilities. Recent policy changes to the AEPS program will require operating these facilities in the future at a capacity rate higher than most have done in recent years thereby allowing additional beneficial environmental remediation work to be performed the industry. This change has made the legacy emission period and resulting set aside

amount currently in the proposed rule insufficient to meet projected future emissions from a higher industry operating capacity that will be required to meet the alternative energy production goals in Tier II of the AEPS program.

In 2004, Pennsylvania enacted an AEPS program to offer energy-related economic development opportunities in the Commonwealth by requiring Pennsylvania's electric distribution companies (EDCs) and electric generation suppliers (EGSs) to offer 8% of their electricity supply from Tier I alternative energy sources and 10% of their supply from Tier II alternative energy sources by 2021. Tier II sources include waste coal, pumped-storage hydro, conventional hydro, municipal solid waste (MSW), wood pulping byproducts, blast furnace gas, and other sources including distributed generation (DG) and demand-side management (DSM). Unfortunately, oversupply in the Tier II market has historically produced AEC prices too small to support plant operations or influence investment decisions – all at a time that certain Tier II projects have been closing due to market dislocation. In June 2020, the JLCC report examined this issue and recommended: *“limiting participation in Tier II of the [AEPS] program to in-state resources to increase credit value.”*

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 to AECs created by registered Tier II alternative energy resources located in the Commonwealth, effectively closing the border on participation in this program and resulting in the cleanup of additional polluting coal refuse pile in the Commonwealth. This language is modeled after Section 2804 of the Administrative Code (amended by Act 40 of 2017), which excluded out-of-state resources from being eligible for the Solar Photovoltaic (PV) Carveout in Tier I of the AEPS program. An AEC represents a megawatt hour of generation, is valid for three years after the date it was generated, and prior to this change could originate within Pennsylvania or the PJM RTO. 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.

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. The result is an investment of over \$100 million per year in Pennsylvania that would otherwise have supported projects and ratepayers in neighboring states. Meanwhile, 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 markets to out of state resources and pushing certain types of generation (e.g., pumped-storage) into the AEPS market.

Prior to this change, the Tier II category under Pennsylvania's AEPS had two notable failures: (i) a historically low AEC price rendering it almost meaningless in the past, and (ii) a looming Tier II structural crisis leading to an expected outflow of over \$100 million per year of Pennsylvania ratepayer financial support to out of state resources. An oversupply of out of state credits historically produced Tier II AEC prices so insignificant as to offer no support for plant operations or investment decisions. While there were 6,678.4 MW of Tier II generation facilities located outside of the Commonwealth registered under the AEPS program, only 4,067 MW of facilities located in

Pennsylvania were similarly registered. As such, 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.

The Public Utility Commission (PUC) has projected that there will be a 2.5 million AEC shortfall in Tier II based upon the previous three years of production from in-state Tier II resources by 2023. However, according to an independent study performed 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. (See Attachment 4).

According to Thorndike Landing, the biggest market change will be the necessity for mine land reclamation to energy facilities to operate at capacity factors between 80% and 90% in the near future. However, during the 5-year period used to calculate legacy emissions for the set aside (2015-2019), this industry did not operate at an annual rate exceeding 58% capacity. Meanwhile, only four facilities exceeded 80% capacity in the high year during the 5-year time period used to establish legacy emissions under the proposed rule with one facility operating at only 37% capacity in its proposed legacy emissions year. (See Attachment 5).

In 2010 and prior, most of these facilities regularly operated at over 80-90% capacity. During this timeframe, a majority of the mine land reclamation to energy 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.

Thus, these facilities should have the ability going forward to again operate at these higher levels with sufficient financial support from an increased AEC price. The Tier II AEC price necessary to achieve this result is estimated to be \$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. If the amount of credits in the set aside were insufficient to meet the compliance requirements for these facilities under the proposed rule, the AEPS credit price could significantly increase beyond this expected amount to account for any excess emissions credits these facilities would be required to purchase.

ARIPPA supports using legacy emissions to establish the amount of CO₂ allowances in the waste coal set aside account. However, the definition of legacy emissions must be adjusted to adequately address the future projected operating capacity of the industry in order to meet the Department's goal of holding this industry harmless under the proposed rule. While the use of recent annual CO₂ emissions data would generally seem a reasonable method to anticipate future emissions under similar market conditions, the emissions data utilized to establish the legacy emissions for these facilities in the proposed rule no longer represents an accurate projection of expected future emissions from the projected increase in operations of these facilities due to the legislative changes

to the AEPS program in Act 114 of 2020.

The definition of “legacy emissions” should therefore be extended to encompass a timeframe when the majority of the industry was operating under PPAs and wholesale energy prices offered sufficient incentives for facilities without PPAs to operate at base load. The updated AEPS Tier II program will offer a similar incentive for these facilities to operate. Alternatively, a reasonable projection of future emissions for the purpose of defining “legacy emissions” may be calculated using the annualized peak operating month for each facility within the current 5-year legacy emissions period in the proposed rule to adequately account for the expected increase in operations at these facilities.

Remaining within the current 5-year timeframe utilized to calculate the set aside in the proposed rule, ARIPPA recommends using Projected Annualized Emissions (PAE) to calculate legacy emissions for establishing the amount of the waste coal set aside account. Legacy emissions would be defined as the amount of CO₂ emissions in tons equal to the annualized total of the highest month of CO₂ emissions from a waste coal-fired unit during the 5-year period beginning January 1, 2015 through December 31, 2019. The amount of the set aside using the PAE during this timeframe would be 14.2 million tons. (See Attachment 6).

The PAE concept, which is allowed by the DEP and EPA in other cases, is a strong basis for calculating future projected emissions allowances for the proposed set aside account. The PAE would capture the highest operating month when the economic conditions were favorable enough to operate closer to design levels while still using recent emissions data during the proposed 5-year legacy emissions period. The recent AEPS changes, like prior power market increases, is expected to allow these plants to operate at levels approaching maximum design capacity. The standard lookback under Prevention of Significant Deterioration/New Source Review (PSD/NSR) evaluations for the DEP and EPA is 5 years, although the DEP will consider allowing up to 10 years under extenuating circumstances and where 5 years is not representative. This would provide a set aside allocation going forward still based upon actual emissions data measured on each plant’s continuous emissions monitoring system (CEMS).

Absent changing the definition of legacy emissions to account for the projected increase in operations, or an exclusion of waste coal-fired units from the definition of CO₂ budget unit as discussed elsewhere in this filing (see *infra*, p.__), the proposed rule creates a fundamental unfairness to those waste coal-fired facilities that operated at a reduced capacity during the proposed 5-year period. It is well known to the Department that the past five 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. Most notably, in just the past 18 months Pennsylvania has witnessed the closure of the Cambria, Wheelabrator Frackville and NEPCO facilities as evidence of that downturn. That removal, remediation and reclamation capacity is forever lost to Pennsylvania. Certain other facilities have adopted innovative and cost saving measures in order to continue to operate at substantially lower levels and persevere in their

environmental mission resulting in an unfairly reduced allocation of CO2 allowances based upon the currently proposed set aside amount.

Using the most recent 5-year period when those facilities have been operating at reduced levels while fighting for survival as the metric for future permitted emissions is not reflective of their full capacity but will ensure an increase in the operating costs and challenges faced by those facilities while simultaneously minimizing their positive environmental contributions. Certainly, that is not the intent of the Department. Furthermore, recent legislative and administrative efforts led by the DEP, the Department of Community and Economic Development, and the General Assembly intended to provide additional resources to encourage environmental reclamation will have been in vain. Finally, as proposed, these facilities will be regularly required to exceed five-year legacy emissions in order to produce the number of AECs necessary to allow Pennsylvania electric utilities to meet their Tier II compliance rates under the AEPS program. The added cost for RGGI compliance for these facilities will require them to seek additional revenue from the AEPS program to offset this cost, thereby increasing Tier II AEC prices beyond current projections and raising electricity prices to consumers. This scenario exemplifies quite clearly why an adjustment to the legacy emissions definition or an outright exclusion of these units from the CO2 budget would be the responsible approach.

A legacy emissions definition that encompasses peak annual emissions from a timeframe dating back to 2010 or prior or calculated using a PAE would accomplish the Department's stated goal in the proposed rule that "waste coal-fired units will incur minimal compliance costs." Should the industry not require the full allocation of the waste coal set aside in any given year, these undistributed CO2 allowances from the waste coal set aside account would be transferred to the strategic use set aside account.

ARIPPA supports the proposed strategic use set aside allocation under §145.342(j). The original intent of creating the strategic use set aside in the proposed rule was to account for a potential "decline in generation from waste coal-fired units." However, with the current projected increase in production from mine land reclamation to energy facilities, maintaining the strategic use set aside will allow DEP to adjust the waste coal set aside to provide sufficient allowances for this industry while ensuring the Department will not be left with undistributed CO2 allowances. Credits from the strategic use set aside will be allocated directly to eligible projects that "encourage and foster promotion of energy efficiency measures, promote renewable or noncarbon-emitting energy technologies, and stimulate or reward investment in the development of innovative carbon emissions abatement technologies." This will allow the Department to support mine land reclamation while investing in additional projects to eliminate air pollution.

Comment – The Department should consider excluding waste coal-fired units from the proposed CO2 budget trading program under the proposed rule.

ARIPPA appreciates the effort in the proposed rule to allow mine land reclamation to energy

facilities to continue their efforts in reclaiming coal refuse and the remediation and reclamation of mining affected lands. Pennsylvania is unique relative to the other states participating in RGGI in that Pennsylvania powered the U.S. for over 100 years with its abundant energy resources, including the mining of coal and the transmission of electricity to many of these same RGGI states. The mining and processing of coal, however, has left coal refuse behind as a legacy pollutant. Coal refuse causes serious environmental damage and health and safety concerns for the residents that live in the coal regions of Pennsylvania.

To allow the mine land reclamation to energy units to maximize the removal of coal refuse and the remediation and reclamation of mining affected lands, the Department should consider simply excluding these units from the proposed CO2 budget trading program and reducing the 78-million-ton Pennsylvania CO2 budget by an amount representing their legacy emissions. By excluding these facilities from the proposed rule, the Department would not only appropriately recognize the great environmental and safety and health benefits of this unique environmental remediation industry, but the Department would also provide environmental justice to the communities where the polluting coal refuse is located and to areas downstream from these coal refuse piles.

The Department has clearly established that mine land reclamation is a priority for the Commonwealth. This proposed rule recognizes the various positive environmental benefits of these units and their importance in the Commonwealth's effort to halt the persistent pollution from acid mine runoff, coal dust, uncontrolled pile fires and other environmental harms caused by the incomparable amount of coal refuse piles scattered across this state. An exclusion from this program would remove uncertainty for future operations of these units under the proposed rule, thereby encouraging them to achieve the maximum removal of polluting coal refuse piles and to reclaim the largest quantity of mining-affected land.

With more abandoned mine land and more miles of streams impaired by acid mine water runoff than any other state in the nation, Pennsylvania's abandoned mine land problem is a distinct problem in stark contrast to any similar environmental issue faced by other participating RGGI states. Our rich industrial heritage, founded on the abundant availability of coal, helped fuel the industrial revolution and prevail in two world wars. However, as a result of this history dating back to the 1800s, we have also been left with a legacy of abandoned mine lands and abandoned mine drainage which scar our landscape, present hazards to our citizens, and degrade our environment. The volume of mining-affected land, particularly from historical pre-SMCRA mining operations, in this Commonwealth make this a uniquely Pennsylvania problem.

Meanwhile, the development of mine land reclamation to energy facilities utilizing CFB technology, long supported and encouraged by the Commonwealth, is a uniquely Pennsylvania solution to that problem. While often incorporated into the regulators' regime for fossil-fuel fired EGUs, the fuel cycle of these facilities, which focuses on the removal and consumption of a waste product and resulting environmental remediation of mining-affected land utilizing the beneficial alkaline ash produced by their combustion process, make them wholly distinct and in large part incomparable to the traditional solid fossil-fuel units.

Pennsylvania has already recognized the irreplaceable nature of these facilities by taking the extraordinary step of incorporating them into the state's AEPS program. The inclusion of waste coal as an alternative fuel source and limitation to its use in CFB facilities under that program shows exactly how distinct both this fuel source and these facilities are from the fossil fuels burned in traditional coal-fired power plants. The removal of polluting coal refuse piles and the beneficial use of ash to remediate the sites from which the coal refuse is removed, as well as other mining-affected lands, demonstrate the unique benefits of utilizing these CFB facilities in contrast to simply burning waste coal in traditional fossil-fuel EGUs.

By removing these facilities from the proposed CO2 budget program and reducing the budget by the number of allowances identified as the waste coal set aside, the Department could accomplish its goal of CO2 control while also accomplishing a stated environmental objective of the Department in a fashion that is the least cost to the Commonwealth's taxpayers other than simply not addressing this blight upon the Pennsylvania landscape and waterways. This change may also provide greater certainty for other RGGI market participants.

Conclusion

Thank you for the opportunity to provide these comments on the proposed CO2 Budget Trading Program. ARIPPA appreciates the support of the Department while developing this proposed rule to consider the legacy environmental issue of mine land reclamation by accounting for the positive environmental benefits to land, air and water provided by the mine land reclamation to energy industry. The long-term public-private partnership between the Commonwealth and the industry as part of the Commonwealth's mine land reclamation efforts has produced some of the most significant AML remediation in the Commonwealth over the past three decades.

ARIPPA supports several alternatives which would allow for the maximum amount of environmental benefit to the Commonwealth from future coal refuse pile removal and mine land reclamation from waste coal-fired units that comprise the mine land reclamation to energy industry:

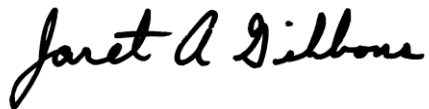
- Amend the waste coal set aside to reflect the tonnages of legacy emissions as the highest year of CO2 emissions from a waste coal-fired unit during the time period that includes annual emissions for all years through at least 2010.
- Amend the waste coal set aside to reflect the tonnages from a PAE calculation by redefining legacy emissions as the amount of CO2 emissions in tons equal to the annualized total of the highest month of CO2 emissions from a waste coal-fired unit during the 5-year period beginning January 1, 2015 through December 31, 2019.
- Exclude waste coal-fired units from the definition of CO2 budget unit under the proposed rule as is described under § 145.302 and § 145.304 relating to applicability.

The Commonwealth has repeatedly emphasized the importance of the mine land reclamation work performed by this industry through enacting legislation and establishing programs to support its continued operation. ARIPPA appreciates that unrelenting support in this proposed rule. With the long-term sustainability of the remaining ten mine land 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 our partnerships with the Commonwealth and environmental organizations to eliminate the remaining ground, air, and water pollution from the legacy of coal mining in Pennsylvania.

While ARIPPA supports the waste coal set aside in the proposed rule, we believe that the definition of legacy emissions must be revised to ensure there are sufficient allowances in the set aside account to allow for the projected increase in operations by this industry due to recent changes to Tier II of the AEPS program. The Department must also account for the continued operation of all ten existing in-state facilities, including the Colver facility. These changes are necessary to achieve the Department's stated goal of minimizing the impact of the proposed rule on this industry while preventing the transfer of cost for RGGI compliance for these facilities to ratepayers through significantly higher Tier II AEC prices. Without amending the definition of legacy emissions or otherwise exempting these facilities, the proposed rule does not accomplish those goals.

If the Department has any questions about these comments, please contact me at 717-763-7635 or the address set forth above.

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
ARIPPA Executive Director

cc: Tom Roberts, ARIPPA President

Attachment 1

PLANT	PILE	ADDRESS	CITY	STATE	ZIP CODE	COUNTY	PENDING ACRES	RECLAIMED ACRES	DESCRIPTION	EJA AREA
Colver	Gallitzin Job (Ridge Energy Company)		Gallitzin	PA	16641	Cambria			Current fuel vendor	Yes
Colver	Job 10 (Ridge Energy Company)		Somerset	PA	15501	Somerset			Current fuel vendor	Yes
Colver	Portage Tipple (Rosebud Mining)		Portage	PA	15946	Cambria			Current fuel vendor	Yes
Colver	Starford Job (Ridge Energy Company)		Starford	PA	15777	Indiana			Current fuel vendor	Potentially
Ebensburg	Mine 37 Coal Refuse Site	Richland Township	Johnstown	PA	15904	Cambria			Waste coal pile	Potentially
Ebensburg	Nanty Glo East Refuse Site		Nanty Glo	PA	15943	Cambria			Consumed/partially reclaimed	Yes
Ebensburg	Nanty Glo West Refuse Site		Nanty Glo	PA	15943	Cambria			Consumed/partially reclaimed	Yes
GPC / SER			Shamokin	PA	17872	Northumberland				Yes
GPC / SER			Ashland	PA	17921	Schuylkill				Yes
GPC / SER			Gilberton	PA	17934	Schuylkill				Yes
GPC / SER			Girardville	PA	17935	Schuylkill				Yes
GPC / SER			Mahanoy City	PA	17948	Schuylkill				Yes
GPC / SER			Minersville	PA	17954	Schuylkill				Potentially
GPC / SER			St. Clair	PA	17970	Schuylkill				Yes
GPC / SER			Shenandoah	PA	17976	Schuylkill				Yes
Mt. Carmel	Coal Run Bank		Marion Heights/Shamokin	PA	17832	Northumberland				Potentially
Mt. Carmel	Emerald Anthracite Site - Bliss Mine		Nanticoke	PA	18634	Luzerne				Yes
Mt. Carmel	Glenn Lyon Mine Bank		Newport Township	PA	18617	Luzerne				Yes
Mt. Carmel	Heavy Media Site - Loree Bank		Larksville	PA	18704	Luzerne				Potentially
Mt. Carmel	PA Colliery Bank		Marion Heights/Shamokin	PA	17832	Northumberland				Potentially
Mt. Carmel	Richards Mine Bank		Marion Heights/Shamokin	PA	17832	Northumberland			7,000 acres with 3 piles in the Marion Heights/Shamokin area within the 17832 zip code	Potentially
Northampton	Ciglio Culm Bank		Avoca	PA	18641	Luzerne				Potentially
Northampton	Coalbrook		Carbondale	PA	18407	Lackawanna				Yes
Northampton	Earth Conservancy - Bliss		Nanticoke	PA	18634	Luzerne				Yes
Northampton	Eckley		Freeland	PA	18224	Luzerne				Potentially
Northampton	Ex UGI Plant Ash Cleanup		Hanover Township	PA	18706	Luzerne				Yes
Northampton	Glen Lyon #6		Glen Lyon	PA	18617	Luzerne				Yes
Northampton	Glen Lyon South		Glen Lyon	PA	18617	Luzerne				Yes
Northampton	Harry E.		Kingston	PA	18704	Luzerne				Potentially
Northampton	Hazleton Shaft		Hazle Township	PA	18201	Luzerne				Yes
Northampton	Hazleton Shaft Jeansville		Hazleton	PA	18201	Luzerne				Yes
Northampton	Huber		Hanover Township	PA	18706	Luzerne				Yes
Northampton	Jeddo #7		Hazle Township	PA	18202	Luzerne				Yes
Northampton	Kaminski #14 Bank - Reclaimed		Pittston	PA	18640	Luzerne				Yes
Northampton	Loomis Reclaimed		Hanover Township	PA	18706	Luzerne				Yes
Northampton	Marvin		Scranton	PA	18509	Lackawanna				Yes
Northampton	Material Transported to NGC - Silt from Project Area		Moosic	PA	18507	Lackawanna				Potentially
Northampton	Mill Creek - Flood Control		Moosic	PA	18507	Lackawanna				Potentially
Northampton	Mineral Reclamation Hanover		Hanover Township	PA	18706	Luzerne				Yes
Northampton	No. 9		Duryea	PA	18642	Luzerne				Potentially
Northampton	Powderly		Carbondale	PA	18407	Lackawanna				Yes
Northampton	Prospect		Wilkes-Barre	PA	18705	Luzerne				Potentially
Northampton	Stearns Bank		Nanticoke	PA	18634	Luzerne				Yes
Northampton	Stelle Enterprise		Avoca	PA	18641	Luzerne				Potentially
Panther Creek	A Bank - Nesquehoning Coal		Nesquehoning	PA	18240	Carbon				Potentially
Panther Creek	Audenreid - AC Fuels		Hazleton	PA	18201	Luzerne				Yes
Panther Creek	Avoca - Min Rec/Stelle		Dupont	PA	18641	Luzerne				Potentially
Panther Creek	Belle Air		Duryea	PA	18642	Luzerne				Potentially
Panther Creek	Branchdale		Branchdale	PA	17923	Schuylkill				Yes
Panther Creek	CG Coal - Fox		Avoca	PA	18641	Luzerne				Potentially
Panther Creek	Coaldale Energy - Great Lakes		Lansford	PA	18232	Carbon				Yes
Panther Creek	EC - Bliss		Nanticoke	PA	18634	Luzerne				Yes
Panther Creek	Eckley		Freeland	PA	18224	Luzerne				Potentially
Panther Creek	Emerald Anthracite		Warrior Run	PA	18706	Luzerne				Potentially
Panther Creek	Gordon		Ashland	PA	17921	Schuylkill				Yes
Panther Creek	Hanover - Min Rec		Hanover Township	PA	18706	Luzerne				Yes
Panther Creek	Harry E.		Kingston	PA	18704	Luzerne				Potentially
Panther Creek	Hazleton - Rossi		Hazleton	PA	18201	Luzerne				Yes

Panther Creek	Hazleton Shaft		Hazle Township	PA	18201	Luzerne				Yes
Panther Creek	Hudson Anthracite		Pittston	PA	18640	Luzerne				Yes
Panther Creek	Jeanville - Haz. Shaft		Hazleton	PA	18201	Luzerne				Yes
Panther Creek	Jeddo #7		Hazle Township	PA	18202	Luzerne				Yes
Panther Creek	JHCC Jeddo 8 Breaker		Hazleton	PA	18201	Luzerne				Yes
Panther Creek	Lehigh Anthracite		Coaldale	PA	18218	Schuylkill				Yes
Panther Creek	Loomis		Hanover Township	PA	18706	Luzerne				Yes
Panther Creek	Mazaika Coal		Tamaqua	PA	18252	Schuylkill				Yes
Panther Creek	Mill Creek		Moosic	PA	18507	Lackawanna				Potentially
Panther Creek	No. 9		Avoca	PA	18641	Luzerne				Potentially
Panther Creek	Primrose Lytle - Curran		Pottsville	PA	17901	Schuylkill				Yes
Panther Creek	Prospect		Wilkes-Barre	PA	18705	Luzerne				Potentially
Panther Creek	Sherman Coal		Pine Grove	PA	17963	Schuylkill				Yes
Panther Creek	Silverbrook		Nanticoke	PA	18634	Luzerne				Yes
Panther Creek	South Tamaqua Coal Pockets		Tamaqua	PA	18252	Schuylkill				Yes
Panther Creek	St. Clair - site of current WalMart		St. Clair	PA	17970	Schuylkill				Yes
Panther Creek	Stoudts Ferry		Mahanoy City	PA	17948	Schuylkill				Yes
Panther Creek	Swatara		Pottsville	PA	17901	Schuylkill				Yes
Panther Creek	Tremont - Donaldson Site		Tremont	PA	17981	Schuylkill				Yes
Panther Creek	UGI Power Plants Clean Up - Boiler ash		Hanover Township	PA	18706	Luzerne				Yes
Rausch Creek	I-81 Bank	125 on the Southside	Frailey Township	PA	17981	Schuylkill			Active mine site	Yes
Rausch Creek	Westwood Mine Site Banks R1-R9	490 W. Main St.	Tremont	PA	17981	Schuylkill			Waste coal piles completely removed and nearly totally reclaimed	Yes
Seward	Amsbry		Ashville	PA	16613	Cambria		33		Potentially
Seward	Bird		Ferndale	PA	15959	Somerset	65			Potentially
Seward	Conrail Rejects		Clearfield	PA	16830	Clearfield				Potentially
Seward	Cooney #3		Portage	PA	15946	Cambria	10			Yes
Seward	Hastings		Hastings	PA	16646	Cambria				Yes
Seward	Heilwood #1		Heilwood	PA	15745	Indiana		27.5		Potentially
Seward	Heilwood #2		Heilwood	PA	15745	Indiana		16		Potentially
Seward	Juniata Processing		Mt Union	PA	17066	Huntingdon		18		Yes
Seward	K&J		Hastings	PA	16646	Cambria		32		Yes
Seward	Laurel Land Development		Nanty Glo	PA	15943	Cambria		43		Yes
Seward	Mine #37		Windber	PA	15963	Cambria	69			Yes
Seward	Mine #40		Windber	PA	15963	Cambria	53			Yes
Seward	Nanty Glo East		Nanty Glo	PA	15943	Cambria	50			Yes
Seward	Nanty Glo West		Nanty Glo	PA	15943	Cambria	83			Yes
Seward	Piney Creek		Clarion	PA	16214	Clarion		25		Yes
Seward	Riley Shaft		Northern Cambria	PA	15714	Cambria		25		Yes
Seward	Seanor		Saltsburg	PA	15681	Westmoreland		25		Yes
Seward	Spangler		Northern Cambria	PA	15714	Cambria	46.18			Yes
Seward	Vintondale		Vintondale	PA	15961	Cambria	8.8			Yes
Seward	Wehrum		Vintondale	PA	15961	Indiana		6		Yes
Yellow	Site located in EJA									
Green	Site potentially in EJA									
Sources:										
PA Environmental Justice Areas, PA DEP, https://padep-1.maps.arcgis.com/apps/webappviewer/index.html?id=f31a188de122467691cae93c3339469c										
ARIPPA Survey (2018)										

BEFORE AND AFTER PHOTOS OF EJA RECLAMATION SITES

Seanor Site, Westmoreland County



Loomis Bank Pile And Fire, Luzerne County



Attachment 2



Robindale Energy

& Associated Companies

COLVER GREEN ENERGY BRINGS NEW LIFE AND JOBS TO A RETIRED CAMBRIA COUNTY PLANT

LATROBE, PA – August 19, 2020 – As part of its expansion in the renewable & alternative energy generation sector, Generation Holdings, LP has agreed to purchase the 110 megawatt Colver Power Project in Colver, Pennsylvania and five related mine reclamation sites from interests associated with Northern Star Generation.

Colver Green Energy LLC, a generation company formed by the owners of Robindale Energy Services, Inc. of Latrobe, Pennsylvania will operate the facility which generates enough electricity to power 130,000 homes in the PJM Interconnection. The transaction also includes completion of reclamation activities at five abandoned mines in Cambria County that are legacy sites created from now defunct coal and steel companies. Additional fuel will be sourced from Somerset, Indiana, and Clearfield Counties.

Colver Power went into service in 1995 and operated as a circulating fluidized bed (CFB) facility until it was shuttered in May 2020. At full load operation this CFB process remediates over 700,000 tons per year of waste material from local abandoned mine lands as fuel while capturing 95%-99% of all emissions that would be created by the legacy abandoned mine land sites burning in place. All of this is done in an environmentally sensitive manner with a multi-decade process that shows the environmental benefits to the region and to the state in both terms of air and water quality as well as mitigating public safety risks inherent to these sites.

Reopening this plant will bring back 70 family sustaining fulltime jobs related to operating the plant and supplying fuel and limestone. Colver Green Energy will be hiring a number of former employees as well as new operators, mechanics, and electricians to fill remaining vacancies to allow the plant to restart and continue reclamation activities in September 2020.

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Contact:

Dennis Simmers 814-748-7961 extension 15

Attachment 3

RGGI Affected Waste Coal Sources - Current Proposed Set Aside

Plant Number	Source Number	Plant	County	Nameplate Capacity (Gross MW)	2015 CO2 (Tons)	2016 CO2 (Tons)	2017 CO2 (Tons)	2018 CO2 (Tons)	2019 Estimated CO2 (Tons)
1	1	Ebensburg Power	Cambria	57.6	341,896	362,905	462,433	604,422	431,414
2	2	Foster Wheeler Mt Carmel Cogen	Northumberland	47.3	539,732	570,033	570,800	527,521	172,496
3	3	Gilberton John B Rich	Schuylkill	44.2	487,964	527,104	508,320	487,127	492,511
3	4	Gilberton John B Rich	Schuylkill	44.2	489,893	533,478	498,576	476,314	478,063
4	5	Northampton Generating	Northampton	134.1	632,839	379,068	316,453	297,897	240,850
5	6	Panther Creek	Carbon	47.0	380,501	101,637	64,005	103,994	103,994
5	7	Panther Creek	Carbon	47.0	403,845	102,409	59,876	112,380	112,380
6	8	Scrubgrass Kennerdell	Venango	47.4	209,778	404,437	374,965	336,297	263,525
6	9	Scrubgrass Kennerdell	Venango	47.4	215,467	378,191	353,865	337,024	239,376
7	10	Seward	Indiana	292.5	1,005,332	1,495,354	1,327,707	1,456,979	966,767
7	11	Seward	Indiana	292.5	936,765	1,635,250	1,464,289	1,418,959	1,000,161
8	12	St Nicholas Cogen	Schuylkill	99.2	1,266,716	1,277,540	1,191,986	1,317,759	1,241,678
9	13	Westwood Generation	Schuylkill	36.0	396,878	110,639	46,020	426,445	306,973
10	14	Interpower Colver	Cambria	118.0		1,000,637		1,094,771	1,031,284
Total					7,307,606	7,878,046	7,239,296	8,997,890	6,050,187

Highlighted highest emissions year during five year period (2015-2019)

Legacy Emissions w/ Colver	10,405,196
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Attachment 4

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.

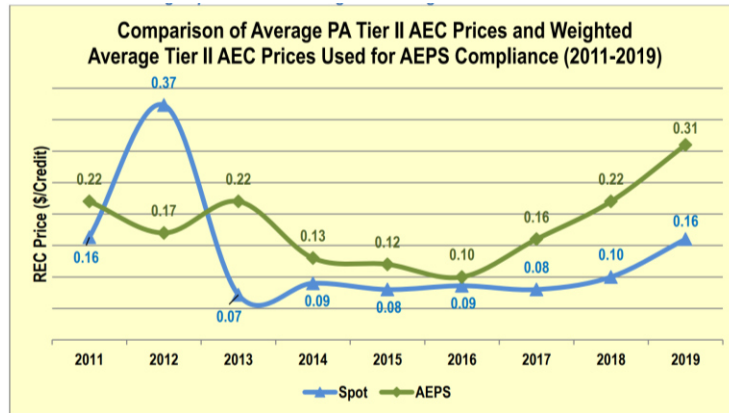
Table 3: Historical Tier 2 Participation by Resource Type

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.

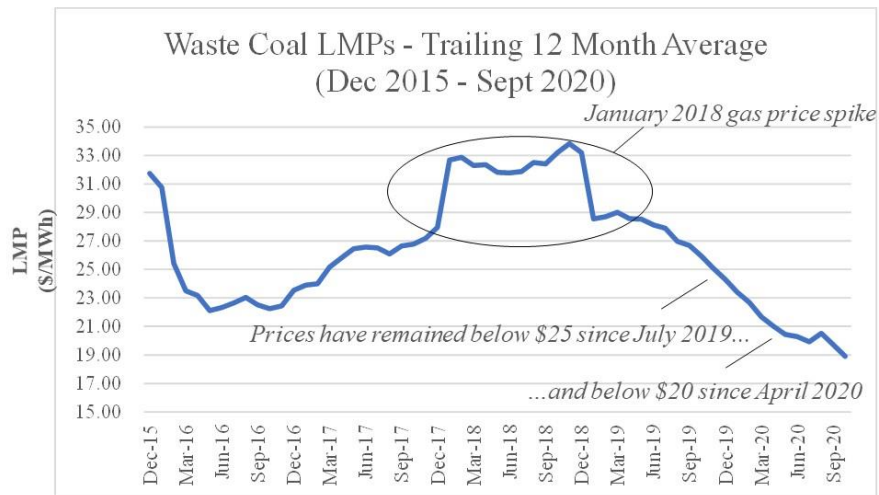
The market for Tier 2 resources has historically been oversupplied. As shown in the table above, combined waste coal and pumped storage hydro have historically been +/- 14 million MWh, far in excess of the annual requirement shown in **Table 1: Summary of Tier 2 Requirements**. This oversupply has been 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

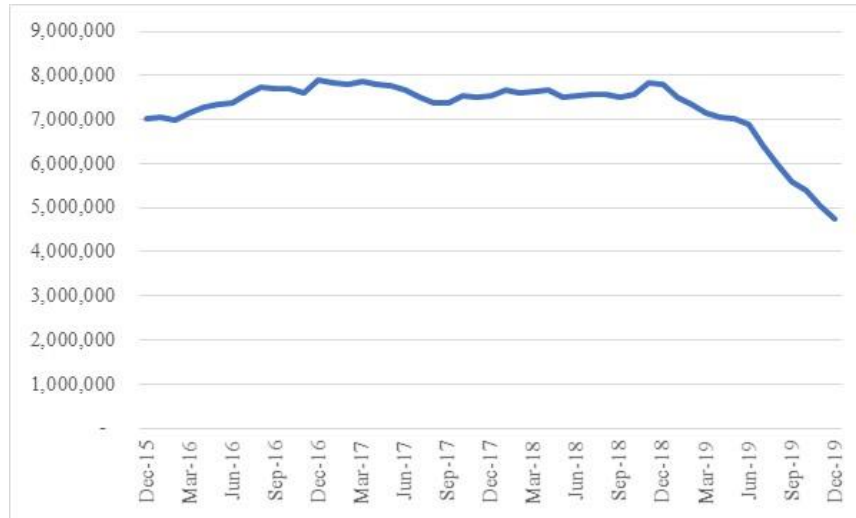


In addition to broader commodity market drivers, in the various PJM states legislative initiatives have been enacted that have the effect of also suppressing wholesale market prices. For instance, Public Service Enterprise Group (“PSEG”) recently filed an application with the New Jersey Board of Public 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.

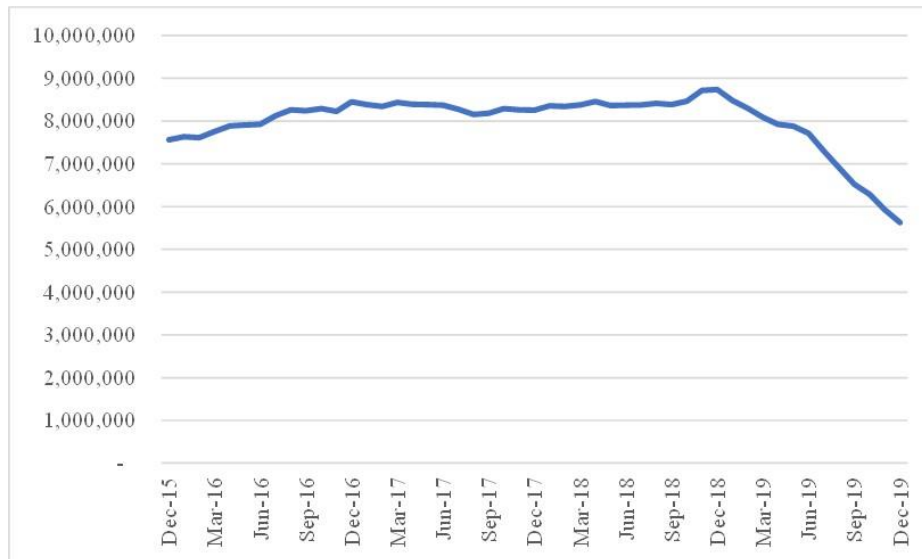
Due to sustained low wholesale market prices, over the past 2 years, five of the 16 waste coal facilities supplying the Pennsylvania Tier 2 market have retired and four additional plants have not generated any power / RECs since 2019. As a result, the amount of waste coal-generated RECs being retired 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.

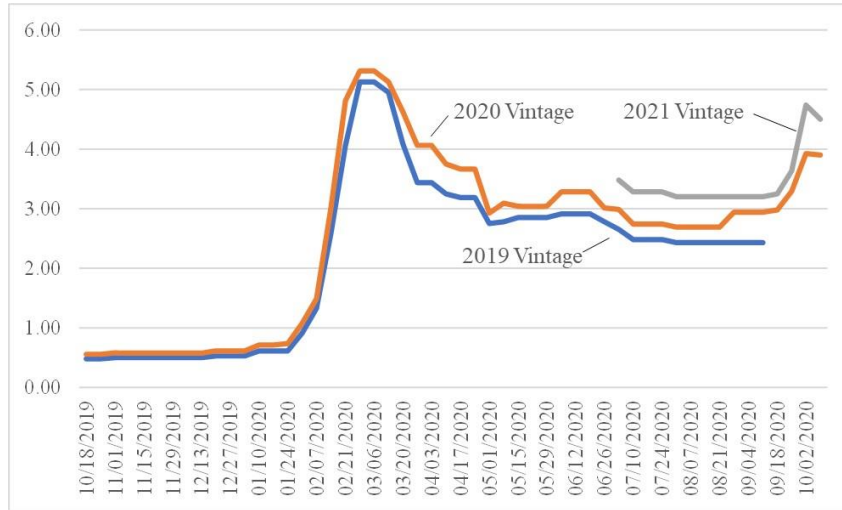
Table 7: Waste Coal Consumption (Tons) – Trailing 12 Months (Dec 2015 – Dec 2019)



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

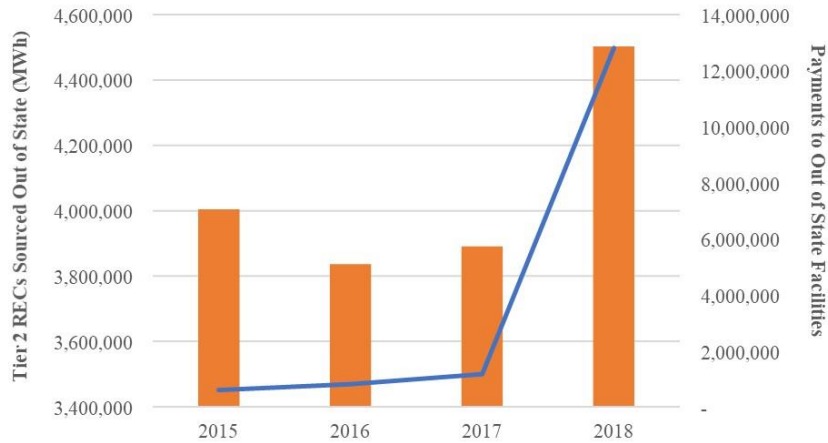
The combination of shrinking waste coal supply and increasing REC demand due to phase-in to 10.0% Tier 2 requirement has put upward pressure on prices. As noted in **Table 4: Summary of Tier 2 Historical Pricing**, weighted average Tier 2 prices under the RPS have ranged from \$0.08 to \$0.22. However, 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
Partner
Thorndike Landing LLC

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 5

Plant	Net Generation (MWh)					Nameplate Capacity (Net MW)	Maximum Net Potential Annual Output (MWh)	Capacity Rate (%): Net Generation / Maximum Net Potential Output				
	2015	2016	2017	2018	2019			2015	2016	2017	2018	2019
Colver Green Energy	824,889	730,854	811,447	812,020	766,676	110.0	963,600	85.6%	75.8%	84.2%	84.3%	79.6%
Ebensburg Power Company	196,225	194,645	248,728	324,850	235,297	50.0	438,000	44.8%	44.4%	56.8%	74.2%	53.7%
Gilberton Power Company	627,844	628,158	633,515	607,399	623,354	80.0	700,800	89.6%	89.6%	90.4%	86.7%	88.9%
Mt. Carmel Cogen	292,816	304,998	313,963	263,357	77,303	43.0	376,680	77.7%	81.0%	83.4%	69.9%	20.5%
Northampton Generating Company	369,147	221,921	188,029	176,949	130,644	112.0	981,120	37.6%	22.6%	19.2%	18.0%	13.3%
Panther Creek Power Operating	470,240	130,471	89,707	151,469	104,608	83.0	727,080	64.7%	17.9%	12.3%	20.8%	14.4%
Westwood Generation	201,231	52,540	21,087	189,238	126,089	30.0	262,800	76.6%	20.0%	8.0%	72.0%	48.0%
Schuylkill Energy Resources	655,704	652,975	619,272	615,972	597,852	86.0	753,360	87.0%	86.7%	82.2%	81.8%	79.4%
Scrubgrass Generating Company	258,457	416,194	432,864	423,961	239,191	86.1	754,236	34.3%	55.2%	57.4%	56.2%	31.7%
Seward Generation	1,676,291	2,787,394	2,449,685	2,571,215	1,857,998	525.0	4,599,000	36.4%	60.6%	53.3%	55.9%	40.4%
Industry Total	5,572,843	6,120,150	5,808,296	6,136,430	4,759,009	1,205.1	10,556,676	52.8%	58.0%	55.0%	58.1%	45.1%
Sources:								High capacity year is highlighted				
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												

Attachment 6

Plant	Highest Month of CO2 Emissions					Potential Yearly CO2 Emissions Based on Highest Month					Max PAE	
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019		
Colver	103,977	105,164	105,417	104,688	103,915	1,247,724	1,261,973	1,265,009	1,256,258	1,246,974	1,265,009	
Ebensburg	53,838	47,098	63,519	77,965	56,295	646,056	565,176	762,228	935,580	675,540	762,228 *	
Gilberton	92,263	100,353	99,008	93,789	88,675	1,107,161	1,204,236	1,188,096	1,125,468	1,064,100	1,204,236	
Mt. Carmel	52,835	55,832	51,395	55,096	32,326	634,020	669,984	616,740	661,152	387,912	669,984	
Northampton	91,422	91,506	81,248	97,446	99,178	1,097,064	1,098,076	974,974	1,169,357	1,190,136	1,190,136	
Panther Creek	90,355	76,618	21,599	84,009	59,596	1,084,256	919,419	259,185	1,008,114	715,154	1,084,256	
Rausch Creek	40,440	30,671	13,215	47,998	42,353	485,280	368,052	158,580	575,976	508,236	575,976	
Scrubgrass	70,897	82,848	68,174	73,600	62,461	850,764	994,176	818,088	883,200	749,532	994,176	
SER	118,367	118,632	120,105	136,160	119,711	1,420,402	1,423,579	1,441,255	1,633,914	1,436,526	1,633,914	
Seward	293,529	388,196	328,572	349,199	314,790	3,522,342	4,658,351	3,942,863	4,190,386	3,777,481	4,658,351	
Total	1,007,922	1,096,918	952,251	1,119,950	979,299	12,095,069	13,163,022	11,427,018	13,439,404	11,751,591	14,038,266	
			* High month for Ebensburg from 2018 was excluded									