west virginia department of environmental protection

Division of Air Quality
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Austin Caperton, Cabinet Secretary
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Pursuant to §45-14-17.2

PRELIMINARY DETERMINATION/FACT SHEET

for the

CONSTRUCTION

of

ESC Brooke County Power I, LLC's
Brooke County Combined Cycle Power Plant

located in

Colliers, Brooke County, WV.

Permit Number: R14-0035
Facility Identification Number: 009-00129

Date: December 4, 2017

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BACKGROUND INFORMATION

Application No.:	R14-0035
Plant ID No.:	009-00129
Applicant:	ESC Brooke County Power I, LLC
Facility Name:	Brooke County Power Plant
Location:	Brooke County
NAICS Code:	221112
Application Type:	PSD Major Construction
Received Date:	March 14, 2016
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$14,500
Date Received:	March 17, 2016, Resubmitted May 18, 2017
Complete Date:	March 30, 2018
Due Date:	September 26, 2018
Applicant Ad Date:	December 11, 2017
Newspaper:	*The Weirton Daily Times*
UTM's:	Easting: 540.28 km Northing: 4,465.58 km Zone: 17

On March 14, 2016 ESC Brooke County Power I, LLC (ESC) submitted a permit application to construct a combined cycle combustion turbine, natural gas/ethane fired electric generation facility in Brooke County, WV. On May 18, 2017 ESC resubmitted the application to move the plant to a different location in Brooke County as well as make other changes to equipment sizes and ratings. The new plant will be a nominal 925 MW facility that will tie into First Energy's existing Tidd-Wylie Ridge 345 kV substation which is located adjacent to the project site. Its output will be sold into the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) regional electric grid.

Emission sources associated with the project are:

* Two General Electric (GE) Frame 7HA.01 or equivalent advanced combined cycle combustion turbines (CTs), with two Heat Recovery Steam Generators (HRSGs) equipped with supplemental duct firing. Both the CTs and duct burners will fire either natural gas or a blend of natural gas and up to 50% ethane (by volume).

* One natural gas fired Auxiliary Boiler with a maximum heat input of 111.9 million BTU per hour.

* One 2,000 kilowatt diesel fired emergency generator (with associated 3,000 gallon diesel storage tank).

* One 315 horse power diesel fired emergency fire water pump (with associated 500 gallon diesel storage tank).

* Two natural gas fired (or a blend of natural gas and up to 50% ethane) fuel gas heaters with a maximum heat input of 5.4 mmbtu/hr each.

* One 35,000 gallon aqueous ammonia storage tank

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* Two generator circuit breakers containing 25 lb of Sulfur Hexafluoride each and three switchyard breakers containing 325 lb of SF_6 each.

The facility wide potential emissions of Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Particulate Matter less than 2.5 microns ($PM_{2.5}$), Particulate Matter less than 10 microns (PM_{10}), Particulate Matter (PM),Volatile Organic Compounds (VOCs), Sulfuric Acid Mist (H_2SO_4) and Greenhouse Gasses (GHGs) are above the "major source" thresholds that require the application to be reviewed under the Prevention of Significant Deterioration (PSD) program administered in WV under 45CSR14. The potential emission rates of Sulfur Dioxide (SO_2), and Lead (Pb) are below the "major source" threshold and, therefore, the application will also be concurrently reviewed under the WV minor source program administered under 45CSR13.

The following document will outline the DAQ's preliminary determination that the construction of the ESC Brooke County Power I, LLC facility will meet the emission limitations and conditions set forth in the DRAFT permit and will comply with all current applicable state and federal air quality rules and standards.

PUBLIC REVIEW PROCEDURES

Public review procedures for a new major construction application dual-reviewed under 45CSR13 and 45CSR14 require action items at the time of application submission and at the time a draft permit is prepared by the DAQ. The following details show compliance with the applicable rules and accepted procedures for public notification with respect to permit application R14-0035.

Actions Taken at Application Submission

Pursuant to §45-13-8.3 and §45-14-17.1, ESC Brooke County Power I, LLC placed a Class I legal advertisement in the following newspaper on the specified date notifying the public of the submission of a permit application:

- *The Weirton Daily Times* (December 11, 2017)

WVDAQ sent a notice of the application and a link for the electronic version of the application was sent to the following parties:

- The U.S Environmental Protection Agency - Region 3 - (December 12, 2017)
- The National Park Service - (April 07, 2016)
- The US Forest Service - (April 7, 2016)

The application was also made available for review on WVDAQs website and at the DAQ Headquarters in Charleston (Kanawha City).

Actions Taken at Completion of Preliminary Determination

Pursuant to §45-13-8.5 and §45-14-17.4, upon completion (and approval) of the preliminary determination and draft permit, a Class 1 legal advertisement will be placed in the following newspaper stating the DAQ's preliminary determination regarding R14-0035:

- *The Weirton Daily Times*

A copy of the preliminary determination and draft permit shall be forwarded to USEPA Region 3. Pursuant to §45-13-8.7, copies of the application, complete file, preliminary determination and draft permit shall be available for public review during the public comment period at the WVDEP Headquarters in Charleston and on DAQ's website. Further, the U.S. Forest Service and the National Park Service will receive copies of the preliminary determination and draft permit upon request. All other requests by interested parties for information relating to permit application R14-0035 shall be provided upon request.

Actions Taken at Completion of Final Determination

Pursuant to §45-14-17.7, and 17.8 upon reaching a final determination concerning R14-0035, the DAQ shall make such determination available for review at WVDEP Headquarters in Charleston and on DAQs website and notify the Northern Panhandle Regional Office in Wheeling of the final determination.

DESCRIPTION OF PROPOSED FACILITY

Description of Process

ESC Brooke County Power I, LLC Overview

The ESC Brooke County Power I, LLC Plant will generate approximately 925 megawatts (MW) of electricity that will be sold on the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) regional electric grid via a direct 345 kV interconnection at the existing Tydd-Wylie Ridge Substation adjacent to the proposed plant site. Pipeline-quality natural gas used by the plant's combustion turbine will be purchased from local suppliers, and will take advantage of the gas produced in nearby natural gas shale plays.

Electricity will be generated using two (2) combined-cycle combustion turbines (BCCT-1 and BCCT-2) each with a design heat input rating of 2,737.7 million Btu per hour (mmbtu/hr). Electricity generated by the combustion turbine will be routed through a local electrical substation and sold on the grid.

To enhance the plant's overall efficiency and increase the amount of electricity generated by the plant, the hot exhaust gases from each combustion turbines will be routed to a downstream Heat Recovery Steam Generator (HRSG). The HRSGs contains a series of heat exchangers

designed to recover the heat from the turbine's exhaust gas and produce steam, as in a boiler. The Project includes the installation of duct burners to produce additional steam in the HRSGs for additional power output from the steam turbine generator. The maximum duct firing level for each combustion turbine/HRSG module is expected to be 424.1 mmbtu/hr on a Higher Heating Value (HHV) basis. The fuel for the duct burners will be the same as for the combustion turbine: natural gas, ethane or a mix of natural gas and ethane. Cooled exhaust gas passing through the HRSGs will be vented to the atmosphere through emission points BCCT-1 and BCCT-2. The Selective Catalytic Reduction (SCR) and Oxidation Catalyst control devices used to reduce NO_x and CO emissions from the combustion turbines will be incorporated into the HRSGs, at locations where the emission control reactions optimally occur.

Selective Catalytic Reduction involves the injection of aqueous ammonia (NH_3) at a concentration of less than 20% by weight into the combustion turbine exhaust gas streams. The ammonia reacts with NO_x in the exhaust gas stream in the presence of a catalyst, reducing it to elemental nitrogen (N_2) and water vapor (H_2O). The aqueous ammonia will be stored on-site in a 35,000 gallon storage tank. The aqueous ammonia storage tank will not normally vent to the atmosphere. It will be equipped with pressure relief valves that would only vent in an emergency. The Oxidation Catalyst does not require the use of chemical reagents.

Steam generated in the HRSGs will be routed to a steam driven turbine that will increase the output of the electric generator. This generator will produce additional electricity that will be sold on the grid. Electricity generated by the combustion turbines and the single steam driven turbine driving the electric generator represent the plant's total electrical output.

The Brooke County Power Plant will use a dry air cooled condenser (DACC) in lieu of a conventional wet cooling tower for steam turbine generator steam condensation. The steam produced in the HRSGs will be used in the steam turbine to produce additional electrical power. Once the steam does its work in the steam turbine, it is exhausted and condensed at a vacuum in the DACC. The cycle is a closed loop system, and the condensate is reused as feed water to the HRSG. The DACC will minimize the use of water at the plant. The DACC will not generate particulate matter (PM) emissions that are typically associated with wet cooling tower drift losses. Therefore, the DACC is not considered an emissions source.

Proposed Equipment

Combustion Turbines

Each of the two 2,737.7 mmbtu/hr (HHV) combined-cycle combustion turbines (BCCT-1 and BCCT-2) will be equipped with an inlet evaporative cooling system, which is used to increase the density of the combustion air, thereby increasing fuel and mass flow and, in turn, power output. The air density increase is accomplished by evaporating water into the inlet air, which decreases its temperature and correspondingly increases its density. The combustion turbines will be coupled with HRSGs to produce steam and achieve higher electric power output. The HRSGs contain a series of heat exchangers designed to recover the heat from the combustion turbine exhaust gas and produce steam. The project includes the installation of duct burners to produce additional steam in the HRSGs for additional power output from the generator. The maximum duct firing level

for each combustion turbine/HRSG module is expected to be 424.1 mmbtu/hr on a HHV basis. The fuel for the duct burners will be the same as for the combustion turbines pipeline quality natural gas. Steam generated in the two HRSGs is routed to a single steam driven turbine. The steam turbine also drives the generator to produce additional electricity that will also be routed through a local electrical substation and sold on the grid.

The combustion turbine will be equipped with dry low-NO_x (DLN) combustors. These combustion controls, along with Selective Catalytic Reduction (SCR) systems, will control emissions of nitrogen oxides (NO_x) from the combustion turbines and duct burners. Oxidation Catalysts will be used to control emissions of carbon monoxide (CO) and volatile organic compounds (VOCs) from the combustion turbines/duct burners. The SCRs and Oxidation Catalysts will be incorporated into the HRSGs so that emissions from both the combustion turbines and duct burners are controlled.

Each combustion turbine/duct burner system will have its own exhaust stack which is expected to be 185 feet above grade.

For permitting and emissions estimating purposes, this application assumes that the combustion turbines and duct burners will operate 8,760 hours per year (hr/yr).

Auxiliary Boiler

A 111.9 mmbtu/hr Auxiliary Boiler (AB-1) will be used to produce steam for plant support. The Auxiliary Boiler will burn natural gas or a blend of natural gas and up to 50% ethane. The Auxiliary Boiler will be equipped with Low-NO_x burners (LNB) to control NO_x emissions.

For permitting and emissions estimating purposes, this application assumes that the Auxiliary Boiler will operate 512,054 mmbtu/year, the equivalent of 4,576 hr/yr at full capacity.

Fuel Gas Heaters

Two 5.4 mmbtu/hr Fuel Gas Heaters (FGH-1 and FGH-2) will be used to preheat the gaseous fuel received by the plant. Preheating the fuel prior to combustion in the combined-cycle CTs (BCCT-1 and BCCT-2) increases the efficiency of the CT, safeguards the fuel pipelines from icing, and protects the CTs from fuel condensates. For permitting and emissions estimating purposes, this application assumed that the both Fuel Gas Heaters will operate 8,760 hr/yr at their maximum heat inputs. However, in order to conform to the modeling protocol, the permit will only allow one heater to operate at a given time, with the other heater serving as a backup.

Emergency Generator

A 2,000 kW Emergency Generator (EG-1) will be used for emergency backup electric power. The fuel for the Emergency Generator will be ultra low sulfur diesel (ULSD), with a sulfur content

no greater than 0.0015% by weight. The Emergency Generator will be periodically operated for short periods per the manufacturer's maintenance instructions to ensure operational readiness in the event of an emergency.

The ULSD fuel for the Emergency Generator will be stored in a 3,000 gallon Emergency Generator Tank (ST-2).

The Emergency Generator will operate no more than 100 hr/yr for maintenance and readiness testing. Other than maintenance and readiness testing, this engine will be used only for emergency purposes. For permitting and emissions estimating purposes, this application assumes that the Emergency Generator will operate a maximum of 100 hr/yr.

Fire Water Pump

A 315 hp Fire Water Pump (FP-1) will be used for plant fire protection. The fuel for the Fire Water Pump will also be ULSD, with a sulfur content no greater than 0.0015% by weight. The Fire Water Pump will also be periodically operated for short periods per the manufacturer's maintenance instructions to ensure operational readiness in the event of an emergency.

The ULSD fuel for the Fire Water Pump will be stored in a 500 gallon Fire Water Pump Tank (ST-1).

The Fire Water Pump will operate no more than 100 hr/yr for maintenance and readiness testing. Other than maintenance and readiness testing, the Fire Water Pump will be used only for emergency purposes. For permitting and emissions estimating purposes, this application assumes that the Fire Water Pump will operate a maximum of 100 hr/yr.

Dry Air Cooled Condensor

It should be noted that the Brooke County Power Plant will utilize DACC instead of a conventional wet cooling tower. The DACC will take the steam (after it is used in the steam turbine) and condense it under vacuum. The condensate is then reused as feed water to the HRSG. Since it is a closed loop, a DACC does not generate the particulate matter emissions that are typically associated with wet cooling towers. Therefore, the DACC is not considered an emissions source.

SITE INSPECTION

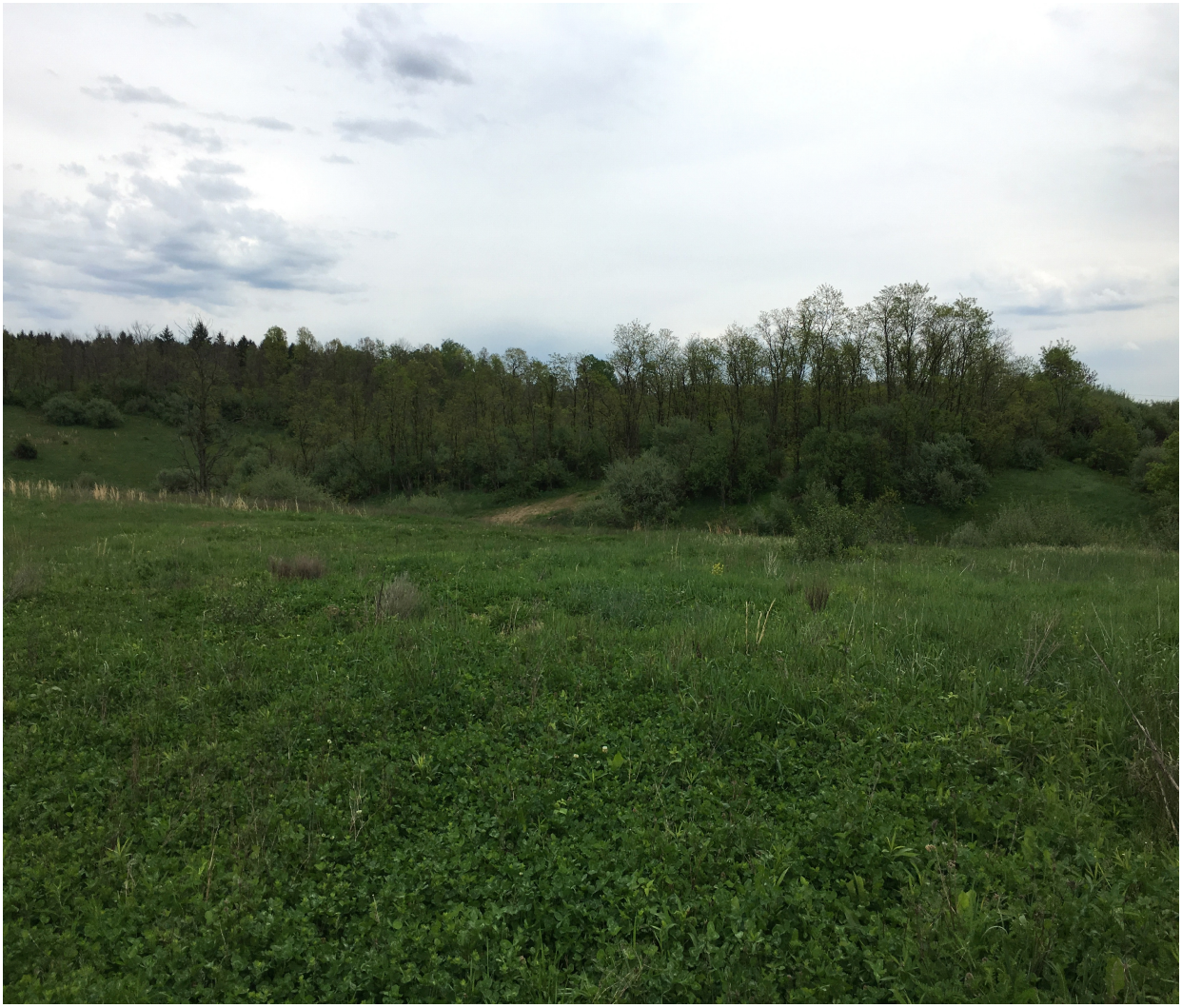
On May 4, 2017 the writer conducted a site inspection of the proposed location of the ESC Brooke County Power I, LLC plant. Joining the writer was Joe Kessler of WVDAQ. The following observations were made during the inspection:

- The proposed site of the plant is located in a rural area approximately 1/3 mile west of the Pennsylvania state line.

- The project site is approximately 1/3 mile from the closest residence and there are approximately a dozen homes within ½ mile of the site.

- Ground level of the site will be approximately 1,100 feet above sea level. The area is relatively flat with a few surrounding hills rising to around 1,200 feet above sea level. Turbine stack height will be approximately 185 feet above ground level. After accounting for plume rise, it is doubtful stack exhaust would directly impact any surrounding hills. As shown in the modeling results (see below) maximum modeled concentrations are below both the NAAQs and PSD increment.

- The following picture was taken the day of the site inspection:



PROPOSED EMISSIONS

The ESC Brooke County Power I, LLC Plant will have the following potential-to-emit of the specified pollutants:

Table 1: Facility-wide PTE

Pollutant	pounds/hour[(1)(3)]	tons/year[(2)(3)]
CO	34.84	255.10
NO_x	82.10	233.10
PM	34.95	149.60
PM_{10}	34.95	149.60
$PM_{2.5}$	34.95	149.60
SO_2	8.20	35.40
VOCs	17.89	87.40
H_2SO_4	5.22	22.80
Lead	0.003	0.012
CO_{2e}	--	3,696,529
Total HAPs	--	9.10

(1) As determined by various averaging periods.
(2) As determined by rolling 12-month totals.
(3) Annual emissions include start up and shut down emissions. Hourly emissions do not (they represent steady state emissions). This is why some annual emissions are greater than 8760*(lb/hr)/2000.

EMISSIONS CALCULATION METHODOLOGIES

The following section will detail the emission calculation methodologies used by ESC Brooke County Power I, LLC to calculate the potential-to-emit of the proposed facility.

Combustion Turbines / Duct Burners

Emissions from each combustion turbine (including duct burner firing) can be broken down into steady state operation emissions and startup/shutdown emissions.

Steady State Operations

Potential emissions of NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$,VOC, sulfuric acid (H_2SO_4), and greenhouse gasses (GHGs) from the combustion turbines were based on vendor specifications provided by GE.

Potential short-term (lb/hr) emission rates were determined based on the GE data, which encompasses the expected range of combustion turbine operating loads and ambient temperatures, with and without the use of inlet air evaporative cooling, and with and without duct firing. From the GE data, the potential short-term emission rates for NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, VOC, H_2SO_4, and GHGs for the combustion turbines were established by selecting the maximum lb/hr emission rates across the expected operating load and ambient temperature ranges. Potential annual (tons/yr) emissions were then calculated by multiplying the maximum short-term emission rates by 8,601 (8760- the 159 hours accounted for in startup and shutdown emissions) hr/yr, then dividing by 2,000 to convert pounds to tons. To convert non CO_2 GHGs to CO_2e 40 CFR 98 Subpart A, Table A-1 was used.

Pb emissions were estimated using AP-42 emission factors.

Maximum short-term and annual emissions from the combustion turbines during steady state operations are summarized in Table 2.

The permit will require testing/Continuous Emission Monitors (CEMs) to confirm compliance with the emission rates.

Table 2: Steady State Turbine Emission Factor Source (per turbine/duct burner unit)

Pollutant	Emission Rate (lb/hr)	Emission Factor Source	Comments
CO	14.1	Manufacturer	Includes use of Oxidation Catalyst
NO_x	23.2	Manufacturer	Includes use of SCR and DLN burners
PM	16.9	Manufacturer	Includes both filterable and condensable PM
PM_{10}	16.9	Manufacturer	Includes both filterable and condensable PM
$PM_{2.5}$	16.9	Manufacturer	Includes both filterable and condensable PM
SO_2	4.0	Manufacturer	Assumes 0.4 grains S/100 ft^3
VOCs	8.1	Manufacturer	Includes use of Oxidation Catalyst
Pb	0.002	AP-42	
GHGs	417,382	Manufacturer	CO_2e Basis
H_2SO_4	2.6	Manufacturer	Assumes 0.4 grains S/100 ft^3
Total HAPs	1.34	AP-42	

Startups and Shutdowns

The combustion turbine is estimated to undergo 260 startups per year. Of these 260 startups, approximately 208 are expected to be hot startups, 40 are expected to be warm startups, and twelve (12) are expected to be cold startups. Accordingly, approximately 260 shutdowns per year are expected. The permit will limit combined startup and shutdown emissions to the total emissions in Table 3, however, the number of each type of startup/shutdown event will not be limited.

A hot start is defined as a start following 8 hours of shutdown or less. A warm start is defined as a start following at least 8 hours of shutdown but not more than 72 hours of shutdown. A cold start is defined as a start following 72 hours of shutdown or more. Table 3 summarizes startup and shutdown emissions and event durations for the combustion turbine, as well as the total startup and shutdown emissions from the combustion turbine. Emission rates are based on manufacturer (GE) performance data.

Table 3: Turbine Startup and Shutdown Emissions(1) (per turbine/duct burner unit combined)

Pollutant	Type of Event	Emission Factor (lb/event)	Number of Anticipated Events/Year	Emissions (lb/yr)
NO_x	Hot Start	70	208	14,560
	Warm Start	175	40	7,000
	Cold Start	330	12	3,960
	Shutdown	7	260	1,820
	Total			27,340
CO	Hot Start	310	208	64,480
	Warm Start	350	40	14,000
	Cold Start	950	12	11,400
	Shutdown	125	260	32,500
	Total			122,380
$PM/PM_{10}/PM_{2.5}$	Hot Start	3.9	208	811
	Warm Start	7.9	40	316
	Cold Start	10.8	12	130
	Shutdown	2.4	260	624
	Total			1,881

VOCs	Hot Start	28	208	5,824
	Warm Start	30	40	1,200
	Cold Start	87	12	1,044
	Shutdown	28	260	7,280
	Total			15,348

(1)Startup and shutdown emissions were not calculated for Pb, GHGs, SO_2, or H_2SO_4 because worst case emissions for those pollutants are believed to occur during steady state operation.

Table 4: Total (Combined) Turbine Emissions (includes both turbine and duct burner)

Pollutant	pounds/hour(1)	tons/year(1)
CO	28.2	243.70
NO_x	46.4	226.90
$PM^{(2)}/PM_{10}/PM_{2.5}$	33.8	147.20
SO_2	8.00	35.00
VOCs	16.20	85.00
H_2SO_4	5.20	22.80
Lead	0.003	0.012
CO_2e	--	3,656,265.00
Total HAPs	--	8.58

(1) Annual emissions include start up and shut down emissions. Hourly emissions do not. This is why some annual emissions are greater than 8760*(lb/hr)/2000.
(2) Includes both filterable and condensable particulate matter.

Auxiliary Boiler Emissions

Auxiliary boiler emissions were based on performance information from a potential vendor. Annual emissions were based on 512,140 mmbtu/year of operation (approximately 4,576 hours per year). PM_{10} and $PM_{2.5}$ were conservatively assumed to equal PM emissions. Short term SO_2 emissions were based on a sulfur content of the fuel of 0.4 grains per 100 dscf. Calculations also assumed that 5% of SO_2 will be converted to SO_3 and 100% of that SO_3 will be converted to H_2SO_4. AP-42 emission factors were used to estimate Pb and HAP emissions. To convert non CO_2 GHGs to CO_2e 40 CFR 98 Subpart A, Table A-1 was used.

Table 5: Auxiliary Boiler Emission Factors

Pollutant	Emission Rate (lb/mmbtu)	Emission Factor Source	Comments
CO	0.037	Vendor	
NO_x	0.011	Vendor	Includes use of Low NO_x burners
PM	0.008	Vendor	Includes both filterable and condensable PM
SO_2	0.0013	Mass Balance	
VOCs	0.008	Vendor	
Pb	4.85E-07	AP-42	
GHGs	14,768 (lb/hr)	40 CFR 98 Sub C	CO_2e Basis
H_2SO_4	0.0000992	Mass Balance	
Total HAPs	1.89 (lb/mmscf)	AP-42	Sum of individual factors

Table 6: Auxiliary Boiler Emissions

Pollutant	lb/hr	tpy
CO	4.14	9.47
NO_x	1.23	2.82
$PM/PM_{10}/PM_{2.5}$	0.87	1.99
SO_2	0.15	0.33
VOCs	0.90	2.05
GHGs (CO_2e basis)	14,768	33,790
H_2SO_4	0.02	0.03
HAPs	0.21	0.47

Fuel Gas Heater Emissions

ESC estimated fuel gas heater emissions using vendor information. PM_{10} and $PM_{2.5}$ emissions were conservatively assumed to equal PM emissions. The fuel sulfur content of the natural gas was, assumed to be 0.4 gr/100 scf.

Potential emissions from the Fuel Gas Heater are summarized in Table 7.

Table 7: Fuel Gas Heater Emissions (combined)

Pollutant	lb/hr	tpy
CO	0.21	0.92
NO_x	0.19	0.85
$PM/PM_{10}/PM_{2.5}$	0.04	0.18
SO_2	0.01	0.03
VOCs	0.04	0.17
GHGs (CO_2e basis)	712	3,120
H_2SO_4	0.001	0.003
HAPs	0.01	0.05

Emergency Generator Emissions

Emissions estimates for criteria pollutants (except SO_2) for the fuel oil fired emergency generator were based on emission factors from potential vendors, and/or applicable NSPS emission standards (specifically 40 CFR 60 Subpart IIII). PM_{10} and $PM_{2.5}$ were conservatively assumed to equal PM emissions. SO_2 emissions were based on a mass balance and assumed a fuel oil sulfur content of 15 ppm. All annual emissions were based on 100 hours of operation per year.

Potential emissions from the Emergency Generator are summarized in Table 9.

Table 8: Emergency Generator Emission Factors

Pollutant	Emission Rate (g/hp-hr)	Emission Factor Source	Comments
CO	0.3	Vendor	
NO_x	5.45	Vendor	
$PM/PM_{10}/PM_{2.5}$	0.025	Vendor	
SO_2	15 ppm S	mass balance	
VOCs	0.11	Vendor	
GHGs	3,161 (lb/hr)	40 CFR 98 Subpart C	CO_2e
Total HAPs	0.001704 (lb/mmbtu)	AP-42	Sum of individual HAP EF's

Table 9: Emergency Generator Emissions

Pollutant	lb/hr	tpy
CO	1.77	0.09
NO_x	32.22	1.61
$PM/PM_{10}/PM_{2.5}$	0.15	0.01
SO_2	0.03	0.01
VOCs	0.65	0.03
GHGs (CO_2e basis)	3,161	158
HAPs	0.04	0.01

Fire Water Pump Emissions

Emissions estimates for the fire water pump were based on emission factors from a mass balance or applicable NSPS emission standards (specifically 40 CFR 60 Subpart IIII). PM_{10} and $PM_{2.5}$ were conservatively assumed to equal PM emissions. All annual emissions were based on 100 hours of operation per year.

Table 10: Fire Water Pump Emission Factors

Pollutant	Emission Rate (g/hp-hr)	Emission Factor Source	Comments
CO	0.44	Vendor	
NO_x	2.69	Vendor	
$PM/PM_{10}/PM_{2.5}$	0.075	Vendor	
SO_2	0.0015 (lb/mmbtu)	Mass Balance	
VOCs	0.083	Vendor	
GHGs	344 (lb/hr)	40 CFR 98 Subpart C	CO_2e basis
Total HAPs	0.003835 (lb/mmbtu)	AP-42	Sum of individual HAP EF's

Table 11: Fire Water Pump Emissions

Pollutant	lb/hr	tpy
CO	0.31	0.02
NO_x	1.87	0.09
$PM/PM_{10}/PM_{2.5}$	0.05	0.01
SO_2	0.01	0.01
VOCs	0.06	0.01
GHGs (CO_2e basis)	344	17.2
HAPs	0.01	0.01

DAQ Review of Emissions Methodology

All emission factors and calculation methodologies were deemed appropriate. With the use of CEMS and compliance testing, the ultimate validity of the emission factors will be tested repeatedly on a periodic post-issuance basis.

REGULATORY APPLICABILITY

The ESC Brooke County Power I, LLC facility is subject to a variety of substantive state and federal air quality rules and regulations. They are as follows: 45CSR2, 45CSR10, 45CSR13, 45CSR14, 45CSR16, 45CSR30, 45CSR33, 45CSR34, 40 CFR 60 - Subpart KKKK, 40 CFR 60 - Subpart Db, 40 CFR 60 - Subpart IIII, 40 CFR 60 - Subpart TTTT and 40 CFR 63 - Subpart ZZZZ. Each applicable rule, and ESC's proposed manner of compliance, will be discussed in detail below. Additionally, those rules that have questionable applicability but do not apply will also be discussed.

WV State-Implementation-Program (SIP) Regulations

45CSR2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers.

The duct burners, fuel gas heater and auxiliary boiler meet the definition of "fuel burning units" under 45CSR2 and are, subject to the applicable requirements therein. However, the combustion turbines themselves do not meet said definition because they do not produce power through *indirect heat transfer*. Each substantive requirement is discussed below:

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the fuel burning units are subject to an opacity limit of 10%. Proper maintenance and operation of the natural gas fired units should keep the opacity of the units

well below 10% during normal operations. The permit will require ESC to conduct Method 22 visible opacity checks on the auxiliary boiler and the combined duct burner/combustion turbine stacks on a monthly basis.

45CSR2 Weight Emission Standard - Section 4.1.b

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Auxiliary Boiler

The allowable particulate matter (PM) emission rate for the auxiliary boiler, identified as a Type "b" fuel burning unit, per 45CSR2, Section 4.1.b, is the product of 0.09 and the total design heat input of the auxiliary boiler in million Btu per hour. The maximum design heat input of the auxiliary boiler will be 111.9 mmbtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the auxiliary boiler will be 10.07 lb/hr. This limit represents filterable PM only and does not include condensable PM. The exemption of condensable PM is located within the 45CSR2 Appendix - which establishes compliance test procedures - by not requiring measurement of the condensable PM.

The maximum potential hourly PM emissions (filterable and condensable - a more conservative estimate) from the auxiliary boiler is estimated to be 0.87 lb/hr. This emission rate is less than 9% of the 45CSR2 limit.

Duct Burner

The allowable particulate matter (PM) emission rate for the duct burners, identified as a Type "a" fuel burning unit, per 45CSR2, Section 4.1.a, is the product of 0.05 and the total design heat input of the duct burners in million Btu per hour. The maximum design heat input of the duct burners will be 424.1 mmbtu/hr each. Using the above equation, the 45CSR2 PM emission limit of the duct burners will be 21.21 lb/hr. This limit represents filterable PM only and does not include condensible PM. The exemption of condensable PM is located within the 45CSR2 Appendix - which establishes compliance test procedures - by not requiring measurement of the condensable PM.

The maximum potential hourly PM emissions (filterable and condensable - a more conservative estimate) from each combined combustion turbine/duct burner stack are estimated to be 16.9 lb/hr. It should be noted that this accounts for emissions from BOTH the turbine and HRSG.

Fuel Heater

45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The heat input of each fuel gas heater (FGH-1) and FGH-2 are below 10 mmbtu/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

45CSR10 has requirements limiting SO_2 emissions from "fuel burning units". The ESC auxiliary boiler and duct burners are defined as a "fuel burning units". It should be noted that §45-10-2.9 explicitly states "'Indirect Heat Exchanger' means a device that combusts any fuel and produces steam or heats water or any other heat transfer medium. *This term includes any duct burner that combusts fuel and is part of a combined cycle system".* However, the combustion turbines themselves do not meet said definition because they do not produce power through *indirect heat transfer*. The applicable requirements are discussed below:

45CSR10 Fuel Burning Units - Section 3

The allowable sulfur dioxide (SO_2) emission rate for the auxiliary boiler, identified as a Type "b" fuel burning unit, per 45CSR10, Section 3.3.f, is the product of 3.2 and the total design heat input of the auxiliary boiler in million Btu per hour. The maximum design heat input of the auxiliary boiler will be 111.9 mmbtu/Hr. Using the above equation, the 45CSR10 SO_2 emission limit of the auxiliary boiler will be 358.08 lb/hr.

The maximum potential hourly SO_2 emissions from the auxiliary boiler is estimated to be 0.15 lb/hr. This emission rate is far less than 1% of the 45CSR10 limit.

The primary purpose of the duct burners is to generate steam to produce electricity for sale which defines the duct burners as type "a" fuel burning units under 45CSR10. For type "a" units, 45CSR10 lists SO_2 limits for specific existing units but does not have a generic limit for new units. Therefore, there is no SO_2 mass emission standard for the duct burners under 45CSR10.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The construction of the ESC Brooke County Power I, LLC Plant is defined as construction of a major source under 45CSR14. The project will be either major or "significant" as defined in 45CSR14 for all criteria pollutants (and Greenhouse Gasses) with the exception of SO_2 and Pb. Therefore, the proposed SO_2 emissions will be permitted under Rule 13.

As required under §45-13-8.3, ESC Brooke County Power I, LLC placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on December 11, 2017 in the *Weirton Daily Times* and the affidavit of publication for this legal advertisement was submitted on December 21, 2017.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration

45CSR14 sets the requirements for new construction of "major stationary sources" (as defined under §45-14-2.43) of air pollution, on a pollutant-by-pollutant basis, in areas that are in attainment with the National Ambient Air Quality Standards (NAAQS). Pursuant to §45-14-7.1, PSD review additionally applies to each pollutant proposed to be emitted in "significant" (as defined under §45-14-2.74) amounts.

The proposed ESC Brooke County Power I, LLC facility will be constructed in Brooke County, WV. Brooke County is classified as in attainment with all NAAQS except that the Cross Creek tax district is classified as non attainment for SO_2. The ESC Brooke County Power plant will be located in the Cross Creek Tax district. The construction of the ESC Brooke County Power I, LLC facility is defined as a construction of a "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, NO_x, $PM_{2.5}$, PM_{10}, PM, VOCs, H_2SO_4 and Greenhouse Gasses (see Table 12). Note that the major source threshold for natural gas fired combined cycle powerplants is 100 tons per year (see the February 2, 1993 memo from Edward Lillis). The substantive requirements of a PSD review includes a best available control technology (BACT) analysis, a modeling analysis, and an additional impacts analysis; each of these will be discussed in detail under the section PSD REVIEW REQUIREMENTS.

Table 12: Pollutants Subject to PSD/NSR

Pollutant	Potential-To-Emit (TPY)	Significance Level (TPY)	PSD (Y/N)
CO	255.10	100	Y
NO_x	233.10	40	Y
$PM_{2.5}$	149.60	10	Y
PM_{10}	149.60	15	Y
PM	149.60	25	Y
SO_2	35.40	100 (NSR)	N
VOCs	87.40	40	Y
GHGs (CO_2e)	3,696,529.00	100,000	Y
Lead	0.012	0.6	N
Sulfuric Acid Mist (H_2SO_4)	22.80	7	Y
Fluorides	0.00	3	N
Vinyl Chloride	0.00	1	N
Total Reduced Sulfur	0.00	10	N
Reduced Sulfur Compounds	0.00	10	N

45CSR16: Standards of Performance for New Stationary Sources

45CSR16 incorporates by reference applicable requirements under 40 CFR 60. 40 CFR 60 Subpart Db, Subpart KKKK, and Subpart IIII apply to the facility (see below under ***Federal Regulations***).

45CSR19: Requirements fo Pre-Construction Review, Determination of Emission Offsets for Proposed New or Modified Stationary Sources of Air Pollutants and Emission Trading for Intrasource Pollutants - *Non Applicability*

Pursuant to 45CSR19, Section 3.1, 45CSR19 "applies to all major stationary sources and major modifications to major stationary sources proposing to construct anywhere in an area which is designated nonattainment." As mentioned earlier Brooke County, WV is classified as in attainment with all NAAQS except that the Cross Creek tax district is classified as Nonattainment for SO_2. Also as mentioned earlier, the proposed facility will not be located in the Cross Creek tax district and would not be a major source for SO_2 anyway.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The ESC Brooke County Power I, LLC facility is subject to the requirements Title V and shall be required to submit their Title V permit application within 12 months after the date of the commencement of the operation or activity (activities) authorized by the proposed permit.

45CSR33: Acid Rain Provisions and Permits

45CSR33 incorporates by reference applicable requirements under 40 CFR 72-77. The proposed combustion turbines will be subject to the Acid Rain Program including emissions standards (40 CFR 72.9), monitoring requirements (40 CFR 75) and permitting provisions (40 CFR 72.3).

45CSR34: Emission Standards for Hazardous Air Pollutants

45CSR34 incorporates by reference applicable requirements under 40 CFR 61, 40 CFR 63 and Section 112 of the Clean Air Act. 40 CFR 63 Subpart ZZZZ applies to the facility (see below under ***Federal Regulations***).

Federal Regulations

40 CFR 60, Subpart Db: Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

Subpart Db has requirements relating to limiting the emissions of NO_x, Particulate Matter, and SO_2 from electric steam generating units. However, natural gas fired boilers are exempt from the PM and SO_2 emission standards. The following discusses the substantive applicable requirements of Subpart Db relating to the auxiliary boiler. Note that per §60.4305(b), duct burners subject to Subpart KKKK are exempt from Subpart Db.

Subpart Db Applicability - Section §60.40b

Pursuant to §60.40b(a), the affected facility to which Subpart Db applies is each steam generating unit that is capable of combusting greater than 29 megawatts (100 million Btu/hour) heat input for which construction, reconstruction or modification is commenced after June 19, 1984. The proposed ESC Brooke County Power I, LLC auxiliary boiler meets these requirements and is subject to the applicable requirements of Subpart Db.

Subpart Db Pollutant Emission Standards - Section §60.42b, §60.43b and §60.44b

Per §60.42b(a) and §60.43b(a), the PM and SO_2 emission standards only apply to steam generating units that burn coal or coal in combination with other fuels. Since the auxiliary boiler will burn only natural gas, it is exempt from these emission standards.

Per §60.44b, NOx emissions are limited to either 0.10 lb/mmbtu or 0.20 lb/mmbtu depending on whether the boiler has a low or high volumetric heat release.

Subpart Db Emissions Monitoring - Section §60.48b

Per §60.48b(b) ESC must install, calibrate and maintain a Continuous Emissions Monitoring System (CEMS) for NO_x and O_2 (or CO_2).

Subpart Db Notification Requirements - Section §60.49b(a)

Section §60.49b(a) outlines the notification of construction and actual startup requirements. ESC Brooke County Power I, LLC is subject to these requirements.

Subpart Db Record-Keeping Requirements - Section §60.48b(b) and Section §60.48b(g)

Sections §60.48b(b) and (g) outline the monitoring and record-keeping requirements. ESC Brooke County Power I, LLC is subject to these requirements.

40 CFR 60, Subpart KKKK: Standards of Performance for Stationary Combustion Turbines

Subpart KKKK has requirements relating to limiting the emissions of NO_x and SO_2 from combustion turbines. The following discusses the substantive applicable requirements of Subpart KKKK relating to the turbines and associated duct burners.

Subpart KKKK Applicability - Section §60.4305(a)

Pursuant to §60.4305(a), Subpart KKKK applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 mmbtu) per hour, based on the higher heating value of the fuel, which commenced construction, modification, or reconstruction after February 18, 2005. Therefore, the combustion turbines are subject to 40 CFR 60 Subpart KKKK.

Subpart KKKK Pollutant Emission Standards - Section §60.4320 and §60.4330

Section §60.4320 requires that turbines meet the NO_x emission standards in Table 1 of the Subpart. Since the turbines at the ESC Brooke County Power I, LLC Plant will be new and greater than 850 mmbtu/hr each, Table 1 requires that they meet a NO_x emission limit of 15 ppmvd at 15% oxygen or 0.43 lb/MW-hr gross energy output.

Section §60.4330(a)(1) and (2) requires that the turbines meet an SO_2 standard of either 0.90 lb/MW-hr gross energy output or 0.060 lb/mmbtu heat input.

Subpart KKKK Other Requirements

Subpart KKKK includes general compliance requirements (60.4333), monitoring requirements (60.4335-60.4370), reporting requirements (60.4375-60.4395), and performance testing requirements (60.4400-60.4415).

40 CFR 60, Subpart GG: Standards of Performance for Gas Turbines - *Non Applicability*

Note that per §60.4305(b), combustion turbines subject to Subpart KKKK are exempt from Subpart GG.

40 CFR 60, Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Subpart IIII contains requirements relating to the performance of compression ignition engines. ESC Brooke County Power I, LLC proposes to use a fire water pump and an emergency generator that are Subject to Subpart IIII. The following discusses the substantive applicable requirements of Subpart IIII relating to the ESC Brooke County Power I, LLC Plant.

Subpart IIII Applicability - Section §60.4200

Pursuant to §60.4200, compression ignition engines manufactured after July 11, 2005 are subject to the subpart. Therefore, Subpart IIII will be applicable to the fire water pump engine and the emergency generator at the proposed ESC Brooke County Power I, LLC Plant.

Subpart IIII Emission Standards - Section §60.4204 and §60.4205

§60.4204 and §60.4205 sets the following standards for the engines (all standards in g/hp-hr):

Table 13: Subpart IIII Emission Standards

Engine	NMHC + NO_x	CO	PM
Fire Water Pump Engine[1]	3	2.6	0.15
Emergency Generator[2]	4.8	2.6	0.15

[1] §60.4204(b)→§60.4201(a)→§89.112(a)
[2] §60.4205(b)→§60.4202(a)(2)→§89.112(a)

Subpart IIII Fuel Requirements - Section §60.4207

Since both engines have a displacement of less than 30 liters per cylinder, per §60.4207 (b), they must use diesel fuel that meets the requirements of 40 CFR 80.510(b) for nonroad diesel fuel.

40 CFR 60, Subpart TTTT: Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units

Subpart TTTT Applicability - Section §60.5509

Since the ESC Brooke County Power I, LLC facility will be a “stationary combustion turbine that commenced construction after January 8, 2014" that has a “base load rating greater than 260 GJ/h (250 mmbtu/h) of fossil fuel (either alone or in combination with any other fuel)” and “serves a generator or generators capable of selling greater than 25 MW of electricity to a utility power distribution system” it will be subject to Subpart TTTT.

Subpart TTTT Emission Standards - Section §60.5520

Table 2 of Subpart TTTT limits CO_2 emissions from new stationary combustion turbines to 1,000 pounds of CO_2 per megawatt-hour on a gross energy output basis.

40 CFR 63, Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ Applicability - §63.6585

Pursuant to §63.6585, stationary reciprocating internal combustion engines that are not being tested at a stationary RICE test cell/stand are subject to Subpart ZZZZ. Therefore, Subpart ZZZZ will be applicable to the fire water pump engine and the emergency generator at the proposed ESC Brooke County Power, LLC Plant.

Subpart ZZZZ Requirements - §63.6590

Pursuant to §63.6590(c)(1) new stationary RICEs at area sources of HAPs must meet the requirements of 40 CFR 60 Subpart IIII (see previous discussion). No other requirements apply to such engines.

Compliance Assurance Monitoring (CAM)

Pursuant to the requirements concerning enhanced monitoring and compliance certification under the CAAA of 1990, the EPA has promulgated regulations codified at 40 CFR 64 to implement compliance assurance monitoring (CAM) for major stationary sources. The CAM provisions of 40 CFR 64 are applicable to major stationary sources that meet the following three criteria: (1) unit is subject to an emission limit for a regulated compound, (2) use a control device (as defined in 40 CFR 64.1) to achieve compliance with the limit, and (3) have pre-control emissions equivalent to major source levels. The only "source" that has pre-control emissions above the major trigger (i.e. 100 tons per year) are the turbines (which have CO, $PM/PM_{10}/PM_{2.5}$ and NO_x emissions of > 100 tpy). However, per 40 CFR 64.2(b)(1)(i), units subject to emission limitations required by a post November 15, 1990 NSPS are exempt from CAM for that pollutant. Therefore, since ESC Brooke County Power I, LLC is subject to 40 CFR 60 Subpart KKKK, it is exempt from CAM for NO_x. Additionally, the turbine will use no control device to meet its $PM/PM_{10}/PM_{2.5}$ limits. For CO (and NO_x), the turbines will be equipped with a Continuous Emissions Monitoring System (CEMS). CEMS are considered a continuous compliance determination method as defined in 40 CFR 64.1. Pursuant to 40 CFR 64.2(b)(1)(vi), pollutants monitored using a continuous compliance determination method are exempt from CAM. Therefore, the combustion turbines are exempt from CAM.

Summary of Applicable Rules

The following table lists each emission point located at the ESC Brooke County Power I, LLC Plant and any substantive applicable rule (this table does not include "process" rules such as 45CSR13 and 45CSR14 only those with applicable emission limits) thereto:

Table 14: Applicable Rules

EP No.	Description	Source ID Nos.	Applicable Rules
BCCT-1,2	Combined Cycle Combustion Turbines	BCCT-1,2	40 CFR 60 Subparts KKKK and TTTT
BCCT-1,2	HRSG w/duct burner	HRSG-1,2	40 CFR 60 Subpart KKKK, 45CSR2, 45CSR10
AB-1	Auxiliary Boiler	AB-1	45CSR2, 45CSR10, 40 CFR 60 Subpart Db
FP-1	Fire Water Pump	FP-1	40 CFR 60 Subpart IIII, 40 CFR 60 Subpart ZZZZ
EG-1	Emergency Generator	EG-1	40 CFR 60 Subpart IIII, 40 CFR 60 Subpart ZZZZ
FGH-1,2	Fuel Gas Heaters	FGH-1,2	45CSR2, 45CSR10
ST-1	500 Gal. Fire Water Pump Diesel storage tank	ST-1	N
ST-2	3,000 gallon Em. Gen. Diesel storage tank	ST-2	N

PSD REVIEW REQUIREMENTS

In 1977 Congress passed the Clean Air Act Amendments (CAAA), which included the Prevention of Significant Deterioration (PSD) program. This program was designed to allow industrial development in areas that were in attainment with the NAAQS without resulting in a non-attainment designation for the area. The program, as implied in the name, *permits the deterioration of the ambient air in an area (usually a county) as long as it is within defined limits (defined as increments)*. The program, however, *does not allow for a significant (as defined by the rule) deterioration of the ambient air*. The program prevents significant deterioration by allowing concentration levels *to increase* in an area within defined limits - called pollutant increments - as long as they never increase enough to exceed the NAAQS. Projected concentration levels are calculated using complex computer simulations that use meteorological data to predict impacts from the source's potential emission rates. The concentration levels are then, in turn, compared to the NAAQS and increments to verify that the ambient air around the source does significantly deteriorate (violate the increments) or violate the NAAQS. The PSD program also requires application of best available control technology (BACT) to new or modified sources, protection of Class 1 areas, and analysis of impacts on soils, vegetation, and visibility.

WV implements the PSD program as a SIP-approved state through 45CSR14. As a SIP-approved state, WV is the sole issuing authority for PSD permits. EPA has reviewed 45CSR14 and concluded that it incorporates all the necessary requirements to successfully meet the goals of the PSD program as discussed above. EPA retains, however, an oversight role in WV's administration of the PSD program.

As stated above, the construction of the ESC Brooke County Power I, LLC Plant is defined as construction of a "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, NO_x, $PM_{2.5}$, PM_{10}, TSP, VOCs, H_2SO_4 and Greenhouse Gases. The substantive requirements of a PSD review includes a best available control technology (BACT) analysis, a modeling analysis, and an additional impacts analysis - each of which will be discussed below.

BACT Analysis

Pursuant to 45CSR14, Section 8.2,ESC Brooke County Power I, LLC is required to apply BACT to each emission source that is constructed and emits a PSD pollutant (VOCs, CO, NO_x, PM_{10}, PM, $PM_{2.5}$, H_2SO_4 and GHGs). BACT is defined under §45-14-2.12 as:

> ". . .an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Secretary, on a case-by-case basis, taking into account energy, environmental and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any federally enforceable emissions limitations or emissions limitations enforceable by the Secretary. If the Secretary determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

A determination of an appropriate BACT emission limit is conducted by using a "top-down" analysis. The key steps in performing a "top-down" BACT analysis are the following: 1) Identification of all applicable control technologies; 2) Elimination of technically infeasible options; 3) Ranking remaining control technologies by control effectiveness; 4) Evaluation of most effective controls and documentation of results; and 5) the selection of BACT. Also included in the BACT selection process is the review of BACT determinations at similar facilities using the RACT/BACT/LAER Clearinghouse (RBLC). The RBLC is a database of RACT, BACT, and LAER determinations maintained by EPA and updated by the individual permitting authorities. It can be accessed online at http://cfpub.epa.gov/rblc/. ESC Brooke County Power I, LLC included a BACT analysis in their permit application generally using the top-down approach as described above. Their complete analysis, including appropriate economic calculations, is included in the ESC Brooke County Power I, LLC permit application and amendments and revisions thereto.

The following table summarizes the ESC Brooke County Power I, LLC BACT selections.

Table 15: ESC Brooke County Power I, LLC BACT Selection

Source	PSD Pollutant											
	CO		NO_x		$PM_{2.5}/PM_{10}/PM^{1)}$		VOCs		H_2SO_4		GHGs	
	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit (CO_{2e})	Tech.(3)
Turbines / Dbs (4)	2.0 ppmvd	OC, CP	2.0 ppmvd	DLNB, SCR, CP	0.008 lb/mmbtu	AF, NG, CP	1ppmvd 2ppmvd	OC, CP	0.00085 lb/mmbtu	NG	829 lb/ MW-hr(5)	NG, GE7HA
Aux. Boiler	0.037 lb/mmbtu	CP	0.011 lb/mmbtu	LNB, CP	0.008 lb/mmbtu	NG, CP	0.008 lb/mmbtu	CP, NG	0.0001 lb/mmbtu	NG	14,768 lb/hr	NG
Fuel Gas Heaters	0.039 lb/mmbtu	CP	0.036 lb/mmbtu	LNB, CP	0.008 lb/mmbtu	NG, CP	0.007 lb/mmbtu	CP, NG	0.0001 lb/mmbtu	NG	3,120 tpy	NG
Fire Water Pump	0.44 g/hp-hr	CP	2.69(2) g/hp-hr	CP	0.075 g/hp-hr	ULSD, CP	3.0(2) g/hp-hr	CP	0.00023 lb/mmbtu	ULSD	17.2 tpy	ULSD, CP
Emergency Gen.	0.3 g/hp-hr	CP	4.8(2) g/hp-hr	CP	0.025 g/hp-hr	ULSD, CP	4.8(2) g/hp-hr	CP	0.00023 lb/mmbtu	ULSD	158 tpy	ULSD, CP

(1) PM emission rates are given in total particulate (filterable + condensable) matter
(2) $NMHC+NO_x$
(3) CP=Good Combustion Practices; SCR = Selective Catalytic Reduction; DLNB = Dry Low NOx Burners; LNB = Low NOx Burners; OC = Oxidation Catalyst; AF = inlet air filtration; NG = Use of Natural Gas, Ethane or a natural gas/ethane blend as a fuel; ULSD = use of Ultra Low Sulfur Diesel as a fuel; GE7HFA = use of GE Frame 7HA.01 turbine or equivalent.
(4) Where 2 limits exist, the upper limit is without duct firing and the bottom limit is with duct firing.
(5) Compliance shall be based on initial manufacturer design basis for combined cycle gross MW output, at 52°F ambient temperature, with duct firing, operating at base load and natural gas fuel.

The following will review the above ESC Brooke County Power I, LLC BACT selections on a by-source category basis. For each process, the review examines the following five salient steps generally followed in the top-down process: (1) Technology Identification, (2) Technically Infeasible Determinations, (3) Effectiveness Ranking of Remaining Technologies, (4) Economically Infeasible Determinations, and (5) RBLC Comparison.

Combustion Turbines/Duct Burners

NO_x

(1) Technology Identification: ESC Brooke County Power I, LLC identified the following as potential NO_x control technologies applicable to the Combustion Turbines / Duct Burners;

* Water or Steam Injection
* Dry Low NO_x Burners
* SCR
* SNCR
* $SCONO_x^{TM}$ (aka EM_x^{TM})

(2) Technically Infeasible Determinations: The only technologies that were determined to be technically infeasible under (1) above was the use of SNCR and SCONO$_x$. The demonstrated application for SCONO$_x$ is currently limited to combined cycle combustion turbines under approximately 50 MW in size. The combustion turbines proposed for this project are approximately 475 MW in size. Therefore, the technology was considered infeasible. ESC also stated that SNCRs were not technically feasible because they require exhaust temperatures significantly higher than will occur at ESC (and likely higher than any combined cycle gas turbines would produce). However, since ESC chose a more effective technology (see below) the question is largely moot.

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC ranked Dry Low NOx Burners in combination with SCR as the top control technology with a resulting NOx emission rate of 2.0 ppmvd @ 15% O_2.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent final entries for large gas fired combined cycle combustion turbines from the RBLC (note only entries with NO_x emissions stated as ppm were considered):

RBLC ID	Date	Company	BACT Emission Limit
MI-0427	11/17/2017	Filer City	3.0 ppm
TX-0819	04/28/2017	SW PSC	2.0 ppm
MI-0423	01/04/2017	Indek Niles, LLC	3.0 ppm
MI-0424	12/05/2016	Holland BPW	3.0 ppm
LA-0313	08/31/2016	Entergy LA, LLC	2.0 ppm
Avg. Emission Limit			2.6ppm

With respect to NO_x emissions, ESC Brooke County Power I, LLC's proposed emission rate of 2 ppmvd is the same or better than other recent RBLC entries. None of the other units employed any NO_x control technology other than DLNB and/or SCR.

CO

(1) Technology Identification: ESC Brooke County Power I, LLC identified Oxidation Catalysts and EM$_x^{TM}$ as the only potential control technologies.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that EM$_x^{TM}$ was not considered feasible for reasons discussed under "NO_x".

(3) Effectiveness Ranking of Remaining Technologies: Oxidation Catalyst is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent final entries for large gas fired combined cycle combustion turbines from the RBLC:

RBLC ID	Date	Company	BACT Emission Limit
MI-0427	11/17/2017	Filer City	4.0 ppm
TX-0819	04/28/2017	SW PSC	2.0 ppm
MI-0423	01/04/2017	Indek Niles, LLC	4.0 ppm
MI-0424	12/05/2016	Holland BPW	4.0 ppm
LA-0313	08/31/2016	Entergy LA, LLC	2.0 ppm
Avg. Emission Limit			3.2 ppm

With respect to CO emissions, ESC Brooke County Power I, LLC's proposed emission rate of 2.0 ppm is significantly more stringent than the average of the last 5 entries into the RBLC.

$PM/PM_{10}/PM_{2.5}$

(1) Technology Identification: ESC Brooke County Power I, LLC identified the following as potential particulate control technologies applicable to the Combustion Turbine / Duct Burners;

* Cyclones/Centrifugal Collectors
* Fabric Filters/Baghouses
* Electrostatic Precipitators (ESPs)
* Scrubbers
* Good Combustion Practices/high efficiency filtration of the turbine inlet and SCR dilution air.

(2) Technically Infeasible Determinations: Each of the post-combustion control technologies (i.e. cyclones, baghouses, ESPs and scrubbers) are generally available. However, none of the technologies are considered practical or technically feasible for installation on gaseous fuel fired combustion turbines.

The particles emitted from gaseous fuel-fired sources are typically less than 1 micron in diameter. Cyclones are not effective on particles with diameters of 10 microns or less. Therefore, a cyclone/centrifugal collection device is not a technically feasible alternative.

Baghouses, ESPs, and scrubbers have never been applied to commercial combustion turbines burning gaseous fuels. Baghouses, ESPs, and scrubbers are typically used on solid or liquid-fuel fired sources with high PM emission concentrations, and are not used in gaseous fuel-fired applications, which have inherently low PM emission concentrations. None of these control technologies are appropriate for use on gaseous fuel fired combustion turbines because of their very low PM emissions levels, and the small aerodynamic diameter of PM from gaseous fuel combustion. Review of the RBLC, indicates that post-combustion controls have not been required as BACT for gaseous fuel-fired combined-cycle combustion turbines. Therefore, the use of baghouses, ESPs, and scrubbers is not considered technically feasible.

(3) Effectiveness Ranking of Remaining Technologies: The only remaining technology is filtration of the turbine inlet air and SCR dilution air.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent final entries for large gas fired combined cycle combustion turbines from the RBLC.

RBLC ID	Date	Company	BACT Emission Rate (lb/mmbtu)
MI-0427	11/17/2017	Filer City	0.0066
MI-0423	01/04/2017	Indek Niles, LLC	0.0048
MI-0424	12/05/2016	Holland BPW	0.014
LA-0313	08/31/2016	Entergy LA, LLC	0.0082
NJ-0085	07/19/2016	Stonegate Power	0.0045
Avg. Emission Rate			0.0076

With respect to particulate emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.008 pounds per hour is consistent with the average of the last 5 entries into the RBLC. Additionally, none of the entries required post combustion controls.

VOCs

(1) Technology Identification: ESC Brooke County Power I, LLC identified Oxidation Catalysts and EM_x^{TM} as the only potential VOC control technologies.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that EM_x^{TM} was not considered feasible for reasons discussed under "NO_x".

(3) Effectiveness Ranking of Remaining Technologies: Oxidation Catalyst is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent final entries for large gas fired combined cycle combustion turbines from the RBLC (note only entries with VOC emissions stated as ppm were considered):

RBLC ID	Date	Company	BACT Emission Rate
TX-0819	04/28/2017	SW PSC	3.5 ppm
MI-0423	01/04/2017	Indek Niles, LLC	4.0 ppm
MI-0424	12/05/2016	Holland BPW	4.0 ppm
LA-0313	08/31/2016	Entergy LA, LLC	2.0 ppm
NJ-0085	07/19/2016	Stonegate Power	2.0 ppm
Avg. Emission Rate			3.1 ppm

With respect to VOC emissions, ESC Brooke County Power I, LLC's proposed emission rate of 1.0 ppm without duct firing and 2.0 ppm with duct firing is consistent with the average of the last 5 entries into the RBLC.

H_2SO_4

(1) Technology Identification: ESC Brooke County Power I, LLC identified only use of natural gas and Flue Gas Desulfurization as potential control technologies.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that post combustion add-on control technologies were not feasible based upon a review of the RBLC. Specifically, ESC states "Based upon a review of the RBLC search

results, existing permits for similar combined-cycle CTs, CT vendor information and technical literature, post-combustion controls have not been applied to CTs.”.

(3) Effectiveness Ranking of Remaining Technologies: Use of pipeline quality natural gas is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent final entries for large gas fired combined cycle combustion turbines with H_2SO_4 limits from the RBLC (note that only entries with a grains of sulfur BACT limit were included):

RBLC ID	Date	Company	BACT Emission Rate (gr S / 100 scf gas)
TX-0788	03/24/2016	APEX Texas Power	0.25[1]
FL-0356	03/09/2016	Florida Power and Light	2.0
TX-0789	03/08/2016	Decordova II Power Co	1.0[1]
TX-0730	04/01/2015	Colorado Bend II Power	0.5[1]
TX-0714	12/19/2014	NRG Texas Power	0.5
Avg. Emission Rate			0.85

[1]Anuual Average

As can be seen from the table, ESCs proposed limit of 0.4 grains of sulfur per 100 standard cubic feet of natural gas is more stringent than all but one entry and compares very favorably to the average of the last five determinations.

GHGs

1) Technology Identification:

Carbon Capture and Storage

Carbon Capture and Storage (CCS) is the only potentially available add-on control option at this time. In order to capture CO_2 emissions from the flue gas, CO_2 must be separated from the exhaust stream. This can be accomplished by a variety of technologies that may include:

- Pre-combustion systems designed to separate CO_2 and hydrogen in the high-pressure synthetic gas typically produced at Integrated Gasification Combined-Cycle (IGCC) power plants; and

- Post-combustion systems that separate CO_2 from flue gas such as:

    - Chemical absorption using an aqueous solution of amines as chemical solvents; or

    - Physical absorption using physical absorption processes such as Rectisol or Selexol.

Separation can be facilitated using oxygen combustion, which employs oxygen instead of ambient air for make-up air supplied for combustion. Applicability of different processes to particular applications will depend on temperature, pressure, CO_2 concentrations, and the presence or absence of contaminants in the gas or exhaust stream.

After CO_2 is separated, it must be prepared for beneficial reuse or transport to a sequestration or storage facility, if a storage facility is not locally available for direct injection. In order to transport CO_2 it must be compressed and delivered via pipeline to a storage facility. Although beneficial reuse options are developing, such as the use of captured material to enhance oil or gas recovery from well fields in the petroleum industry, currently, the demand for CO_2 for such applications is well below the quantity of CO_2 that is available for capture from EGUs.

Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. Sequestration of CO_2 is generally accomplished by injecting captured CO_2 at high pressures into deep subsurface formations for long-term storage. These subsurface formations must be either local to the point of capture, or accessible via pipeline, to enable the transportation of recovered CO_2 to the permanent storage location. Storage facilities typically include:

1) Geologic formations;
2) Depleted oil and gas reservoirs;
3) Unmineable coal seams;
4) Saline formations;
5) Basalt formations; or
6) Terrestrial ecosystems.

Once injected, the pressurized CO_2 remains “supercritical” and behaves like a liquid. Supercritical CO_2 is denser and takes up less space than gaseous CO_2. Once injected, the CO_2 occupies pore spaces in the surrounding rock. Saline water that already resides in the pore space would be displaced by the denser CO_2. Over time, the CO_2 can dissolve in residual water, and chemical reactions between the dissolved CO_2 and rock can create solid carbonate minerals, more permanently trapping the CO_2.

Thermal Efficiency

An emissions reduction strategy focused on energy efficiency primarily deals with increasing the thermal efficiency of a combustion turbine. Higher thermal efficiency means that less fuel is required for a given output, which results in lower GHG emissions. Maximizing EGU efficiency is an alternative available to reduce the consumption of fuel required to generate a fixed amount of output. The largest efficiency losses for a combined-cycle combustion turbine are inherent in the design of the combustion turbine and the heat recovery system. The mechanical input to the combustion turbine compressor consumes energy, and is integral to how a combustion turbine works. Therefore, there is no opportunity for efficiency gains other than the differences in design between manufacturers or models. Heat recovery in the exhaust gas is another point of efficiency loss. Heat recovery efficiency depends upon the design of the heat recovery system, and varies between manufacturers and models.

The efficiency of the combustion turbines/duct burners employed can vary widely. One alternative to reduce CO_2 emissions is to maximize combustion turbine efficiency through various design techniques. Any increase in energy efficiency within the operation of the combustion turbine yields reductions in the generation of CO_2 emissions on a per unit output basis. For example, combustion turbine suppliers typically offer several different models with a variety of efficiency ratings.

Combustion Air Cooling

A common method used to improve the energy efficiency of combustion turbines is to cool the combustion air entering the combustion turbines during the summer months. Cooling the combustion air via heat exchanger systems maximizes the expansion of the air molecules and enhances the work the expanding gases perform on the turbine blades, hence producing higher amounts of electricity. A higher electric output improves the overall efficiency of the EGU. Based on general guidance available and recent analyses conducted regarding combustion air cooling, achievable reductions in fuel usage and CO_2 emissions may range from 10 -15%.

Lower Carbon Fuels

Carbon dioxide is produced as a combustion product of any carbon containing fuel. All fossil fuels contain varying amounts of fuel-bound carbon that is converted during the combustion process to produce CO_2 and CO. However, the use of lower carbon content gaseous fuels such as pipeline-quality natural gas or ethane, compared to the use of higher carbon-containing fuels such as coal, pet-coke or residual fuel oils, can reduce CO_2 emissions from combustion.

Natural gas and ethane combustion results in significantly lower GHG emissions than coal combustion (117.0 lb/mmbtu, for natural gas and 131.4 lb/mmbtu for ethane versus 205.6 lb/mmbtu for bituminous coal). The use of lower carbon containing fuels in combustion turbines is an effective means to reduce the generation of CO_2 during the combustion process.

(2) Technically Infeasible Determinations:

Carbon Capture and Storage

In general, the availability of add-on control options to remove GHGs from an EGU exhaust stream is limited. CCS is the only potentially available add-on control option at this time, but this technology is limited and in the early stages of its development.

Although numerous carbon capture, storage, and beneficial CO_2 use demonstration projects are in various stages of planning and implementation across the globe, including several in the U.S. that are funded by the Department of Energy (DOE), the technologies needed for a full-scale generating facility are not yet commercially available.

Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. The geological formations near the ESC project provide limited, if any, alternatives to adequately and permanently store recovered CO_2.

Extensive characterization studies would be needed to determine the extent and storage potential for CO_2 from ESC sources. These studies would take several years of investigation, including drilling characterization wells, and would likely require small-scale injection testing before determining their full-scale viability.

There are neither local geologic reservoirs, nor pipelines dedicated to CO_2 transport available near the proposed project at this time. In addition, carbon capture technologies have yet to be demonstrated on a full-scale power generation facility. Therefore, options involving CCS are not currently considered feasible for this project.

It should also be noted that the proposed BACT limit of 829 lb/MW-hr (see below) is significantly less than EPA's NSPS GHG limit of 1,000 lb/MW-hr for new natural gas fired turbines greater than 250 MW. Additionally, EPA notes that new turbines should be able to meet this limit without any add on controls. Given that this is a relatively new addition to the NSPS (finalized October 23, 2015) that addresses new construction, it seems that USEPA would have implemented a requirement for CCS if the technology was currently considered practical.

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC ranked using thermally efficient turbines in conjuction with lower carbon fuels as the top control technology with a resulting GHG emission rate of 829 lb CO_{2e}/MW-hr (based on gross MW output, combined cycle mode, and duct firing).

Although combustion air cooling is considered technically feasible, other options such as a more efficient combustion turbine are considered more effective in terms of overall net environmental benefit. The proposed combustion turbines will be equipped with inlet evaporative cooling systems, which are a form of combustion air cooling.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technologies, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large gas fired combined cycle combustion turbines from the RBLC (note that only entries with GHG emission limits in lb/MW-hr were used):

RBLC ID	Date	Company	BACT Emission Rate
TX-0819	04/28/2017	SW PSC	960 lb/MW-hr
MI-0423	01/04/2017	Indek Niles, LLC	802 lb/MW-hr
MI-0424	12/05/2016	Holland BPW	992 lb/MW-hr
LA-0313	08/31/2016	Entergy LA, LLC	1,000 lb/MW-hr
NJ-0085	07/19/2016	Stonegate Power	888 lb/MW-hr
Avg. Emission Rate			928.4 lb/MW-hr

Comparisons among the various combustion turbines are somewhat complicated in that different bases can be used to establish certain parameters. For example, combustion turbine outputs can be specified on a net or gross basis, and can vary based on fuel, load, ambient temperature, whether duct firing is occurring, and other factors. GHG emission rates can be specified on a LHV or HHV basis. Nevertheless, in context, the ESC Brooke County Power I, LLC combustion turbines compare favorably (calculated emission rate of 829 lb/MW-hr, combined cycle mode) with other recent combustion turbine projects in terms of output-based GHG emission rates and heat rates, which indicates that the proposed combustion turbines represent an efficient design that has been accepted as BACT for GHGs in other PSD permits. It should be noted that ESC Brooke County Power I, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, fuel gas heaters, emergency generator, fire water pump and circuit breakers) of 3,695,535 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit.

Auxiliary Boiler

NO_x

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential control technologies (other than low NO_x burners and good combustion practices) for control of NO_x from the auxiliary boiler. However, SCR should have been included in this step since they can be used to control NO_x emissions from boilers.

(2) Technically Infeasible Determinations: Despite the fact that ESC Brooke County Power I, LLC did not identify SCRs as a potential control technology, EPAs Air Pollution Control Technology Fact Sheet for SCRs says that SCRs can be used and are cost

effective for natural gas fired boilers over 50 mmbtu/hr. Therefore, in the writers opinion, SCR must be evaluated for use on the auxiliary boiler.

(3) Effectiveness Ranking of Remaining Technologies: SCR in combination low NO_x burners is the top control technology. Use of low NO_x burners without SCR is the remaining technology.

(4) Economically Infeasible Determinations: Since ESC did not identify SCR as a potential control technology, they obviously did not submit an economic analysis to determine whether or not one was cost effective. However, given that proposed annual emissions from the boiler total only 2.82 tons per year, it is obvious that an SCR would not be economically feasible. According to EPAs Air Pollution Control Technology Fact Sheet, SCRs remove approximately 70%-90% of NO_x. In this case, even a 90% removal efficiency would only reduce emissions by less than 2.54 tons per year. Even if you assume $10,000 per ton to be economically feasible (an extraordinary assumption) the entire SCR system would have to be installed and operated at a an annualized cost of less than $25,400. This is obviously not the case. This high incremental cost effectiveness number is driven by the already low NO_x emission rate and the limited hours of operation of the auxiliary boiler (the auxiliary boiler will be limited to no more than the equivalent of 4,576 hours of operation a year at maximum capacity.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired boilers (between 100 and 250 mmbtu/hr) from the RBLC.

RBLC ID	Date	Company	BACT Emission Rate
MI-0427	11/17/2017	Filer City	0.04 lb/mmbtu
MI-0423	01/04/2017	Indek Niles, LLC	0.04 lb/mmbtu
VA-0325	06/17/2016	VEPCO	0.011 lb/mmbtu
TN-0162	04/19/2016	TVA	0.013 lb/mmbtu
PA-0306	02/12/2016	Tenaska PA Partners	0.011 lb/mmbtu
Avg. Emission Rate			0.023 lb/mmbtu

With respect to NO_x emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.011 lb/mmbtu obviously compares favorably with other recent RBLC entries.

CO

(1) Technology Identification: ESC Brooke County Power I, LLC could not identify any potential control technologies for control of CO from the auxiliary boiler. However, Oxidation Catalyst should have been included in this step since it is used to control CO emissions from other types of fuel combustion sources.

(2) Technically Infeasible Determinations: The writer determined Oxidation Catalysts to be technically infeasible for the auxiliary boiler. Oxidation catalysts are used to reduce CO emissions from natural gas or oil-fired combustion turbines, with typical CO reductions of 50 – 90%. However, oxidation catalysts have limited demonstration on boilers.

Oxidation catalysts operate according to the following general reaction:

$2CO + O_2 \rightarrow 2CO_2$

Typical excess oxygen (O_2) levels in combustion turbines are 12 – 15%, compared to 1.5 – 7% in natural gas fired boilers ("BOILER TUNE-UP GUIDE FOR NATURAL GAS AND LIGHT FUEL OIL OPERATION" Greg Harrell, PH.D., P.E.). These low excess O_2 levels will limit the effectiveness of the oxidation catalyst.

Additionally, the writer could find no entries in the RBLC where oxidation catalysts had actually been demonstrated.

(3) Effectiveness Ranking of Remaining Technologies: Good combustion practices are the only technologies remaining.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired boilers (between 100 mmbtu/hr and 250 mmbtu/hr) from the RBLC. Note only entries with CO emissions stated as lb/mmbtu (or which were easily converted to lb/mmbtu) were considered:

RBLC ID	Date	Company	BACT Emission Rate
MI-0427	11/17/2017	Filer City	0.04 lb/mmbtu
MI-0423	01/04/2017	Indek Niles, LLC	0.04 lb/mmbtu
VA-0325	06/17/2016	VEPCO	0.035 lb/mmbtu
TN-0162	04/19/2016	TVA	0.084 lb/mmbtu
PA-0306	02/12/2016	Tenaska PA Partners	0.037 lb/mmbtu
Avg. Emission Rate			0.0472 lb/mmbtu

With respect to CO emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.037 lb/mmbtu is comparable to other recent RBLC entries. None of the other units employed any CO control technology other than good combustion practices.

$PM_{2.5}$/PM_{10}/PM

(1) Technology Identification: ESC Brooke County Power I, LLC identified the following as potential particulate control technologies applicable to the Auxiliary Boiler;

* Cyclones/Centrifugal Collectors
* Fabric Filters/Baghouses
* Electrostatic Precipitators (ESPs)
* Scrubbers
* Good Combustion Practices / use of natural gas

(2) Technically Infeasible Determinations: Each of the post-combustion control technologies (i.e. cyclones, baghouses, ESPs and scrubbers) are generally available. However, none of the post combustion, add on control technologies are considered practical or technically feasible for installation on gaseous fuel fired boilers.

The particles emitted from gaseous fuel-fired units are typically less than 1 micron in diameter. Cyclones are not effective on particles with diameters of 10 microns or less. Therefore, a cyclone/centrifugal collection device is not a technically feasible alternative.

Baghouses, ESPs, and scrubbers have never been applied to commercial small boilers burning gaseous fuels. Baghouses, ESPs, and scrubbers are typically used on solid or liquid-fuel fired sources with high PM emission concentrations, and are not used in gaseous fuel-fired applications, which have inherently low PM emission concentrations. None of these control technologies is appropriate for use on small gaseous fuel fired boilers because of their very low PM emissions levels, and the small aerodynamic diameter of PM from gaseous fuel combustion. Review of the RBLC, indicates that post-combustion controls have not been required as BACT for gaseous fuel-fired boilers. Therefore, the use of baghouses, ESPs, and scrubbers is not considered technically feasible.

(3) Effectiveness Ranking of Remaining Technologies: The only remaining technology is good combustion practices.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for gas fired boilers between 100 and 250 mmbtu/hr from the RBLC. Note only entries with either particulate emissions stated as lb/mmbtu (or with enough information to easily convert limits to lb/mmbtu were considered). Additionally, only entries addressing total Particulate Matter (filterable and condensable) were used.

RBLC ID	Date	Company	BACT Emission Rate
MI-0427	11/17/2017	Filer City	0.0075 lb/mmbtu
MI-0423	01/04/2017	Indek Niles, LLC	0.0075 lb/mmbtu
VA-0325	06/17/2016	VEPCO	0.007 lb/mmbtu
TN-0162	04/19/2016	TVA	0.008 lb/mmbtu
PA-0306	02/12/2016	Tenaska PA Partners	0.075 lb/mmbtu
Avg. Emission Rate			0.0075 lb/mmbtu

With respect to PM/PM_{10}/$PM_{2.5}$ emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.008 lb/mmbtu is comparable to other recent RBLC entries. None of the other units employed any particulate control technology other than good combustion practices. Additionally, if the BACT limit was set at the 0.0075 lb/hr average it would reduce PM emissions by less than 0.13 tons per year.

VOCs

(1) Technology Identification: ESC Brooke County Power I, LLC could not identify any potential control technologies for control of VOCs from the auxiliary boiler. However, Oxidation Catalyst should have been included in this step since they are used to control VOC emissions from other types of fuel combustion sources.

(2) Technically Infeasible Determinations: For similar reasons to those expressed under "CO" above, the writer determined Oxidation Catalysts to be technically infeasible for the auxiliary boiler.

Additionally, the writer could find no entries into the RBLC where oxidation catalysts had actually been demonstrated on small natural gas fired boilers.

(3) Effectiveness Ranking of Remaining Technologies: Good combustion practices are the only technologies remaining.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired boilers (betweeen 100 and 250 mmbtu/hr) from the RBLC. Note only entries with VOC emissions stated as lb/mmbtu (or which were easily converted to lb/mmbtu) were considered:

RBLC ID	Date	Company	BACT Emission Rate
MI-0423	01/04/2017	Indek Niles, LLC	0.004 lb/mmbtu
PA-0306	02/12/2016	Tenaska PA Partners	0.0054 lb/mmbtu
NE-0059	03/25/2015	AG Processing Inc.	0.0054 lb/mmbtu
AK-0083	01/06/2015	Agrium US Inc.	0.0054 lb/mmbtu
WV-0025	11/21/2014	Moundsville Power	0.006 lb/mmbtu
Avg. Emission Rate			0.0052 lb/mmbtu

With respect to VOC emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.008 lb/mmbtu is higher than the average of other recent RBLC entries. However, given the limited hours of operation the boiler will be permitted for (4,576 hours per year), decreasing the limit from 0.008 lb/mmbtu to the average of 0.0052 lb/mmbtu would only decrease VOC emissions by less than 0.72 tons per year. None of the other units employed any VOC control technology other than good combustion practices.

H_2SO_4

(1) Technology Identification: ESC Brooke County Power I, LLC identified only use of natural gas as a potential control technology.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that post combustion add-on control technologies were not feasible "since there are no post-combustion control technologies available for H_2SO_4 emissions from small natural gas fired boilers...".

(3) Effectiveness Ranking of Remaining Technologies: Use of natural gas or an natural gas/ethane mix with a maximum sulfur content of 0.4 gr/100 SCF is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: A review of the RBLC found only two BACT entries in the last 10 years for boilers between 100 mmbtu/hour and 250 mmbtu/hour that had limits for sulfuric acid mist. One of those (PA-0306) contains only an annual (tons per year) limit.

RBLC ID	Date	Company	BACT Emission Rate
VA-0325	06/17/2016	VEPCO	0.0001 lb/mmbtu

With respect to H_2SO_4 emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.0001 lb/mmbtu is exactly the same as the other applicable entry in the RBLC.

GHGs

For reasons similar to those discussed under "Combustion Turbines" above, there are currently no technically feasible add on control technologies to reduce GHG emissions from the auxiliary boiler. Therefore, GHG emissions from the auxiliary boiler will be controlled by exclusive use of natural gas or a natural gas/ethane blend and good combustion practices. ESC Brooke County Power I, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of 3,695,535 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the auxiliary boiler a limit of 132 lb CO_2/mmbtu was selected based on the emission factor used. The following table includes only entries which gave limits in lb/mmbtu basis (or limits that were easily converted to lb/mmbtu). Many of the entries were expressed in tons per year. Limits expressed in tons per year are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's auxiliary boiler.

RBLC ID	Date	Company	BACT Emission Rate
VA-0325	06/17/2016	VEPCO	117.1 lb/mmbtu
TN-0162	04/19/2016	TVA	117 lb/mmbtu
AK-0083	01/06/2015	Agrium US Inc.	118 lb/mmbtu
WV-0025	11/21/2014	Moundsville Power	120.8 lb/mmbtu
AR-0121	11/18/2013	LSB Industries	117 lb/mmbtu
Avg. Emission Rate			117.67 lb/mmbtu

ESC's rate is very comparable to the other rates in the RBLC.

Emergency Generator

NO_x

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on NO_x control technologies applicable to the emergency generator. Given the purpose, size, and limited annual operating hours of the use of the emergency generator, this is reasonable. Therefore, ESC Brooke County Power I,

LLCs proposed use good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT. When choosing an actual BACT performance level ESC Brooke County Power I, LLC used a combined NO_x + NMHC limit. The combined NO_x + NMHC limit is consistent with the applicable NSPS and several of the RBLC entries. ESC Brooke County Power chose a BACT level of 4.8 g/hp-hr. This is based on the applicable Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: A review of data of recent entries for large (>500 hp) diesel fired emergency generators from the RBLC showed that most emergency generators have NOx + NMHC emission limits of 4.8 g/hp-hr.

CO

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on CO control technologies applicable to the emergency generator. Given the purpose, size, and limited annual operating hours of the emergency generator, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing resulting in a CO level of 0.3 g/hp-hr as BACT. It should be noted this is far below the 2.6 g/hp-hr applicable NSPS Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large (>500 hp) diesel fired emergency generators from the RBLC. Note that only entries with a CO limit expressed in g/hp-hr (or in units which is could easily be converted) were used.

RBLC ID	Date	Company	BACT Emission Rate
FL-0363	12/04/2017	Florida Power & Light	2.6 g/hp-hr
LA-0312	06/30/2017	South Louisiana Methanol	2.6 g/hp-hr
MI-0425	05/09/2017	Arauco North America	2.6 g/hp-hr
IN-0263	03/23/2017	Midwest Fertilizer Co.	2.6 g/hp-hr
MI-0423	01/04/2017	Indeck Niles	2.6 g/hp-hr
Avg. Emission Rate			2.6 g/hp-hr

With respect to emissions, the proposed emission rate of 0.3 g/hp-hr is far below other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

$PM/PM_{10}/PM_{2.5}$

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on PM control technologies applicable to the emergency generator. Given the purpose, size, and limited annual operating hours of the emergency generator, this seems reasonable. Therefore, ESC Brooke County Power I, LLC proposed using good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing resulting in a $PM/PM_{10}/PM_{2.5}$ level of 0.025 g/hp-hr as BACT. It should be noted that 0.15 g/hp-hr is the applicable NSPS Subpart IIII PM limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for large (>500 hp) diesel fired emergency generators from the RBLC. Note that only entries with PM emission limits expressed in terms of g/hp-hr were considered .

RBLC ID	Date	Company	BACT Emission Rate
FL-0363	12/04/2017	Florida Power & Light	0.15 g/hp-hr
LA-0312	06/30/2017	South Louisiana Methanol	0.15 g/hp-hr
IN-0263	03/23/2017	Midwest Fertilizer Co.	0.15 g/hp-hr
MI-0423	01/04/2017	Indeck Niles	0.15 g/hp-hr
PA-0310	09/02/2016	CPV Fairview	0.15 g/hp-hr
Avg. Emission Rate			0.15 g/hp-hr

With respect to emissions, the proposed emission rate of 0.025 g/hp-hr is significantly more stringent than other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

VOCs

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on VOC control technologies applicable to the emergency generator. Given the purpose, size, and limited annual operating hours of the emergency generator, this seems reasonable. Therefore, ESC Brooke County Power I, LLC proposed use good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT. When choosing an actual BACT performance level, ESC Brooke County Power I, LLC used a combined NO_x + NMHC limit. The combined NO_x + NMHC limit is consistent with the applicable NSPS and several of the RBLC entries. ESC Brooke County Power chose a BACT level of 4.8 g/hp-hr. This is based on the applicable Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: A review of data of recent entries for large (>500 hp) diesel fired emergency generators from the RBLC showed that most emergency generators have NOx + NMHC emission limits of 4.8 g/hp-hr.

H_2SO_4

(1) Technology Identification: ESC Brooke County Power I, LLC identified only use of Ultra Low Sulfur Diesel (ULSD) as a potential control technology.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that post combustion add-on control technologies were not feasible .

(3) Effectiveness Ranking of Remaining Technologies: Use of ULSD is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: Only five entries with H_2SO_4 limits from the RBLC were found so the data is very limited. However, the ones entered seem to be consistent with the use of ULSD fuel with a sulfur content of 15 ppm.

GHGs

For reasons similar to those discussed under "Combustion Turbines" above, there are currently no technically feasible add on control technologies to reduce GHG emissions from the emergency generator. Therefore, GHG emissions from the emergency generator will be controlled by exclusive use of good combustion practices. ESC Brooke County Power I, LLC proposed only a facility wide GHG limit (including turbine, auxiliary boiler, emergency generator, fire water pump, gas heater and circuit breakers) of 3,695,535 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the emergency generator, a limit of 158 tons per year was selected. Most entries into the RBLC for GHGs from large emergency generators are in units of either lb/hr or tpy. Limits expressed in tons per year or pounds per hour are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's emergency generator.

Fire Water Pump

NO_x

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on NO_x control technologies applicable to the fire water pump. Given the purpose, size, and limited annual operating hours of the use of the emergency generator, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT. When choosing an actual BACT performance level ESC Brooke County Power I, LLC used a combined NO_x + NMHC limit. The combined NO_x + NMHC limit is consistent with the applicable NSPS and several of the RBLC entries. ESC Brooke County Power chose a BACT level of 2.69 g/hp-hr. This is below the applicable Subpart IIII limit of 3.0 g/hp-hr.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for small (<500 hp) diesel fired fire water pumps from the RBLC. Note that only entries with NO_x + NMHC emission limits expressed in terms of g/hp-hr were considered .

RBLC ID	Date	Company	BACT Emission Rate
OK-0175	06/29/2017	Wildhorse Terminal	3.0 g/hp-hr
MI-0423	01/04/2017	Indeck Niles	3.0 g/hp-hr
MI-0424	12/05/2016	Holland BPW	3.0 g/hp-hr
PA-0310	09/02/2016	CPV Fairview	3.0 g/hp-hr
LA-0313	08/31/2016	Entergy LA, LLC	3.0 g/hp-hr
Avg. Emission Rate			3.0 g/hp-hr

[1]Doesn't appear to meet the NSPS so it is assumed to be erroneous and not included in the average emission rate

With respect to emissions, the proposed emission rate of 2.69 (NO_x + NMHC) g/hp-hr is lower than any of the other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

CO

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on CO control technologies applicable to the fire water pump. Given the purpose, size, and limited annual operating hours of the fire water pump, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing resulting in a CO level of 0.44 g/hp-hr as BACT. It should be noted this is far below the 2.6 g/hp-hr applicable NSPS Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for small (<500 hp) diesel fired emergency generators from the RBLC. Note that only entries with a CO limit expressed in g/hp-hr (or units which are easily converted) were used.

RBLC ID	Date	Company	BACT Emission Rate
FL-0363	12/04/2017	Florida Power & Light	3.5 g/hp-hr
MI-0423	01/04/2017	Indeck Niles	2.6 g/hp-hr
LA-0306	12/20/2016	Topchem Pollock	2.6 g/hp-hr
MI-0424	12/05/2016	Holland BPW	3.7 g/hp-hr
PA-0310	09/02/2016	CPV Fairview	2.61 g/hp-hr
Avg. Emission Rate			3.00 g/hp-hr

With respect to CO emissions, the proposed emission rate of 0.44 g/hp-hr obviously compares very favorably to other recent RBLC entries. None of the other units employed any CO control technology other than good combustion practices.

PM/PM_{10}/$PM_{2.5}$

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on PM control technologies applicable to the fire water pump engine. Given the purpose, size, and limited annual operating hours of the fire water pump, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing resulting in a PM/PM_{10}/$PM_{2.5}$ level of

0.075 g/hp-hr as BACT. It should be noted that 0.15 g/hp-hr is the applicable NSPS Subpart IIII PM limit.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for small (<500 hp) diesel fired fire water pump engines from the RBLC. Note that only entries with PM emission limits expressed in terms of g/hp-hr (or units which could easily be converted) were considered .

RBLC ID	Date	Company	BACT Emission Rate
FL-0363	12/04/2017	Florida Power & Light	0.15 g/hp-hr
MI-0423	01/04/2017	Indeck Niles	0.15 g/hp-hr
LA-0306	12/20/2016	Topchem Pollock	0.15 g/hp-hr
MI-0424	12/05/2016	Holland BPW	0.22 g/hp-hr
PA-0310	09/02/2016	CPV Fairview	0.15 g/hp-hr
Avg. Emission Rate			0.164 g/hp-hr

With respect to particulate emissions, ESC Brooke County Power I, LLC's proposed emission rate of 0.075 g/hp-hr obviously compares very favorably to other recent RBLC entries. None of the other units employed any particulate control technology other than good combustion practices.

VOCs

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on VOC control technologies applicable to the fire water pump. Given the purpose, size, and limited annual operating hours of the fire water pump, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices as BACT.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for small (<500 hp) diesel fired engines from the RBLC. Note that only entries with units of g/hp-hr were considered .

RBLC ID	Date	Company	BACT Emission Rate
OK-0175	06/29/2017	Wildhorse Terminal	3.0 g/hp-hr
LA-0313	08/31/2016	Entergy LA, LLC	3.0 g/hp-hr
VA-0325	06/17/2016	VEPCO	3.0 g/hp-hr
TX-0799	06/08/2016	Phillips 66	1.14 g/hp-hr
KS-0030	03/31/2016	Mid Kansas Electric	1.14 g/hp-hr
Avg. Emission Rate			2.26 g/hp-hr

[1]Doesn't appear to meet the NSPS so it is assumed to be erroneous and not included in the average emission rate

With respect to emissions, the proposed emission rate of 2.69 (NO_x + NMHC) g/hp-hr is similar to other recent RBLC entries. It is also important to note that the limit proposed by ESC is a combined NO_x + NMHC number. It appears obvious (but in some cases it was not explicitly stated) that the some of the above numbers are also NO_x + NMHC. None of the other units employed any control technology other than good combustion practices.

H_2SO_4

(1) Technology Identification: ESC Brooke County Power I, LLC identified only the use of Ultra Low Sulfur Diesel (ULSD) as a potential control technology.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that post combustion add-on control technologies were not feasible.

(3) Effectiveness Ranking of Remaining Technologies: Use of ULSD is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: Only four final entries with H_2SO_4 limits expressed in units that could be converted to lb/mmbtu from the RBLC were found so the data is very limited. They are included in the table below. It should be noted that other entries seemed to be consistent with the use of ULSD fuel with a sulfur content of 15 ppm.

RBLC ID	Date	Company	BACT Emission Rate
VA-0325	06/17/2016	VEPCO	0.0001 lb/mmbtu
NY-0103	02/03/2016	Cricket Valley	0.0001 lb/mmbtu
FL-0354	08/25/2015	Florida Light and Power	0.0015% S[1]
MA-0039	01/30/2014	Footprint Power Salem Harbor	0.00011 lb/mmbtu
PA-0291	04/23/2013	Hickory Run Energy	0.00037 lb/mmbtu
Avg. Emission Rate			0.00017 lb/mmbtu

[1]Not included in the average but used to show consistency with the ESC proposed conditions.

With respect to H_2SO_4 emissions, the proposed emission rate of 0.00023 lb/mmbtu appears to be consistent with other recent RBLC entries. None of the other units employed any H_2SO_4 control technology other than use of ULSD.

GHGs

For reasons similar to those discussed under "Combustion Turbines" above, there are currently no technically feasible add on control technologies to reduce GHG emissions from the fire water pump engines. Therefore, GHG emissions from the fire water pump engines will be controlled by exclusive use of good combustion practices ESC Brooke County Power I, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, gas heater, emergency generator, fire water pump and circuit breakers) of 3,695,535 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the fire water pump, a limit of 17.2 tons per year was selected. Most entries into the RBLC for GHGs from small RICEs are in units of either lb/hr or tpy. Limits expressed in tons per year or pounds per hour are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's fire water pump.

Fuel Gas Heaters

NO_x

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential control technologies (other than low NO_x burners and good combustion practices) for control of NO_x from the fuel gas heaters. Given the size and emission levels from the unit this is reasonable.

(2) Technically Infeasible Determinations: None.

(3) Effectiveness Ranking of Remaining Technologies: Good combustion practices and the use of low NO_x burners is the only identified technology.

(4) Economically Infeasible Determinations: None

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired heaters (of similar size) from the RBLC. Note only entries with NO_x emissions stated as lb/mmbtu (or which were easily converted to lb/mmbtu) were considered:

RBLC ID	Date	Company	BACT Emission Rate
IL-0121	09/27/2016	Invenergy	0.033 lb/mmbtu
PA-0310	09/02/2016	CPV Fairview	0.035 lb/mmbtu
FL-0356	03/09/2016	Florida Power & Light	0.10 lb/mmbtu
OK-0173	01/19/2016	Commercials Metals Co.	0.10 lb/mmbtu
KS-0032	12/14/2015	CHS McPherson	0.030 lb/mmbtu
Avg. Emission Rate			0.024 lb/mmbtu

With respect to NO_x emissions, the proposed emission rate of 0.036 lb/mmbtu appears to be similar to other recent RBLC entries.

CO

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential control technologies (other than good combustion practices) for control of CO from the fuel gas heaters. Given the size and emission levels from the unit this is reasonable.

(2) Technically Infeasible Determinations: None.

(3) Effectiveness Ranking of Remaining Technologies: Good combustion practices is the only identified technology.

(4) Economically Infeasible Determinations: None

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired heaters (of similar size) from the RBLC. Note only entries with CO emissions stated as lb/mmbtu (or which were easily converted to lb/mmbtu) were considered:

RBLC ID	Date	Company	BACT Emission Rate
PA-0310	09/02/2016	CPV Fairview	0.080 lb/mmbtu
OK-0173	01/19/2016	Commercials Metals Co.	0.084 lb/mmbtu
PA-0311	09/01/2015	Moxie Freedom	0.037 lb/mmbtu
TX-0694	02/02/2015	Indeck Wharton LLC	0.04 lb/mmbtu
TX-0691	05/20/2014	NRG Texas Power	0.054 lb/mmbtu
Avg. Emission Rate			0.059 lb/mmbtu

With respect to CO emissions, the proposed emission rate of 0.039 lb/mmbtu appears to compare favorably to other recent RBLC entries.

$PM_{2.5}$/PM_{10}/PM

(1) Technology Identification: ESC Brooke County Power I, LLC identified the following as potential particulate control technologies applicable to the fuel gas heaters;

* Cyclones/Centrifugal Collectors
* Fabric Filters/Baghouses
* Electrostatic Precipitators (ESPs)
* Scrubbers
* Good Combustion Practices / use of natural gas

(2) Technically Infeasible Determinations: Each of the post-combustion control technologies (i.e. cyclones, baghouses, ESPs and scrubbers) are generally available. However, for the same reasons discussed under "Auxiliary Boiler" none of the post combustion, add on control technologies are considered practical or technically feasible for installation on the fuel gas heaters.

(3) Effectiveness Ranking of Remaining Technologies: The only remaining technology is good combustion practices.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: The following table was constructed using data for the three most recent entries for small gas fired heaters from the RBLC. Only three were included because so few comparably sized and utilized natural gas fired heaters are listed in the RBLC.

RBLC ID	Date	Company	BACT Emission Rate
OK-0173	01/19/2016	Commercials Metals Co.	0.0076 lb/mmbtu
PA-0311	09/01/2015	Moxie Freedom	0.007 lb/mmbtu
MI-0412	12/04/2013	Holland Board of Pub. Works	0.0075 lb/mmbtu
Avg. Emission Rate			0.0074 lb/mmbtu

The average of the three recent entries into the RBLC are comparable to ESCs chosen BACT level of 0.008 lb/mmbtu. If BACT was reduced from 0.008 lb/mmbtu to 0.0074 lb/mmbtu (the lowest recent comparable level) it would result in PM emissions being reduced by a maximum of 57 **pounds** per **year**.

VOCs

(1) Technology Identification: ESC Brooke County Power I, LLC did not identify any potential add on VOC control technologies applicable to the fuel gas heaters. Given the size, and limited annual emissions of the fuel gas heaters, this is reasonable. Therefore, ESC Brooke County Power I, LLC proposed the use of natural gas or a natural gas/ethane blend and good combustion practices.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Brooke County Power I, LLC identified only good combustion practices as BACT.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: Very few recent entries for similarly sized natural gas fired heater with VOC limits exist in the RBLC. However, given that proposed baseline VOC emissions from the two combined heaters total only 0.34 tons per year, the proposed limit of 0.007 lb/mmbtu is reasonable.

H_2SO_4

(1) Technology Identification: ESC Brooke County Power I, LLC identified only the use of natural gas with a maximum sulfur content of 0.4 gr/100scf.

(2) Technically Infeasible Determinations: ESC Brooke County Power I, LLC determined that post combustion add-on control technologies were not feasible.

(3) Effectiveness Ranking of Remaining Technologies: Use of natural gas or a natural gas/ethane blend is the only remaining control technology.

(4) Economically Infeasible Determinations: Since ESC Brooke County Power I, LLC selected the top technically feasible control technology, no economic determinations are necessary.

(5) DAQ Review of RBLC: Very few recent entries for similarly sized natural gas fired heater with H_2SO_4 limits exist in the RBLC. Given that proposed baseline H_2SO_4 emissions from the two combined heaters total only 0.006 tons per year, the proposed limit of 0.0000992 lb/mmbtu is reasonable.

GHGs

For reasons similar to those discussed under "Combustion Turbines", there are currently no technically feasible add on control technologies to reduce GHG emissions from the fuel gas heaters. Therefore, GHG emissions from the fuel gas heaters will be controlled by exclusive use of natural gas or a natural gas/ethane blend and good combustion practices. ESC Brooke County Power I, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, gas heater, emergency generator, fire water pump and circuit breakers) of 3,695,535 tons CO_2e per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the fuel gas heaters, a limit of 3,120 tons per year each was selected.

DAQ Conclusion on BACT Analysis

The DAQ has concluded that, with the exceptions noted above and corrected for, ESC Brooke County Power I, LLC correctly conducted a BACT analysis using the top-down analysis and eliminated technologies for appropriate reasons. The DAQ concludes that the emission rates under Table 15 are achievable, are consistent with recent applicable BACT determinations on the RBLC, and are accepted as BACT. Further, the DAQ accepts the selected technologies and proposed efficiency rates as BACT.

Additionally, it is the WVDAQs opinion that the start up and shut down emission limits in Table 3 represent BACT. The General Electric 7HA.01 combustion turbine proposed for the project can achieve compliance with steady-state emissions limits within one (1) hour of start-up for all start-up types (i.e. cold, warm, or hot), as well as achieve shutdown within 15 minutes, further minimizing periods of increased emissions during these events.

Modeling Analysis - 45CSR14 Section 9 and Section 10

45CSR14 Section 9 requires subject sources to demonstrate that "allowable emission increases from the proposed source or modification, in conjunction with all other applicable emission increases or reductions would not cause or contribute to " a NAAQS violation or an exceedance of a maximum allowable increase over the baseline concentration in any area." This typically includes modeling of effects in both "Class I" and "Class II" areas.

ESC Brooke County Power I, LLC was required to do a modeling analysis to determine the potential impacts on Class II areas only. Class I area modeling was not performed (as explained below). The pollutants required to be modeled were CO, NO_x, $PM_{2.5}$ and PM_{10}. Greenhouse gases are not modeled as part of the PSD application review process and VOC emissions (as a precursor to tropospheric ozone formation) were addressed through a qualitative analysis by the applicant in the modeling protocol. The results of the modeling analyses are summarized below. More detailed descriptions of these modeling analyses and quantitative results are contained in reports attached to this evaluation as Attachment A. The reports were prepared by Jon McClung of DAQs Planning Section.

Class I Modeling

As part of the Clean Air Act Amendments (CAA) of 1977, Congress designated a list of national parks, memorial parks, wilderness areas, and recreational areas as federal Class I air quality areas. Federal Class I areas are defined as national parks over 6,000 acres, and wilderness areas and memorial parks over 5,000 acres. As part of this designation, the CAA gives the Federal Land Managers (FLM's) an affirmative responsibility to protect the natural and cultural resources of Class I areas from the adverse impacts of air pollution. The impacts on a Class I area from an emissions source are determined through complex computer models that take into account the source's emissions, stack parameters, meteorological conditions, and terrain.

If an FLM demonstrates that emissions from a proposed source will cause or contribute to adverse impacts on the air quality related values (AQRV's) of a Class I area, and the permitting authority concurs, the permit will be denied. The AQRVs typically reviewed, in the case of evaluating adverse impacts, are visibility (both regional and direct plume impact) and acid deposition (including both nitrogen and sulfur).

Additionally, the Class I Increments designated under National Ambient Air Quality Standards (NAAQS) may not be exceeded. Class I Increments are limits to how much the air quality may deteriorate from a reference point (called the baseline). There are Class I Increments for NO_2, PM_{10}, and SO_2.

There are generally four Class I areas that may have to be considered when conducting PSD reviews in West Virginia. These are, in West Virginia, the Otter Creek Wilderness Area and the Dolly Sods Wilderness Area; both of which are managed by the US Forest Service. The Shenandoah National Park, managed by the National Park Service, and the James River Face Wilderness Area, managed by the US Forest Service, are in Virginia. The ESC Brooke County Power I, LLC facility will be located approximately 102 miles from the Otter Creek Wilderness Area, 112 miles from the Dolly Sods Wilderness Area, 157 miles from the Shenandoah National park, and 178 miles from the James River Face Wilderness Area.

The Federal Land Managers responsible for evaluating affects on AQRVs for federally protected Class I areas were consulted and did not require modeling analyses specific to Class I areas for the proposed project. However, out of an abundance of caution ESC evaluated the project related increases (for the three closest class I areas) of NO_x, $PM_{10,}$ and $PM_{2.5}$ against the Class I SILs by applying the AERMOD dispersion model at a distance of 50 km from the project site. All modeled concentrations were below the Class I SILs.

Class II Modeling

A Class II Modeling analysis can require up to three runs to determine compliance with Rule 14. First, the proposed source is modeled by itself, on a pollutant by pollutant basis, to determine if it produces a "significant impact;" an ambient concentration published by US EPA. If the dispersion model determines that the proposed source produces significant impacts, then the demonstration proceeds to the second stage. If the model finds that the proposed source produces "insignificant impacts", no further modeling is needed. The modeling indicated that NO_2, $PM_{2.5}$ and PM_{10} (24 hour average only) were "significant," thereby requiring the applicant to proceed to the next stage of the modeling process for that pollutant.

The next tier of the modeling analysis is to determine if the proposed facility in combination with the existing sources will produce an ambient impact that is less than the National Ambient Air Quality Standards (NAAQS).

As shown in Table 5 of Attachment A, the total concentration of each pollutant is less than the NAAQS for all averaging periods and all operating scenarios.

This final stage is usually to determine how much of the PSD Increment the proposed construction of the facility consumes, along with all other increment consuming sources. This value may not exceed the PSD Increment. PSD Increments are the maximum concentration increases above a baseline concentration that are allowed. As shown in Table 6 of Attachment A, the total concentration is less than the PSD increment for each pollutant and all averaging times.

The applicant therefore passes all the required Air Quality Impact Analysis tests as required for Class II Areas under 45CSR14. Attached to this evaluation is a report prepared by Jon McClung on April 16, 2018 that details the above analysis and presents the results in tabular form.

Additional Impacts Analysis - 45CSR14 Section 12

Section 12 of 45CSR14 requires an applicant to provide "an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification." It also requires the applicant to perform "an analysis of the air quality impact projected for the area as a result of general commercial, residential, industrial and other growth associated with the source or modification." No quantified thresholds are promulgated for comparison to the additional impacts analysis.

ESC Brooke County Power I, LLC provided a short Additional Impacts Analysis in their modeling report. In their analysis, they looked at potential impacts on soils, vegetation and visibility. The conclusions of that analysis are included below.

"The impact of the proposed Project on growth is not expected to be significant. The ESC Brooke Project is expected to create approximately 30 full time positions on the property once the facility is constructed and operational. It is expected that many of these positions will be able to be filled locally. Therefore, no significant air quality or other environmental impacts are expected due to population growth associated with this Project."

Evaluation of potential impacts on vegetation and soils were performed by comparison of maximum modeled impacts from the Project to Air Quality Related Value (AQRV) screening concentrations provided in the EPA document "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals" and to NAAQS secondary standards. The screening levels represent the minimum concentrations in either plant tissue or soils at which adverse growth effects or tissue injury was reported in the literature. The NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation. Therefore, comparing the modeled emissions to the AQRVs and the NAAQS secondary standards provides an indication as to whether potential impacts are likely to be significant."

Pollutant	Averaging Period	AQRV Screening Levels (µg/m^3)	Secondary NAAQS (µg/m^3)	Max. Modeled Concentrations
PM_{10}	24-hour	--	150	9.75
	Annual	--	50	0.89
$PM_{2.5}$	24-hour	--	35	9.75
	Annual	--	15	0.89
NO_2	4-hour	3,760	--	24.81
	8-hour	3,760	--	18.52
	1-month	564	--	3.05
	Annual	100	100	1.53
CO	Weekly	1,800,000	--	41.20[1]

[1]Weekly impact approximated by 24-hr average impact.

In order to assess visibility impacts ESC:

"has identified a local state forest to further assess Project emissions of possible visibility impairment. Ohios Fernwood State Forest is located approximately 14 km to the west of the Project site. There are vistas in the state forest that offer visitors views of the surrounding countryside. ESC has used the VISCREEN (Version 1.01, dated 13190) visibility model to assess

the Project impact on this viewshed. VISCREEN was executed following the procedures described in EPA's Workbook for Plume Visual Impact Screening and Analysis for Level-1 visibility assessments. ESC notes that the VISCREEN level 1 procedure contains extremely conservative assumptions (sustained low wind speed of 1 m/s and F-class Pasquill-Gifford stability class), and VISCREEN's internal criteria used to determine a significant visibility impact are also very conservative, having been derived to protect visibility impacts in Class I areas. Despite this conservatism, ESC is providing the VISCREEN level 1 analysis to demonstrate that any visibility impact that can be expected due to the Project will be insignificant."

Minor Source Baseline Date (Brooke County, WV) - Section 2.42.b

On March 30, 2018 the permit application R14-0035 was deemed complete. This action, as per 45CSR14, Section 2.42.b, has triggered the minor source baseline date (MSBD) for the following areas:

Minor Source Baseline Triggering

Pollutant	Brooke County
NO_2	Yes
PM_{10}	Yes
$PM_{2.5}$	Yes

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides general toxicity information for those pollutants not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), and Sulfur Dioxide (SO_2). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal and state programs designed to limit their emissions and public exposure. These programs include federal source-specific HAP limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of Hazardous Air Pollutants (HAPs). All non-criteria regulated pollutants proposed to be emitted by the facility with the exception of sulfuric acid mist (H_2SO_4) are defined as Hazardous Air Pollutants (HAPs). HAPS and H_2SO_4 will be discussed separately below.

HAPs

Section 112(b) of the Clean Air Act (CAA) identifies 188 compounds as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The combustion of both natural gas and fuel oil has the potential to produce HAPs. However, the

potential HAP emissions from the facility are below the levels that define a major HAP source. Therefore, the facility is considered a minor (or area) HAP source, and no source-specific major source NESHAP or MACT standards apply. The following table lists each HAP *potentially* emitted by the facility in excess of 20 pounds/year (0.01 tons/year) and the carcinogenic risk associated thereto (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Acetaldehyde	VOC	Yes	B2 - Probable Human Carcinogen
Acrolein	VOC	No	Inadequate Data
Benzene	VOC	Yes	A - Human Carcinogen
Ethylbenzene	VOC	No	D-Not Classifiable
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen
Hexane	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data

(1) POMs defines a broad class of compounds that includes the polycyclic aromatic hydrocarbon compounds (PAHs), some of which include compounds classified as B2-probable human carcinogens .

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. The regulatory applicability of any potential NESHAP or MACT to the ESC Brooke County Power I, LLC Plant was discussed above. For a complete discussion of the known health effects refer to the IRIS database located at *www.epa.gov/iris.*

Sulfuric Acid Mist (H_2SO_4)

The compound of H_2SO_4 is regulated under 45CSR14 with a significance level that can trigger BACT for each source that contributes H_2SO_4 emissions. As discussed above, the potential H_2SO_4 emissions from the facility triggered a BACT analysis for the compound. H_2SO_4 is not represented in the IRIS database and is not listed as a HAP. Concerning the carcinogenity of sulfuric acid, the Agency for Toxic Substances and Disease Registry (ATSDR) states that "[t]he ability of sulfuric acid to cause cancer in laboratory animals has not been studied. The International Agency for Research on Cancer (IARC) has determined that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans. IARC has not classified pure sulfuric acid for its carcinogenic effects."

MONITORING, REPORTING, AND RECORD-KEEPING OF OPERATIONS

Emissions Monitoring

The primary purpose of emissions monitoring is to guarantee the permittee's compliance with emission limits and operating restrictions in the permit on a continuous basis. Emissions monitoring may include any or all of the following:

- Real-time continuous emissions monitoring to sample and record pollutant emissions (CEMS, COMS);
- Parametric monitoring of variables used to determine potential emissions (recording of material throughput, fuel usage, production, etc.);
- Monitoring of control device performance indicators (pressure drops, catalyst injection rates, etc.) to guarantee efficacy of pollution control equipment;
- Visual stack observations to monitor opacity.

It is the permittee's responsibility to record, certify, and report the monitoring results so as to verify compliance with the emission limits. Specific emissions monitoring requirements for each emissions unit at the proposed ESC Brooke County Power I, LLC facility are discussed below.

Turbines/HRSGs

As mentioned previously, the turbines and their associated HRSGs (duct burner) exhaust to common stacks designated as BCCT-1 and BCCT-2. ESC Brooke County Power shall be required to show continuous compliance with the BCCT-1 and BCCT-2 emission limits by using the monitoring specified in the following table:

BCCT-1 and BCCT-2 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	CEMS	Permit	Pursuant to Perf. Spec.-4 of 40 CFR 60
NO_x	CEMS	Subpart KKKK	Pursuant to §60.4345
$PM/PM_{10}/PM_{2.5}$	Initial stack test, fuel usage	Permit	Method 5 & Method 202 or other as approved
SO_2	Fuel usage + fuel sulfur content	Subpart KKKK	Fuel S content Pursuant to §60.4360
VOCs	Initial stack test, fuel usage	Permit	Method 18 or 25 as approved or other as approved
Lead	Fuel usage	Permit	
H_2SO_4	Fuel usage + fuel sulfur content	Permit	Fuel S content Pursuant to §60.4360
GHGs	Initial stack test + fuel usage	Permit, Subpart TTTT	Method 3A or 3B as approved for CO_2. Calcs for non CO_2 GHGs.
HAPs	Fuel usage	Permit	
Opacity	Monthly VE readings	Permit, 45CSR2	Method 22

The CEMS will provide a continuous and real-time method of determining compliance with the emission limits specified in the permit. The CEMS will be installed and operated according to the applicable provisions of 40 CFR 60. Parametric monitoring will also be used to show compliance with emissions limits. This will include monitoring fuel combusted in the turbine and duct burners and sampling the fuel to determine its constituent characteristics.

Auxiliary Boiler

AB-1 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Fuel usage	Permit	
NO_x	Fuel usage	Permit	
$PM/PM_{10}/PM_{2.5}$	Fuel usage	45CSR2, Permit	
SO_2/ H_2SO_4	Fuel usage + fuel sulfur content	45CSR10, Permit	Fuel S content Pursuant to §60.4360
VOCs	Fuel usage	Permit	
GHGs	Fuel usage	Permit	
HAPs	Fuel usage	Permit	
Opacity	Monthly VE readings	Permit, 45CSR2	Method 22

Emergency Generator

EG-1 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Hours of Op. + Certified Engine	Subpart IIII	
NO_x	Hours of Op. + Certified Engine	Subpart IIII	
$PM/PM_{10}/PM_{2.5}$	Hours of Op. + Certified Engine	Subpart IIII	
SO_2/ H_2SO_4	Fuel usage + Hours of Operation	Subpart IIII	Fuel S content limited per §60.4207
VOCs	Hours of Op. + Certified Engine	Subpart IIII	
GHGs	Fuel usage + Hours of Operation	Permit	
HAPs	Fuel usage + Hours of Operation	Permit	

Fire Water Pump Engine

FP-1 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Hours of Op. + Certified Engine	Subpart IIII	
NO_x	Hours of Op. + Certified Engine	Subpart IIII	
$PM/PM_{10}/PM_{2.5}$	Hours of Op. + Certified Engine	Subpart IIII	
SO_2 / H_2SO_4	Fuel usage + Hours of Operation	Subpart IIII	Fuel S content limited per §60.4207
VOCs	Hours of Op. + Certified Engine	Subpart IIII	
GHGs	Fuel usage + Hours of Operation	Permit	
HAPs	Fuel usage + Hours of Operation	Permit	

Fuel Gas Heaters

FGH-1 and FGH-2 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Fuel usage	Permit	
NO_x	Fuel usage	Permit	
$PM/PM_{10}/PM_{2.5}$	Fuel usage	45CSR2, Permit	
SO_2 / H_2SO_4	Fuel usage	45CSR10, Permit	
VOCs	Fuel usage	Permit	
GHGs	Fuel usage	Permit	
HAPs	Fuel usage	Permit	

Record-Keeping

ESC Brooke County Power I, LLC will be required to follow the standard record-keeping boilerplate in the permit. This will require them to maintain records of all data monitored for the permit and keep the information for five years. All collected data will be available to the Director upon request. ESC Brooke County Power I, LLC will also be required to follow all the record-keeping requirements as applicable in the 45CSR2, 45CSR10, and 40 CFR 60, Subpart Db, Subpart KKKK and Subpart IIII and 40 CFR 63 Subpart ZZZZ.

Reporting

ESC Brooke County Power I, LLC will also be required to follow all the reporting requirements as applicable in 45CSR2, 45CSR10, and 40 CFR 60, Subpart Db, Subpart KKKK and Subpart IIII and 40 CFR 63 Subpart ZZZZ.

PERFORMANCE TESTING

Performance testing is required to verify the emission factors used to determine the units' potential-to-emit and show compliance with permitted emission limits. Performance testing must be conducted in accordance with accepted test methods and according to a protocol approved by the Director prior to testing. All units subject to a standard under 40 CFR 60 are required to perform an initial performance test according to the applicable Subpart. Periodic testing may be required thereafter depending on the specifics of the emissions unit in question. Under the WV SIP, testing is required at the discretion of the Director.

Turbines/Duct Burners

Initial and periodic testing is required on the turbine/duct burner stacks (BCCT-1 and BCCT-2) to determine compliance with the following emission limits using the noted test methods:

BCCT-1 and BCCT-2 Testing Requirements

Pollutant	Test Method(1)
CO(2)	Method 10B
NO_x(2)	Method 19
PM	Method 202
PM (filterable only)	Method 5
$PM_{10}/PM_{2.5}$	Method 202
VOCs	Method 18
H_2SO_4	Method 8
Opacity	Method 22

(1) All test methods refer to those given under 40 CFR 60, Appendix A
(2) Data obtained during required RATA testing of the CO and NO_x CEMs may be used in lieu of the required testing.

Performance testing after the initial test will be required on a schedule set forth in the permit. The permittee shall also be required to test and verify initial compliance with BACT limits in the permit for the turbine/duct burner and thereafter on a schedule set forth in the permit.

Emergency Generator/Fire Water Pump Engine

Performance testing for emergency generator and fire water pump engine are limited to those required under 40 CFR 60, Subpart IIII.

Other Sources

Testing of other sources will be at the discretion of the Director.

RECOMMENDATION TO DIRECTOR

The WVDAQ has preliminarily determined that the construction of the ESC Brooke County Power I, LLC, natural gas fired power plant near Colliers, Brooke County will meet the emission limitations and conditions set forth in the DRAFT permit and will comply with all current applicable state and federal air quality rules and standards including 45CSR14, the WV Legislative Rule implementing the Prevention of Significant Deterioration program. A final decision regarding the DRAFT permit will be made after consideration of all public comments. It is the recommendation of the undersigned, upon review and approval of this document and the DRAFT permit, that the WVDAQ, pursuant to §45-14-17, go to public notice on permit application R14-0035.

Steven R. Pursley, PE
Engineer

Date

Attachment A: Modeling Analyses