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*Pursuant to §45-14-17.2*

# PRELIMINARY DETERMINATION/FACT SHEET

*for the*

## CONSTRUCTION

*of*

## Moundsville Power, LLC's
## Moundsville Combined Cycle Power Plant

*located in*

## Moundsville, Marshall County, WV.

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**Permit Number: R14-0030**
**Facility Identification Number: 051-00188**

**Date: October 1, 2014**

# Table of Contents

# BACKGROUND INFORMATION

| | |
|---|---|
| Application No.: | R14-0030 |
| Plant ID No.: | 051-00188 |
| Applicant: | Moundsville Power, LLC |
| Facility Name: | Moundsville Power Plant |
| Location: | Marshall County |
| NAICS Code: | 221112 |
| Application Type: | PSD Major Construction |
| Received Date: | October 7, 2013 |
| Engineer Assigned: | Steven R. Pursley, PE |
| Fee Amount: | $14,500 |
| Date Received: | October 10, 2013 |
| Complete Date: | May 14, 2014 |
| Due Date: | November 10, 2014 |
| Applicant Ad Date: | December 26, 2013 |
| Newspaper: | *The Intelligencer* |
| UTM's: | Easting: 517.3 km Northing: 4,417.2 km Zone: 17 |

On October 7, 2013 Moundsville Power, LLC submitted a permit application to construct a 549 megawatt (based on vendor performance data for an operating scenario at 59°F, without duct firing, evaporative cooling off and the turbines firing natural gas at base load), combined cycle combustion turbine, natural gas-fired electric generation facility in Moundsville, Marshall County, WV. The plant will be located at an existing Honeywell site and occupy approximately 40 acres of the 280 acre site. The plant will tie into the American Electric Power (AEP) high voltage transmission system in the area, and sell its output into the Pennsylvania-New Jersey-Maryland Interconnection LLC regional electric grid.

Emission sources associated with the project are:

* Two General Electric (GE) Frame 7FA.04 advanced combined cycle combustion turbines (CTs), each with Heat Recovery Steam Generators (HRSGs) equipped with supplemental duct firing.

* One natural gas fired Auxiliary Boiler with a maximum heat input of 100 million BTU per hour.

* One 1,500 kilowatt diesel fired emergency generator (with associated 3,000 gallon diesel storage tank).

* One 251 horse power diesel fired emergency fire water pump (with associated 500 gallon diesel storage tank).

* One wet, mechanical draft cooling tower consisting of 10 cells.

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), 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 ($SO_2$), Lead (Pb) and Sulfuric Acid Mist ($H_2SO_4$) 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 Moundsville Power, 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 compliance with the statutory and accepted procedures for public notification with respect to permit application R14-0030.

***Actions Taken at Application Submission***

Pursuant to §45-13-8.3 and §45-14-17.1, Moundsville Power, 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 Intelligencer* (December 26, 2013)

A copy of the permit application was sent to the following parties:

- The DAQs Northern Panhandle Regional Office (NPRO) in Wheeling (March 12, 2014)
- The U.S Environmental Protection Agency - Region 3 (February 7, 2014)

Additionally, copies were offered to the following parties who declined:

- The National Park Service
- The US Forest Service

The application was also available at the DAQ Headquarters in Charleston (Kanawha City) for review.

### *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 newspapers stating the DAQ's preliminary determination regarding R14-0030:

- *The Intelligencer*
- *Moundsville Daily Echo*

A copy of the preliminary determination and draft permit shall be forwarded to EPA 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 the Northern Panhandle Regional Office in Wheeling. 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 R14-0030 shall be provided upon request. Additionally, the preliminary determination and draft permit will be posted on WVDAQ's webpage.

A public meeting to accept written and oral comments concerning the preliminary determination and draft permit may take place on a date to be determined at the time the public notice is published (at the Directors discretion).

### *Actions Taken at Completion of Final Determination*

Pursuant to §45-14-17.7, and 17.8 upon reaching a final determination concerning R14-0030, the DAQ shall make such determination available for review at WVDEP Headquarters in Charleston and notify the Northern Panhandle Regional Office in Wheeling of the final determination.

## DESCRIPTION OF PROPOSED FACILITY

### *Description of Process*

Moundsville Power, LLC Overview

The Moundsville Power, LLC Plant will generate approximately 549 megawatts (MW) of electricity that will be sold on the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) regional electric grid. Pipeline-quality natural gas used by the plant's combustion turbines will be purchased from local suppliers, and will take advantage of the gas produced in nearby natural gas shale plays. In addition, the combustion turbines may fire a blend of pipeline-quality natural gas with up to 25% ethane by volume. Electricity will be generated using two (2) combined-cycle combustion turbines (CCCT-1 and CCCT-2), each rated at 197 MW (at various ambient temperature design conditions) and 2,087 million Btu per hour (MMBtu/hr). Electricity generated by the combustion turbines 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 electric generated by the plant, the hot exhaust gases from the combustion turbines is routed to downstream Heat Recovery Steam Generators (HRSGs). The HRSGs contain a series of heat exchangers designed to recover the heat from the turbines' exhaust gas and produce steam, as in a boiler. Each combustion turbine will have its own HRSG. Cooled exhaust gas passing through the HRSGs is vented to the atmosphere through emission points CCCT-1 and CCCT-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.

The SCRs involve the injection of aqueous ammonia ($NH_3$) with a concentration of less than 20% by weight into the combustion turbine exhaust gas streams. Ammonia reacts with $NO_x$ in the exhaust gas stream, reducing it to elemental nitrogen ($N_2$) and water vapor ($H_2O$). The aqueous ammonia will be stored on-site in one (1) storage tank, with a capacity of 20,000 gallons. 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. Steam generated in the HRSGs is routed to a steam driven electric generator. This generator produces up to an additional 203 MW of electricity that is also sold on the grid. Electricity generated by the two (2) combustion turbines and the single steam generator represent the plant's total electrical output. Water from the plant's wet, mechanical draft Cooling Tower is used to cool the steam driven electric generator. Make-up water is added to the Cooling Tower as necessary to account for water evaporated in the Cooling Tower. Exhaust from the Cooling Tower is vented through emission point CT-1. Steam condensate from the steam generator is routed back to the HRSGs for reuse in the steam cycle. Support equipment will also be used by the plant to assist with facility operations. A 100 MMBtu/hr Auxiliary Boiler is used to produce steam for plant support. In addition, a 1,500 kW (approximately 2,000 hp) Emergency Generator (EG-1) is used for emergency backup electric power, and a 251 hp Fire Water Pump (FP-1) will be used for plant fire protection. Both the Emergency Generator and the Fire Water Pump will run on ultra low sulfur diesel (ULSD) fuel, and will be periodically operated for short periods per manufacturer's maintenance instructions to ensure operational readiness in the event of an emergency. The ULSD fuel will be stored in two (2) storage tanks; the 500 gallon Fire Water Pump Tank (ST-1), and the 3,000 gallon Emergency Generator Tank (ST-2). The storage tanks are considered "De Minimis" per 45CSR13 Table 45-13B item 58.

<u>Proposed Equipment</u>

### Combustion Turbines

The highly efficient combined-cycle combustion turbines (CCCT-1 and CCCT-2) will be equipped with inlet evaporative cooling systems, which are 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. Each combustion turbine will be coupled with a HRSG 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, 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 generators. The maximum duct firing level for each combustion turbine/HRSG module is expected to be 65 MMBtu/hr on a Lower Heating Value (LHV) basis, which equates to 72.1 MMBtu/hr on a HHV basis. The fuel for the duct burners will be the same as for the combustion turbines: either pipeline quality natural gas or a blend of pipeline-quality natural gas and up to 25% ethane. Steam generated in the HRSGs is routed to a steam driven electric generator. This generator produces up to an additional 203 MW of electricity that will also be routed through a local electrical substation and sold on the grid.

Each combustion turbine will have its own exhaust stack. Each stack is expected to be 180.5 feet above grade.

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

**Auxiliary Boiler**

A 100 MMBtu/hr Auxiliary Boiler will be used to produce steam for plant support. The Auxiliary Boiler will burn either pipeline-quality natural gas or a blend of pipeline-quality natural gas and up to 25% ethane. The Auxiliary Boiler will be equipped with ultra low-NOx burners (ULNB) and flue gas recirculation (FGR) to control NOx emissions.

For permitting and emissions estimating purposes, this application assumes that the Auxiliary Boiler will operate the equivalent of 2,000 hr/yr.

**Emergency Generator**

A 1,500 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 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, these engines 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 500 hr/yr.

**Fire Water Pump**

A 251 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 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 500 hr/yr.

**Cooling Tower**

A wet, mechanical draft Cooling Tower will be used to cool the plant's steam driven electric generator. Make-up water is added to the Cooling Tower as necessary to account for water evaporated in the Cooling Tower. Air from the Cooling Tower will be vented through emission point CT-1. Steam condensate from the steam generator is routed back to the HRSGs for reuse.

The make-up cooling water for the Cooling Tower will come from the nearby Ohio River. High efficiency drift eliminators will be used to control particulate matter (PM) emissions from the Cooling Tower.

For permitting and emissions estimating purposes, this application assumes that the Cooling Tower will operate 8,760 hr/yr.

## SITE INSPECTION

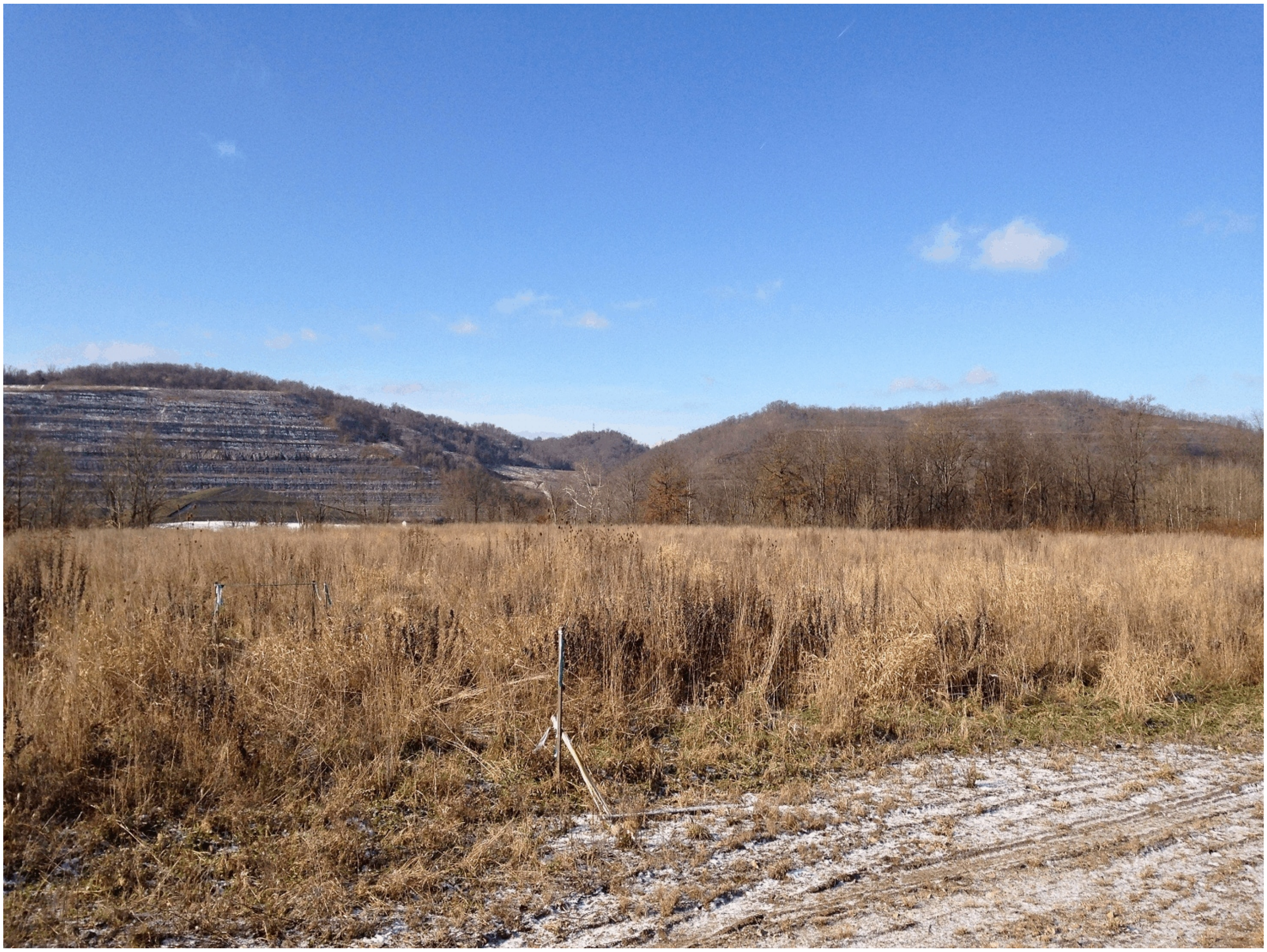
On December 12, 2013 the writer conducted a site inspection of the proposed location of the Moundsville Power, LLC plant. Joining the writer were Jon McClung of the DAQ Planning Section and Fred Durham, (then) DAQ Deputy Director. During the visit DAQ met with: John Black of TRC representing Moundsville Power, LLC, and Tom Wickstrom of ERM. The following observations were made during the inspection:

- The proposed site of the plant is located approximately three miles west southwest of Moundsville, Marshall County, WV.

- The power generation facility will lie between State Route 2 and the Ohio River. It will be located on a 37 acre section of a 388 acre EPA Superfund site that was formerly operated by Allied Corporation, among others. The plant will be just across Route 2 from several residential areas.

- The general topography of the area is a river valley (approximately 0.75 miles wide). Ground level of the site will be approximately 720 feet above sea level. The surrounding mountains rise over 1,200 feet above sea level. Stack height will be approximately 180 feet above ground level.

- The following pictures were taken the day of the site inspection:



## PROPOSED EMISSIONS

The Moundsville Power, 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 | 35.37 | 209.40 |
| $NO_x$ | 45.07 | 145.30 |
| PM | 16.90 | 71.20 |
| $PM_{10}$ | 16.66 | 70.10 |
| $PM_{2.5}$ | 16.19 | 68.00 |
| $SO_2$ | 1.09 | 4.80 |
| VOCs | 12.61 | 74.80 |
| $H_2SO_4$ | 0.81 | 3.10 |
| Lead | 0.010 | 0.01 |
| $CO_{2e}$ | -- | 2,240,618.00 |
| Total HAPs | -- | 12.10 |

(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. 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 Moundsville Power, LLC to calculate the potential-to-emit of the proposed facility.

***Combustion Turbines / Duct Burners***

Emissions from the combustion turbines (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. The GE data addresses both pipeline-quality natural gas firing and the firing of a blend of pipeline-quality natural gas and up to 25% ethane. 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 8,760 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. The writer verified that the recently updated (January 2014) GWP (was used for each GHG.

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/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 | 9.2 | Manufacturer | Includes use of Oxidation Catalyst |
| $NO_x$ | 15.2 | Manufacturer | Includes use of SCR and DLN burners |
| PM | 7.6 | Manufacturer | Includes both filterable and condensable PM |
| $PM_{10}$ | 7.6 | Manufacturer | Includes both filterable and condensable PM |
| $PM_{2.5}$ | 7.6 | Manufacturer | Includes both filterable and condensable PM |
| $SO_2$ | 0.5 | Manufacturer | |
| VOCs | 5.3 | Manufacturer | Includes use of Oxidation Catalyst |
| Pb | 0.001 | AP-42 | |
| GHGs | 254,315 | Manufacturer | $CO_{2e}$ Basis |
| $H_2SO_4$ | 0.36 | Manufacturer | |
| Other HAPs | 1.36 | AP-42 | |

**Startups and Shutdowns**

After one (1) year of "continuous" operation, each combustion turbine is estimated to undergo 260 startups per year. Of these 260 startups, approximately 208 are expected to be hot startups, 48 are expected to be warm startups, and four (4) are expected to be cold startups. Accordingly, approximately 260 shutdowns per year are expected.

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 each combustion turbine, as well as the total startup and shutdown emissions from each of the two (2) combustion turbines. Emission rates are based on manufacturer (GE) performance data.

**Table 3: Turbine Startup and Shutdown Emissions**(1) (Two turbine/duct burner units combined)

| Pollutant | Type of Event | Emission Factor (lb/event) | Number of Events/Year | Emissions (lb/yr) |
|---|---|---|---|---|
| $NO_x$ | Hot Start | 19 | 416 | 7904 |
| | Warm Start | 33 | 96 | 3168 |
| | Cold Start | 47 | 8 | 376 |
| | Shutdown | 5 | 520 | 2600 |
| | Total | | | 14048 |
| CO | Hot Start | 273 | 416 | 113568 |
| | Warm Start | 280 | 96 | 26880 |
| | Cold Start | 1381 | 8 | 11048 |
| | Shutdown | 175 | 520 | 91000 |
| | Total | | | 242496 |
| PM | Hot Start | 2.7 | 416 | 1123 |
| | Warm Start | 4.3 | 96 | 413 |
| | Cold Start | 6 | 8 | 48 |
| | Shutdown | 1.5 | 520 | 780 |
| | Total | | | 2364 |

| | | | | |
|---|---|---|---|---|
| $PM_{10}$ | Hot Start | 2.7 | 416 | 1123 |
| | Warm Start | 4.3 | 96 | 413 |
| | Cold Start | 6 | 8 | 48 |
| | Shutdown | 1.5 | 520 | 780 |
| | Total | | | 2364 |
| $PM_{2.5}$ | Hot Start | 2.7 | 416 | 1123 |
| | Warm Start | 4.3 | 96 | 413 |
| | Cold Start | 6 | 8 | 48 |
| | Shutdown | 1.5 | 520 | 780 |
| | Total | | | 2364 |
| VOCs | Hot Start | 55 | 416 | 22880 |
| | Warm Start | 56 | 96 | 5376 |
| | Cold Start | 380 | 8 | 3040 |
| | Shutdown | 46 | 520 | 23920 |
| | Total | | | 55216 |

(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 Turbine Emissions** (includes both turbines and duct burners)

| Pollutant | pounds/hour(1) | tons/year(1) |
|---|---|---|
| CO | 18.50 | 202.20 |
| $NO_x$ | 30.40 | 140.20 |
| PM(2) | 15.10 | 67.40 |
| $PM_{10}$(2) | 15.10 | 67.40 |
| $PM_{2.5}$(2) | 15.10 | 67.40 |
| $SO_2$ | 1.10 | 4.80 |
| VOCs | 10.60 | 73.90 |
| $H_2SO_4$ | 0.70 | 3.10 |
| Lead | 0.002 | 0.01 |
| $CO_{2e}$ | -- | 2,227,797.00 |
| Total HAPs | -- | 11.90 |

(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 200,000 MMBTU/year of operation (approximately 2,000 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 2.0 grains per 100 dscf and a 95% fuel sulfur conversion to $SO_2$ and 5% conversion to $SO_3$. Sulfuric acid mist ($H_2SO_4$) emissions conservatively assume that all $SO_3$ combines with water to form $H_2SO_4$. To convert non $CO_2$ GHGs to $CO_{2e}$ 40 CFR 98 Subpart A, Table A-1 was used. The writer verified that the recently updated (January 2014) GWP was used for each GHG.

**Table 5: Auxiliary Boiler Emission Factors**

| Pollutant | Emission Rate (lb/MMBTU) | Emission Factor Source | Comments |
|---|---|---|---|
| CO | 0.04 | Vendor | |
| $NO_x$ | 0.02 | Vendor | Includes use of Low $NO_x$ burners w/FGR |
| PM | 0.005 | Vendor | Includes both filterable and condensable PM |
| $PM_{10}$ | 0.005 | Vendor | Includes both filterable and condensable PM |
| $PM_{2.5}$ | 0.005 | Vendor | Includes both filterable and condensable PM |
| $SO_2$ | 0.0006 | AP-42/Mass Balance | Mass balance for hourly/AP-42 for annual |
| VOCs | 0.006 | Vendor | |
| Pb | 4.85E-07 | AP-42 | |
| GHGs | 12,081 (lb/hr) | AP-42 | $CO_{2e}$ Basis |
| $H_2SO_4$ | 4.46E-05 | Mass Balance | |
| Total HAPs | 1.89 | AP-42 | |

**Table 6: Auxiliary Boiler Emissions**

| Pollutant | lb/hr | tpy |
|---|---|---|
| CO | 4.00 | 4.00 |
| $NO_x$ | 2.00 | 2.00 |
| PM | 0.50 | 0.50 |
| $PM_{10}$ | 0.50 | 0.50 |
| $PM_{2.5}$ | 0.50 | 0.50 |

| | | |
|---|---|---|
| $SO_2$ | 0.06 | 0.06 |
| VOCs | 0.60 | 0.60 |
| GHGs ($CO_{2e}$ basis) | 12,081 | 12,081 |
| $H_2SO_4$ | 0.01 | 0.01 |
| HAPs | 0.19 | 0.19 |

### *Cooling Tower Emissions*

Potential emissions from the proposed Cooling Tower are limited to PM emissions. The drift emissions from the Cooling Towers are limited to the particulate associated with dissolved solids in liquid droplets that become entrained in the air stream exiting the Cooling Tower. The particle size distribution is dependent on several factors including the design of the Cooling Tower, the efficiency of the drift eliminators, and the concentration of TDS in the circulating water.

PM emission estimates from the proposed Cooling Towers are based on a water circulation rate of 159,000 gallons per minute (gpm), a drift rate of 0.0005% of the circulating water rate, a maximum TDS content in the make-up cooling water of 300 mg/L, and a maximum of six (6) cycles of concentration in the circulating water.

Based on the Reisman and Frisbie method, "Calculating Realistic $PM_{10}$ Emissions from Cooling Towers" (Reisman and Frisbie, 2002), $PM_{10}$ emissions are estimated to be less than 50% of the PM emissions at the assumed TDS concentration (i.e. a maximum of 1,800 mg/L in the circulating water). Likewise, $PM_{2.5}$ emissions are estimated to be less than 0.2% of the PM emissions at the assumed TDS concentration.

Potential emissions from the Cooling Tower are summarized in Table 7.

**Table 7: Cooling Tower Emissions**

| **Pollutant** | **lb/hr** | **tpy** |
|---|---|---|
| PM | 0.72 | 3.2 |
| $PM_{10}$ | 0.5 | 2.1 |
| $PM_{2.5}$ | 0.01 | 0.01 |

### *Emergency Generator Emissions*

Emissions estimates for the 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. All annual emissions were based on 500 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 | 2.6 | Subpart IIII | |
| $NO_x$ | 2.52 | Vendor + EE | $NO_x$ + NMHC given by vendor. Applicant assumed 90-10 $NO_x$ - VOC split |
| PM | 0.09 | Vendor | |
| $PM_{10}$ | 0.09 | Vendor | |
| $PM_{2.5}$ | 0.09 | Vendor | |
| $SO_2$ | 0.02 (lb/hr) | mass balance | |
| VOCs | 0.28 | Vendor + EE | $NO_x$ + NMHC given by vendor. Applicant assumed 90-10 $NO_x$ - VOC split |
| GHGs | 163 (lb/mmbtu) | 40 CFR 98 Subpart C | |
| Total HAPs | 0.004 (lb/mmbtu) | AP-42 | Sum of individual HAP EF's |

**Table 9: Emergency Generator Emissions**

| Pollutant | lb/hr | tpy |
|---|---|---|
| CO | 11.53 | 2.88 |
| $NO_x$ | 11.18 | 2.79 |
| PM | 0.40 | 0.10 |
| $PM_{10}$ | 0.40 | 0.10 |
| $PM_{2.5}$ | 0.40 | 0.10 |
| $SO_2$ | 0.03 | 0.01 |
| VOCs | 1.24 | 0.31 |
| GHGs ($CO_{2e}$ basis) | 2416 | 604 |
| HAPs | 0.01 | 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 500 hours of operation per year.

**Table 10: Fire Water Pump Emission Factors**

| Pollutant | Emission Rate (g/hp-hr) | Emission Factor Source | Comments |
|---|---|---|---|
| CO | 2.6 | Subpart IIII | |
| $NO_x$ | 2.70 | Subpart IIII+ EE | $NO_x$ + NMHC given by Subpart IIII. Applicant assumed 90-10 $NO_x$ - VOC split |
| PM | 0.15 | Subpart IIII | |
| $PM_{10}$ | 0.15 | Subpart IIII | |
| $PM_{2.5}$ | 0.15 | Subpart IIII | |
| $SO_2$ | 0.01 (lb/hr) | mass balance | |
| VOCs | 0.30 | Subpart IIII+ EE | $NO_x$ + NMHC given by Subpart IIII. Applicant assumed 90-10 $NO_x$ - VOC split |
| GHGs | 163 (lb/mmbtu) | 40 CFR 98 Subpart C | |
| Total HAPs | 0.004 (lb/mmbtu) | AP-42 | Sum of individual HAP EF's |

**Table 11: Fire Water Pump Emissions**

| Pollutant | lb/hr | tpy |
|---|---|---|
| CO | 1.44 | 0.36 |
| $NO_x$ | 1.49 | 0.37 |
| PM | 0.08 | 0.03 |
| $PM_{10}$ | 0.08 | 0.03 |
| $PM_{2.5}$ | 0.08 | 0.03 |
| $SO_2$ | 0.01 | 0.01 |
| VOCs | 0.17 | 0.04 |
| GHGs ($CO_{2e}$ basis) | 309 | 77 |
| 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 Moundsville Power, 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 Dc, 40 CFR 60 Subpart IIII and 40 CFR 63 - Subpart ZZZZ. Each applicable rule, and Moundsville Power's proposed compliance thereto, 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 and auxiliary boiler meet the definition of "fuel burning units" under 45CSR2 and are, therefore, 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 Moundsville Power, LLC to conduct Method 22 visible opacity checks on the auxiliary boiler and the combined duct burner/combustion turbine stack on a monthly basis.

### ***45CSR2 Weight Emission Standard - Section 4.1.b***

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 100 mmBtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the auxiliary boiler will be 9.0 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 0.50 lb/hr. This emission rate is less than 6% of the 45CSR2 limit.

The allowable particulate matter (PM) emission rate for the two combined 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 two combined duct burners will be 144.2 mmBtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the duct burners will be 7.21 lb/hr. This limit represents filterable PM only and does not include condesible 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 two combined combustion turbine/duct burner stacks are estimated to be 15.1 lb/hr. However, this represents emissions from both the turbines and the duct burners. If we separate duct burner emissions and turbine emissions by weighting them in proportion to the heat input (144.2 mmbtu/hr for the two duct burners and approximately 4,174 mmbtu/hr for the two turbines) we can see that the duct burners account for only about 0.53 pounds per hour of PM. This emission rate is less than 8% of the 45CSR2 limit.

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 Moundsville Power 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 3.1.e (note that Marshall county is in the Priority I region), is the product of 3.1 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 100 mmBtu/Hr. Using the above equation, the 45CSR10 $SO_2$ emission limit of the auxiliary boiler will be 310 lb/hr.

The maximum potential hourly $SO_2$ emissions from the auxiliary boiler is estimated to be 0.06 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 a 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 Moundsville Power, LLC Plant is defined as a 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 $SO_2$. Therefore, the proposed $SO_2$ emissions will be permitted under Rule 13.

As required under §45-13-8.3, Moundsville Power, 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 26, 2013 in the Intelligencer and the affidavit of publication for this legal advertisement was submitted on January 29, 2014.

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 Moundsville Power, LLC facility will be constructed in Marshall County, WV, which is classified as in attainment with all NAAQS except $SO_2$. The construction of the Moundsville Power, LLC facility is defined as a construction of a "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, $NO_x$, $PM_{2.5}$, $PM_{10}$, TSP, VOCs, 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**

| Pollutant | Potential-To-Emit (TPY) | Significance Level (TPY) | PSD (Y/N) |
|---|---|---|---|
| CO | 209.40 | 100 | Y |
| $NO_x$ | 145.30 | 40 | Y |
| $PM_{2.5}$ | 68.00 | 10 | Y |
| $PM_{10}$ | 70.10 | 15 | Y |
| PM | 71.20 | 25 | Y |
| $SO_2$ | 4.80 | 40 | N |
| VOCs | 74.80 | 40 | Y |
| GHGs ($CO_{2e}$) | 2,240,618.00 | 100,000 | Y |
| Lead | 0.01 | 0.6 | N |
| Sulfuric Acid Mist | 3.10 | 7 | N |
| 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 Dc, 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 Marshall County, WV is classified as in nonattainment with the NAAQS for $SO_2$. However, since the Moundsville Power, LLC Plant will emit less than 100 tons per year of $SO_2$, it is not defined as a major stationary source under the rule. Therefore, 45CSR19 does not apply to the proposed Moundsville Power, LLC Plant facility.

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 Moundsville Power, 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 Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

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

***Subpart Dc Applicability - Section §60.40c***

Pursuant to §60.40c(a), the affected facility to which Subpart Dc applies is each steam generating unit that is capable of combusting 29 megawatts (100 million Btu/hour) heat input or less but greater than or equal to 2.9 megawatts (10 million Btu/hr) for which construction, reconstruction or modification is commenced after June 9, 1989. The proposed Moundsville Power, LLC auxiliary boiler meets these requirements and is subject to the applicable requirements of Subpart Dc.

***Subpart Dc Pollutant Emission Standards - Section §60.42c and §60.43c***

Per §60.42c(a) and §60.43c(a), the 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.

***Subpart Dc Notification Requirements - Section §60.48c(a)***

Section §60.48c outlines the notification of construction and actual startup requirements to be followed to be in compliance with Subpart Dc. Moundsville Power, LLC is subject to these requirements.

***Subpart Dc Record-Keeping Requirements - Section §60.48c(f) and Section §60.48c(g)***

Sections §60.48c(f) and (g) outline the fuel record-keeping requirements required to be followed to be in compliance with Subpart Dc. Moundsville Power, LLC is subject to these requirements.

<u>40 CFR 60, Subpart KKKK: Standards of Performance for Stationary Combustion Turbines</u>

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 Moundsville Power, 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. Moundsville Power, LLC proposes to use a fire water pump and emergency generator that are Subject to Subpart IIII. The following discusses the substantive applicable requirements of Subpart IIII relating to the Moundsville Power, 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 fire water pump engine and emergency generator at the proposed Moundsville Power, LLC Plant.

***Subpart IIII Emission Standards - Section §60.4204 and §60.4205***

§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 | 3 | -- | 0.15 |
| Emergency Generator | 4.8 | 2.6 | 0.15 |

***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 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 Moundsville 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 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, Moundsville Power, LLC is exempt from CAM for $NO_x$. 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 Moundsville Power, 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 |
|---|---|---|---|
| CCCT-1 | Combined Cycle Combustion Turbine | CCCT-1 | 40 CFR 60 Subpart KKKK |
| CCCT-2 | Combined Cycle Combustion Turbine | CCCT-2 | 40 CFR 60 Subpart KKKK |
| CCCT-1 | HRSG w/duct burner | HRSG-1 | 40 CFR 60 Subpart KKKK, 45CSR2, 45CSR10 |
| CCCT-2 | HRSG w/duct burner | HRSG-2 | 40 CFR 60 Subpart KKKK, 45CSR2, 45CSR10 |
| CT-1 | Cooling Tower | CT-1 | N |
| AB-1 | Auxiliary Boiler | AB-1 | 45CSR2, 45CSR10, 40 CFR 60 Subpart Dc |
| 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 |
| 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 Moundsville Power, LLC Plant is defined as a construction of a "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, $NO_x$, $PM_{2.5}$, $PM_{10}$, TSP, VOCs and Greenhouse Gasses. 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 - Section 8.2***

Pursuant to 45CSR14, Section 8.2, Moundsville Power, 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, $PM_{2.5}$, 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/. Moundsville Power, 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 Moundsville Power, LLC permit application and amendments and revisions thereto.

The following table summarizes the Moundsville Power, LLC BACT selections.

**Table 15: Moundsville Power, LLC BACT Selection**

| Source | PSD Pollutant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_x$ | | $PM_{2.5}/PM_{10}/PM^{(1)}$ | | VOCs | | GHGs | |
| | 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 | 7.6 lb/hr | AF, NG, CP | 1ppmvd 2ppmvd | OC | 793 lb/ MW-hr(5) | NG, GE7FA |
| Aux. Boiler | 0.04 lb/mmbtu | CP | 0.02 lb/mmbtu | ULNB, FGR, CP | 0.005 lb/mmbtu | NG, CP | 0.006 lb/mmbtu | CP, NG | 12,081 lb/hr | NG |
| Cooling Tower | n/a | n/a | n/a | n/a | 0.72/0.50 /0.01 lb/hr | DE(5) | n/a | n/a | n/a | n/a |
| Fire Water Pump | 2.6 g/hp-hr | CP | 3.0(2) g/hp-hr | CP | 0.15 g/hp-hr | ULSD, CP | 3.0(2) g/hp-hr | CP | 163 lb/mmbtu | NG |
| Emergency Gen. | 2.6 g/hp-hr | CP | 2.8(2) g/hp-hr | CP | 0.09 g/hp-hr | ULSD, CP | 2.8(2) g/hp-hr | CP | 163 lb/mmbtu | NG |

(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; DE=Drift Eliminators; DLNB = Dry Low NOx Burners; ULNB = Ultra Low NOx Burners; FGR = Flue Gas Recirculation; OC = Oxidation Catalyst; AF = inlet air filtration; NG = Use of Natural Gas(or a natural gas/ethane blend) as a fuel; ULSD = use of Ultra Low Sulfur Diesel as a fuel; GE7FA = use of GE Frame 7FA.04 turbines.
(4) Where 2 limits exist, the upper limit is without duct firing and the bottom limit is with duct firing.
(5) Based on Combined Cycle gross MW output, at 59°F ambient temperature, with no duct firing, evaporative cooling on, and natural gas fuel.

The following will review the above Moundsville Power, 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: Moundsville Power, 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
* $SCONO_x$™ (aka $EM_x$™)

(2) Technically Infeasible Determinations: The only technology that was determined to be technically infeasible under (1) above was the use of $SCONO_x$. 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 197 MW in size. Therefore, the technology was considered infeasible.

(3) Effectiveness Ranking of Remaining Technologies: Moundsville Power, 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 Moundsville Power, 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 gas fired combined cycle combustion turbines from the RBLC (note only entries with NOx emissions stated as ppm were considered):

| RBLC ID | Date | Company | BACT Emission Rate[(1)] |
|---|---|---|---|
| TX-0641 | 11/12/2013 | Pinecrest Energy | 2.0 ppm |
| MI-0405 | 4/23/2013 | Midland Cogen | 2.0 ppm |
| PA-0291 | 4/23/2013 | Hickory Run Energy | 2.0 ppm |
| VA-0321 | 3/12/2013 | VEPCO | 2.0 ppm |
| PA-0286 | 1/31/2013 | Moxie Energy | 2.0 ppm |
| **Avg. Emission Rate** | | | 2.0 ppm |

(1) All emission rates include duct firing.

With respect to $NO_x$ emissions, Moundsville Power, LLC's proposed emission rate of 2 ppmvd is exactly the same as other recent RBLC entries. None of the other units employed any NOx control technology other than DLNB and/or SCR.

***CO***

(1) Technology Identification: Moundsville Power, LLC identified Oxidation Catalysts and $EM_x$™ as the only potential control technologies.

(2) Technically Infeasible Determinations: Moundsville Power, LLC determined that $EM_x$™ 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 Moundsville Power, 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 gas fired combined cycle combustion turbines from the RBLC (note only entries with CO emissions stated as ppm were considered):

| RBLC ID | Date | Company | BACT Emission Rate[1] |
|---|---|---|---|
| PA-0298 | 3/04/2014 | Future Power PA | 3.0 ppm |
| TX-0641 | 11/12/2013 | Pinecrest Energy | 2.0 ppm |
| MI-0405 | 4/23/2013 | Midland Cogen | 10.5 ppm[2] |
| PA-0291 | 4/23/2013 | Hickory Run Energy | 2.0 ppm |
| VA-0321 | 3/12/2013 | VEPCO | 1.5 ppm |
| **Avg. Emission Rate** | | | 3.8 ppm |

(1) All emission rates include duct firing.
(2) No controls were required.

With respect to CO emissions, Moundsville Power, LLC's proposed emission rate of 2.0 ppm is significantly more stringent than the average of the last 5 entries into the RBLC. Even throwing out the Midland facility which for some reason was not required to use add on controls, the 2.00 ppm limit is still more stringent than the average limit of 2.125 ppm.

***PM/PM$_{10}$/PM$_{2.5}$***

(1) Technology Identification: Moundsville Power, LLC identified the following as potential particulate control technologies applicable to the Combustion Turbines / 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 is 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, as well as USEPA and state permit databases, 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 Moundsville Power, 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 gas fired combined cycle combustion turbines from the RBLC. (note only entries with either particulate emissions stated as lb/hr or with enough information to easily convert limits to lb/hr were considered):

| RBLC ID | Date | Company | BACT Emission Rate[1] (lb/hr) |
|---|---|---|---|
| PA-0298 | 3/04/2014 | Future Power PA | 10.4 |
| TX-0641 | 11/12/2013 | Pinecrest Energy | 26.2 |
| OH-0352 | 6/18/2013 | Arcadis, US, Inc. | 10.1[2] |
| MI-0405 | 4/23/2013 | Midland Cogen | 19.89[3] |
| PA-0291 | 4/23/2013 | Hickory Run Energy | 18.5 |
| **Avg. Emission Rate** | | | 17.02 |

(1) All emission rates include duct firing.
(2) The more stringent of two limits depending on which turbine brand the company chooses.
(3) Limit is for $PM_{2.5}$

With respect to particulate emissions, Moundsville Power, LLC's proposed emission rate of 7.6 lb/hr for PM, $PM_{10}$ and $PM_{2.5}$ is significantly more stringent than any of the last 5 entries into the RBLC. Additionally, none of the entries required post combustion controls.

***VOCs***

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

(2) Technically Infeasible Determinations: Moundsville Power, 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 Moundsville Power, 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 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[1] |
|---|---|---|---|
| PA-0298 | 3/04/2014 | Future Power PA | 2.0 ppm/2.0 ppm |
| TX-0641 | 11/12/2013 | Pinecrest Energy | 2.0 ppm/2.0 ppm |
| PA-0291 | 4/23/2013 | Hickory Run Energy | 1.5 ppm/1.5 ppm |
| VA-0321 | 3/12/2013 | VEPCO | 0.7 ppm[2] |
| PA-0286 | 1/31/13 | Moxie Energy | 1.0 ppm/1.5 ppm |
| **Avg. Emission Rate** | | | 1.44 ppm / 1.75 ppm |

(1) When two rates are given, the first is without duct firing and the second is with duct firing.
(2) Without duct firing. No limit given in RBLC with duct firing.

With respect to VOC emissions, Moundsville Power, 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. The proposed rate is slightly more stringent when duct firing is not occurring and slightly less stringent (though still in an acceptable range) when it is.

**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:

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

- o 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%.

*Cogeneration/Combined Heat & Power*

Cogeneration, or Combined Heat and Power (CHP), is the operation of a combustion system to generate both heat for electric power generation and useful thermal energy for a process. The electric power is distributed for use, while the thermal energy is used locally to support heating systems or industrial processes. A CHP system allows for the use of energy in the form of heat to provide thermal energy that would otherwise be lost in cooling water for a traditional EGU. For combustion turbine systems, the more likely CHP technique would be to provide space heating for nearby buildings or to provide makeup heat to nearby coal-fired EGUs (likely application for power plants with combustion turbine and coal-fired EGUs onsite). The use of this otherwise lost heat would thereby improve the overall efficiency of the EGU or process, and subsequently reduce overall $CO_2$ emissions, on an equivalent basis.

The use of a CHP system provides an opportunity to extract additional energy from heat otherwise lost in a traditional EGU. However, this type of system requires the removal of steam from the steam turbine, which reduces the amount of electric power generation recognized in the CHP. This electrical energy is instead transformed to thermal energy for use on a more local basis. The advantage to a CHP system is the net improvement of overall fuel efficiency compared to a traditional EGU operation.

*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 result in significantly lower GHG emissions than coal combustion (117.0 lb/MMBtu and 131.4 lb/MMBtu, for natural gas and ethane, respectively, 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, and even this technology is limited and infantile in 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. In fact, President Obama formed an Interagency Task Force on Carbon Capture and Storage, co-chaired by DOE and USEPA, in early 2010 to develop a federal strategy for overcoming the barriers to the widespread, cost effective deployment of CCS within 10 years, with an ultimate goal of bringing several commercial demonstration projects online by 2016.

Without a market to use the recovered $CO_2$, the material would instead require sequestration, or permanent storage. The geological formations near the Moundsville Power, LLC 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 Moundsville Power, LLC 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.

When asked to provide further information, Moundsville Power, LLC provided the following.

*"CCS involves three (3) categories of technologies used to achieve the physical capture and storage of carbon dioxide (CO2) produced from stationary sources:*

*(1) Separation and capture of CO2 from flue gas;*
*(2) Pressurization and transport to a storage site; and*
*(3) Injection and long-term storage or sequestration of the CO2 captured.*

*Separation and Capture*

*Despite some of the challenges associated with CCS, CO2 emissions from combustion sources theoretically can be separated and captured through post-combustion methods. However, because the air used for combustion contains over 75% nitrogen, the CO2 concentration in the exhaust gases is only 5 to 20%, depending on the amount of excess air and the carbon content of the fuel, making it costly and energy intensive to capture.*

*To implement CCS, Moundsville Power would need to install an amine-based scrubbing system and associated compressors. This is the most maturetechnology potentially available for CCS. As part of developing a cost estimate for CCS, Moundsville Power used cost information from a U.S. Department of Energy (US DOE)-National Energy Technology Laboratory (NETL) study from 2010 to determine the capital cost of such an amine scrubbing system and its associated compressors.*

*Pressurization and Transport*

*Currently, because there is no local customer or use for captured CO2 near the project site, Moundsville Power requires off-site CO2 sequestration, involving utilization of a CO2 pipeline in order to transport CO2 to distant geologic formations that are conducive to sequestration. Building such a pipeline for dedicated use by a single facility will almost certainly make any project economically infeasible. However, such an option may be effective if adequate storage capacities exist, and if reasonable transportation prices can be arranged with a pipeline operator.*

*...The closest existing CO2 transport pipeline to Moundsville Power is located in Mississippi, roughly 950 miles from the project site. Although building a 1,000 mile pipeline is a technically feasible option for CO2 transport, it would be cost prohibitive and would be expected to lead to increased CO2 emissions because of the additional compression required to transport the captured CO2 over such a large distance. Aside from the direct costs, such a pipeline project would likely face major permitting challenges. If permitting of such a line was even possible, it would take years to permit and construct.*

*Geological Sequestration*

*Dedicated geological sequestration of CO2 requires close proximity to a favorable geologic formation. Moundsville Power used the US DOE-NETL National Carbon Sequestration Database and Geographic Information System (NATCARB) to identify the nearest geologic carbon sequestration site that may be suitable for the project.*

*...West Virginia and surrounding states have identified potentially viable CO2 geologic storage resources in oil and gas fields, deep coal seams (> 2,400 feet), and saline aquifers. Development of these sites is in its infancy. Additional significant research and testing would be required to develop and regulate these sites for large-scale use by a CO2 emitter such as Moundsville Power. The nearest test site that is undergoing small-scale validation testing was identified as a coal seam in Russell County, Virginia. Costs to implement CCS include constructing a 12-inch diameter, 300-mile long pipeline to deliver the compressed CO2 to this potential site.*

*A 12-inch pipe is conservatively small and likely underestimates the costs for constructing the pipeline. Further, the cost-effectiveness estimate is conservatively low as the estimate does not include compressor stations which would likely be needed to transport the gases over this distance. Additionally, for this cost-effectiveness estimate, no allowance was provided for mitigation of the likely substantial ecological and social impacts of building a new pipeline over such a large distance.*

*Based on the analysis above and due to the fact that there are no suitable CO2 storage locations or existing transport pipelines close to the project site, the use of add-on controls for carbon sequestration is considered to be technically infeasible."*

It should also be noted that the proposed BACT limit of 793 lb/MW-hr (see below) is significantly less than EPA's proposed 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 (http://www2.epa.gov/sites/production/files/2013-09/documents/20130920technicalfactsheet.pdf). Given that this is a brand new addition to the NSPS (not even finalized yet) that addresses new construction, it seems that USEPA would have implemented a requirement for CCS if the technology was currently considered practical.

*Cogeneration/Combined Heat & Power*

For a CHP system to be beneficial, there must be a local need for thermal energy, because thermal energy cannot be effectively transported over extended distances. Given the proposed use of an extremely efficient combustion turbine operated in an efficient combined-cycle mode, there is no reasonable net environmental benefit of a CHP system for the proposed project. Therefore, CHP is not considered technically feasible for this project.

(3) Effectiveness Ranking of Remaining Technologies: Moundsville Power, LLC ranked using thermally efficient turbines in conjuction with lower carbon fuels as the top control technology with a resulting GHG emission rate of 793 lb $CO_{2e}$/MW-hr (based on gross MW output, combined cycle mode, no duct firing, and evaporative cooling on) and 1213 lb $CO_{2e}$/MW-hr (based on gross MW output, simple cycle mode and evaporative cooling on).

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 Moundsville Power, 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 |
|---|---|---|---|
| PA-0296 | 12/17/2013 | Berks Hollow Energy | 1,000 lb/MW-hr |
| MI-0405 | 4/23/2013 | Midland Cogen | 1,071 lb/MW-hr |
| TX-0632 | 11/29/2012 | Calpine Corp. | 920 lb/MW-hr |
| TX-0633 | 11/29/2012 | Calpine Corp. | 920 lb/MW-hr |
| DE-0023 | 10/31/2012 | NRG Energy Center | 1085 lb/MW-hr |
| **Avg. Emission Rate** | | | 999.2 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 Moundsville Power, LLC combustion turbines compare favorably (calculated emission rate of 793 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 Moundsville Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of 2,240,618 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: Moundsville Power, LLC did not identify any potential control technologies 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 Moundsville Power, LLC stated "There is currently no technically feasible add-on control technology to reduce $NO_x$ emissions from gaseous fuel fired auxiliary boilers of the size proposed for the Moundsville Power, LLC Project" EPAs Air Pollution Control Technology Fact Sheet for SCRs says that SCRs can be used and 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. To this end, the writer requested and Moundsville Power, LLC supplied, an economic feasibility analysis relating to installation of SCR technology on the auxiliary boiler.

(3) Effectiveness Ranking of Remaining Technologies: SCR in combination with flue gas recirculation and ultra low $NO_x$ burners is the top control technology. Flue gas recirculation and use of ultra low $NO_x$ burners without SCR is the remaining technology.

(4) Economically Infeasible Determinations: In a cost analysis provided by Moundsville Power, LLC, SCR had an incremental (over ULNB with FGR) cost effectiveness of $64,940/ton-$NO_x$ removed. 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 2,000 hours of operation a year and no more than 12 hours of operation a day. Based on this result of the cost analysis, Moundsville Power, LLC eliminated Selective Catalytic Reduction and chose ULNB with FGR as the BACT technology.

(5) DAQ Review of RBLC: The following table was constructed using data for the 5 most recent entries for natural gas fired boilers (100 mmbtu/hr or less) 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 |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 0.02 lb/mmbtu |
| PA-0291 | 04/23/2013 | Hickory Run Energy | 0.011 lb/mmbtu |
| SC-0149 | 01/03/2013 | Klauser Holding | 0.036 lb/mmbtu |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 0.032 lb/mmbtu |
| NJ-0080 | 11/01/2012 | Hess Newark Energy Center | 0.05 lb/mmbtu |
| **Avg. Emission Rate** | | | 0.0298 lb/mmbtu |

With respect to $NO_x$ emissions, Moundsville Power, LLC's proposed emission rate of 0.02 lb/mmbtu is more stringent than many other recent RBLC entries. None of the other units employed any $NO_x$ control technologies other than use of ultra low $NO_x$ burners and flue gas recirculation.

***CO***

(1) Technology Identification: Moundsville Power, 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. For boilers, good combustion can include low-NOx burners (LNB), FGR, and ULNB that each support effective combustion that minimizes CO formation. Although these efficient combustion techniques are targeted to reduce NOx emissions, they have a collateral impact of minimizing CO formation.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 (100 mmbtu/hr or less) 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 |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 0.055 lb/mmbtu |
| PA-0291 | 04/23/2013 | Hickory Run Energy | 0.036 lb/mmbtu |
| SC-0149 | 01/03/2013 | Klauser Holding | 0.039 lb/mmbtu |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 0.083 lb/mmbtu |
| FL-0335 | 09/05/2012 | Klauser Holding | 0.039 lb/mmbtu |
| **Avg. Emission Rate** | | | 0.050 lb/mmbtu |

With respect to CO emissions, Moundsville Power, LLC's proposed emission rate of 0.04 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: Moundsville Power, 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 but 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, as well as USEPA and state permit databases, 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 Moundsville Power, 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 gas fired boilers 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 |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 0.008 lb/mmbtu |
| PA-0291 | 04/23/2013 | Hickory Run Energy | 0.005 lb/mmbtu |
| SC-0149 | 01/03/2013 | Klauser Holding | 0.005 lb/mmbtu |
| NJ-0079 | 07/25/2012 | CPV Shore | 0.005 lb/mmbtu |
| OH-0350 | 07/18/2012 | Republic Steel | 0.007 lb/mmbtu |
| **Avg. Emission Rate** | | | 0.006 lb/mmbtu |

With respect to PM/$PM_{10}$/$PM_{2.5}$ emissions, Moundsville Power, LLC's proposed emission rate of 0.005 lb/mmbtu is comparable to other recent RBLC entries. None of the other units employed any particulate control technology other than good combustion practices.

***VOCs***

(1) Technology Identification: Moundsville Power, 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 Moundsville Power, 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 (100 mmbtu/hr or less) 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 |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 0.006 lb/mmbtu |
| PA-0291 | 04/23/2013 | Hickory Run Energy | 0.0015 lb/mmbtu |
| SC-0149 | 01/03/2013 | Klauser Holding | 0.003 lb/mmbtu |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 0.005 lb/mmbtu |
| FL-0335 | 09/05/2012 | Klauser Holding | 0.003 lb/mmbtu |
| **Avg. Emission Rate** | | | 0.004 lb/mmbtu |

With respect to VOC emissions, Moundsville Power, LLC's proposed emission rate of 0.006 lb/mmbtu is slightly higher than the average of other recent RBLC entries. However, given the limited hours of operation the boiler will be permitted for (2,000 hours per year), decreasing the limit from 0.006 lb/mmbtu to the average of 0.004 lb/mmbtu would only decrease VOC emissions by less than 0.2 tons per year. None of the other units employed any VOC control technology other than good combustion practices.

***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 pipeline quality natural gas and good combustion practices. Moundsville Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of 2,240,618 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 120.8 lb/mmbtu based on the emission factor used was selected. The writer was unable to find any GHG BACT limits in the RBLC for small, natural gas fired boilers expressed in anything other than tons per year. However, the tons per year limit for the Arcadis US facility was able to be converted into a lb/mmbtu limit of 117.89. This is very comparable to the Moundsville Power, LLC limit.

Emergency Generator

**$NO_x$**

(1) Technology Identification: Moundsville Power, 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 seems reasonable. Therefore, Moundsville Power, LLC proposed use good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing (estimated total of 500 hours per year of operation).

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: Moundsville Power, 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 Moundsville Power, 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. It's somewhat unclear what level Moundsville Power, LLC actually proposed. The application seems to go back and forth in several places between the NSPS Subpart IIII applicable limit of 4.8 g/hp-hr and the vendor emission factor of 2.8 g/hp-hr. However, given that the vendor has indicated that 2.8 g/hp-hr is achievable, the writer believes it is the proper BACT level.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 $NO_x$ + NMHC emission limits (or where the $NO_x$ and VOC limits could be easily combined) were considered .

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 4.8 g/hp-hr |
| LA-0272 | 03/27/2013 | Dyno Nobel Louisiana Ammonia | 4.8 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 4.8 g/hp-hr[1] |
| AK-0076 | 08/20/2012 | Exxon Mobile | 4.8 g/hp-hr[1] |
| MI-0395 | 07/13/2012 | General Motors Tech Center | 4.9 g/hp-hr[1] |
| **Avg. Emission Rate** | | | 4.82 g/hp-hr |

[1]The RBLC actually lists this limit for $NO_x$ solely. It is included here under the assumption that it is actually for $NO_x$ + NMHC.

With respect to emissions, the selected emission rate of 2.8 g/hp-hr is significantly lower than the average of other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

**CO**

(1) Technology Identification: Moundsville Power, 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 seems reasonable. Therefore, Moundsville Power, 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: Moundsville Power, 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 2.6 g/hp-hr as BACT. It should be noted that 2.6 g/hp-hr is the applicable NSPS Subpart IIII limit.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 were used.

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| IA-0106 | 07/12/2013 | CF Industries Nitrogen | 2.6 g/hp-hr |
| OH-0352 | 06/18/2013 | Arcadis US | 2.6 g/hp-hr |
| LA-0272 | 03/27/2013 | Dyno Nobel Louisiana Ammonia | 2.6 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 2.6 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 2.6 g/hp-hr |
| **Avg. Emission Rate** | | | 2.6 g/hp-hr |

With respect to emissions, the proposed emission rate of 2.6 g/hp-hr is exactly the same as 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: Moundsville Power, 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, Moundsville Power, 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: Moundsville Power, 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 0.09 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 Moundsville Power, 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 |
|---|---|---|---|
| IA-0106 | 07/12/2013 | CF Industries Nitrogen | 0.15 g/hp-hr |
| OH-0352 | 06/18/2013 | Arcadis US | 0.15 g/hp-hr |
| LA-0272 | 03/27/2013 | Dyno Nobel Louisiana Ammonia | 0.15 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 0.15 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 0.15 g/hp-hr |
| **Avg. Emission Rate** | | | 0.15 g/hp-hr |

With respect to emissions, the proposed emission rate of 0.09 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: Moundsville Power, 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, Moundsville Power, 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: Moundsville Power, 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, Moundsville Power, 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. It's somewhat unclear what level Moundsville Power, LLC actually proposed. The application seems to go back and forth in several places between the NSPS Subpart IIII applicable limit of 4.8 g/hp-hr and the vendor emission factor of 2.8 g/hp-hr. However, given that the vendor has indicated that 2.8 g/hp-hr is achievable, the writer believes it is the proper BACT level.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 $NO_x$ + NMHC emission limits (or where the $NO_x$ and VOC limits could be easily combined) were considered .

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 4.8 g/hp-hr |
| LA-0272 | 03/27/2013 | Dyno Nobel Louisiana Ammonia | 4.8 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 4.8 g/hp-hr[1] |
| AK-0076 | 08/20/2012 | Exxon Mobile | 4.8 g/hp-hr[1] |
| MI-0395 | 07/13/2012 | General Motors Tech Center | 4.9 g/hp-hr[1] |
| **Avg. Emission Rate** | | | 4.82 g/hp-hr |

[1]The RBLC actually lists this limit for $NO_x$ solely. It is included here under the assumption that it is actually for $NO_x$ + NMHC.

With respect to emissions, the selected emission rate of 2.8 g/hp-hr is significantly lower than any of other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

**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 generators. Therefore, GHG emissions from the emergency generator will be controlled by exclusive use of good combustion practices. Moundsville Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of 2,240,618 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 163 lb/mmbtu based on the emission factor used was selected. The writer was able to find only 1 GHG BACT limit in the RBLC for diesel fired emergency generators expressed in anything other than tons per year. That limit was 1.55 g/kw-hr for an emergency generator at the Iowa Fertilizer Company (RBLC ID IA-0105). That equates to roughly 1 lb/mmbtu. This is obviously an erroneous entry. However, since the size and annual hours of operation limits were given, the tons per year limit for the Arcadis US facility was able to be converted into a lb/mmbtu limit of 457.4. The Moundsville Power, LLC limit is obviously more stringent.

Fire Water Pump

**$NO_x$**

(1) Technology Identification: Moundsville Power, 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 fire water pump, this seems reasonable. Therefore, Moundsville Power, 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: Moundsville Power, 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 Moundsville Power, LLC used a combined $NO_x$ + NMHC limit of 3.0 g/hp-hr. The combined $NO_x$ + NMHC limit is consistent with the applicable NSPS and several of the RBLC entries. It should be noted that the NSPS Subpart IIII limit for this engine is 3.0 g/hp-hr.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 $NO_x$ + NMHC emission limits (or where the $NO_x$ and VOC limits could be easily combined) were considered .

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 3.0 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 3.0 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 3.0 g/hp-hr |
| SC-0159 | 07/09/2012 | Michelin North America | 3.0 g/hp-hr |
| SC-0113 | 02/08/2012 | Pyramax Ceramics | 3.0 g/hp-hr |
| **Avg. Emission Rate** | | | 3.0 g/hp-hr |

With respect to emissions, the proposed emission rate of 3.0 g/hp-hr is exactly the same as other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

**CO**

(1) Technology Identification: Moundsville Power, LLC did not identify any potential add on CO control technologies applicable to the fire water pump engine. Given the purpose, size, and limited annual operating hours of the engine, this seems reasonable. Therefore, Moundsville Power, 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: Moundsville Power, 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 2.6 g/hp-hr as BACT.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 a CO limit expressed in g/hp-hr were used.

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 3.5 g/hp-hr |
| PA-0286 | 01/31/2013 | Moxie Energy LLC | 0.5 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 2.6 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 2.6 g/hp-hr |
| SC-0113 | 02/08/2012 | Pyramax Ceramics | 2.6 g/hp-hr |
| **Avg. Emission Rate** | | | 2.36 g/hp-hr |

With respect to CO emissions, Moundsville Power, LLC's proposed emission rate of 2.6 g/hp-hr is slightly higher than the average of other recent RBLC entries. However, given the limited hours of operation the engine will operate (estimated 500 hours per year), decreasing the limit from 2.6 g/hp-hr to the average of 2.36 g/hp-hr would only decrease CO emissions by less than 0.03 tons per year. None of the other units employed any CO control technology other than good combustion practices.

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

(1) Technology Identification: Moundsville Power, 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 seems

reasonable. Therefore, Moundsville Power, 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: Moundsville Power, 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 0.15 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 Moundsville Power, 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 were considered .

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 0.15 g/hp-hr |
| PA-0286 | 01/31/2013 | Moxie Energy LLC | 0.09 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 0.15 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 0.15 g/hp-hr |
| VA-0319 | 08/27/2012 | Gateway Green Energy | 0.15 g/hp-hr |
| **Avg. Emission Rate** | | | 0.138 g/hp-hr |

With respect to particulate emissions, Moundsville Power, LLC's proposed emission rate of 0.15 g/hp-hr is slightly higher than the average of other recent RBLC entries. However, given the limited hours of operation the engine will operate (estimated 500 hours per year), decreasing the limit from 0.15 g/hp-hr to the average of 0.138 g/hp-hr would only decrease particulate emissions by less than 4 **pounds** per **year**. None of the other units employed any particulate control technology other than good combustion practices.

**VOCs**

(1) Technology Identification: Moundsville Power, 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 seems reasonable.

Therefore, Moundsville Power, 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: Moundsville Power, 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 Moundsville Power, LLC used a combined $NO_x$ + NMHC limit of 3.0 g/hp-hr. The combined $NO_x$ + NMHC limit is consistent with the applicable NSPS and several of the RBLC entries. It should be noted that the NSPS Subpart IIII limit for this engine is 3.0 g/hp-hr.

(4) Economically Infeasible Determinations: Since Moundsville Power, 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 $NO_x$ + NMHC emission limits (or where the $NO_x$ and VOC limits could be easily combined) were considered .

| RBLC ID | Date | Company | BACT Emission Rate |
|---|---|---|---|
| OH-0352 | 06/18/2013 | Arcadis US | 3.0 g/hp-hr |
| IN-0158 | 12/03/2012 | St. Joseph Energy | 3.0 g/hp-hr |
| IA-0105 | 10/26/2012 | Iowa Fertilizer Company | 3.0 g/hp-hr |
| SC-0159 | 07/09/2012 | Michelin North America | 3.0 g/hp-hr |
| SC-0113 | 02/08/2012 | Pyramax Ceramics | 3.0 g/hp-hr |
| **Avg. Emission Rate** | | | 3.0 g/hp-hr |

With respect to emissions, the proposed emission rate of 3.0 g/hp-hr is exactly the same as other recent RBLC entries. None of the other units employed any control technology other than good combustion practices.

**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. Moundsville Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of

2,240,618 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 engine a limit of 163 lb/mmbtu based on the emission factor used was selected. The writer was able to find only 1 GHG BACT limit in the RBLC for diesel fired fire water pump engines expressed in anything other than tons per year. That limit was 1.55 g/kw-hr for an fire water pump engine at the Iowa Fertilizer Company (RBLC ID IA-0105). That equates to roughly 1 lb/mmbtu. This is obviously an erroneous entry. However, since the size and annual hours of operation limits were given, the tons per year limit for the Arcadis US facility was able to be converted into a lb/mmbtu limit of approximately 455.9. The Moundsville Power, LLC limit is obviously more stringent.

Cooling Tower

Moundsville Power, LLC has proposed as BACT for the Cooling Tower a drift eliminator with an efficiency of 0.0005%. This is consistent with BACT determinations on the RBLC for industrial cooling towers.

DAQ Conclusion on BACT Analysis

The DAQ has concluded that, with the exceptions noted above and corrected for, Moundsville Power, 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.

***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.

Moundsville Power, 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 the pollutants undergoing PSD review: 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 Moundsville Power, LLC facility is approximately 88 miles from the Otter Creek Wilderness Area, 97 miles from the Dolly Sods Wilderness Area, 159 miles from the Shenandoah National park, and 175 miles from the James River Face Wilderness Area.

Class II modeling performed showed that Moundsville's potential effects on all four Class I areas were insignificant. Additionally, 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. Therefore, no Class I modeling was performed.

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 only $NO_2$ (specifically the 1 hour standard for $NO_2$) was "significant," thereby requiring the applicant to proceed to the next stage of the modeling process for that pollutant.

This next 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. However, an increment for the 1 hour $NO_x$ standard has not been established. Therefore, the applicant simply went directly to the last tier of the modeling analysis.

The last 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 Tables 8 and 9 of Attachment A, "although the maximum modeled concentration in the form of the standard for each scenario exceeds the NAAQS, Moundsville Power, LLC's contribution is less than the Significant Impact Limit (SIL) paired in time and space". It has been EPA and WVDAQs longstanding policy that a facility does not "cause or contribute to" an exceedance of the NAAQS if its contribution is less than the SIL.

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 June 18, 2014 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.

Moundsville Power, LLC provided a short Additional Impacts Analysis in the application. In their analysis, they looked at potential impacts of economic growth associated with the proposed facility, as well as 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 Moundsville Power, LLC project is expected to create approximately 35 full time positions once the facility is constructed and operational. It is expected that these positions will be able to be filled locally, due to the planned closure of local coal fired power plant operations that have already taken place or are expected to occur in the near future. Therefore, no significant air quality or environmental impacts are expected due to net population growth associated with this project.*
>
> *Moundsville Power, LLC notes that the result of the SILs and NNAAQS analysis presented above demonstrate that the Project will not have a significant impact on air quality*

*in the region. Therefore, the projects impact on soils, vegetation, and visibility will be minimal. It should be noted that Moundsville Power, LLC will comply with the applicable West Virginia visible emission regulations, which will ensure that emissions from the proposed Project do not have adverse effects on local visibility."*

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

On May 14, 2014 the permit application R14-0030 was deemed complete. This action, as per 45CSR14, Section 2.42.b, has triggered the minor source baseline date (MSBD) for the following areas:

**Table 16: Minor Source Baseline Triggering**

| Pollutant | Marshall County |
|---|---|
| $NO_2$ | Previously |
| $PM_{10}$ | 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)):

**Table 17: Potential HAP Carcinogenic Risk**

| HAPs | Type | Known/Suspected Carcinogen | Classification |
|---|---|---|---|
| Acetaldehyde | VOC | Yes | B2 - Probable Human Carcinogen |
| Acrolein | VOC | No | Not Assessed |
| Benzene | VOC | Yes | A - Human Carcinogen |
| Ethylbenzene | VOC | No | D-Not Classifiable |
| Formaldehyde | VOC | Yes | B1 - Probable Human Carcinogen |
| Hexane | VOC | No | Inadequate Data |
| Naphthalene | VOC | Yes | C-Possible Human Carcinogen |
| POM[(1)] | VOC | Yes | B2 - Probable Human Carcinogen |
| 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 Moundsville Power, 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 did not trigger 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 Moundsville Power, LLC facility are discussed below.

Turbines/HRSG

As mentioned previously, each turbine and its associated HRSG (duct burner) exhaust to a common stack designated as CCCT-1 and CCCT-2. Moundsville Power, LLC shall be required to show continuous compliance with the CCCT-1 and CCCT-2 emission limits by using the monitoring specified in the following table:

**Table 18: CCCT-1 & CCCT-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 | 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 turbines and duct burners and sampling the fuel to determine its constituent characteristics.

Auxiliary Boiler

**Table 19: 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 | |
| $SO_2$ | 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

**Table 20: 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 | |
| $SO_2$ | 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

**Table 21: 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 | |
| $SO_2$ | 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 | |

Cooling Towers

Compliance with the cooling tower emission limits shall be achieved by the following requirements:

- Moundsville Power, LLC shall continuously monitor the circulating water flow rate in units of gallons per minute and the circulating water's total dissolved solids content via conductivity of cooling tower CT-1.

- Moundsville Power, LLC shall take a grab sample of the cooling tower circulating water and analyze on a weekly basis to determine the total solids content of the cooling tower circulating water. Upon request of the permittee, the Director may change the frequency of the testing under this section to a monthly basis once enough data has been established to verify compliance.

***Record-Keeping***

Moundsville Power, 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 in the permit and keep the information for five years. All collected data will be available to the Director upon request. Moundsville Power, LLC will also be required to follow all the record-keeping requirements as applicable in the 45CSR2, 45CSR10, and 40 CFR 60, Subpart Dc, Subpart KKKK and Subpart IIII and 40 CFR 63 Subpart ZZZZ.

***Reporting***

Moundsville Power, LLC will also be required to follow all the reporting requirements as applicable in the 45CSR2, 45CSR10, and 40 CFR 60, Subpart Dc, Subpart KKKK and Subpart OOO 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 each turbine/duct burner stack (CCCT-1, CCCT-2) to determine compliance with the following emission limits using the noted test methods:

**Table 22: CCCT-1 & CCCT-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 turbines/duct burners 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 Marshall Power, LLC, natural gas fired power plant near Moundsville, Marshall 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 R14-0030.

________________________________________
Steven R. Pursley, PE
Engineer

________________________________________
Date

**Attachment A: Modeling Analyses**