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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R14-0030A
Plant ID No.:	051-00188
Applicant:	Moundsville Power, LLC
Facility Name:	Moundsville Facility
Location:	Marshall County
NAICS Code:	221112
Application Type:	Class II Administrative Update
Received Date:	April 23, 2015
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$2,000.00
Date Received:	$1,000 - May 1, 2015; $1,000 - June 17, 2015
Complete Date:	June 17, 2015
Due Date:	August 14, 2015
Applicant Ad Date:	April 28, 2015
Newspaper:	*Moundsville Daily Echo*
UTM's:	Easting: 517.35 km Northing: 4,417.18 km Zone: 17
Description:	Administrative Update to incorporate design changes to the turbines, cooling tower and fire water pump.

DESCRIPTION OF PROCESS

On October 7, 2013 Moundsville Power, LLC submitted a permit application to construct a natural gas-fired combined cycle 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. Permit R14-0030 was issued for the facility on November 21, 2014.

On April 23, 2015, Moundsville Power submitted this application to incorporate certain design changes to the facility. Specifically Moundsville Power proposes the following:

Combustion Turbine/HRSG Changes:

* Increase the maximum heat input of each combustion turbine from 2,087 mmbtu/hr to 2,232 mmbtu/hr. Moundsville Power still intends to use the turbine proposed in the original application (GE Frame 7FA:04). However, since the application was submitted the emissions and performance profile of the turbine have been refined by the manufacturer. This change in conjunction with the increase in duct firing rate, discussed below, will increase the capacity of the facility from approximately 589 MW (the original application, and subsequent permit, described the facility as having a nominal capacity of 549 MW but this was based on a specific, typical, operating scenario and not an absolute maximum) to approximately 631 MW.

* Increase the maximum duct firing rate for each HRSG from 72.1 mmbtu/hr to 187.61 mmbtu/hr.

* Minor variations in stack parameters.

Cooling Tower Changes:

* Use of a 1x6 cell configuration tower instead of a 2x5 configuration.

* Increase in design circulating water rate from 159,000 gpm to 164,110 gpm.

* Decrease in exhaust flow rate per cell from 1.8 mmacfm to 1.45 mmacfm.

* Increase in maximum TDS concentration in the circulating water from 1.8 g/L to 2.4 g/L.

* Other minor design changes.

Fire Water Pump Changes

* Increase from 251 hp to 500 hp.

SITE INSPECTION

No site inspection was performed for this permitting action. However, a site inspection was performed for the original PSD application. The following comes directly from the preliminary determination for R14-0030:

"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."*

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Currently permitted emissions from the two CT/HRSG units (combined) are as follows:

Pollutant	lb/hr[1]	tpy[1]
CO	18.4 (1 hour average)	202.20
NO_x	30.4(1 hour average)	140.20
PM	15.2	67.40
PM_{10}	15.2	67.40
$PM_{2.5}$	15.2	67.40
SO_2	1.0	4.80
VOCs	10.6	73.90
Pb	0.002	0.01
GHGs (CO_{2e})	508,630	2,227,797.00
H_2SO_4	0.72	3.10
HAPs	2.72	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.

Lead and HAP emissions from the two revised CT/HRSG units (combined) are based on AP-42. All other emissions are based on vendor information from GE.

Pollutant	lb/hr[1]	tpy[1]
CO	19.84 (1 hour average)	208.15
NO_x	32.60 (1 hour average)	149.81
PM	17.80	79.15
PM_{10}	17.80	79.15
$PM_{2.5}$	17.80	79.15
SO_2	1.30	5.55
VOCs	11.40	77.28
Pb	0.002	0.01
GHGs (CO_{2e})	545,112.6	2,387,593.00
H_2SO_4	0.82	3.57
HAPs	2.98	13.06

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.

Therefore, the increases in permitted emissions due to the refined performance profile of the turbines are as follows:

Pollutant	lb/hr	tpy
CO	1.44	5.95
NO_x	2.20	9.61
PM	2.60	11.75
PM_{10}	2.60	11.75
$PM_{2.5}$	2.60	11.75
SO_2	0.30	0.75
VOCs	0.80	3.38
Pb	--	--
GHGs (CO_{2e})	36,482.6	159,796.00
H_2SO_4	0.10	0.47
HAPs	0.26	1.16

Currently permitted emissions from the cooling tower are as follows:

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

Emissions from the redesigned cooling tower are based on the Reisman and Frisbie method, "Calculating Realistic PM_{10} Emissions from Cooling Towers" (Reisman and Frisbie, 2002). This is the same method that was used to calculate emissions from the originally proposed cooling tower.

Pollutant	lb/hr	tpy
PM	0.99	4.34
PM_{10}	0.57	2.48
$PM_{2.5}$	0.01	0.01

Therefore, the increases in permitted emissions due to the redesigned cooling tower are as follows:

Pollutant	lb/hr	tpy
PM	0.27	1.14
PM_{10}	0.07	0.38
$PM_{2.5}$	--	--

Currently permitted emissions from the fire water pump are as follows:

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

Emissions from the new, larger pump engine are based on the same emission factors used to calculate emissions from the currently permitted pump. Specifically, CO and PM were based on the applicable NSPS standard. NO_x and VOCs were based on the applicable standard plus an engineering estimate that the NO_x + NMHC standard was 90% NO_x and 10% VOC. SO_2 was based on a mass balance. HAPs were based on AP-42 and GHGs were based on 40 CFR 98 Subpart C. All annual emissions are based on 500 hours of operation per year.

Pollutant	lb/hr	tpy
CO	2.87	0.72
NO_x	2.98	0.74
PM	0.17	0.04
PM_{10}	0.17	0.04
$PM_{2.5}$	0.17	0.04
SO_2	0.01	0.01
VOCs	0.33	0.08
GHGs (CO_{2e} basis)	596	149
HAPs	0.02	0.01

Therefore, the increases due to the larger fire water pump engine will be as follows:

Pollutant	lb/hr	tpy
CO	1.43	0.36
NO_x	1.49	0.37
PM	0.09	0.01
PM_{10}	0.09	0.01
$PM_{2.5}$	0.09	0.01
SO_2	--	--
VOCs	0.16	0.04
GHGs (CO_{2e} basis)	287	72
HAPs	0.01	--

Therefore the total increase due to all proposed changes are as follows:

Pollutant	lb/hr	tpy
CO	2.87	6.31
NO_x	3.69	9.98
PM	2.96	12.90
PM_{10}	2.76	12.14
$PM_{2.5}$	2.69	11.76
SO_2	0.30	0.75
VOCs	0.96	3.42
GHGs (CO_{2e})	36,769.6	159,868.00
H_2SO_4	0.10	0.47
HAPs	0.27	1.16

REGULATORY APPLICABILITY

The state and federal rules with applicability to the changes addressed by this permit application are as follows:

STATE RULES

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

The duct burners 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 requires Moundsville Power, LLC to conduct Method 22 visible opacity checks on 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 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 375.22 mmBtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the duct burners will be 18.76 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 17.8 lb/hr. It should be noted that this emission limit meets the requirement even though it 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 (375.22 mmbtu/hr for the two duct burners and approximately 4,464 mmbtu/hr for the two turbines) we can see that the duct burners account for only about 1.38 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 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 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

Moundsville Power wishes to make several substantive changes to it's existing permit. Since these changes do not result in an increase of emissions of more than 6 pounds per hour and 10 tons per year, the changes can be made as a Class II Administrative Update. As required under §45-13-8.3 ("Notice Level A"), Moundsville Power placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on April 28, 2015 in the *Moundsville Daily Echo* and the affidavit of publication for this legal advertisement was submitted on May 8, 2015.

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

Because the proposed changes do not meet the definition of "major modification" in 45CSR§14-2.40, the project is not subject to the requirements of PSD. However, due to the fact that the changes were proposed so close to the issuance of the original permit, it

was determined that the substantive portions of PSD review should be revisited with this application. Therefore, Moundsville Power resubmitted their air dispersion modeling to reflect the new changes (see Attachment A). Additionally, the writer will address BACT ramifications below.

Facility's new Potential to Emit

Pollutant	Potential-To-Emit (TPY)	Significance Level (TPY)	PSD (Y/N)
CO	215.71	100	Y
NO_x	155.28	40	Y
$PM_{2.5}$	79.76	10	Y
PM_{10}	82.24	15	Y
PM	84.10	25	Y
SO_2	5.55	40	N
VOCs	78.22	40	Y
GHGs (CO_{2e})	2,400,486.00	100,000	Y
Lead	0.01	0.6	N
Sulfuric Acid Mist	3.57	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

As can be seen by the above table, PSD review was not triggered for any new pollutant due to this application.

Combustion Turbines/Duct Burners

The BACT levels for NO_x, VOCs and CO do not change with this application. They remain at 2.0 ppm, 1ppm/2ppm, and 2.0 ppm respectively. The BACT level for Greenhouse Gases (GHGs) actually decreases slightly from 793 lb/MW-hr to 792 lb/MW-hr (based on Combined Cycle gross MW output, at 59 F ambient temperature, with no duct firing, evaporative cooling on, and natural gas fuel). The BACT level for $PM/PM_{10}/PM_{2.5}$ will increase slightly from 7.6 pounds per hour to 8.9 pounds per hour. However, as can be seen from the table below (included in the original Preliminary Determination for R14-0030) the selected BACT level is still more stringent than any of the last 5 entries into the RBLC.

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 $PM_{2.5}$

Fire Water Pump

No changes in the selected BACT levels are proposed for the fire water pump engine. They remain as follows:

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]
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

(1) PM emission rates are given in total particulate (filterable + condensable) matter
(2) $NMHC+NO_x$
(3) CP=Good Combustion Practices; NG = Use of Natural Gas(or a natural gas/ethane blend) as a fuel; ULSD = use of Ultra Low Sulfur Diesel as a fuel;

Cooling Towers

The following comes directly from the Preliminary Determination for permit application R14-0030:

> *"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."*

No changes in the drift eliminator efficiency (drift eliminator efficiency is how most cooling tower BACT limits in the RBLC are expressed) is proposed. However, the PM emission limit will increase from 0.72 pounds per hour to 0.99 pounds per hour.

FEDERAL RULES

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

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

Subpart KKKK Applicability - Section §60.4305(a)

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

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

Section §60.4320 requires that turbines meet the NO_x emission standards in Table 1 of the Subpart. Since the turbines at the 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 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 that is Subject to Subpart IIII. The following discusses the substantive applicable requirements of Subpart IIII relating to the fire water pump engine.

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.

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):

Engine	NMHC + NO_x	CO	PM
Fire Water Pump Engine	3	--	0.15

Subpart IIII Fuel Requirements - Section §60.4207

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

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

On August 3, 2015, EPA Administrator Gina McCarthy signed a notice which, among other things, amended 40 CFR Part 60 by adding Subpart TTTT. At the same time, USEPA submitted the notice to the Federal Register for publication. As of this date the notice has not been published. Therefore, no official version of the rule is available.

However, it should be noted that the Moundsville Power facility DOES appear to meet the standard that will be required by the new rule. Specifically, it seems the new rule will require new, base load, stationary combustion turbines to meet an emission standard of 1,000 lb CO_2/MW-hr gross output (however, given Moundsville Powers ability to combust a natural gas/ethane mix, the actual emission limit might have to be calculated monthly and be based on the specific fuel mix). The BACT level for GHGs stated above (792 lb/MW-hr) would obviously meet this limit.

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 at the 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.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

No new non-criteria regulated pollutants will be emitted due to these changes. Therefore, the discussion in the original preliminary determination is still applicable. The following comes directly from the preliminary determination for R14-0030:

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

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

HAPs

Section 112(b) of the Clean Air Act (CAA) identifies 188 compounds as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The combustion of both natural gas and fuel oil has the potential to produce HAPs. However, the potential HAP emissions from the facility are below the levels that define a major HAP source. Therefore, the facility is considered a minor (or area) HAP source, and no source-specific major source NESHAP or MACT standards apply. The following table lists each HAP potentially emitted by the facility in excess of 20 pounds/year (0.01 tons/year) and the carcinogenic risk associated thereto (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Acetaldehyde	VOC	Yes	B2 - Probable Human Carcinogen
Acrolein	VOC	No	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.'"

AIR QUALITY IMPACT ANALYSIS

Although this is a minor modification to an existing major stationary source, because these changes were made so soon after the issuance of a PSD permit, the decision was made to require Moundsville Power to submit revised modeling. See the modeling report by Jon McClung of DAQs planning section which is attached hereto.

MONITORING OF OPERATIONS

No additional monitoring above what is already required in R14-0030 is deemed necessary.

CHANGES TO PERMIT R14-0030

The following changes were made to R14-0030:

* Table 1.0 was changed to reflect the new heat inputs for the turbines and duct burners. Additionally, the cooling towers water circulation rate was increased and the engine size for the fire water pump engine was increased.

* Condition 4.1.2 was revised to reflect the new CT/HRSG hourly emission limits.

* Some clarifying language was added to the column headings of condition 4.1.3.

* Condition 4.1.4 was revised to reflect the new CT/HRSG annual emission limits.

* Condition 4.1.5 was changed to reflect the new, higher, PM limit and new, lower, GHG limit.

* Condition 4.1.27 was revised to reflect the new fire pump engine emission limits.

* The fuel usage rate in condition 4.1.29 was changed to reflect the requirements of the new, larger, engine.

* The PM and PM_{10} cooling tower emission limits in condition 4.1.34 were increased.

RECOMMENDATION TO DIRECTOR

Information supplied in the application indicates that compliance with all applicable regulations will be achieved. Therefore it is the recommendation of the writer that permit R14-0030A be granted to Moundsville Power, LLC for their Moundsville Facility in Marshall County.

Steven R. Pursley, PE
Engineer

8-5-15

August 5, 2015

Attachment A

MEMO

To: Steve Pursley
From: Jon McClung JDM
CC: Laura Crowder, Jay Fedczak, Bev McKeone, Joe Kessler
Date: June 24, 2015
Re: Moundsville Power LLC Modeling Review
Class II Administrative Update Application R14-30A

I have completed my review and replication of the air dispersion modeling analysis submitted in support of the Class II Administrative Update Permit Application (R14-30A) for the Moundsville Power LLC (Moundsville Power) facility to be located in Moundsville, Marshall County, WV. The Division of Air Quality (DAQ) approved Permit R14-30 for Moundsville Power on November 21, 2014. Moundsville Power submitted an application for a Class II Administrative Update on April 22, 2015. The dispersion modeling analysis for the original PSD application was required pursuant to §45-14-9 (Requirements Relating to the Source's Impact on Air Quality). Moundsville Power has performed an air quality analysis that includes the changes proposed in the Class II Administrative Update Application. This memo focuses on these changes; please refer to the original report dated June 18, 2014 for complete details regarding the review and replication of the original PSD application and the modeling report submitted by Moundsville Power supporting the Class II Update. The revised modeling analysis performed by Moundsville Power follows the orginal approved protocol with updates as noted below.

The changes Moundsville Power proposes in the application R14-30A are:

- Increase in the maximum heat input of each combustion turbine (CT) from 2;087 million Btu per hour (MMBtu/hr) to 2,232 MMBtu/hr;
- Increase in the maximum duct firing rate for each heat recovery steam generator (HRSG) from 72.1 MMBtu/hr to 187.61 MMBtu/hr;
- A reduction in the exhaust stack height of each CT/HRSG from 180.5 feet to 175 feet;
- Minor variations in exhaust gas flow rates and temperature for each CT/HRSG;
- Changes in the locations of downwash structures and modeled point sources; and
- Increase in the size of the emergency Fire Water pump from 251 horsepower (hp) to 500hp.

Overall, these changes increase the nominal electric generating capacity of the plant from 549 megawatts (MW) to 631 MW.

Marshall County, WV is in attainment or unclassifiable/attainment status for all criteria pollutants except for 1-hr SO_2. Project emissions of SO_2 are below the significant emission rate (SER), therefore SO_2 is not subject to new source review. Pollutants emitted in excess of the significant emission rate are subject to PSD review in areas of attainment. The criteria pollutants that exceed the SER associated with the proposed facility are in Table 1.

Table 1. Project emission rates

Pollutant	Original PSD Application Project Emissions (tons/yr)	Class II Administrative Update Application Project Emissions (tons/yr)	PSD Review
NO_x	145.3	155.3	Applicable
CO	209.4	215.7	Applicable
SO_2	4.8	5.6	Not Applicable
PM_{10}	70.1	82.3	Applicable
$PM_{2.5}$	68.0	79.8	Applicable
VOC	74.8	78.3	Applicable
GHG (CO2e)	2,240,618	2,400,486	Applicable

Dispersion modeling was conducted for NO_x, CO, PM_{10}, and $PM_{2.5}$. Greenhouse gases (GHG) are not modeled as part 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. Modeled emission rates are included in Attachment 1 and stack parameters are included in Attachment 2.

Table 2 presents a summary of the air quality standards that were addressed for NO_2, CO, PM_{10}, and $PM_{2.5}$.

Table 2. Ambient Air Quality Standards, SILs, and PSD Increments (All concentrations in $\mu g/m^3$)

Pollutant	Averaging Period	SIL	PSD Increments	NAAQS
NO_2	1-Hour	7.5	-	188
	Annual	1	25	100
PM_{10}	24-Hour	5	30	150
	Annual	1	17	-

$PM_{2.5}$	24-Hour	1.2	9	35
	Annual	0.3	4	12
CO	1-Hour	2000	-	40,000
	8-Hour	500	-	10,000

An air quality impact analysis, as a part of the PSD review process, is a two tiered process. First, a proposed facility is modeled by itself, on a pollutant-by-pollutant and averaging-time basis, to determine if ambient air concentrations predicted by the model exceed the significant impact level (SIL). If ambient impacts are below the SIL then the proposed source is deemed to not have a significant impact and no further modeling is needed. If ambient impacts exceed the SIL then the modeling analysis proceeds to the second tier of cumulative modeling. The cumulative modeling analysis consists of modeling the proposed facility with existing off-site sources and adding representative background concentrations and comparing the results to PSD increments (increment consuming and expanding sources only) and NAAQS. In order to receive a PSD permit, the proposed source must comply with PSD increments and must not cause or contribute to an exceedance of the NAAQS. In cases where the NAAQS are predicted to be exceeded in the cumulative analysis, the proposed source would not be considered to cause or contibute to the exceedance if the project-only impacts are less that the SIL.

Modeling Basis

The modeling system used conforms to 40 CFR 51 Appendix W, applicable guidance, and the approved protocol. The differences between the original PSD modeling analysis and the Class II Administrative Update modeling analysis is summarized below:

- The latest version of AERMOD available was used (version 14134) in default mode. The original PSD modeling used the latest version of AERMOD available at the time (version 13350).
- The latest version of AERMET available was used (version 14134). The original PSD modeling used the latest version of AERMET available at the time (version 13350).

Modeling Operating Scenarios

For the combustion turbines, auxiliary boiler, cooling tower, emergency generator, and fire pump, the modeling performed in support of the Class II Administrative Update application uses the same modeling operating scenarios as the original PSD application.

For the auxiliary boiler, the controlling modeling conditions continue to be 12 hr/day and 2000 hr/yr of operation. For the emergency generator and fire pump, the controlling modeling conditions continue to be 1 hr/day and 500 hr/yr of operation.

SIL Analysis Results (Tier I)

The results of the Significant Impact Analysis for the Moundsville Power Project sources are included in Tables 4-7. The results represent continuous operation of both turbines simultaneously for 8760 hour/year, except for the cold start scenario as described in the original modeling report. The modeling conditions for the auxiliary boiler, emergency generator, fire pump, and cooling tower are as described above. For all pollutants and averaging times, the maximum modeled concentration is below the significant impact level except for 1-hr NO_2. No further modeling analysis is necessary except for 1-hr NO_2.

Table 4. NO_2 SIL Analysis Results

Pollutant	Averaging Time	Combustion Turbine Modeling Scenario	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
NO_2	1-hr	Normal Operation 100% load (worst case normal operation)	**25.06**	7.5
	1-hr	Hot Start	**28.45**	
	1-hr	Warm Start	**42.11**	
	1-hr	Cold Start CT#1	**29.11**	
	1-hr	Cold Start CT#2	**28.87**	
	1-hr	Shutdown	**25.06**	
	Annual	Normal Operation 100% load (worst case)	0.58	1

Table 5. CO SIL Analysis Results

Pollutant	Averaging Time	Combustion Turbine Modeling Scenario	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
CO	1-hr	Normal Operation 100% load (worst case normal operation)	471.20	2,000
	1-hr	Hot Start	471.20	
	1-hr	Warm Start	471.20	
	1-hr	Cold Start CT#1	1036.78	
	1-hr	Cold Start CT#2	1030.96	
	1-hr	Shutdown	471.20	
	8-hr	Normal Operation 100% load (worst case)	180.68	500

Table 6. $PM_{2.5}$ SIL Analysis Results

Pollutant	Averaging Time	Combustion Turbine Modeling Scenario	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
$PM_{2.5}$	24-hr	50% Load (worst case)	1.05	1.2
	24-hr	100% Load	1.05	
	Annual	50% Load (worst case)	0.18	0.3
	Annual	100% load	0.15	

Table 7. PM_{10} SIL Analysis Results

Pollutant	Averaging Time	Combustion Turbine Modeling Scenario	Maximum Modeled Concentration ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
PM_{10}	24-hr	50% Load (worst case)	4.21	5
	24-hr	100% Load	4.21	
	Annual	50% Load (worst case)	0.20	1
	Annual	100% load	0.19	

Cumulative Analysis Results (Tier I)

The results of the Cumulative Impact Analysis for the 1-hr NO_2 NAAQS of 188 $\mu g/m^3$ are included in Tables 8-9. The analysis only includes an evaluation of compliance with the NAAQS since an increment for 1-hr NO_2 has not been established. This analysis includes impacts the Moundsville Power Project sources, off-site existing sources, and representative background concentrations of NO_2. For the Moundsville Power Project sources, the results represent continuous operation of both turbines simultaneously for 8760 hour/year, except for the cold start scenario as described above. The modeling conditions for the auxiliary boiler, emergency generator, fire pump, and cooling tower are as described above. For off-site existing sources, the impacts represent maximum hourly potential emissions, as determined from Title V permits and applications submitted to the Division of Air Quality. The background concentration data is for the monitor in Washington County, PA (ID # 41-125-0005) as summarized above with detailed information in the applicant's modeling report.

The cumulative analysis evaluated impacts at all receptors above the SIL in the SIL analysis. The SIL analysis is based on the highest-first-high concentration. The cumulative analysis is based on the form of the 1-hr NO_2 standard, which is the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations, which is equivalent to the 8th highest rank of daily maximum concentrations.

The MAXDCONT output option from AERMOD allows the determination of contribution of all sources to modeled concentrations. This option was used to determine Moundsville Power's contribution to the total modeled concentration at all modeled receptors for all hours in the meteorological data.

Table 8 shows the maximum modeled concentrations for all the receptors modeled in the cumulative analysis for all operating scenarios. Moundsville Power's contribution is less than

the SIL, paired in time and space. EPA's and DAQ's longstanding use of the SIL as a permitting tool is that a facility does not cause or contribute to an exceedance of the NAAQS if it's contribution is less than the SIL and may still receive a permit as long as all other criteria are met.

Table 8. NO_2 NAAQS Analysis Results - Maximum Modeled Concentrations

Pollutant	Aver-aging Time	Combustion Turbine Modeling Scenario	Maximum Modeled Concentration Exceeding NAAQS	Rank	Moundsville Power Contribution	SIL	Background Contribution
			($\mu g/m^3$)		($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
NO_2	1-hr	Normal Operation 100% load (worst case normal operation)	268.03	8th	0.08	7.5	36.35
	1-hr	Hot Start	268.06	8th	0.11		36.35
	1-hr	Warm Start	268.08	8th	0.13		36.35
	1-hr	Cold Start CT#1	268.06	8th	0.11		36.35
	1-hr	Cold Start CT#2	268.06	8th	0.11		36.35
	1-hr	Shutdown	268.03	8th	0.08		36.35

Table 9 shows Moundsville Power's maximum modeled contribution to the modeled NAAQS exceedances, rather than Table 8 that shows Moundsville Power's contribution to the maximum NAAQS exceedances. These results show that Moundsville Power's maximum contribution to a NAAQS exceedance remains below the SIL. No further modeling for 1-hr NO_2 is necessary.

Table 9. NO_2 NAAQS Analysis Results - Moundsville Power's Maximum Modeled Contribution to the Modeled NAAQS Exceedances

Pollutant	Aver-aging Time	Combustion Turbine Modeling Scenario	Modeled Concentration Exceeding NAAQS with Maximum Moundsville Contribution	Rank	Moundsville Power Contribution	SIL	Background Contribution
			($\mu g/m^3$)		($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
NO_2	1-hr	Normal Operation 100% load (worst case normal operation)	204.12	9th	1.66	7.5	33.21
	1-hr	Hot Start	195.56	8th	2.69		36.35
	1-hr	Warm Start	196.51	8th	3.64		36.35
	1-hr	Cold Start CT#1	189.09	9th	3.03		36.35
	1-hr	Cold Start CT#2	195.91	8th	3.04		36.35
	1-hr	Shutdown	204.13	9th	1.67		33.21

Summary

The air quality impact analysis prepared and submitted by Moundsville Power, in support of the Class II Administrative Update application, has been reviewed and replicated and conforms to 40 CFR 51 Appendix W, applicable guidance, and the original PSD modeling protocol. The analysis demonstrates that the proposed facility operations will have modeled impacts less than the SILs for all pollutants and averaging times except for 1-hr NO_2. The cumulative modeling analysis demonstrates that Moundsville Power's contribution to the modeled NAAQS exceedances for 1-hr NO_2 are less than the SIL and Moundsville Power does not cause or contribute to the modeled NAAQS exceedances.

ATTACHMENT 1

Modeled Emission Rates from Applicant's Report

Table C-1 Modeled Emission Rates

Source	Model ID	NO_X		PM_{10}		$PM_{2.5}$		CO	
		1-hr	Annual	24-hr	Annual	24-hr	Annual	1-hr	8-hr
		lb/hr	*tpy*	*lb/hr*	*tpy*	*lb/hr*	*tpy*	*lb/hr*	*lb/hr*
CT #1 - Heat Recovery Steam Generator Stack[1]	HRSG1	16.30	74.90	9.15	39.58	9.15	39.58	9.92	182.55
CT #2 - Heat Recovery Steam Generator Stack[1]	HRSG2	16.30	74.90	9.15	39.58	9.15	39.58	9.92	182.55
Cooling Tower[2]	CT01-CT06	–	–	0.10	0.42	3.5E-04	1.5E-03	–	–
Auxilliary Boiler[3]	AUX	2.00	2.00	0.25	0.50	0.25	0.50	4.00	4.00
Fire Pump[4,5]	FIRE	0.17	0.74	0.007	0.04	0.007	0.04	2.87	2.87
Emergency Generator[4,5]	EGEN	0.6	2.80	0.017	0.10	0.017	0.10	11.53	11.53

Source	Model ID	NO_X		PM_{10}		$PM_{2.5}$		CO	
		1-hr	Annual	24-hr	Annual	24-hr	Annual	1-hr	8-hr
		g/s	*g/s*	*g/s*	*g/s*	*g/s*	*g/s*	*g/s*	*g/s*
CT #1 - Heat Recovery Steam Generator Stack[1]	HRSG1	2.05	2.15	1.15	1.14	1.15	1.14	1.25	23.00
CT #2 - Heat Recovery Steam Generator Stack[1]	HRSG2	2.05	2.15	1.15	1.14	1.15	1.14	1.25	23.00
Cooling Tower[2]	CT01-CT06	–	–	0.0120	0.0120	4.410E-05	4.363E-05	–	–
Auxilliary Boiler[3]	AUX	0.25	0.06	0.03	0.01	0.03	0.01	0.504	0.504
Fire Pump[4,5]	FIRE	0.02	0.02	8.93E-04	1.18E-03	8.93E-04	1.18E-03	0.362	0.362
Emergency Generator[4,5]	EGEN	0.08	0.08	0.0021	0.0029	0.0021	0.0029	1.453	1.453

[1] - Emissions from the CTs reflect the emissions from startup and shutdown events for the annual averaging period for all pollutants. For the 24-hr averaging period for $PM_{2.5}$ and PM_{10}, the emission rate reflects the addition of 6 lb of emissions (amount equivalent to one cold startup) and 24 hours of the maximum normal operation PM emission rate of 8.9 lb/hr. Similarly, the CO 8-hr emission rate reflects one cold startup, 1,381 lb of emissions (amount equivalent to one cold startup) and 8 hours of the maximum normal operation CO emission rate of 9.92 lb/hr. NO_X and CO startup and shutdown emissions for the 1-hr averaging period were modeled separately. Emissions associated with startup and shutown are presented in Table D-2.

[2] - The emissions for the cooling towers represent the emissions per cell. There are six cells total.

[3] - Emissions of $PM_{2.5}$ and PM_{10} from the Auxiliary Boiler represent 12 hrs./day of operation for the 24-hr average emission rate.

[4] - Emissions of $PM_{2.5}$ and PM_{10} from the Fire Pump and Emergency Generator represent 1 hr./day of operation for the 24-hr average emission rate.

[5] - Maximum 1-hr NO_X emissions from the Fire Pump and Emergency Generator were not used in the modeling analysis of 1-hr NO_2. For the 1-hr averaging period, annualized emissions were used for the emergency equipment. Please refer to Section 2.2.2 of the air quality modeling protocol included as Attachment 1 of this report for a discussion of treatment of intermittent emissions in the 1-hr modeling analyses.

Table C-2 Modeled Emission Rates – 1-hr Averaging Periods - Startup and Shutdown Scenarios

Source	Model ID	NO_X		CO	
		1-hr		1-hr	
		lb/hr	*g/s*	*lb/hr*	*g/s*
CT Hot Startup Scenario	HRSG1HS - HRSG2HS	28.51	3.59	278.79	35.13
CT Warm Startup Scenario	HRSG1WS - HRSG2WS	38.43	4.84	283.31	35.70
CT Cold Startup Scenario	HRSG1CS - HRSG2CS	48.36	6.09	1381.83	174.11
CT Shutdown Scenario	HRSG1SD - HRSG2SD	17.50	2.20	182.61	23.01

ATTACHMENT 2

Modeled Stack Parameters from Applicant's Report

Table D-1 Source Locations

Source	Model ID	Location (UTM Zone 17)		
		UTM Easting	UTM Northing	Elevation
		m	*m*	*ft*
CT #1 - Heat Recovery Steam Generator Stack	HRSG1	517,364.49	4,417,182.45	717
CT #2 - Heat Recovery Steam Generator Stack	HRSG2	517,327.15	4,417,166.73	717
Cooling Tower[1]	CT01-CT06	517,446.83	4,417,099.73	717
Auxilliary Boiler	AUX	517,394.53	4,417,228.58	717
Fire Pump	FIRE	517,372.54	4,417,150.63	717
Emergency Generator	EGEN	517,339.02	4,417,298.78	717

[1] - The cooling tower consists of 6 individual cells.

Table D-2 CT Worst Case Normal Operation Stack Parameters

Source	Model ID	Stack Height	Exhaust Temperature	Exhaust Exit Velocity	Stack Inner Diameter
		ft	*°F*	*ft/s*	*ft*
CT Worst-Case CO Scenario - 1-hr and 8-hr - 100% Load	HRSG1_100 - HRSG2_100	175.0	161	64	18.5
CT Worst-Case NO_X Scenario - 1-hr and Annual - 100% Load	HRSG1_100 - HRSG2_100	175.0	161	64	18.5
CT Worst-Case $PM_{2.5}/PM_{10}$ Scenario - 24-hr and Annual - 50% Load	HRSG1_50 - HRSG2_50	175.0	163	43	18.5
CT $PM_{2.5}/PM_{10}$ Scenario - 24-hr and Annual - 100% Load	HRSG1_100 - HRSG2_100	175.0	160	57	18.5

Table D-3 CT Startup/Shutdown Stack Parameters

Source	Model ID	Stack Height	Exhaust Temperature	Exhaust Exit Velocity	Stack Inner Diameter
		ft	*°F*	*ft/s*	*ft*
CT Hot Startup Scenario	HRSG1HS - HRSG2HS	175.0	161	50	18.5
CT Warm Startup Scenario	HRSG1WS - HRSG2WS	175.0	160	44	18.5
CT Cold Startup Scenario	HRSG1CS - HRSG2CS	175.0	160	38	18.5
CT Shutdown Scenario	HRSG1SD - HRSG2SD	175.0	161	56	18.5

Table D-4 Cooling Towers, Auxiliary Boiler, and Emergency Equipment Stack Parameters

Source	Model ID	Stack Height	Exhaust Temperature	Exhaust Exit Velocity	Stack Inner Diameter
		ft	*°F*	*ft/s*	*ft*
Cooling Tower	CT01-CT06	60.0	66	19	40.0
Auxilliary Boiler	AUX	42.0	300	173	3.5
Fire Pump	FIRE	11.0	900	106	0.5
Emergency Generator	EGEN	13.0	900	229	1.5