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Pursuant to §45-14-17.2

PRELIMINARY DETERMINATION/FACT SHEET

for the

CONSTRUCTION

of

ESC Harrison County Power, LLC's
Harrison County Combined Cycle Power Plant

located in

Clarksburg, Harrison County, WV.

Permit Number: R14-0036
Facility Identification Number: 033-00264

Date: August 28, 2017

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BACKGROUND INFORMATION

Application No.:	R14-0036
Plant ID No.:	033-00264
Applicant:	ESC Harrison County Power, LLC
Facility Name:	Harrison County Power Plant
Location:	Harrison County
NAICS Code:	221112
Application Type:	PSD Major Construction
Received Date:	November 22, 2016
Engineer Assigned:	Steven R. Pursley, PE
Fee Amount:	$14,500
Date Received:	December 16, 2016
Complete Date:	April 26, 2017
Due Date:	October 23, 2017
Applicant Ad Date:	November 23, 2016
Newspaper:	*The Exponent Telegram*
UTM's:	Easting: 558.35 km Northing: 4,349.17 km Zone: 17

On November 22, 2016 ESC Harrison County Power, LLC submitted a permit application to construct a 640 megawatt (based on vendor performance data for an operating scenario at 32°F, with duct firing, evaporative cooling off and the turbines firing natural gas at base load), combined cycle combustion turbine, natural gas-fired electric generation facility near Clarksburg, Harrison County, WV. The plant will tie into First Energy's existing Glen Falls 138 kV substation which is located about two miles north of the project site. Its output will be sold into the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) regional electric grid.

Emission sources associated with the project are:

* One General Electric (GE) Frame 7HA.02 or equivalent advanced combined cycle combustion turbine (CT), with one Heat Recovery Steam Generator (HRSG) equipped with supplemental duct firing. Both the CT and duct burner will fire pipeline quality natural gas exclusively.

* One natural gas fired Auxiliary Boiler with a maximum heat input of 77.8 million BTU per hour.

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

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

* One natural gas fired fuel gas heater with a maximum heat input of 5.5 mmbtu/hr.

* One 35,000 gallon aqueous ammonia storage tank.

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

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

The following document will outline the DAQ's preliminary determination that the construction of the ESC Harrison County 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 show compliance with the applicable rules and accepted procedures for public notification with respect to permit application R14-0036.

Actions Taken at Application Submission

Pursuant to §45-13-8.3 and §45-14-17.1, ESC Harrison County 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 Exponent-Telegram* (November 23, 2016)

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

- The U.S Environmental Protection Agency - Region 3 - (February 14, 2017)
- The National Park Service - (January 19, 2017)
- The US Forest Service - (January 19, 2017)

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

Actions Taken at Completion of Preliminary Determination

Pursuant to §45-13-8.5 and §45-14-17.4, upon completion (and approval) of the preliminary determination and draft permit, a Class 1 legal advertisement will be placed in the following newspaper stating the DAQ's preliminary determination regarding R14-0036:

- *The Exponent-Telegram*

A copy of the preliminary determination and draft permit shall be forwarded to USEPA Region 3. Pursuant to §45-13-8.7, copies of the application, complete file, preliminary determination and draft permit shall be available for public review during the public comment period at the WVDEP Headquarters in Charleston and on DAQ's website. Further, the U.S. Forest Service and the National Park Service will receive copies of the preliminary determination and draft permit upon request. All other requests by interested parties for information relating to permit application R14-0036 shall be provided upon request.

Actions Taken at Completion of Final Determination

Pursuant to §45-14-17.7, and 17.8 upon reaching a final determination concerning R14-0036, the DAQ shall make such determination available for review at WVDEP Headquarters in Charleston and on DAQs website and notify the North Central Regional Office in Fairmont of the final determination.

DESCRIPTION OF PROPOSED FACILITY

Description of Process

ESC Harrison County Power, LLC Overview

The ESC Harrison County Power, LLC Plant will generate approximately 640 megawatts (MW) of electricity that will be sold on the Pennsylvania-New Jersey-Maryland Interconnection LLC (PJM) regional electric grid via a direct 138 kV interconnection at the existing Glen Falls Substation about 2 miles north of the proposed plant site. Pipeline-quality natural gas used by the plant's combustion turbine will be purchased from local suppliers, and will take advantage of the gas produced in nearby natural gas shale plays.

Electricity will be generated using one (1) combined-cycle combustion turbine (HCCT-1) with a design heat input rating of 3,496.2 million Btu per hour (mmbtu/hr). Electricity generated by the combustion turbine will be routed through a local electrical substation and sold on the grid.

To enhance the plant's overall efficiency and increase the amount of electricity generated by the plant, the hot exhaust gases from the combustion turbine will be routed to a downstream Heat Recovery Steam Generator (HRSG). The HRSG contains a series of heat exchangers designed to recover the heat from the turbine's exhaust gas and produce steam, as in a boiler. The Project includes the installation of duct burners to produce additional steam in the HRSG for additional power output from the steam turbine generator. The maximum duct firing level is expected to be 1,001.3 mmbtu/hr on a Higher Heating Value (HHV) basis. The fuel for the duct burners will be the same as for the combustion turbine: pipeline-quality natural gas. Cooled exhaust gas passing through the HRSG will be vented to the atmosphere through emission point HCCT-1. 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 HRSG, at locations where the emission control reactions optimally occur.

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

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

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

<u>Proposed Equipment</u>

Combustion Turbine

The highly efficient, 3,496.2 mmbtu/hr (HHV) combined-cycle combustion turbine (HCCT-1) will be equipped with an inlet evaporative cooling system, which is used to increase the density of the combustion air, thereby increasing fuel and mass flow and, in turn, power output. The air density increase is accomplished by evaporating water into the inlet air, which decreases its temperature and correspondingly increases its density. The combustion 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. The project includes the installation of duct burners to produce additional steam in the HRSG for additional power output from the generator. The maximum duct firing level is expected to be 1,001.3 mmbtu/hr on a HHV basis. The fuel for the duct burners will be the same as for the combustion turbines pipeline quality natural gas. Steam generated in the HRSG is routed to a steam driven turbine. The steam turbine also drives the generator to produce additional electricity that will also be routed through a local electrical substation and sold on the grid.

The combustion turbine will be equipped with dry low-NO_x (DLN) combustors. These combustion controls, along with a Selective Catalytic Reduction (SCR) system, will control emissions of nitrogen oxides (NO_x) from the CT. An Oxidation Catalyst will be used to control emissions of carbon monoxide (CO) and volatile organic compounds (VOCs) from the CT.

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

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

Auxiliary Boiler

A 77.8 mmbtu/hr Auxiliary Boiler (AB-1) will be used to produce steam for plant support. The Auxiliary Boiler will burn pipeline-quality natural gas. The Auxiliary Boiler will be equipped with Low-NO_x burners (LNB) to control NO_x emissions.

For permitting and emissions estimating purposes, this application assumes that the Auxiliary Boiler will operate 355,984 mmbtu/year, the equivalent of 4,576 hr/yr at full capacity.

Fuel Gas Heater

A 5.5 mmbtu/hr Fuel Gas Heater (FGH-1) will be used to preheat the gaseous fuel received by the plant. Preheating the fuel prior to combustion in the combined-cycle CT (HCCT-1) increases the efficiency of the CT, safeguards the fuel pipelines from icing, and protects the CT from fuel condensates. For permitting and emissions estimating purposes, this application assumes that the Fuel Gas Heater will operate 8,760 hr/yr.

Emergency Generator

A 2,000 kW Emergency Generator (EG-1) will be used for emergency backup electric power. The fuel for the Emergency Generator will be ultra low sulfur diesel (ULSD), with a sulfur content no greater than 0.0015% by weight. The Emergency Generator will be periodically operated for short periods per the manufacturer's maintenance instructions to ensure operational readiness in the event of an emergency.

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

The Emergency Generator will operate no more than 100 hr/yr for maintenance and readiness testing. Other than maintenance and readiness testing, 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 100 hr/yr.

Fire Water Pump

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

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

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

Dry Air Cooled Condensor

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

SITE INSPECTION

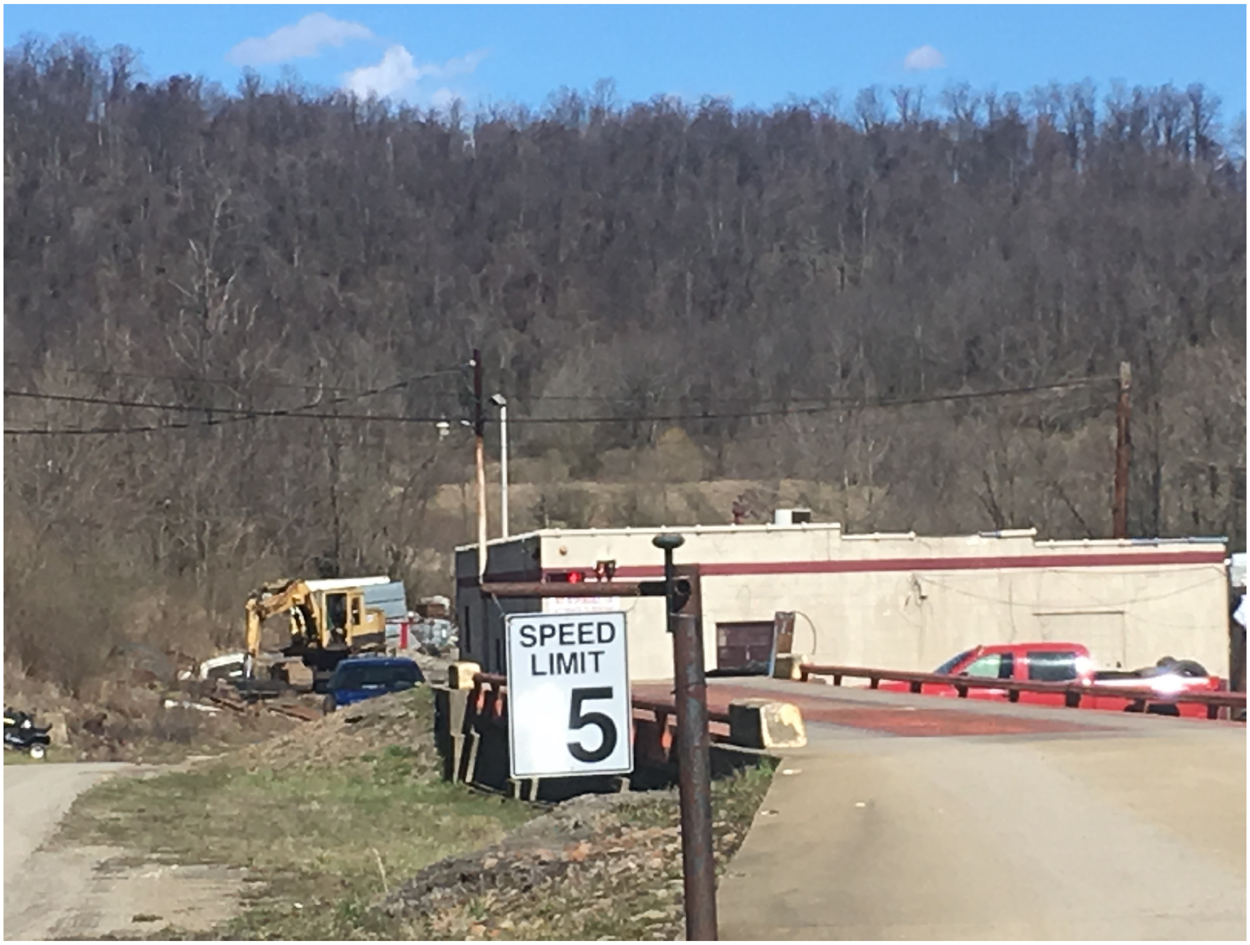
On March 8, 2017 the writer conducted a site inspection of the proposed location of the ESC Harrison County Power, LLC plant. Joining the writer was James Edwards of ESC. The following observations were made during the inspection:

- The proposed site of the plant is located adjacent to the Clarksburg city limits.
- The power generation facility will be located just north of Clarksburg at the end of the existing "Salvage Street" aka PeeKay Road. The plant will be very close to multiple residences. One residence will have an unobscured, direct view of the site. ESC has secured an option to buy that residence and has indicated that they will purchase the house when the project progresses.
- Ground level of the site will be approximately 1085 feet above sea level. The surrounding mountains rise to around 1,300 to 1,400 feet above sea level. Turbine stack height will be

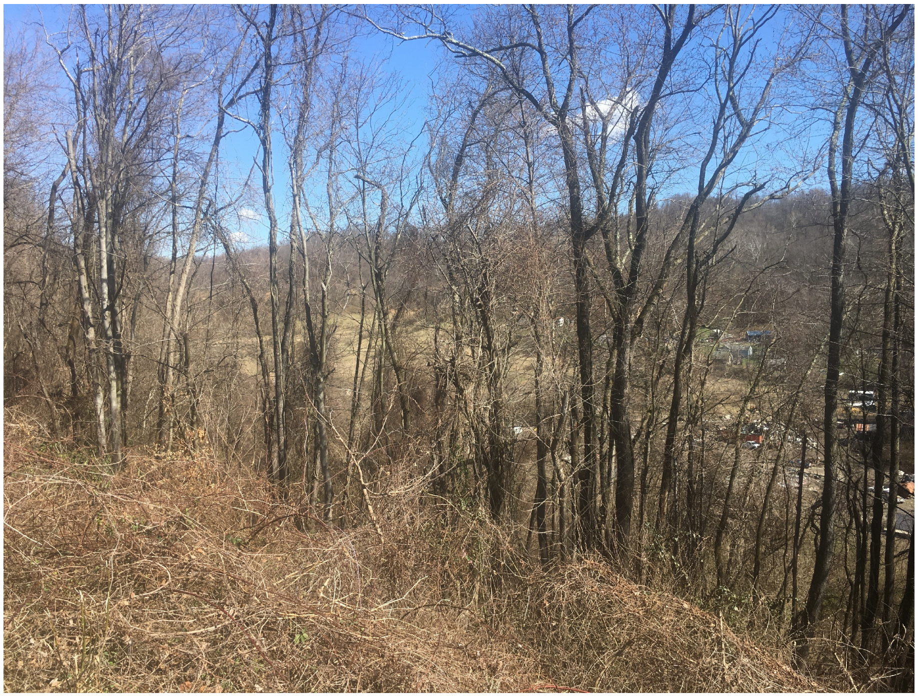
approximately 185 feet above ground level. After accounting for plume rise, it is doubtful stack exhaust would directly impact the surrounding hills. As shown in the modeling results (see below) maximum modeled concentrations are below both the NAAQs and PSD increment.

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

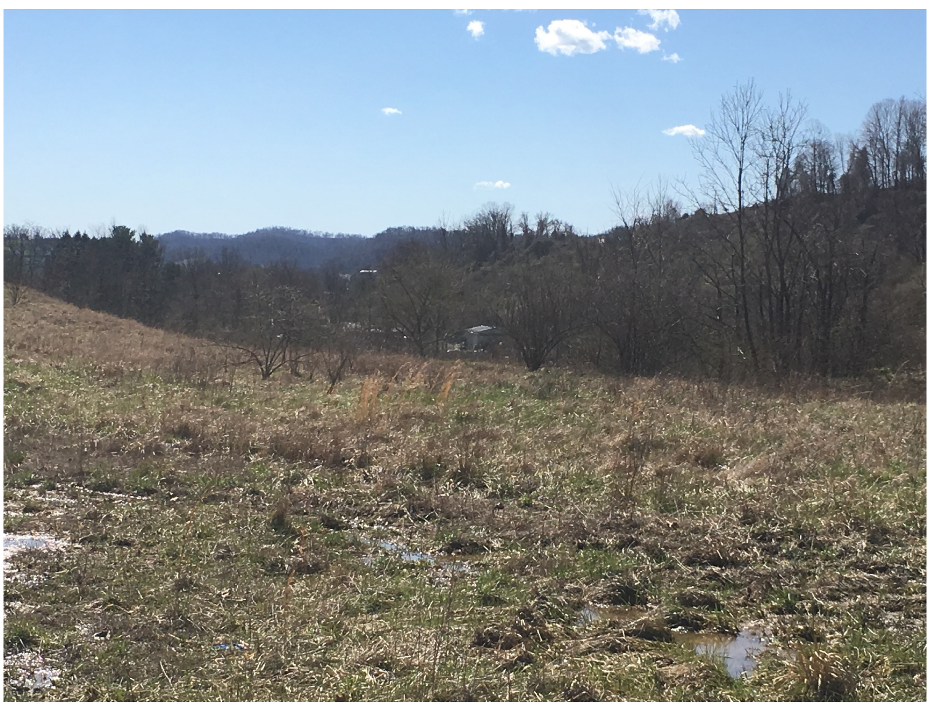
The powerblock will sit on the shelf that can be seen in the distance behind the recycling center.



A view of the proposed site from a ridge to the west of the facility.



A view from the site looking south toward the recycling center and then Clarksburg.



PROPOSED EMISSIONS

The ESC Harrison County 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	25.17	131.70
NO_x	68.05	160.70
PM	23.44	101.70
PM_{10}	23.44	101.70
$PM_{2.5}$	23.44	101.70
SO_2	6.13	26.30
VOCs	12.77	56.40
H_2SO_4	3.82	16.80
Lead	0.002	0.01
CO_{2e}	--	2,338,896
Total HAPs	--	6.23

(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 ESC Harrison County Power, LLC to calculate the potential-to-emit of the proposed facility.

Combustion Turbine / Duct Burner

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

Steady State Operations

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

Potential short-term (lb/hr) emission rates were determined based on the GE data, which encompasses the expected range of combustion turbine operating loads and ambient temperatures, with and without the use of inlet air evaporative cooling, and with and without duct firing. From the GE data, the potential short-term emission rates for NO_x, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, VOC, H_2SO_4, and GHGs for the combustion turbines were established by selecting the maximum lb/hr emission rates across the expected operating load and ambient temperature ranges. Potential annual (tons/yr) emissions were then calculated by multiplying the maximum short-term emission rates by 8,760 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.

Pb emissions were estimated using AP-42 emission factors.

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

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

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

Pollutant	Emission Rate (lb/hr)	Emission Factor Source	Comments
CO	20.0	Manufacturer	Includes use of Oxidation Catalyst
NO_x	32.9	Manufacturer	Includes use of SCR and DLN burners
PM	22.6	Manufacturer	Includes both filterable and condensable PM
PM_{10}	22.6	Manufacturer	Includes both filterable and condensable PM
$PM_{2.5}$	22.6	Manufacturer	Includes both filterable and condensable PM
SO_2	6.0	Manufacturer	Assumes 0.4 grains S/100 ft^3
VOCs	11.4	Manufacturer	Includes use of Oxidation Catalyst
Pb	0.002	AP-42	
GHGs	528,543	Manufacturer	CO_2e Basis
H_2SO_4	3.8	Manufacturer	Assumes 0.4 grains S/100 ft^3
Total HAPs	1.34	AP-42	

Startups and Shutdowns

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

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

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

Pollutant	Type of Event	Emission Factor (lb/event)	Number of Anticipated Events/Year	Emissions (lb/yr)
NO_x	Hot Start	67	208	13,936
	Warm Start	130	40	5,200
	Cold Start	264	12	3,168
	Shutdown	7	260	1,820
	Total			24,124
CO	Hot Start	120	208	24,960
	Warm Start	155	40	6,200
	Cold Start	790	12	9,480
	Shutdown	124	260	32,240
	Total			72,880
$PM/PM_{10}/PM_{2.5}$	Hot Start	4.6	208	957
	Warm Start	9.1	40	364
	Cold Start	13	12	156
	Shutdown	2.7	260	702
	Total			2,179

VOCs	Hot Start	9	208	1,872
	Warm Start	10	40	400
	Cold Start	55	12	660
	Shutdown	26	260	6,760
	Total			9,692

(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 turbine and duct burner)

Pollutant	pounds/hour(1)	tons/year(1)
CO	20.0	124.00
NO_x	32.9	156.20
PM(2)/PM_{10}/$PM_{2.5}$	22.6	100.10
SO_2	6.00	26.10
VOCs	11.40	54.80
H_2SO_4	3.80	16.70
Lead	0.002	0.01
CO_2e	--	2,315,020.00
Total HAPs	--	5.86

(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 355,894 mmbtu/year of operation (approximately 4,576 hours per year). PM_{10} and $PM_{2.5}$ were conservatively assumed to equal PM emissions. Short term SO_2 emissions were based on a sulfur content of the fuel of 0.4 grains per 100 dscf. Calculations also assumed that 10% of SO_2 will be converted to SO_3 and 100% of that SO_3 will be converted to H_2SO_4 . AP-42 emission factors were used to estimate Pb and HAP emissions. To convert non CO_2 GHGs to CO_2e 40 CFR 98 Subpart A, Table A-1 was used.

Table 5: Auxiliary Boiler Emission Factors

Pollutant	Emission Rate (lb/mmbtu)	Emission Factor Source	Comments
CO	0.037	Vendor	
NO_x	0.011	Vendor	Includes use of Low NO_x burners
PM	0.008	Vendor	Includes both filterable and condensable PM
SO_2	0.0011	Mass Balance	
VOCs	0.008	Vendor	
Pb	4.85E-07	AP-42	
GHGs	9,107 (lb/hr)	40 CFR 98 Sub C	CO_2e Basis
H_2SO_4	0.00017	Mass Balance	
Total HAPs	1.9 (lb/mmscf)	AP-42	Sum of individual factors

Table 6: Auxiliary Boiler Emissions

Pollutant	lb/hr	tpy
CO	2.88	6.58
NO_x	0.86	1.96
$PM/PM_{10}/PM_{2.5}$	0.60	1.38
SO_2	0.09	0.20
VOCs	0.62	1.42
GHGs (CO_2e basis)	9,107	20,837
H_2SO_4	0.0132	0.03
HAPs	0.15	0.33

Fuel Gas Heater Emissions

ESC estimated fuel gas heater emissions using AP-42. PM_{10} and $PM_{2.5}$ emissions were conservatively assumed to equal PM emissions. The fuel sulfur content of the natural gas was, assumed to be 0.4 gr/100 scf.

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

Table 7: Fuel Gas Heater Emissions

Pollutant	lb/hr	tpy
CO	0.21	0.93
NO_x	0.20	0.86
$PM/PM_{10}/PM_{2.5}$	0.04	0.19
SO_2	0.01	0.03
VOCs	0.04	0.17
GHGs (CO_2e basis)	641	2,806
H_2SO_4	0.0010	0.0041
HAPs	0.01	0.05

Emergency Generator Emissions

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

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

Table 8: Emergency Generator Emission Factors

Pollutant	Emission Rate (g/hp-hr)	Emission Factor Source	Comments
CO	0.3	Vendor	
NO_x	4.45	Vendor	
$PM/PM_{10}/PM_{2.5}$	0.03	Vendor	
SO_2	15 ppm S	mass balance	
VOCs	0.11	Vendor	
GHGs	163.06 (lb/mmbtu)	40 CFR 98 Subpart C	Sum of individual GHGs. Mass basis (NOT CO_2e)
Total HAPs	0.001704 (lb/mmbtu)	AP-42	Sum of individual HAP EF's

Table 9: Emergency Generator Emissions

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

Fire Water Pump Emissions

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

Table 10: Fire Water Pump Emission Factors

Pollutant	Emission Rate (g/hp-hr)	Emission Factor Source	Comments
CO	0.44	Vendor	
NO_x	2.69	Vendor	
$PM/PM_{10}/PM_{2.5}$	0.075	Vendor	
SO_2	0.003 (lb/hr)	Mass Balance	
VOCs	0.08	Vendor	
GHGs	163.06 (lb/mmbtu)	40 CFR 98 Subpart C	Sum of individual GHGs. Mass basis (NOT CO_2e)
Total HAPs	0.003847 (lb/mmbtu)	AP-42	Sum of individual HAP EF’s

Table 11: Fire Water Pump Emissions

Pollutant	lb/hr	tpy
CO	0.31	0.02
NO_x	1.87	0.09
$PM/PM_{10}/PM_{2.5}$	0.05	0.01
SO_2	0.01	0.01
VOCs	0.06	0.01
GHGs (CO_2e basis)	344	17
HAPs	0.01	0.01

DAQ Review of Emissions Methodology

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

REGULATORY APPLICABILITY

The ESC Harrison County 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, 40 CFR 60 - Subpart TTTT and 40 CFR 63 - Subpart ZZZZ. Each applicable rule, and ESC's proposed manner of compliance, will be discussed in detail below. Additionally, those rules that have questionable applicability but do not apply will also be discussed.

WV State-Implementation-Program (SIP) Regulations

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

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

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the fuel burning units are subject to an opacity limit of 10%. Proper maintenance and operation of the natural gas fired units should keep the opacity of the units well below 10% during normal operations. The permit will require ESC to conduct Method 22 visible opacity checks on the auxiliary boiler and the combined duct burner/combustion turbine stack on a monthly basis.

45CSR2 Weight Emission Standard - Section 4.1.b

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Auxiliary Boiler

The allowable particulate matter (PM) emission rate for the auxiliary boiler, identified as a Type "b" fuel burning unit, per 45CSR2, Section 4.1.b, is the product of 0.09 and the total design heat input of the auxiliary boiler in million Btu per hour. The maximum design heat input of the auxiliary boiler will be 77.8 mmbtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the auxiliary boiler will be 7.0 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 0.60 lb/hr. This emission rate is less than 9% of the 45CSR2 limit.

Duct Burner

The allowable particulate matter (PM) emission rate for the duct burner, identified as a Type "a" fuel burning unit, per 45CSR2, Section 4.1.a, is the product of 0.05 and the total design heat input of the duct burners in million Btu per hour. The maximum design heat input of the duct burner will be 1,001.3 mmbtu/Hr. Using the above equation, the 45CSR2 PM emission limit of the duct burners will be 50.06 lb/hr. This limit represents filterable PM only and does not include condensible PM. The exemption of condensable PM is located within the 45CSR2 Appendix - which establishes compliance test procedures - by not requiring measurement of the condensable PM.

The maximum potential hourly PM emissions (filterable and condensable - a more conservative estimate) from the combined combustion turbine/duct burner stack are estimated to be 22.6 lb/hr. However, this represents emissions from both the turbine and the duct burners. If we separate duct burner emissions and turbine emissions by weighting them in proportion to the heat input (1,001.3 mmbtu/hr for the duct burner and approximately 3,496.2 mmbtu/hr for the turbine) we can see that the duct burners account for only about 5.03 pounds per hour of PM. This emission rate is less than 23% of the 45CSR2 limit.

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

Fuel Heater

The heat input of the proposed fuel gas heater (FGH-1) is below 10 mmbtu/hr. Therefore, this unit is exempt from the aforementioned sections of 45CSR2.

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

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

45CSR10 Fuel Burning Units - Section 3

The allowable sulfur dioxide (SO_2) emission rate for the auxiliary boiler, identified as a Type "b" fuel burning unit, per 45CSR10, Section 3.3.f, is the product of 3.2 and the total design heat input of the auxiliary boiler in million Btu per hour. The maximum design heat input of the auxiliary boiler will be 77.8 mmbtu/Hr. Using the above equation, the 45CSR10 SO_2 emission limit of the auxiliary boiler will be 248.96 lb/hr.

The maximum potential hourly SO_2 emissions from the auxiliary boiler is estimated to be 0.09 lb/hr. This emission rate is far less than 1% of the 45CSR10 limit.

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

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

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

As required under §45-13-8.3, ESC Harrison County 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 November 23, 2016 in the *Exponent Telegram* and the affidavit of publication for this legal advertisement was submitted on January 19, 2017.

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

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

The proposed ESC Harrison County Power, LLC facility will be constructed in Harrison County, WV, which is classified as in attainment with all NAAQS. The construction of the ESC Harrison County 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}, PM, VOCs, H_2SO_4 and Greenhouse Gasses (see Table 12). Note that the major source threshold for natural gas fired combined cycle powerplants is 100 tons per year (see the February 2, 1993 memo from Edward Lillis). The substantive requirements of a PSD review includes a best available control technology (BACT) analysis, a modeling analysis, and an additional impacts analysis; each of these will be discussed in detail under the section PSD REVIEW REQUIREMENTS.

Table 12: Pollutants Subject to PSD

Pollutant	Potential-To-Emit (TPY)	Significance Level (TPY)	PSD (Y/N)
CO	131.70	100	Y
NO_x	160.70	40	Y
$PM_{2.5}$	101.70	10	Y
PM_{10}	101.70	15	Y
PM	101.70	25	Y
SO_2	26.30	40	N
VOCs	56.40	40	Y
GHGs (CO_2e)	2,338,896.00	100,000	Y
Lead	0.01	0.6	N
Sulfuric Acid Mist (H_2SO_4)	16.80	7	Y
Fluorides	0.00	3	N
Vinyl Chloride	0.00	1	N
Total Reduced Sulfur	0.00	10	N
Reduced Sulfur Compounds	0.00	10	N

45CSR16: Standards of Performance for New Stationary Sources

45CSR16 incorporates by reference applicable requirements under 40 CFR 60. 40 CFR 60

Subpart Dc, Subpart KKKK, and Subpart IIII apply to the facility (see below under ***Federal Regulations***).

<u>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</u> - *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 Harrison County, WV is classified as in attainment with all NAAQS.

<u>45CSR30: Requirements for Operating Permits</u>

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The ESC Harrison County 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.

<u>45CSR33: Acid Rain Provisions and Permits</u>

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).

<u>45CSR34: Emission Standards for Hazardous Air Pollutants</u>

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

<u>40 CFR 60, Subpart Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units</u>

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 ESC Harrison County 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. ESC Harrison County 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. ESC Harrison County Power, LLC is subject to these requirements.

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

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

Subpart KKKK Applicability - Section §60.4305(a)

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

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

Section §60.4320 requires that turbines meet the NO_x emission standards in Table 1 of the Subpart. Since the turbines at the ESC Harrison County 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. ESC Harrison County Power, LLC proposes to use a fire water pump and an emergency generator that are Subject to Subpart IIII. The following discusses the substantive applicable requirements of Subpart IIII relating to the ESC Harrison County 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 the fire water pump engine and the emergency generator at the proposed ESC Harrison County Power, LLC Plant.

Subpart IIII Emission Standards - Section §60.4204 and §60.4205

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

Table 13: Subpart IIII Emission Standards

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

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

Subpart IIII Fuel Requirements - Section §60.4207

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

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

Subpart TTTT Applicability - Section §60.5509

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

Subpart TTTT Emission Standards - Section §60.5520

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

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

Subpart ZZZZ Applicability - §63.6585

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

Subpart ZZZZ Requirements - §63.6590

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

Compliance Assurance Monitoring (CAM)

Pursuant to the requirements concerning enhanced monitoring and compliance certification under the CAAA of 1990, the EPA has promulgated regulations codified at 40 CFR 64 to implement compliance assurance monitoring (CAM) for major stationary sources. The CAM provisions of 40 CFR 64 are applicable to major stationary sources that meet the following three criteria: (1) unit is subject to an emission limit for a regulated compound, (2) use a control device (as defined in 40 CFR 64.1) to achieve compliance with the limit, and (3) have pre-control emissions equivalent to major source levels. The only "source" that has pre-control emissions above the major trigger (i.e. 100 tons per year) are the turbines (which have CO, $PM/PM_{10}/PM_{2.5}$ and NO_x emissions of > 100 tpy). However, per 40 CFR 64.2(b)(1)(i), units subject to emission limitations required by a post

November 15, 1990 NSPS are exempt from CAM for that pollutant. Therefore, since ESC Harrison County Power, LLC is subject to 40 CFR 60 Subpart KKKK, it is exempt from CAM for NO_x. Additionally, the turbine will use no control device to meet its $PM/PM_{10}/PM_{2.5}$ limits. For CO (and NO_x), the turbines will be equipped with a Continuous Emissions Monitoring System (CEMS). CEMS are considered a continuous compliance determination method as defined in 40 CFR 64.1. Pursuant to 40 CFR 64.2(b)(1)(vi), pollutants monitored using a continuous compliance determination method are exempt from CAM. Therefore, the combustion turbines are exempt from CAM.

Summary of Applicable Rules

The following table lists each emission point located at the ESC Harrison County 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
HCCT-1	Combined Cycle Combustion Turbine	HCCT-1	40 CFR 60 Subparts KKKK and TTTT
HCCT-1	HRSG w/duct burner	HRSG-1	40 CFR 60 Subpart KKKK, 45CSR2, 45CSR10
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
FGH-1	Fuel Gas Heater	FGH-1	45CSR2, 45CSR10
ST-1	500 Gal. Fire Water Pump Diesel storage tank	ST-1	N
ST-2	3,000 gallon Em. Gen. Diesel storage tank	ST-2	N

PSD REVIEW REQUIREMENTS

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

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

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

BACT Analysis

Pursuant to 45CSR14, Section 8.2,ESC Harrison County 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, $PM_{2.5}$, H_2SO_4 and GHGs). BACT is defined under §45-14-2.12 as:

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

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

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

Table 15: ESC Harrison County Power, LLC BACT Selection

Source	PSD Pollutant											
	CO		NO_x		$PM_{2.5}/PM_{10}/PM$ (1)		VOCs		H_2SO_4		GHGs	
	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit	Tech.(3)	Limit (CO_{2e})	Tech.(3)
Turbines / Dbs (4)	2.0 ppmvd	OC, CP	2.0 ppmvd	DLNB, SCR, CP	18.2 lb/hr	AF, NG, CP	1ppmvd 2ppmvd	OC, CP	0.0009 lb/mmbtu	NG	826 lb/ MW-hr(5)	NG, GE7HA
Aux. Boiler	0.037 lb/mmbtu	CP	0.011 lb/mmbtu	LNB, FGR, CP	0.008 lb/mmbtu	NG, CP	0.008 lb/mmbtu	CP, NG	0.00017 lb/mmbtu	NG	9,107 lb/hr	NG
Fuel Gas Heater	0.039 lb/mmbtu	CP	0.036 lb/mmbtu	LNB, CP	0.008 lb/mmbtu	DE(5)	0.007 lb/mmbtu	n/a	0.0017 lb/mmbtu	NG	2,806 tpy	NG
Fire Water Pump	0.44 g/hp-hr	CP	2.69(2) g/hp-hr	CP	0.075 g/hp-hr	ULSD, CP	3.0(2) g/hp-hr	CP	0.0002 lb/mmbtu	ULSD	17 tpy	ULSD, CP
Emergency Gen.	0.3 g/hp-hr	CP	4.8(2) g/hp-hr	CP	0.025 g/hp-hr	ULSD, CP	4.8(2) g/hp-hr	CP	0.0002 lb/mmbtu	ULSD	158 tpy	ULSD, CP

(1) PM emission rates are given in total particulate (filterable + condensable) matter
(2) NMHC+NO_x
(3) CP=Good Combustion Practices; SCR = Selective Catalytic Reduction; DLNB = Dry Low NOx Burners; LNB = Low NOx Burners; FGR = Flue Gas Recirculation; OC = Oxidation Catalyst; AF = inlet air filtration; NG = Use of Natural Gas as a fuel; ULSD = use of Ultra Low Sulfur Diesel as a fuel; GE7HFA = use of GE Frame 7HA.02 turbine or equivalent.
(4) Where 2 limits exist, the upper limit is without duct firing and the bottom limit is with duct firing.
(5) Compliance shall be based on initial manufacturer design basis for combined cycle gross MW output, at 32°F ambient temperature, with duct firing, evaporative cooling off, operating at base load and natural gas fuel.

The following will review the above ESC Harrison County 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: ESC Harrison County 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
* $SCONO_x^{TM}$ (aka EM_x^{TM})

(2) Technically Infeasible Determinations: The only technologies that were determined to be technically infeasible under (1) above was the use of SNCR and $SCONO_x$. The demonstrated application for $SCONO_x$ is currently limited to combined cycle combustion turbines under approximately 50 MW in size. The combustion turbine proposed for this project is approximately 350 MW in size. Therefore, the technology was considered infeasible. ESC also stated that SNCRs were not technically feasible because they require exhaust temperatures significantly higher than will occur at ESC (and likely higher than any combined cycle gas turbines would produce). However, since ESC chose a more effective technology (see below) the question is largely moot.

(3) Effectiveness Ranking of Remaining Technologies: ESC Harrison County 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 ESC Harrison County 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 final entries for large gas fired combined cycle combustion turbines from the RBLC (note only entries with NO_x emissions stated as ppm were considered):

RBLC ID	Date	Company	BACT Emission Rate[1]
NJ-0085	07/19/2016	Stonegate Power	2.0 ppm (LAER)
TX-0788	03/24/2016	APEX Texas Power	2.0 ppm
FL-0356	03/09/2016	Florida Power and Light	2.0 ppm
TX-0789	03/08/2016	Decordova II Power Co	2.0 ppm
CT-0157	11/30/2015	CPV Towantic, LLC	2.0 ppm (LAER)
Avg. Emission Rate			2.0 ppm

(1) All emission rates include duct firing.

With respect to NO_x emissions, ESC Harrison County Power, LLC's proposed emission rate of 2 ppmvd is exactly the same as other recent RBLC entries (even when LAER was applicable). None of the other units employed any NO_x control technology other than DLNB and/or SCR.

CO

(1) Technology Identification: ESC Harrison CountyPower, LLC identified Oxidation Catalysts and EM_x^{TM} as the only potential control technologies.

(2) Technically Infeasible Determinations: ESC Harrison County 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: SinceESC Harrison County 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 final 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]
NJ-0085	07/19/2016	Stonegate Power	2.0 ppm
TX-0788	03/24/2016	APEX Texas Power	4.0 ppm
FL-0356	03/09/2016	Florida Power and Light	4.3 ppm[2]
TX-0789	03/08/2016	Decordova II Power Co	4.0 ppm
CT-0157	11/30/2015	CPV Towantic, LLC	1.7 ppm
Avg. Emission Rate			3.2 ppm

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

With respect to CO emissions, ESC Harrison County 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 Florida Power and Light 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 2.925 ppm.

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

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

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

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

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

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

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 final entries for large gas fired combined cycle combustion turbines from the RBLC.

RBLC ID	Date	Company	BACT Emission Rate[(1)(2)] (lb/hr)
NJ-0085	07/19/2016	Stonegate Power	18.3[(2)]
TX-0788	03/24/2016	APEX Texas Power	19.35
TX-0789	03/08/2016	Decordova II Power Co	35.47
CT-0157	11/30/2015	CPV Towantic, LLC	9.73
CT-0158	11/30/2015	CPV Towantic, LLC	9.73
Avg. Emission Rate			18.52

(1) All emission rates include duct firing.
(2) Filterable and Condensible rate.

With respect to particulate emissions, ESC Harrison County Power, LLC's proposed emission rate of 18.2 pounds per hour is consistent with the average of the last 5 entries into the RBLC. Additionally, none of the entries required post combustion controls.

VOCs

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

(2) Technically Infeasible Determinations: ESC Harrison County 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 ESC Harrison County 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 final entries for large gas fired combined cycle combustion turbines from the RBLC (note only entries with VOC emissions stated as ppm were considered):

RBLC ID	Date	Company	BACT Emission Rate[(1)]
NJ-0085	07/19/2016	Stonegate Power	2.0
TX-0788	03/24/2016	APEX Texas Power	2.0

FL-0356	03/09/2016	Florida Power and Light	1.0 ppm
TX-0789	03/08/2016	Decordova II Power Co	2.0 ppm
CT-0157	11/30/2015	CPV Towantic, LLC	1.0 ppm/2.0 ppm
Avg. Emission Rate			1.60 ppm / 1.80 ppm

(1) When two rates are given, the first is without duct firing and the second is with duct firing.

With respect to VOC emissions, ESC Harrison County 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.

H_2SO_4

(1) Technology Identification: ESC Harrison County Power, LLC identified only use of natural gas and unspecified "post-combustion add-on controls" as potential control technologies.

(2) Technically Infeasible Determinations: ESC Harrison County Power, LLC determined that post combustion add-on control technologies were not feasible based upon a review of the RBLC. Specifically, ESC states "Based upon a review of the RBLC search results, existing permits for similar combined cycle combustion turbines, CT vendor information and technical literature, post combustion controls have not been applied to CTs.".

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 final entries for large gas fired combined cycle combustion turbines with H_2SO_4 limits from the RBLC (note that only entries with a grains of sulfur BACT limit were included):

RBLC ID	Date	Company	BACT Emission Rate (gr S / 100 scf gas)
TX-0788	03/24/2016	APEX Texas Power	0.25[1]
FL-0356	03/09/2016	Florida Power and Light	2.0
TX-0789	03/08/2016	Decordova II Power Co	1.0[1]

TX-0730	04/01/2015	Colorado Bend II Power	0.5[1]
TX-0714	12/19/2014	NRG Texas Power	0.5
Avg. Emission Rate			0.85

[1]Anuual Average

With respect to H_2SO_4 emissions, ESC Harrison County Power, LLC actually proposed a BACT limit of 0.0009 lb/mmbtu. However, none of the RBLC limits were expressed in these units. Therefore the above table compares ESCs underlying natural gas sulfur content (upon which the lb/mmbtu limit was based) to recently issued BACT determinations. As can be seen from the table, ESCs proposed limit of 0.4 grains of sulfur per 100 standard cubic feet of natural gas is more stringent than all but one entry and compares very favorably to the average of the last five determinations.

GHGs

1) Technology Identification:

Carbon Capture and Storage

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

- Pre-combustion systems designed to separate CO_2 and hydrogen in the high-pressure synthetic gas typically produced at Integrated Gasification Combined-Cycle (IGCC) power plants; and
- Post-combustion systems that separate CO_2 from flue gas such as:
    - 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 combustion results in significantly lower GHG emissions than coal combustion (117.0 lb/mmbtu, for natural gas versus 205.6 lb/mmbtu for bituminous coal). The use of lower carbon containing fuels in combustion turbines is an effective means to reduce the generation of CO_2 during the combustion process.

(2) Technically Infeasible Determinations:

Carbon Capture and Storage

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

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

Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. The geological formations near the ESC Harrison County 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 ESC Harrison County 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.

It should also be noted that the proposed BACT limit of 826 lb/MW-hr (see below) is significantly less than EPA's NSPS GHG limit of 1,000 lb/MW-hr for new natural gas fired turbines greater than 250 MW. Additionally, EPA notes that new turbines should be able to meet this limit without any add on controls. Given that this is a relatively new addition to the NSPS (finalized October 23, 2015) that addresses new construction, it seems that USEPA would have implemented a requirement for CCS if the technology was currently considered practical.

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: ESC Harrison County 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 826 lb CO_{2e}/MW-hr (based on gross MW output, combined cycle mode, duct firing, and evaporative cooling off).

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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
NJ-0085	07/19/2016	Stonegate Power	888 lb/MW-hr
TX-0788	03/24/2016	APEX Texas Power	924 lb/MW-hr
TX-0791	03/18/20136	Rockwood Energy Center	865 lb/MW-hr[1]
FL-0356	03/09/2016	Florida Power & Light	850 lb/MW-hr
TX-0787	03/01/2016	Southern Power	937 lb/MW-hr
Avg. Emission Rate			892.8 lb/MW-hr

[1]The most stringent of six limits depending on which turbine the company chooses.

Comparisons among the various combustion turbines are somewhat complicated in that different bases can be used to establish certain parameters. For example, combustion turbine outputs can be specified on a net or gross basis, and can vary based on fuel, load, ambient temperature, whether duct firing is occurring, and other factors. GHG emission rates can be specified on a LHV or HHV basis. Nevertheless, in context, the ESC Harrison County Power, LLC combustion turbines compare favorably (calculated emission rate of 826 lb/MW-hr, combined cycle mode) with other recent combustion turbine projects in terms of output-based GHG emission rates and heat rates, which indicates that the proposed combustion turbines represent an efficient design that has been accepted as BACT for GHGs in other PSD permits. It should be noted that ESC Harrison County Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, fuel gas heater, emergency generator, fire water pump and circuit breakers) of 2,338,896 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit.

Auxiliary Boiler

NO_x

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

(2) Technically Infeasible Determinations: Despite the fact that ESC Harrison County Power, LLC did not identify SCRs as a potential control technology, EPAs Air Pollution Control Technology Fact Sheet for SCRs says that SCRs can be used and are cost effective for natural gas fired boilers over 50 mmbtu/hr. Therefore, in the writers opinion, SCR must be evaluated for use on the auxiliary boiler.

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

(4) Economically Infeasible Determinations: Since ESC did not identify SCR as a potential control technology, they obviously did not submit an economic analysis to determine whether or not one was cost effective. However, given that proposed annual emissions from the boiler total only 1.96 tons per year, it is obvious that an SCR would not be economically feasible. According to EPAs Air Pollution Control Technology Fact Sheet, SCRs remove approximately 70%-90% of NO_x. In this case, even a 90% removal efficiency would only reduce emissions by 1.76 tons per year. Even if you assume $10,000 per ton to be economically feasible (an extraordinary assumption) the entire SCR system would have to be installed and operated at a an annualized cost of less than $18,000. This is obviously not the case. This high incremental cost effectiveness number is driven by the already low NO_x emission rate and the limited hours of operation of the auxiliary boiler (the auxiliary boiler will be limited to no more than 4,576 hours of operation a year.

(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
NJ-0085	07/19/2016	Stonegate Power	0.01 lb/mmbtu[1]
NJ-0084	03/10/2016	PSEG Fossil LLC	0.01 lb/mmbtu[1]
FL-0356	03/09/2016	Florida Power & Light	0.05 lb/mmbtu
MD-0045	11/13/2015	Mattawoman Energy	0.01 lb/mmbtu
TX-0772	11/06/2015	Jefferson Railport Terminal	0.011 lb/mmbtu
Avg. Emission Rate			0.0182 lb/mmbtu

[1]Emission rate based on LAER rather than BACT.

With respect to NO_x emissions, ESC Harrison County Power, LLC's proposed emission rate of 0.011 lb/mmbtu is consistent with many other recent RBLC entries. It is less than the average of the most recent five entries even when two LAER decisions are included. None of the other units employed any NO_x control technologies other than use of low NO_x burners and flue gas recirculation.

CO

(1) Technology Identification: ESC Harrison County 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-NO_x burners (LNB), and FGR, that each support effective combustion that minimizes CO formation. Although these efficient combustion techniques are targeted to reduce NO_x emissions, they have a collateral impact of minimizing CO formation.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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
NJ-0085	07/19/2016	Stonegate Power	0.037 lb/mmbtu
NJ-0084	03/10/2016	PSEG Fossil LLC	0.036 lb/mmbtu
FL-0356	03/09/2016	Florida Power & Light	0.08lb/mmbtu
MD-0045	11/13/2015	Mattawoman Energy	0.037 lb/mmbtu
OK-0168	05/05/2015	O G and E	0.0075 lb/mmbtu
Avg. Emission Rate			0.0395 lb/mmbtu

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

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

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

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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
NJ-0085	07/19/2016	Stonegate Power	0.005 lb/mmbtu
NJ-0084	03/10/2016	PSEG Fossil LLC	0.005 lb/mmbtu
MD-0045	11/13/2015	Mattawoman Energy	0.0075 lb/mmbtu
MD-0046	10/31/2014	Keys Energy Center	0.0075 lb/mmbtu
IA-0107	04/14/2014	Interstate Power & Light	0.0080 lb/mmbtu
Avg. Emission Rate			0.0066 lb/mmbtu

With respect to $PM/PM_{10}/PM_{2.5}$ emissions, ESC Harrison County Power, LLC's proposed emission rate of 0.008 lb/mmbtu is higher but comparable to other recent RBLC entries. None of the other units employed any particulate control technology other than good combustion practices. Additionally, if the BACT limit was set at the 0.0066 lb/hr average it would reduce PM emissions by less than 0.25 tons per year.

VOCs

(1) Technology Identification: ESC Harrison County 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 ESC Harrison County 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
NJ-0085	07/19/2016	Stonegate Power	0.005 lb/mmbtu
NJ-0084	03/10/2016	PSEG Fossil LLC	0.004 lb/mmbtu
MD-0045	11/13/2015	Mattawoman Energy	0.003 lb/mmbtu[1]
MD-0046	10/31/2014	Keys Energy Center	0.002 lb/mmbtu[1]
IA-0107	04/14/2014	Interstate Power & Light	0.005 lb/mmbtu
Avg. Emission Rate			0.0038 lb/mmbtu

[1]Emission rate based on LAER.

With respect to VOC emissions, ESC Harrison County Power, LLC's proposed emission rate of 0.008 lb/mmbtu is higher than the average of other recent RBLC entries. However, given the limited hours of operation the boiler will be permitted for (4,576 hours per year), decreasing the limit from 0.008 lb/mmbtu to the average of 0.0038 lb/mmbtu would only decrease VOC emissions by less than 0.75 tons per year. None of the other units employed any VOC control technology other than good combustion practices.

H_2SO_4

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

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

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 final entries for small natural gas fired boilers with H_2SO_4 limits from the RBLC (note that only entries with a lb/mmbtu limit or a limit that is easily converted to lb/mmbtu were included):

RBLC ID	Date	Company	BACT Emission Rate
NJ-0085	07/19/2016	Stonegate Power	0.0001 lb/mmbtu
NJ-0084	03/10/2016	PSEG Fossil LLC	0.00025 lb/mmbtu
MD-0045	11/13/2015	Mattawoman Energy	0.004 lb/mmbtu
IA-0107	04/14/2014	Interstate Power & Light	0.00009 lb/mmbtu
MA-0039	01/30/2014	Footprint Power Salem	0.0009 lb/mmbtu
Avg. Emission Rate			0.0011 lb/mmbtu

With respect to H_2SO_4 emissions, ESC Harrison County Power, LLC's proposed emission rate of 0.00017 lb/mmbtu is consistent with most and lower than the average of other recent RBLC entries. None of the other units employed any H_2SO_4 control technology other than the use of natural gas.

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. ESC Harrison County Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, emergency generator, fire water pump and circuit breakers) of 2,338,896 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 117 lb CO_2/mmbtu was selected based on the emission factor used. The writer was able to find only three GHG BACT limits in the RBLC for small, natural gas fired boilers expressed in anything other than lbs/hr or tons per year. Limits expressed in tons per year are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's auxiliary boiler.

RBLC ID	Date	Company	BACT Emission Rate
AR-0140	09/18/2013	Big River Steel	117 lb/mmbtu
OR-0050	03/05/2014	Troutdale Energy Center	117 lb/mmbtu
MA-0039	01/30/2014	Footprint Power Salem	119 lb/mmbtu
Avg. Emission Rate			117.67 lb/mmbtu

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

Emergency Generator

NO_x

(1) Technology Identification: ESC Harrison County 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 is reasonable. Therefore, ESC Harrison County Power, LLCs proposed use good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Harrison County 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 ESC Harrison County 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. ESC Harrison County Power chose a BACT level of 4.8 g/hp-hr. This is based on the applicable Subpart IIII limit.

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

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

CO

(1) Technology Identification: ESC Harrison County 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 is reasonable. Therefore, ESC Harrison County 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: ESC Harrison County 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 0.3 g/hp-hr as BACT. It should be noted this is far below the 2.6 g/hp-hr applicable NSPS Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 (or g/kw-hr which is easily converted) were used.

RBLC ID	Date	Company	BACT Emission Rate
FL-0356	03/09/2016	Florida Power & Light	2.6 g/hp-hr
TX-0728	04/01/2015	BASF	0.0126 g/hp-hr[1]
AK-0082	01/23/2015	Exxon Mobil	2.6 g/hp-hr
WV-0025	11/21/2014	Moundsville Power	2.6 g/hp-hr
IL-0114	09/05/2014	Cronus Chemicals	2.6 g/hp-hr
Avg. Emission Rate			2.08 g/hp=hr

[1]This appears to be a typo. It seems unrealistic. Additionally, other information in the RBLC entry (engine size, annual emission limit and an hours per year operation limit) seem to reflect a significantly higher limit (somewhere around 2.3 g/hp-hr). However, it is included here out of an abundance of caution.

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

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

(1) Technology Identification: ESC Harrison County 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, ESC Harrison County 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: ESC Harrison County 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 0.025 g/hp-hr as BACT. It should be noted that 0.15 g/hp-hr is the applicable NSPS Subpart IIII PM limit.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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
NJ-0084	03/10/2016	PSEG Fossil	0.044 g/hp-hr
FL-0356	03/09/2016	Florida Power & Light	0.15 g/hp-hr
LA-0292	01/22/2016	Cameron Interstate Pipeline	0.15 g/hp-hr
TX-0728	04/01/2015	BASF	0.045 g/hp-hr
AK-0082	01/23/2015	Exxon Mobil	0.15 g/hp-hr
Avg. Emission Rate			0.108 g/hp-hr

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

VOCs

(1) Technology Identification: ESC Harrison County 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, ESC Harrison County 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: ESC Harrison County 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, ESC Harrison County 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. ESC Harrison County Power chose a BACT level of 4.8 g/hp-hr. This is based on the applicable Subpart IIII limit.

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

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

H_2SO_4

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

(2) Technically Infeasible Determinations: ESC Harrison County Power, LLC determined that post combustion add-on control technologies were not feasible "since there are no post-combustion control technologies available for H_2SO_4 emissions from small emergency diesel engines.

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

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

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

GHGs

For reasons similar to those discussed under "Combustion Turbines" above, there are currently no technically feasible add on control technologies to reduce GHG emissions from the emergency generator. Therefore, GHG emissions from the emergency generator will be controlled by exclusive use of good combustion practices. ESC Harrison County Power, LLC proposed only a facility wide GHG limit (including turbine, auxiliary boiler, emergency generator, fire water pump, gas heater and circuit breakers) of 2,338,896 tons CO_{2e} per year.

However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the emergency generator, a limit of 158 tons per year was selected. Most entries into the RBLC for GHGs from large emergency generators are in units of either lb/hr or tpy. Limits expressed in tons per year or pounds per hour are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's emergency generator.

Fire Water Pump

NO_x

(1) Technology Identification: ESC Harrison County 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 use of the emergency generator, this is reasonable. Therefore, ESC Harrison County Power, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Harrison County 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 ESC Harrison County 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. ESC Harrison County Power chose a BACT level of 2.69 g/hp-hr. This is below the applicable Subpart IIII limit of 3.0 g/hp-hr.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 pumps from the RBLC. Note that only entries with NO_x + NMHC emission limits expressed in terms of g/hp-hr were considered .

RBLC ID	Date	Company	BACT Emission Rate
NJ-0085	07/19/2016	Stonegate Power	2.85 g/hp-hr
NJ-0084	03/10/2016	PSEG Fossil	2.15 g/hp-hr
IN-0234	12/08/2015	Grain Processing Corp.	9.5 g/hp-hr[1]
MD-0045	11/13/2015	Mattawoman Energy, LLC	3.0 g/hp-hr
FL-0354	08/25/2015	Florida Power and Light	3.0 g/hp-hr
Avg. Emission Rate			2.75 g/hp-hr

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

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

CO

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

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Harrison County 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 0.44 g/hp-hr as BACT. It should be noted this is far below the 2.6 g/hp-hr applicable NSPS Subpart IIII limit.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 emergency generators from the RBLC. Note that only entries with a CO limit expressed in g/hp-hr (or units which are easily converted) were used.

RBLC ID	Date	Company	BACT Emission Rate
NJ-0085	07/19/2016	Stonegate Power	2.6 g/hp-hr
NJ-0084	03/10/2016	PSEG Fossil	4.4 g/hp-hr
FL-0356	03/09/2016	Florida Power and Light	2.6 g/hp-hr
IN-0234	12/08/2015	Grain Processing Corp.	2.01 g/hp-hr
MD-0045	11/13/2015	Mattawoman Energy, LLC	2.6 g/hp-hr
Avg. Emission Rate			2.84 g/hp-hr

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

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

(1) Technology Identification: ESC Harrison County 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 is reasonable. Therefore, ESC Harrison County Power, LLC proposed the use of good combustion practices and no more than 100 hours per year of operation for maintenance and readiness testing as BACT.

(2) Technically Infeasible Determinations: None

(3) Effectiveness Ranking of Remaining Technologies: ESC Harrison County 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 0.075 g/hp-hr as BACT. It should be noted that 0.15 g/hp-hr is the applicable NSPS Subpart IIII PM limit.

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 (or units which could easily be converted) were considered .

RBLC ID	Date	Company	BACT Emission Rate
NJ-0085	07/19/2016	Stonegate Power	0.15 g/hp-hr
NJ-0084	03/10/2016	PSEG Fossil	0.126 g/hp-hr
FL-0356	03/09/2016	Florida Power and Light	0.15 g/hp-hr
IN-0234	12/08/2015	Grain Processing Corp.	0.16 g/hp-hr
MD-0045	11/13/2015	Mattawoman Energy, LLC	0.15 g/hp-hr
Avg. Emission Rate			0.147 g/hp-hr

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

VOCs

(1) Technology Identification: ESC Harrison County 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 is reasonable. Therefore, ESC Harrison County Power, LLC proposed the use of good

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

(2) Technically Infeasible Determinations: None

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 heaters from the RBLC. Note that only entries with units of lb/mmbtu were considered .

RBLC ID	Date	Company	BACT Emission Rate
NJ-0085	07/19/2016	Stonegate Power	2.85 g/hp-hr
NJ-0084	03/10/2016	PSEG Fossil	2.15 g/hp-hr
IN-0234	12/08/2015	Grain Processing Corp.	9.5 g/hp-hr[1]
MD-0045	11/13/2015	Mattawoman Energy, LLC	3.0 g/hp-hr
FL-0354	08/25/2015	Florida Power and Light	3.0 g/hp-hr
Avg. Emission Rate			2.75 g/hp-hr

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

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

H_2SO_4

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

(2) Technically Infeasible Determinations: ESC Harrison County Power, LLC determined that post combustion add-on control technologies were not feasible "since there are no post-combustion control technologies available for H_2SO_4 emissions from small emergency diesel engines."

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

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

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

RBLC ID	Date	Company	BACT Emission Rate
MA-0039	01/30/2014	Footprint Power Salem Harbor	0.00011 lb/mmbtu
PA-0291	04/23/2013	Hickory Run Energy	0.00037 lb/mmbtu
Avg. Emission Rate			0.00024 lb/mmbtu

With respect to H_2SO_4 emissions, the proposed emission rate of 0.0002 lb/mmbtu appears to be consistent with other recent RBLC entries. None of the other units employed any H_2SO_4 control technology other than use of ULSD.

GHGs

For reasons similar to those discussed under "Combustion Turbines" above, there are currently no technically feasible add on control technologies to reduce GHG emissions from the fire water pump engines. Therefore, GHG emissions from the fire water pump engines will be controlled by exclusive use of good combustion practices ESC Harrison County Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, gas heater, emergency generator, fire water pump and circuit breakers) of 2,338,896 tons CO_{2e} per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the fire water pump, a limit of 17 tons per year was selected. Most entries into the RBLC for GHGs from fire water pumps are in units of either lb/hr or tpy. Limits expressed in tons per year or pounds per hour are of little value because they are obviously proportional to size and usage which may or may not be comparable to ESC's fire water pump.

Fuel Gas Heater

NO_x

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

(2) Technically Infeasible Determinations: None.

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

(4) Economically Infeasible Determinations: None

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

RBLC ID	Date	Company	BACT Emission Rate
FL-0356	03/09/2016	Florida Power & Light	0.10 lb/mmbtu
OK-0173	01/19/2016	Commercials Metals Co.	0.10 lb/mmbtu
TX-0694	02/02/2015	Indeck Wharton LLC	0.10 lb/mmbtu
TX-0691	05/20/2014	NRG Texas Power	0.10 lb/mmbtu
TX-0656	05/16/2014	Natgasoline	0.036 lb/mmbtu
Avg. Emission Rate			0.087 lb/mmbtu

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

CO

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

(2) Technically Infeasible Determinations: None.

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

(4) Economically Infeasible Determinations: None

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

RBLC ID	Date	Company	BACT Emission Rate
OK-0173	01/19/2016	Commercials Metals Co.	0.084 lb/mmbtu
TX-0694	02/02/2015	Indeck Wharton LLC	0.04 lb/mmbtu
TX-0691	05/20/2014	NRG Texas Power	0.054 lb/mmbtu
MS-0092	05/08/2014	Emberclear GTL MS	0.08 lb/mmbtu
TX-0693	04/22/2014	Golden Spread Elec. Co-op	0.08 lb/mmbtu
Avg. Emission Rate			0.0676 lb/mmbtu

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

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

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

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

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

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

(4) Economically Infeasible Determinations: Since ESC Harrison County 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 2 most recent entries for small gas fired heaters from the RBLC. Only two were included because so few comparably sized and utilized natural gas fired heaters are listed in the RBLC.

RBLC ID	Date	Company	BACT Emission Rate
OK-0173	01/19/2016	Commercials Metals Co.	0.0076 lb/mmbtu
MI-0412	12/04/2013	Holland Board of Pub. Works	0.0075 lb/mmbtu
Avg. Emission Rate			0.00755 lb/mmbtu

The average of the two recent entries into the RBLC are comparable to ESCs chosen BACT level of 0.008 lb/mmbtu. If BACT was reduced from 0.008 lb/mmbtu to 0.0075 lb/mmbtu (the lowest recent comparable level) it would result in PM emissions being reduced by a maximum of 24 **pounds** per **year**.

VOCs

(1) Technology Identification: ESC Harrison County Power, LLC did not identify any potential add on VOC control technologies applicable to the fuel gas heater. Given the size, and limited annual emissions of the fuel gas heater, this is reasonable. Therefore, ESC Harrison County Power, LLC proposed the use of pipeline quality natural gas and good combustion practices.

(2) Technically Infeasible Determinations: None

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

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

(5) DAQ Review of RBLC: Very few recent entries for similarly sized natural gas fired heater with VOC limits exist in the RBLC. However, given that proposed baseline VOC emissions from the heater total only 0.17 tons per year, the limit is reasonable.

H_2SO_4

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

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

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

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

(5) DAQ Review of RBLC: Very few recent entries for similarly sized natural gas fired heater with H_2SO_4 limits exist in the RBLC. Given that proposed baseline H_2SO_4 emissions from the heater total only 0.0041 tons per year, the limit is reasonable.

GHGs

For reasons similar to those discussed under "Combustion Turbines", there are currently no technically feasible add on control technologies to reduce GHG emissions from the fuel gas heater. Therefore, GHG emissions from the fuel gas heater will be controlled by exclusive use of pipeline quality natural gas and good combustion practices. ESC Harrison County Power, LLC proposed only a facility wide GHG limit (including turbines, auxiliary boiler, gas heater, emergency generator, fire water pump and circuit breakers) of 2,338,896 tons CO_2e per year. However, this evaluation and the permit will incorporate numerical BACT limits on each individual emission unit. For the fuel gas heater, a limit of 2,806 tons per year was selected.

DAQ Conclusion on BACT Analysis

The DAQ has concluded that, with the exceptions noted above and corrected for, ESC Harrison County 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.

ESC Harrison County 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 CO, NO_x, $PM_{2.5}$ and PM_{10}. Greenhouse gases are not modeled as part of the PSD application review process and VOC emissions (as a precursor to tropospheric ozone formation) were addressed through a qualitative analysis by the applicant in the modeling protocol. The results of the modeling analyses are summarized below. More detailed descriptions of these modeling analyses and quantitative results are contained in reports attached to this evaluation as Attachment A. The reports were prepared by Jon McClung of DAQs Planning Section.

Class I Modeling

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

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

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

There are generally four Class I areas that may have to be considered when conducting PSD reviews in West Virginia. These are, in West Virginia, the Otter Creek Wilderness Area and the Dolly Sods Wilderness Area; both of which are managed by the US Forest Service. The Shenandoah National Park, managed by the National Park Service, and the James River Face Wilderness Area, managed by the US Forest Service, are in Virginia. The ESC Harrison County Power, LLC facility is approximately 42 miles from the Otter Creek Wilderness Area, 55 miles from the Dolly Sods Wilderness Area, 100 miles from the Shenandoah National park, and 124 miles from the James River Face Wilderness Area.

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

Class II Modeling

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

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

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

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

The applicant therefore passes all the required Air Quality Impact Analysis tests as required for Class II Areas under 45CSR14. Attached to this evaluation is a report prepared by Jon McClung on July 14, 2017 that details the above analysis and presents the results in tabular form.

Additional Impacts Analysis - 45CSR14 Section 12

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

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

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

Evaluation of potential impacts on vegetation and soils were performed by comparison of maximum modeled impacts from the Project to Air Quality Related Value (AQRV) screening concentrations provided in the EPA document “A Screening Procedure for the Impacts of Air

Pollution Sources on Plants, Soils, and Animals" and to NAAQS secondary standards. The screening levels represent the minimum concentrations in either plant tissue or soils at which adverse growth effects or tissue injury was reported in the literature. The NAAQS secondary standards were set to protect public welfare, including protection against damage to crops and vegetation. Therefore, comparing the modeled emissions to the AQRVs and the NAAQS secondary standards provides an indication as to whether potential impacts are likely to be significant."

Pollutant	Averaging Period	AQRV Screening Levels (μg/m^3)	Secondary NAAQS (μg/m^3)	Max. Modeled Concentrations
PM_{10}	24-hour	--	150	8.47
	Annual	--	50	1.08
$PM_{2.5}$	24-hour	--	35	8.47
	Annual	--	15	1.08
NO_2	4-hour	3,760	--	34.48
	8-hour	3,760	--	26.00
	1-month	564	--	5.10
	Annual	100	100	2.44
CO	Weekly	1,800,000	--	48.38[1]

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

In order to assess visibility impacts ESC:

"has identified a local public park to further assess Project emissions of possible visibility impairment. Tygart Lake State Park is located approximately 25 km to the east of the Project site. The park offers visitors a wide view of Tygart Lake from the Tygart Lodge building on the western shore of the lake. ESC has used the VISCREEN (Version 1.01, dated 13190) visibility model to assess the Project impact on this viewshed. VISCREEN was executed following the procedures described in EPA's Workbook for Plume Visual Impact Screening and Analysis for Level-1 visibility assessments. ESC notes that the VISCREEN level 1 procedure contains extremely conservative assumptions (sustained low wind speed of 1 m/s and F-class Pasquill-Gifford stability class), and VISCREEN's internal criteria used to determine a significant visibility impact are also very conservative, having been derived to protect visibility impacts in Class I areas. Despite this conservatism, ESC is providing the VISCREEN level 1 analysis to demonstrate that any visibility impact that can be expected due to the Project will be insignificant."

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

On April 24, 2017 the permit application R14-0036 was deemed complete. This action, as per 45CSR14, Section 2.42.b, has triggered the minor source baseline date (MSBD) for the following areas:

Minor Source Baseline Triggering

Pollutant	Harrison County
NO_2	Yes
PM_{10}	Previously
$PM_{2.5}$	Yes

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

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

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

HAPs

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

HAPs	Type	Known/Suspected Carcinogen	Classification
Acetaldehyde	VOC	Yes	B2 - Probable Human Carcinogen
Benzene	VOC	Yes	A - Human Carcinogen
Ethylbenzene	VOC	No	D-Not Classifiable
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen

Hexane	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data

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

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. The regulatory applicability of any potential NESHAP or MACT to the ESC Harrison County 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 triggered a BACT analysis for the compound. H_2SO_4 is not represented in the IRIS database and is not listed as a HAP. Concerning the carcinogenity of sulfuric acid, the Agency for Toxic Substances and Disease Registry (ATSDR) states that "[t]he ability of sulfuric acid to cause cancer in laboratory animals has not been studied. The International Agency for Research on Cancer (IARC) has determined that occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans. IARC has not classified pure sulfuric acid for its carcinogenic effects."

MONITORING, REPORTING, AND RECORD-KEEPING OF OPERATIONS

Emissions Monitoring

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

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

etc.) to guarantee efficacy of pollution control equipment;

- Visual stack observations to monitor opacity.

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

Turbine/HRSG

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

HCCT-1 Monitoring

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

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

Auxiliary Boiler

AB-1 Monitoring

Pollutant	Monitoring Method	Permit/Rule Citation	Comment
CO	Fuel usage	Permit	
NO_x	Fuel usage	Permit	

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

Emergency Generator

EG-1 Monitoring

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

Fire Water Pump Engine

FP-1 Monitoring

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

Fuel Gas Heater

FGH-1 Monitoring

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

Record-Keeping

ESC Harrison County 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 for the permit and keep the information for five years. All collected data will be available to the Director upon request. ESC Harrison County 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

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

PERFORMANCE TESTING

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

Turbine/Duct Burner

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

HCCT-1 Testing Requirements

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

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

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

Emergency Generator/Fire Water Pump Engine

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

Other Sources

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

RECOMMENDATION TO DIRECTOR

The WVDAQ has preliminarily determined that the construction of the ESC Harrison County Power, LLC, natural gas fired power plant near Clarksburg, Harrison 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 R14-0036.

Steven R. Pursley, PE
Engineer

8-28-17

Date

Attachment A: Modeling Analyses

MEMO

To: Steve Pursley
From: Jon McClung JDM
CC: Laura Crowder, Bev McKeone, Ed Andrews, Joe Kessler
Date: July 14, 2017
Re: ESC Harrison County Power, LLC Modeling Review - PSD Application R14-0036

I have completed my review and replication of the air quality impact analysis submitted in support of the PSD permit application (R14-0036) for the proposed construction of the ESC Harrison County Power, LLC (ESC) facility to be located near Clarksburg, West Virginia, within Harrison County. Review and replication of components of the modeling analysis were also performed by Ed Andrews, Joe Kessler, Steve Pursley, and Fadi Qutaish. The protocol for this modeling analysis was submitted by ESC on November 22, 2016 and approved by West Virginia Division of Air Quality (DAQ) on January 27, 2017. The PSD permit application was received in November 2016 and the modeling report was received on March 30, 2017. This dispersion modeling analysis is required pursuant to §45-14-9 (Requirements Relating to the Source's Impact on Air Quality).

As part of the review process, an applicant for a PSD permit performs the air quality impact analysis and submits the results to the DAQ. The DAQ then reviews and replicates the modeling runs to confirm the modeling inputs, procedures, and results. This memo contains a synopsis of the modeling analysis. For a complete technical description of the modeling analysis, please consult the protocol and modeling analysis report submitted by the applicant.

ESC proposes to construct, install, and operate a new combined-cycle combustion turbine (CT) electric power plant (Project). The proposed plant is expected to have a nominal electric generating capacity of 640 megawats (MW).

The emissions sources associated with the Project are:

- One (1) General Electric (GE) Frame 7HA.02 advanced combined-cycle Combustion Turbine (CT), with a Heat Recovery Steam Generator (HRSG) equipped with Duct Burners (DBs);
- One (1) Auxiliary Boiler with a maximum heat input of 77.8 million British Thermal Units per hour (MMBtu/hr);
- One (1) Fuel Gas Heater with a maximum heat input of 5.5 MMBtu/hr;
- One (1) 2,000-kilowatt (kW) Emergency Generator;
- One (1) 315-horsepower (hp) emergency Fire Water Pump; and
- Diesel fuel, lubricating oil, and aqueous ammonia storage tanks.

The CT/DBs will exclusively use pipeline-quality natural gas and will be equipped with Selective Catalytic Reduction (SCR) to minimize nitrogen oxide (NO_x) emissions, and Oxidation Catalysts to minimize carbon monoxide (CO) and volatile organic compound (VOC) emissions. The Auxiliary Boiler and Fuel Gas heater will also exclusively utilize pipeline-quality natural gas. The fuel for the Emergency Generator and Fire Water Pump will be Ultra Low Sulfur Distillate (ULSD).

This review is for the Class II area surrounding the proposed project site. Class I areas within 300 km of the project site are: Dolly Sods Wilderness (WV), Otter Creek Wilderness (WV), James River Face Wilderness (Virginia), and Shenandoah National Park (Virginia). The Federal Land Managers (FLMs) responsible for evaluating potential affects on Air Quality Related Values (AQRVs) for federally protected Class I areas were consulted. Based on the emissions from the proposed project and the distances to the Class I areas the National Park Service stated a Class I analysis relating to Shenandoah National Park for this project is not required. The U.S. Forest Service, for the Dolly Sods, Otter Creek, and James River Face Wilderness Areas, has not indicated a need for a Class I analysis. Attachment 1 contains the communications by the Federal Land Managers.

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

Table 1. Project Emission Rates

Pollutant	Project Emissions (tons/yr)	PSD Significance Level (tons/yr)
NO_x	**160.7**	40
CO	**131.7**	100
SO_2	26.3	40
PM_{10}	**101.7**	15
$PM_{2.5}$	**101.7**	Direct $PM_{2.5}$: 10 NO_x: 40 SO_2: 40
O_3	**NO_x: 160.7** **VOC: 56.4**	NO_x: 40 VOC: 40

Dispersion modeling was conducted for NO_x, CO, PM_{10}, and $PM_{2.5}$. Secondary formation of $PM_{2.5}$ as a result of NO_x emissions was addressed by ESC and is discussed below. Also, formation of ozone from NO_x and VOC emissions was addressed by the applicant and is discussed below. The modeled emission rates and stack characteristics for the Project for normal operations, startup events, and shutdown events are included in Attachment 2.

Table 2 presents a summary of the air quality standards that were addressed for NO_2, PM_{10}, and $PM_{2.5}$. The pollutants, averaging times, increments, significant impact levels (SILs) and National Ambient Air Quality Standards (NAAQS) are listed. The SIL for 1-hour NO_2 represents the value the Division of Air Quality has implemented as described in the memorandum included in Attachment 3.

Table 2. Ambient Air Quality Standards, SILs, and PSD Increments (All concentrations in µg/m3)

Pollutant	Averaging Period	SIL	PSD Increments	NAAQS
CO	1-Hour	2,000	-	40,000
	8-Hour	500	-	10,000
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	0.2	4	12

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, no background concentration) and NAAQS. In order to receive a PSD permit, the proposed source must not cause or contribute to an exceedance of the NAAQS or PSD increments. In cases where the PSD increments or NAAQS are predicted to be exceeded in the cumulative analysis, the proposed source would not be considered to cause or contribute to the exceedance if the project-only impacts are less that the SIL.

On January 22, 2013, the U.S. Court of Appeals for the District of Columbia Circuit vacated two provisions in EPA's PSD regulations containing SILs for $PM_{2.5}$. The court granted the EPA's request to remand and vacate the SIL provisions in Sections 51.166(k)(2) and 52.21(k)(2) of the regulations so that EPA could address corrections. EPA's position remains that the court decision does not preclude the use of SILs for $PM_{2.5}$ but special care should be taken in applying the SILs for $PM_{2.5}$. This special care involves ensuring that the difference between the NAAQS and the representative measured background concentration is greater than the SIL. If this difference is greater than the SIL, then it is appropriate to use the SIL as a screening tool to inform the decision as to whether to require a cumulative air quality impact analysis. As shown in Table 3, for both the 24-hr and annual averaging time for $PM_{2.5}$, this difference is greater than the SIL and it is appropriate to use the SIL as a screening tool. Included in Attachment 4 are the WV $PM_{2.5}$ Design Values, Final and Certified.

Table 3. $PM_{2.5}$ NAAQS, Monitor Design Values, and Significant Impact Levels (All concentrations in $\mu g/m^3$)

$PM_{2.5}$ Averaging Period	NAAQS	Clarksburg Monitor Design Value (54-033-0003)	Difference between NAAQS and Monitored Design Value	Significant Impact Level (SIL)
		2014-2016		
24-hr	35	18	17	1.2
Annual	12	8.4	3.6	0.2

<u>Modeling Basis</u>

The modeling system used conforms to 40 CFR 51 Appendix W, applicable guidance, and the approved protocol and is summarized below:

- ESC used the latest version of the regulatory dispersion model and supporting programs: AERMOD (version 16216r), AERMET (version 16216), AERMINUTE (version 15272), AERMAP (version 11103), AERSURFACE (version 13016), and BPIP (version 04274). The AERMOD modeling system (AERMOD, AERMET, AERMAP) is the regulatory default modeling system for near-field (<50km) regulatory dispersion modeling.
- AERMET was used to process five years of surface meteorological data from the North Central West Virginia Airport (ICAO code: KCKB; WBAN Station ID 03802). Upper air data from Pittsburgh, PA (WBAN Station ID 94823) were used.
- AERSURFACE was used to develop appropriate surface characteristic (albedo, Bowen ratio, surface roughness) inputs to AERMET.
- A nested receptor grid was developed and AERMAP was used to determine terrain heights and hill height scales for use by AERMOD.
- Background NO_2 monitoring data for the cumulative analysis for the 1-hr and annual NO_2 standards are from a monitor in Washington County, PA (ID #42-125-0005).

- Background 24-hour and annual $PM_{2.5}$ monitoring data were obtained from the Clarksburg, WV monitor (54-033-0003).
- Background concentrations for the 24-hour PM_{10} standard are from a monitor in Washington County, PA (ID #42-125-0005).
- The Plume Volume Molar Ratio Method (PVMRM) option in AERMOD was used to characterize NO_2 from modeled concentrations of NO_x.
- The surface friction velocity adjustment (ADJ_U*) option was utilized in AERMET.

Secondary Formation of $PM_{2.5}$ and Ozone

In December 2016, EPA released a draft guidance memorandum[1] (MERP Memorandum) that describes how modeled emission rates of precursors (MERPs) could be calculated as part of a Tier 1 ozone and secondary $PM_{2.5}$ formation analysis to assess a project's emissions of precursor pollutants. The MERPs may be used to describe an emission rate of a precursor that is expected to result in ambient ozone (O_3) or fine particulate matter ($PM_{2.5}$) that would be less than a specific air quality concentration threshold for O_3 or $PM_{2.5}$ that a permitting authority chooses to use to determine whether an impact causes or contributes to a violation of the NAAQS for O_3 or $PM_{2.5}$. Based on this guidance, ESC has calculated a MERP for ozone and quantified the potential secondary formation of $PM_{2.5}$.

The MERP Memorandum defines a MERP as:

MERP = Critical Air Quality Threshold * (Modeled emission rate from hypothetical source/ Modeled air quality impact from hypothetical source)

For ozone EPA has proposed a Significant Impact Level (SIL) of 1 ppb and this value can be used to represent the critical air quality threshold. Using the conservative stack height release scenario for a hypothetical source in the MERP Memo results in a NO_X MERP of 367.6 tpy and a VOC MERP of 2,941.2 tpy. ESC's potential emissions from the Project are 160.7 tpy NO_X and 56.4 tpy VOC, both below the respective MERP for each precursor. The precursors can be cumulatively evaluated showing the Project cumulative MERP consumption. A cumulative MERP consumption less than 100% indicates that a project would not cause an ozone concentration exceeding the SIL.

The cumulative consumption for the ESC Project can be calculated as:

(ESC NO_X emissions (160.7 tpy)/ NO_X MERP (367.6 tpy) + ESC VOC emissions (56.4 tpy) / VOC MERP (2,941.2 tpy)) * 100 = 45.6%.

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[1]Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (12/02/16)

Where project sources emit both primary $PM_{2.5}$ and precursors of secondary $PM_{2.5}$, EPA guidance indicates that applicants need to combine primary and secondary impacts to determine total $PM_{2.5}$ impacts as part of the PSD compliance demonstration. The ESC Project proposed sources will emit both primary $PM_{2.5}$ and precursors of secondary $PM_{2.5}$. The primary $PM_{2.5}$ impacts have been evaluated by ESC through dispersion modeling using AERMOD. The secondary formation of $PM_{2.5}$ from the precursor emissions of NO_X and SO_2 have been evaluated by ESC using the relationships between emissions and impacts provided by EPA using photochemical modeling in the MERP Memorandum. The total secondary $PM_{2.5}$ (24-hr) impact from the project is 0.034 $\mu g/m^3$. The total secondary $PM_{2.5}$ (annual) impact from the project is 0.00133 $\mu g/m^3$. The secondary $PM_{2.5}$ impacts are combined with the AERMOD direct modeled impacts to obtain the total combined impacts for the PSD compliance demonstration, as described below.

Modeling Operating Scenarios

As required by 40 CFR 51 Appendix W, as incorporated by reference in §45-14-10 (Modeling Requirements), ESC performed a load analysis to determine the operating conditions that cause the maximum ground-level concentrations. Specifically, ESC evaluated twenty-seven (27) steady-state load and ambient conditions from the proposed GE model turbine. This analysis was conducted for all applicable averaging periods for NO_2, PM_{10}, $PM_{2.5}$, and CO. The highest modeled concentration from the various combustion turbine loads were noted for each pollutant and averaging period combination, and the load that produced the highest modeled result for each pollutant and averaging period combination was used in all subsequent model analyses for comparison to the applicable SILs, NAAQS, and PSD increments, as necessary.

Startup and shutdown operations of the CT/HRSG were evaluated in addition to the steady-state normal operating scenarios. The anticipated time spent for the CT/HRSG to be undergoing a startup operation is approximately 107 hours per year (208 hot starts, 40 warm starts, and 12 cold starts), while 52 hours per year for shutdowns is anticipated.

The Fire Water Pump and Emergency Generator are intermittent emissions scenario sources. EPA guidance allows for the exclusion of intermittent emissions scenario sources from 1-hr NO_2 modeling since the brief periods of emissions from these units would be unlikely to significantly contribute to NAAQS exceedances considering the probabilistic form of the 1-hr NO_2 standard. For the proposed emergency diesel engine units - the Emergency Generator and Fire Water Pump - ESC conservatively used annualized average emission rates for the 1-hr NO_2 modeling analysis.

SIL Analysis Results (Tier I)

The results of the Significant Impact Analysis for the ESC Project sources are included in Table 4. All pollutant modeled concentrations except for 1-hr CO and 8-hr CO exceed their respective SIL and a cumulative analysis is required for these pollutants. No further modeling analysis is necessary for 1-hr CO and 8-hr CO.

Table 4. SIL Analysis Results

Pollutant	Avg. Period	Modeled Scenario	Secondary Formation Contribution ($\mu g/m^3$)	Maximum Modeled Conc. ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	Significant Impact Level (SIL) ($\mu g/m^3$)
NO_2	1-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	N/A	52.26	**52.26**	7.5
	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	N/A	2.44	**2.44**	1
$PM_{2.5}$	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	0.034	7.23	**7.26**	1.2
	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	0.00133	1.00	**1.00**	0.2
PM_{10}	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	N/A	8.47	**8.47**	5

Pollutant	Avg. Period	Modeled Scenario	Secondary Formation Contribution (μg/m³)	Maximum Modeled Conc. (μg/m³)	Total Conc. (μg/m³)	Significant Impact Level (SIL) (μg/m³)
PM_{10}	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	N/A	1.08	**1.08**	1
CO	1-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	N/A	199.31	199.31	2,000
	1-hour	Cold Start Scenario	N/A	1427.82	1427.92	2,000
	8-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	N/A	71.84	71.84	500
	8-hour	Cold Start Scenario	N/A	71.85	81.85	500

Cumulative Analysis Results (Tier II)

The cumulative analysis includes the modeled impacts from the ESC Project sources, off-site existing sources, secondary formation contribution to $PM_{2.5}$, and representative background concentrations. For off-site existing sources, the impacts represent maximum hourly potential emissions, as determined from applicable permits. The background concentration data is 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.

Table 5 shows the maximum total concentrations for all the receptors modeled in the cumulative analysis.

Table 5. NAAQS Analysis Results - Maximum Total Concentrations

Pollutant	Averaging Period	Modeled Scenario	Total Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	1-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	115.50	188
	1-hour	Cold Start Scenario	168.62	
	1-hour	Warm Start Scenario	161.38	
	1-hour	Hot Start Scenario	146.25	
	1-hour	Shutdown Scenario	115.50	
	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	20.78	100
$PM_{2.5}$	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	26.20	35
	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	10.28	12
PM_{10}	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	89.82	150

Table 6 shows the maximum total Class II Increment concentrations, which include maximum modeled concentrations from increment consuming sources and secondary $PM_{2.5}$ contributions. An increment analysis was not performed for 1-hr NO_2 since an increment level has not been established.

Table 6. Class II Increment Analysis Results

Pollutant	Averaging Period	Modeled Scenario	Total Concentration ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)
NO_2	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	3.88	25
$PM_{2.5}$	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	7.37	9
	Annual	Normal Operation 100% Load (worst case normal operation, Scenario 11)	1.23	4
PM_{10}	24-hour	Normal Operation 100% Load (worst case normal operation, Scenario 1)	11.83	30
	Annual	Normal Operation 100% Load (worst case, Scenario 11)	1.92	17

Summary

The air quality impact analysis prepared and submitted by ESC to the DAQ has been reviewed and replicated and conforms to 40 CFR 51 Appendix W, applicable guidance, and the modeling protocol. The cumulative modeling analysis demonstrates that no modeled exceedances of the NAAQS or Class II Increments are predicted.

ATTACHMENT 1

Federal Land Manager AQRV Determinations

McClung, Jon D

From: Stacy, Andrea <andrea_stacy@nps.gov>
Sent: Tuesday, February 7, 2017 2:39 PM
To: Kessler, Joseph R
Cc: Claire O'Dea (cbodea@fs.fed.us); Jalyn Cummings (jalyn_cummings@nps.gov); Holly Salazer (holly_salazer@nps.gov); Jackson, Bill -FS (bjackson02@fs.fed.us); Pitrolo, Melanie -FS (mpitrolo@fs.fed.us); Tedd Hoffman (elhuffman@fs.fed.us); Notar, John; McKeone, Beverly D; Pursley, Steven R; McClung, Jon D; Don Shepherd; Susan Johnson
Subject: Re: WV PSD Permit Application Notification

Hi Joe,

Thank you for providing the following information for the proposed ESC Harrison County Power PSD project. We agree that this facility is unlikely to result in adverse impacts to AQRVs in Shenandoah NP and are confirming that a Class I analysis will not be necessary for this permit.

We also recognize that in this case, you used conservative assumptions in your Q/d analysis, which further supports our conclusion. As always, we appreciate that you are making this determination in consultation with the FLMs and within the scope of FLM guidance.

Finally, could you please provide us with a copy of the completed permit application (i.e., we don't need all of the iterations, just the application that is deemed complete), the draft & final permits and any staff analyses on the BACT determination when these documents become available? We need to document/file this information with our screening records. Otherwise, no additional follow up is necessary (unless the project proposal changes substantially). Thanks again for keeping us in the loop.

Regards,
Andrea Stacy

On Thu, Jan 19, 2017 at 12:53 PM, Kessler, Joseph R <Joseph.R.Kessler@wv.gov> wrote:

Attached is the FLM Notification Form for the following PSD Permit Application submitted on March 14, 2016:

Permit Number: R14-0036

Applicant: ESC Harrison County Power, LLC

Location: Harrison County, WV

Facility ID Number: 033-00264

The permit application is available online at:
http://www.dep.wv.gov/daq/Documents/December%202016%20Applications/033-00264_APPL_R14-0036.pdf.

FYI, the maximum hourly emission levels given on the attached form are based the all emission units running simultaneously (with the CTs are operating at steady-state) as based on information given in the permit application. The annual emission levels given on the form represent the proposed facility-wide PTE including startup/shutdown as given in the permit application. However, pursuant to guidance in the flag document, for calculating the following Q/D, we conservatively calculated the worst 24-hour aggregate emission level of all pollutants (NOx, SO_2, PM, and H_2SO_4) based on the maximum hourly emissions given on the form (all emission units – including emergency generator - operating simultaneously for 24-hours) with the addition of one cold start and one shutdown per day of the CT. This daily maximum was then multiplied by 365 to give us a Q of approximately 515 TPY. Based on Otter Creek's distance of 62 km, this would give the facility a Q/D of ~ **8.31** (ESC calculated a Q/D of 3.9). However, this method was considered very conservative as we did not replace any daily steady-state hours with startup or shutdown hours and included the emergency generator operating simultaneously with the CTs for 24 ours continuously. We reserve the right to refine this methodology in other projects where a more accurate Q/D may be desirable.

Let me know if you have any questions or comments.

Thank You,

Joe Kessler, PE

Engineer

West Virginia Division of Air Quality

601-57th St., SE

Charleston, WV 25304

Phone: (304) 926-0499 x1219

Fax: (304) 926-0478

Joseph.r.kessler@wv.gov

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Andrea Stacy
National Park Service
Air Resources Division

12795 W. Alameda Pkwy
P.O. Box 25287
Denver, CO 80225
andrea_stacy@nps.gov
303-969-2816 (phone)
303-969-2822 (Fax)

McClung, Jon D

From: Kessler, Joseph R
Sent: Monday, April 17, 2017 10:59 AM
To: Sams, Charles E -FS
Cc: Pursley, Steven R; McClung, Jon D
Subject: RE: ESC Harrison County Power Permit
Attachments: Final ESC Harrison County Power LLC Air Quality Modeling Report.pdf

At this time the permit application has not yet been deemed complete (however, we believe it will be soon). When we have a draft permit and preliminary determination prepared and are approved to go to public notice, we will forward you a copy of both. Attached is the modeling report, and per earlier determinations, it does not contain significant Class I modeling. It does contain an evaluation of the Class I SILs by using the maximum modeled concentrations of NO_X, PM_{10}, and $PM_{2.5}$ out at 50 km from the source. It remains our conclusion, and based on the determination of the NPS and your preliminary determination, that an AQRV analysis and increment analysis are not required for the Class I areas. The modeling report and results are currently under review.

Let me know if you have any other questions,

Thanks,

Joe Kessler, PE
Engineer
West Virginia Division of Air Quality
601-57th St., SE
Charleston, WV 25304
Phone: (304) 926-0499 x1219
Fax: (304) 926-0478
Joseph.r.kessler@wv.gov

From: Sams, Charles E -FS [mailto:csams@fs.fed.us]
Sent: Friday, April 14, 2017 2:52 PM
To: Kessler, Joseph R <Joseph.R.Kessler@wv.gov>
Subject: ESC Harrison County Power Permit
Importance: High

Mr. Kessler,
I want to update my records on progress re: the ESC Harrison County PSD permit. You indicated a draft permit would be available to the Forest Service during the public comment period. However, I will take this opportunity to point out the normal Federal Land Management agency review period should start a full 30 days before the public comment period begins. Can you tell me when you expect the public comment period to start? I understand the Forest Service's tentative opinion was that the facility would likely screen out from further Class I wilderness analysis. However, that opinion was not definitive, and I had requested a copy of the draft permit before the FLM made a definitive decision. My renewed interest in this permit was sparked when I recently saw that the permit application refers to a separate document to be prepared for the PSD Class I modeling analysis. The Forest Service would appreciate reviewing this modeling analysis document as soon as possible, to definitively understand WVEPA's logic either to proceed with modeling or preclude the process based on input from the FLMs.
Thank you,

Chuck Sams

Charles Sams, QEP, ARA
R8 & R9 Air Quality Program Manager
Forest Service
Southern Region Biological and Physical Resources
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Atlanta, GA 30309
www.fs.fed.us

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ATTACHMENT 2

Emission Rates and Stack Characteristics

Table 2-1 Stack Characteristics and Emission Rates – Normal Operations

Emissions Unit	NO_X Short Term	NO_X Annual	CO Short Term (1-hr)	CO Short Term (8-hr)
	g/s	g/s	g/s	g/s
Combustion Turbine/HRSG[a]	4.15	4.49	2.52	2.52
Auxiliary Boiler[b]	0.11	0.06	0.36	0.36
Fuel Gas Heater	0.02	0.02	0.03	0.03
Emergency Generator[c,d,e]	0.046	0.046	0.224	0.028
Emergency Firewater Pump[c,d,e]	0.003	0.003	0.039	0.005

Emissions Unit	$PM_{2.5}$ Short Term	$PM_{2.5}$ Annual	PM_{10} Short Term	PM_{10} Annual
	g/s	g/s	g/s	g/s
Combustion Turbine/HRSG[a]	2.85	2.88	2.85	2.88
Auxiliary Boiler[b]	0.08	0.04	0.08	0.04
Fuel Gas Heater	0.005	0.005	0.005	0.005
Emergency Generator[c,d,e]	0.001	0.0002	0.001	0.0002
Emergency Firewater Pump[c,d,e]	0.0003	0.0001	0.0003	0.0001

Emissions Unit	Stack Height	Base Elevatio n	Stack Exhaust Temp.	Exhaust Exit Velocity	Stack Diameter
	m	m	K	m/s	m
Combustion Turbine/HRSG (Short-term)[a]	56.39	330.71	330.9	23.02	6.55
Combustion Turbine/HRSG (Annual)[a]	56.39	330.71	340.7	23.01	6.55
Auxiliary Boiler	10.67	330.71	399.8	17.69	0.69
Fuel Gas Heater	4.57	330.71	588.7	18.49	0.18
Emergency Generator	4.57	330.71	673.2	222.59	0.20
Emergency Firewater Pump	4.57	330.71	789.3	36.22	0.15

Notes:

a) CT emissions and stack parameters are based on the worst case normal operation scenarios from the load analysis. Scenario 1 was the worst case short-term scenario, while Scenario 11 was the worst case annual scenario. Annual CT emissions represent a conservative annual emissions profile that accounts for 8,760 hours/yr of normal operation in addition to the estimated emissions due to startups and shutdowns (additional SUSD details provided in Appendix D).

b) Auxiliary Boiler annual emissions based on 4576 hours/year.

c) Emergency equipment 1-hr NO_X, annual NO_X and annual PM emissions are based on an annualized emission rate assuming 100 hours of operation/year.

d) Emissions of PM_{10} and $PM_{2.5}$ from the emergency equipment represent 1 hour/day for the 24-hr average emissions rate.

e) Emergency equipment emissions represent 1 hour of operation for an 8 hour averaging period (8-hr CO).

Table D-1 – Modeled Emission Rates and Stack Parameters for Startup and Shutdown Events

Emissions Unit	Scenario[a]	Emission Rates[b] NOx (1-hr) g/s	CO (1-hr) g/s	CO (8-hr) g/s	$PM_{2.5}$ (24-hr) g/s	PM_{10} (24-hr) g/s
Combustion Turbine/HRSG	Cold Start	33.61	99.75	14.67	2.80	2.80
	Warm Start	17.76	20.37	4.75	2.81	2.81
	Hot Start	11.21	16.80	4.31	2.83	2.83
	Shutdown	4.20	17.64	4.41	2.84	2.84

Emissions Unit	Scenario[a]	Stack Parameters[c] Stack Height m	Base Elevation m	Stack Exhaust Temp. K	Exhaust Exit Velocity m/s	Stack Diameter m
Combustion Turbine/HRSG	Cold Start (1-hr)	56.39	330.71	343.2	13.45	6.55
	Cold Start (8-hr)	56.39	330.71	332.5	21.82	6.55
	Cold Start (24-hr)	56.39	330.71	331.4	22.62	6.55
	Warm Start (1-hr)	56.39	330.71	339.8	16.06	6.55
	Warm Start (8-hr)	56.39	330.71	332.0	22.15	6.55
	Warm Start (24-hr)	56.39	330.71	331.3	22.73	6.55
	Hot Start (1-hr)	56.39	330.71	335.4	19.54	6.55
	Hot Start (8-hr)	56.39	330.71	331.5	22.59	6.55
	Hot Start (24-hr)	56.39	330.71	331.1	22.88	6.55
	Shutdown (1-hr)	56.39	330.71	333.6	21.02	6.55
	Shutdown (8-hr)	56.39	330.71	331.3	22.77	6.55
	Shutdown (24-hr)	56.39	330.71	331.0	22.94	6.55

a - Startup and shutdown emissions and stack parameters were blended with worst case normal operation (Scenario 1) emissions and stack parameters for the relevant averaging periods. The properties that were blended together can be found below in Table D-2.

b - Emission rates reflect the addition of lb/event (for startup or shutdown) with the normal operation emissions in lb/hr for the duration of the averaging period. For example, the amount of NO_X emitted during 1 hour of cold start is equal to 264 lbs + (32.9 lb/hr for 5 minutes, or 2.74 lbs) = 266.74 lb/hr.

c - Stack exhaust temperature and exhaust exit velocity are calculated by weighting the duration of the startup/shutdown scenario and the normal operation scenario by the percentage of the averaging periods that each respectively represents. For example, for one hour of warm start is 66.7% warm start and 33.3% normal operations (Scenario 1). Therefore, the stack exhaust temperature would be (66.7% * 344.3 K) + (33.3% * 330.9 K) = 339.8 K.

Table D-2 –Startup and Shutdown Properties

Scenario	Event Duration	Exhaust Flow	Stack Exhaust Temp.	NOX	CO	$PM_{2.5}/PM_{10}$
	min	*acfm*	*K*	*lb/event*	*lb/event*	*lb/event*
Scenario 1[a]	N/A	1,645,167	330.9	32.9	20	22.6
Cold Start	55	899,167	344.3	264	790	10.7
Warm Start	40	899,167	344.3	130	155	7.8
Hot Start	20	899,167	344.3	67	120	3.9
Shutdown	12	928,833	344.3	7	124	2.3

a - Scenario 1 represents normal operations. Emission rates for Scenario 1 are in lb/hr.

ATTACHMENT 3

Division of Air Quality Memorandum regarding Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
dep.wv.gov

MEMORANDUM

To: Jay Fedczak
Fred Durham

Cc: John Benedict
Bev McKeone
Joe Kessler
Steve Pursley

From: Jon McClung JDM

Date: January 28, 2014

Subject: Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide

Summary

As a follow-up to our discussions regarding the use of interim significant impact levels (SILs) for the 1-hour nitrogen dioxide (NO_2) and 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standards (NAAQS), I have conducted a detailed review of EPA's relevant guidance concerning their recommended SILs. EPA's guidance provides recommended SILs for 1-hr NO_2 and 1-hr SO_2 to serve as a useful screening tool for implementing the PSD requirements for an air quality analysis. EPA has provided recommended interim SILs since they have not yet codified final SILs through rulemaking. I have confirmed via discussions with the EPA Region 3 Modeler, Timothy A. Leon Guerrero, that the recommended SILs are consistent for use with EPA's PSD permitting program, as codified in 40 CFR 51. We have reviewed EPA's recommended interim SILs for 1-hr NO_2 and 1-hr SO_2 and concur with EPA's finding that an applicant for a PSD permit demonstrating an air quality impact at or below the SIL is *de minimis* in nature and would not cause a violation of the NAAQS. The interim SILs should be used in air quality impact assessments for PSD permit applications until EPA issues a final rule establishing SILs for 1-hr NO_2 and 1-hr SO_2.

Discussion

On February 9, 2010, EPA published a final rule, which became effective on April 12, 2010, establishing a new 1-hour NO_2 NAAQS at 100 ppb (188 $\mu g/m^3$ at 25 °C and 760 mm Hg), based on the 3-year average of the 98^{th}-percentile of the annual distribution of the daily maximum 1-hour concentrations.

On June 22, 2010, EPA published a final rule, which became effective on August 23, 2010, establishing a new 1-hour SO_2 NAAQS at 75 ppb (196 $\mu g/m^3$ at 25 °C and 760 mm Hg), based on the 3-year average of the 99^{th}-percentile of the annual distribution of the daily maximum 1-hour concentrations.

EPA guidance establishes that an air quality assessment for a PSD application begins with the applicant estimating the potential air quality impacts from the project source alone. If a source demonstrates an impact above a SIL then a cumulative impact analysis and PSD increment analysis is required. If modeled impacts do not exceed the SIL, the permitting authority may conclude that the project would not cause or contribute to a violation of the NAAQS and EPA would not consider it necessary to conduct a more comprehensive cumulative impact assessment. Establishing an appropriate SIL is an integral part of the PSD air quality analysis process since without it a permitting authority may not conclude that impacts below a SIL are *de minimis* and further analyses that may not be necessary to demonstrate compliance would automatically be required.

Interim 1-Hour NO_2 and 1-Hour SO_2 SILs

This memo documents the establishment, for the West Virginia PSD program, of an interim 1-hour NO_2 SIL of 4 ppb (7.5 $\mu g/m^3$), which is the same as that recommended by EPA in the June 29, 2010 memorandum from Stephen D. Page, *Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program.* This memorandum, which contains the technical analysis to determine the SIL, is appended as Attachment 1.

This memo also documents the establishment, for the West Virginia PSD program, an interim 1-hour SO_2 SIL of 3 ppb (7.8 $\mu g/m^3$), which is the same as that recommended by EPA in the August 23, 2010 memorandum from Stephen D. Page, *Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program.* This memorandum, which contains the technical analysis to determine the SIL, is appended as Attachment 2.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUN 29 2010

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards

TO: Regional Air Division Directors

On January 22, 2010, the Environmental Protection Agency (EPA) announced a new 1-hour nitrogen dioxide (NO_2) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO_2 NAAQS or 1-hour NO_2 standard) of 100 parts per billion (ppb), which is attained when the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb at each monitor within an area. EPA revised the primary NO_2 NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour NO_2 NAAQS was published in the Federal Register on February 9, 2010 (75 FR 6474), and the standard became effective on April 12, 2010. EPA policy provides that any federal Prevention of Significant Deterioration (PSD) permit issued under 40 CFR 52.21 on or after that effective date must contain a demonstration of source compliance with the new 1-hour NO_2 standard.

EPA is aware of reports from stakeholders indicating that some sources—both existing and proposed—are modeling potential violations of the 1-hour NO_2 standard. In many cases, the affected units are emergency electric generators and pump stations, where short stacks and limited property rights exist. However, larger sources, including coal-fired and natural gas-fired power plants, refineries, and paper mills, could also model potential violations of the new NO_2 NAAQS.

To respond to these reports and facilitate the PSD permitting of new and modified major stationary sources, we are issuing the attached guidance, in the form of two memoranda, for implementing the new 1-hour NO_2 NAAQS under the PSD permit program. The guidance contained in the attached memoranda addresses two areas. The first memorandum, titled, "General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour NO_2 standard. This guidance memorandum sets forth a recommended interim 1-hour NO_2 significant impact level (SIL) that states may consider when carrying out the required

PSD air quality analysis for NO_2, until EPA promulgates a 1-hour NO_2 SIL via rulemaking. The second memorandum, titled "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard," includes specific modeling guidance for estimating ambient NO_2 concentrations and determining compliance with the new 1-hour NO_2 standard.

This guidance does not bind state and local governments and the public as a matter of law. Nevertheless, we believe that state and local air agencies and industry will find this guidance useful when carrying out the PSD permit process. We believe it will provide a consistent approach for estimating NO_2 air quality impacts from proposed construction or modification of NOx emissions sources. For the most part, the attached guidance reiterates existing policy and guidance, but focuses on how this information is relevant to implementation of the new 1-hour NO_2 NAAQS.

Please review the guidance included in the two attached memoranda. If you have questions regarding the general implementation guidance contained in the first memorandum, please contact Raj Rao (rao.raj@epa.gov). If you have questions regarding the modeling guidance in the second memorandum, please contact Tyler Fox (fox.tyler@epa.gov). We are continuing our efforts to address permitting issues related to NO_2 and other NAAQS including the recently-signed 1-hour sulfur dioxide NAAQS. We plan to issue additional guidance to address these new 1-hour standards in the near future.

Attachments:

1. Memorandum from Anna Marie Wood, Air Quality Policy Division, to EPA Regional Air Division Directors, "General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level" (June 28, 2010).
2. Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (June 28, 2010).

cc: Anna Marie Wood
Richard Wayland
Raj Rao
Tyler Fox
Dan deRoeck
Roger Brode
Rich Ossias
Elliott Zenick
Brian Doster

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

June 28, 2010

MEMORANDUM

SUBJECT: General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level

FROM: Anna Marie Wood, Acting Director /s/
Air Quality Policy Division

TO: Regional Air Division Directors

INTRODUCTION

We are issuing the following guidance to explain and clarify the procedures that may be followed by applicants for Prevention of Significant Deterioration (PSD) permits and permitting authorities reviewing such applications to properly demonstrate that proposed construction will not cause or contribute to a violation of the new 1-hour nitrogen dioxide (NO_2) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO_2 NAAQS or 1-hour NO_2 standard) that became effective on April 12, 2010. EPA revised the primary NO_2 NAAQS by promulgating a 1-hour NO_2 NAAQS to provide the requisite protection of public health. Under section 165(a)(3) of the Clean Air Act (the Act) and sections 52.21(k) and 51.166(k) of EPA's PSD regulations, to obtain a permit, a source must demonstrate that its proposed emissions increase will not cause or contribute to a violation of any NAAQS.

This guidance is intended to: (1) explain the recommended procedures for stakeholders to follow to properly address concerns over high preliminary modeled estimates of ambient NO_2 concentrations that suggest potential violations of the new 1-hour NO_2 standard under some modeling and permitting scenarios; (2) help reduce the burden of modeling for the hourly NO_2 standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour NO_2 concentrations; and (3) identify approaches that allow sources and permitting authorities to mitigate, in a manner consistent with existing regulatory requirements, potential modeled violations of the 1-hour NO_2 NAAQS, where appropriate. Accordingly, the techniques described in this memorandum may be used by permit applicants and permitting authorities to configure projects and permit conditions in order to reasonably conclude that a proposed source's emissions do not cause or contribute to modeled 1-hour NO_2 NAAQS violations so that permits can be issued in accordance with the applicable PSD program requirements.

This guidance discusses existing provisions in EPA regulations and previous guidance for applying those provisions but focuses on the relevancy of this information for implementing the new NAAQS for NO_2. Importantly, however, this guidance also sets forth a recommended interim 1-hour NO_2 significant impact level (SIL) that EPA will use for implementing the federal PSD program, and that states may choose to rely upon to implement their PSD programs for NOx if they agree that these values represent *de minimis* impact levels and incorporate into each permit record a rationale supporting this conclusion. This interim SIL is a useful screening tool that can be used to determine whether or not the emissions from a proposed source will significantly impact hourly NO_2 concentrations, and, if significant impacts are predicted to occur, whether the source's emissions "cause or contribute to" any modeled violations of the new 1-hour NO_2 NAAQS.

BACKGROUND

On April 12, 2010, the new 1-hour NO_2 NAAQS became effective. EPA interprets its regulations at 40 CFR 52.21 (the federal PSD program) to require permit applicants to demonstrate compliance with "any" NAAQS that is in effect on the date a PSD permit is issued. (See, e.g., EPA memo dated April 1, 2010, titled "Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards.") Due to the introduction of a short-term averaging period for the 1-hour NO_2 NAAQS, we anticipate that some stationary sources with relatively short stacks may experience increased difficulty demonstrating that emissions from new construction or modifications will not cause or contribute to a violation of the 1-hour NO_2 NAAQS.

We are responding to reports from stakeholders which indicate that some sources, existing and proposed, are modeling high hourly NO_2 concentrations showing violations of the 1-hour NO_2 NAAQS—based only on the source's projected emissions of NOx under some modeling and permitting scenarios. We find that, in many cases, the modeled violations are resulting from emissions at emergency electric generators and pump stations, where short stacks and limited property rights exist. In other cases, the problem may occur during periods of unit startup, particularly where controls may initially not be in operation. Finally, certain larger sources, including coal-fired and natural gas-fired power plants, refineries, and paper mills could also experience problems in meeting the new 1-hour NO_2 NAAQS using particular modeling assumptions and permit conditions.

We believe that, in some instances, the projected violations result from the use of maximum modeled concentrations that do not adequately take into account the form of the 1-hour standard, and are based on the conservative assumption of 100% NOx-to-NO_2 conversion in the ambient air. To the extent that this is the case, it may be possible to provide more accurate projections of ambient NO_2 concentrations by applying current procedures which account for the statistical form of the 1-hour NO_2 standard, as well as more realistic estimates of the rate of conversion of NOx emissions to ambient NO_2 concentrations. See EPA Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (June 28, 2010) for specific modeling guidance for estimating ambient NO_2 concentrations consistent with the new 1-hour NO_2 NAAQS. In addition, where short stacks are currently being used, or are under design, it may be possible to lessen the source's air quality impacts without improper dispersion by implementing "good engineering practice" (GEP) stack heights to increase the height of existing or designed stacks to avoid excessive concentrations due to downwash, as described in the guidance below.

It is EPA's expectation that the guidance in this memorandum and available modeling guidance for NO_2 assist in resolving some of the issues arising from preliminary analyses that are reportedly showing potential exceedances of the new 1-hour NO_2 NAAQS that would not be present under more refined modeling applications. In addition, the techniques described in this memorandum may also help avoid violations of the standard through design of the proposed source or permit conditions, consistent with existing regulatory requirements, which enable the source to demonstrate that its proposed emissions increase will not cause or contribute to a modeled violation of the 1-hour NO_2 standard. Moreover, the interim 1-hour NO_2 SIL that is included in this guidance will provide a reasonable screening tool for efficiently implementing the PSD requirements for an air quality impact analysis.

The following discussion provides guidance concerning demonstrating compliance with the new NAAQS and mitigating modeled violations using air quality-based permit limits more stringent than what the Best Available Control Technology provisions may otherwise require, air quality offsets, the use of GEP stack heights, possible permit conditions for emergency generators, and an interim 1-hour NO_2 SIL.

AIR-QUALITY BASED EMISSIONS LIMITATIONS

Once a level of control required by the Best Available Control Technology provisions is proposed by the PSD applicant, the proposed source's emissions must be modeled at the BACT emissions rate(s) to demonstrate that those emissions will not cause or contribute to a violation of any NAAQS or PSD increment. EPA's 1990 Workshop Manual (page B.54) describes circumstances where a source's emissions based on levels proposed through the top-down process may not be sufficiently controlled to prevent modeled violations of an increment or NAAQS. In such cases, it may be appropriate for PSD applicants to propose a more stringent control option (that is, beyond the level identified via the top-down process) as a result of an adverse impact on the NAAQS or PSD increments.

DEMONSTRATING COMPLIANCE WITH THE NEW NAAQS & MITIGATING MODELED VIOLATIONS WITH AIR QUALITY OFFSETS

A 1988 EPA memorandum provides procedures to follow when a modeled violation is identified during the PSD permitting process. See Memorandum from Gerald A. Emison, EPA OAQPS, to Thomas J. Maslany, EPA Air Management Division, "Air Quality Analysis for Prevention of Significant Deterioration (PSD)." (July 5, 1988). In brief, a reviewing authority may issue a proposed new source or modification a PSD permit only if it can be shown that the proposed project's emissions will not "cause or contribute to" any modeled violations.

To clarify the above statement, in cases where modeled violations of the 1-hour NO_2 NAAQS are predicted, but the permit applicant can show that the NOx emissions increase from the proposed source will not have a significant impact *at the point and time of any modeled violation*, the permitting authority has discretion to conclude that the source's emissions will not contribute to the modeled violation. As provided in the July 5, 1988, guidance memo, in such instances, because of the proposed source's *de minimis* contribution to any modeled violation, the source's impact will not be considered to cause or contribute to such modeled violations, and the permit could be issued. This concept continues to apply, and the significant impact level (described further below) may be used as part of this analysis. A 2006 decision by the EPA Environmental Appeals Board (EAB) provides detailed reasoning that demonstrates the permissibility of finding that a PSD source would not be considered to cause or contribute to a modeled NAAQS violation because its estimated air quality impact was insignificant at the time and place of the modeled violations.[1] See In re *Prairie State Gen. Co.*, 13 E.A.D. ___, ___, PSD Appeal No. 05-05, Slip. Op. at 137-144 (EAB 2006)

However, where it is determined that a source's impact does cause or contribute to a modeled violation, a permit cannot be issued without some action taken to mitigate the source's impact. In accordance with 40 CFR 51.165(b)[2], a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in an NO_2 attainment area, but would cause or contribute to a violation of the 1-hour NO_2 NAAQS anywhere may "reduce the impact of its emissions upon air quality by obtaining sufficient emission reductions to, at a minimum, compensate for its adverse ambient [NO_2] impact where the major source or major modification would otherwise cause or contribute to a violation …." An applicant can meet this requirement for obtaining additional emissions reductions by either reducing its emissions at the source, e.g., promoting more efficient production methodologies and energy efficiency, or by obtaining air quality offsets (see below). See, e.g., In re *Interpower of New York, Inc.*, 5 E.A.D. 130, 141 (EAB 1994).[3] A State may also provide the necessary emissions reductions by imposing emissions limitations on other sources through an approved State Implementation Plan (SIP) revision. These approaches may also be combined as necessary to demonstrate that a source will not cause or contribute to a violation of the NAAQS.

Unlike emissions offset requirements in nonattainment areas, in addressing the air quality offset concept, it may not be necessary for a permit applicant to fully offset the proposed emissions increase if an emissions reduction of lesser quantity will mitigate the adverse air quality impact on a modeled violation. ("Although full emission offsets are not required, such a source must obtain emission offsets sufficient to compensate for its air quality impact where the violation occurs." 44 FR 3274, January 16, 1979, at 3278.) To clarify this, the 1988 guidance memo referred to above states that:

> offsets sufficient to compensate for the source's significant impact must be obtained pursuant to an approved State offset program consistent with State Implementation Plan (SIP) requirements under 40 CFR 51.165(b). Where the source is contributing to an

[1] While there is no 1-hour NO_2 significant impact level (SIL) currently defined in the PSD regulations, we believe that states may adopt interim values, with the appropriate justification for such values, to use for permitting purposes. In addition, we are recommending an interim SIL as part of this guidance for implementing the NO_2 requirements in the federal PSD program, and in state programs where states choose to use it.

[2] The same provision is contained in EPA's Interpretative Ruling at 40 CFR part 51 Appendix S, section III.

[3] In contrast to Nonattainment New Source Review permits, offsets are not mandatory requirements in PSD permits if it can otherwise be demonstrated that a source will not cause or contribute to a violation of the NAAQS. See, In re *Knauf Fiber Glass, GMBH*, 8 E.A.D. 121, 168 (EAB 1999).

existing violation, the required offset may not correct the violation. Such existing violations must be addressed [through the SIP].

In addition, in order to determine the appropriate emissions reductions, the applicant and permitting authority should take into account modeling procedures for the form of the 1-hour standard and for the appropriate NOx-NO_2 conversion rate that applies in the area of concern. As part of this process, existing ambient ozone concentrations and other meteorological conditions in the area of concern may need to be considered. Note that additional guidance for this and other aspects of the modeling analysis for the impacts of NOx emissions on ambient concentrations of NO_2 are addressed in EPA modeling guidance, including the June 28, 2010, Memorandum titled, "Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard."

"GOOD ENGINEERING PRACTICE" STACK HEIGHT & DISPERSION TECHNIQUES

If a permit applicant is unable to show that the source's proposed emissions increase will not cause or contribute to a modeled violation of the new 1-hour NO_2 NAAQS, the problem could be the result of plume downwash effects which may cause high ambient concentrations near the source. In such cases, a source may be able to raise the height of its existing stacks (or designed stacks if not yet constructed) to a GEP stack height of at least 65 meters, measured from the ground-level elevation at the base of the stack.

While not necessarily totally eliminating the effects of downwash in all cases, raising stacks to GEP height may provide substantial air quality benefits in a manner consistent with statutory provisions (section 123 of the Act) governing acceptable stack heights to minimize extensive concentrations due to atmospheric downwash, eddies or wakes. Permit applicants should also be aware of the regulatory restrictions on stack heights for the purpose of modeling for compliance with NAAQS and increments. Section 52.21(h) of the PSD regulations currently prohibits the use of dispersion techniques, such as stack heights above GEP, merged gas streams, or intermittent controls for setting NOx emissions limits or to meet the annual and 1-hour NAAQS and annual NO_2 increments. However, stack heights in existence before December 31, 1970, and dispersion techniques implemented before then, are not affected by these limitations. EPA's general stack height regulations are promulgated at 40 CFR 51.100(ff), (gg), (hh), (ii), (jj), (kk) and (nn), and 40 CFR 51.118.

a. *Stack heights*: A source cannot take credit for that portion of a stack height in excess of the GEP height when modeling to develop the NOx emissions limitations or to determine source compliance with the annual and 1-hour NO_2 NAAQS. It should be noted, however, that this limitation <u>does not limit</u> the actual height of any stack constructed by a new source or modification.

The following limitations apply in accordance with §52.21(h):

- For a stack height less than GEP, the actual stack height must be used in the source impact analysis for NOx emissions;

- For a stack height equal to or greater than 65 meters, the impact on NOx emission limits may be modeled using the greater of:
  - A *de minimis* stack height equal to 65 meters, as measured from the ground-level elevation at the base of the stack, without demonstration or calculation (40 CFR 51.100(ii)(1));
  - The refined formula height calculated using the dimensions of nearby structures in accordance with the following equation:

  GEP = H + 1.5L, where H is the height of the nearby structure and L is the lesser dimension of the height or projected width of the nearby structure (40 CFR 51.100(ii)(2)(ii)).[4]

- A GEP stack height exceeding the refined formula height may be approved when it can be demonstrated to be necessary to avoid "excessive concentrations" of NO_2 caused by atmospheric downwash, wakes, or eddy effects by the source, nearby structures, or nearby terrain features.
  (40 CFR 51.100(ii)(3), (jj), (kk));

- For purposes of PSD (and NOx/NO_2), "excessive concentrations" means a maximum ground-level concentration of NO_2 due to NOx emissions from a stack due in whole or in part to downwash, wakes, and eddy effects produced by nearby structures or nearby terrain features which individually is at least 40 percent in excess of the maximum NO_2 concentration experienced in the absence of such effects and (a) which contributes to a total NO_2 concentration due to emissions from all sources that is greater than the annual or 1-hour NO_2 NAAQS or (b) greater than the PSD (annual) increment for NO_2.
  (40 CFR 51.100(kk)(1)).

Reportedly, for economic and other reasons, many existing source stacks have been constructed at heights less than 65 meters, and source impact analyses may show that the source's emissions will cause or contribute to a modeled violation of the annual or 1-hour NO_2 NAAQS. Where this is the case, sources should be aware that they can increase their stack heights up to 65 meters without a GEP demonstration.

b. *Other dispersion techniques*: The term "dispersion technique" includes any practice carried out to increase final plume rise, subject to certain exceptions (40 CFR 51.100(hh)(1)(iii), (2)(i) – (v)). Beyond the noted exceptions, such techniques are not allowed for getting credit for modeling source compliance with the annual and 1-hour NO_2 NAAQS and annual NO_2 increment.

[4] For stacks in existence on January 12, 1979, the GEP equation is GEP = 2.5 H (provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation for NOx (40 CFR 51.100(ii)(2)(i)

OPERATION OF EMERGENCY EQUIPMENT & GENERAL STARTUP CONDITIONS

In determining an emergency generator's potential to emit, existing guidance (EPA memo titled "Calculating Potential to Emit (PTE) for Emergency Generators," September 6, 1995) allows a default value of 500 hours "for estimating the number of hours that an emergency generator could be expected to operate under worst-case conditions." The guidance also allows for alternative estimates to be made on a case-by-case basis for individual emergency generators. This time period must also consider operating time for both testing/maintenance as well as for emergency utilization. Likewise, existing EPA policy does not allow NOx emissions to be excluded from the source impact analysis (NAAQS and increments) when the emergency equipment is operating during an emergency. EPA provides no exemption from compliance with the NAAQS during periods of emergency operation. Thus, it is not sufficient to consider only emissions generated during periods of testing/maintenance in the source impact analysis.

If during an emergency, emergency equipment is never operated simultaneously with other emissions units at the source that the emergency equipment will back up, a worst-case hourly impact analysis may very well occur during periods of normal source operation when other emissions units at the facility are likely to be operating simultaneously with the scheduled testing of emergency equipment. To avoid such worst-case modeling situations, a permit applicant may commit to scheduling the testing of emergency equipment during times when the source is not otherwise operating, or during known off-peak operating periods. This could provide a basis to justify not modeling the 1-hour impacts of the emergency equipment under conditions that would include simultaneous operation with other onsite emissions units. Accordingly, permits for emergency equipment may include enforceable conditions that specifically limit the testing/maintenance of emergency equipment to certain periods of time (seasons, days of the week, hours of the day, etc.) as long as these limitations do not constitute dispersion techniques under 40 CFR 51.1(hh)(1)(ii).

We also note that similar problems associated with the modeling of high 1-hour NO_2 concentrations have been reported to occur during startup periods for certain kinds of emissions units—often because control equipment cannot function during all or a portion of the startup process. EPA currently has no provisions for exempting emissions occurring during equipment startups from the air quality analysis to demonstrate compliance with the NAAQS. Startup emissions may occur during only a relatively small portion of the unit's total annual operating schedule; however, they must be included in the required PSD air quality analysis for the NAAQS. Sources may be willing to accept enforceable permit conditions limiting equipment startups to certain hours of the day when impacts are expected to be lower than normal. Such permit limitations can be accounted for in the modeling of such emissions. Applicants should direct other questions arising concerning procedures for modeling startup emissions to the applicable permitting authority to determine the most current modeling guidance.

SCREENING VALUES

In the final rule establishing the hourly NO_2 standard, EPA discussed various implementation considerations for the PSD permitting program. 75 FR.6474, 6524 (Feb. 9, 2010). This discussion included the following statements regarding particular screening values that have historically been used on a widespread basis to facilitate implementation of the PSD permitting program:

> We also believe that there may be a need to revise the screening tools currently used under the NSR/PSD program for completing NO_2 analyses. These screening tools include the significant impact levels (SILs), as mentioned by one commenter, but also include the significant emissions rate for emissions of NOx and the significant monitoring concentration (SMC) for NO_2. EPA intends to evaluate the need for possible changes or additions to each of these important screening tools for NOx/NO_2 due to the addition of a 1-hour NO_2 NAAQS. If changes or additions are deemed necessary, EPA will propose any such changes for public notice and comment in a separate action. 75 FR 6525.

EPA intends to conduct an evaluation of these issues and submit our findings in the form of revised significance levels under notice and comment rulemaking if any revisions are deemed appropriate. In the interim, for the reasons provided below, we recommend the continued use of the existing significant emissions rates (SER) for NOx emissions as well as an interim 1-hour NO_2 SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour NO_2 NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour NO_2 SIL contained herein under the federal PSD program and offers states the opportunity to use it in their PSD programs if they choose to do so. EPA is not addressing the significant monitoring concentrations in this memorandum.

SIGNIFICANT EMISSIONS RATE

Under the terms of existing EPA regulations, the applicable significant emissions rate for nitrogen oxides is 40 tons per year. 40 CFR 52.21(b)(23); 40 CFR 51.166(b)(23). The significant emissions rates defined in those regulations are specific to individual pollutants but are not differentiated by the averaging times of the air quality standards applicable to some of the listed pollutants. Although EPA has not previously promulgated a NO_2 standard using an averaging time of less than one year, the NAAQS for SO_2 have included standards with 3-hour and 24-hour averaging times for many years. EPA has applied the 40 tons per year significant emissions rate for SO_2 across all of these averaging times. Until the evaluation described above and any associated rulemaking is completed, EPA does not believe it has cause to apply the NO_2 significant emissions rate any differently than EPA has historically applied the SO_2 significant emissions rate and others that apply to standards with averaging times less than 1 year.

Under existing regulations, an ambient air quality impact analysis is required for "each pollutant that [a source] would have the potential to emit in significant amounts." 40 CFR 52.21(m)(1)(i)(a); 40 CFR. 51.166(m)(1)(i)(a). For modifications, these regulations require this analysis for "each pollutant for which [the modification] would result in a significant net emissions increase." 40 CFR.52.21(m)(1)(i)(b); 40 CFR.51.166(m)(1)(i)(b). EPA construes this regulation to mean that an ambient impact analysis is not necessary for pollutants with emissions rates below the significant emissions rates in paragraph (b)(23) of the regulations. No additional action by EPA or permitting authorities is necessary at this time to apply the 40 tpy significant emissions rate in existing regulations to the hourly NO_2 standard.

INTERIM 1-HOUR NO_2 SIGNIFICANT IMPACT LEVEL

A significant impact level (SIL) serves as a useful screening tool for implementing the PSD requirements for an air quality analysis. The primary purpose of the SIL is to serve as a screening tool to identify a level of ambient impact that is sufficiently low relative to the NAAQS or PSD increments such that the impact can be considered trivial or *de minimis*. Hence, the EPA considers a source whose individual impact falls below a SIL to have a *de minimis* impact on air quality concentrations that already exist. Accordingly, a source that demonstrates that the projected ambient impact of its proposed emissions increase does not exceed the SIL for that pollutant at a location where a NAAQS or increment violation occurs is not considered to cause or contribute to that violation. In the same way, a source with a proposed emissions increase of a particular pollutant that will have a significant impact at some locations is not required to model at distances beyond the point where the impact of its proposed emissions is below the SILs for that pollutant. When a proposed source's impact by itself is not considered to be "significant," EPA has long maintained that any further effort on the part of the applicant to complete a cumulative source impact analysis involving other source impacts would only yield information of trivial or no value with respect to the required evaluation of the proposed source or modification. The concept of a SIL is grounded on the *de minimis* principles described by the court in *Alabama Power Co. v. Costle*, 636 F.2d 323, 360 (D.C. Cir. 1980); See also *Sur Contra La Contaminacion v. EPA*, 202 F.3d 443, 448-49 (1st Cir. 2000) (upholding EPA's use of SIL to allow permit applicant to avoid full impact analysis); *In re: Prairie State Gen. Co.,* PSD Appeal No. 05-05, Slip. Op. at 139 (EAB 2006)

EPA has codified several SILs into regulations at 40 CFR 51.165(b). EPA plans to undertake rulemaking to develop a 1-hour NO_2 SIL for the new NAAQS for NO_2. However, EPA has recognized that the absence of an EPA-promulgated SIL does not preclude permitting authorities from developing interim SILs for use in demonstrating that a cumulative air quality analysis would yield trivial gain. Response to Comments, Implementation of New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers in Diameter ($PM_{2.5}$), pg. 82 (March 2008) [EPA-HQ-OAR-2003-0062-0278].

Until such time as a 1-hour NO_2 SIL is defined in the PSD regulations, we are herein providing a recommended interim SIL that we intend to use as a screening tool for completing the required air quality analyses for the new 1-hour NO_2 under the federal PSD program at 40 CFR 52.21. To support the application of this interim SIL in each instance, a permitting authority that utilizes this SIL as part of an ambient air quality analysis should include in the permit record the analysis reflected in this memorandum and the referenced documents to demonstrate that an air quality impact at or below the SIL is *de minimis* in nature and would not cause a violation of the NAAQS.

Using the interim 1-hour NO_2 SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in NOx emissions, a cumulative air quality analysis is required; (2) the area of impact within which a cumulative air quality analysis should focus; and (3) whether, as part of a cumulative air quality analysis, the proposed source's NOx emissions will cause or contribute to a modeled violation of the 1-hour NO_2 NAAQS.

In this guidance, EPA recommends an interim 1-hour NO_2 SIL value of 4 ppb. To determine initially whether a proposed project's emissions increase will have a significant impact (resulting in the need for a cumulative air quality analysis), this interim SIL should be compared to either of the following:

- The highest of the 5-year averages of the maximum modeled 1-hour NO_2 concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour NO_2 concentration predicted across all receptors based on 1 year of site-specific meteorological data, or the highest of the multi-year averages of the maximum modeled 1-hour NO_2 concentrations predicted each year at each receptor, based on 2 or more, up to 5 complete years of available site-specific meteorological data.

Additional guidance will be forthcoming for the purpose of comparing a proposed source's modeled impacts to the interim 1-hour NO_2 SIL in order to make a determination about whether that source's contribution is significant when a cumulative air quality analysis identifies violations of the 1-hour NO_2 NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour NO_2 SIL by using an impact equal to 4% of the 1-hour NO_2 NAAQS (which is 100 ppb). We have chosen this approach because we believe it is reasonable to base the interim 1-hour NO_2 SIL directly on consideration of impacts relative to the 1-hour NO_2 NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676, August 7, 1980 at 52705-52710. For PM and SO_2, we defined the SER as the emissions rate that resulted in an ambient impact equal to 4% of the applicable short-term NAAQS. The 1980 analysis focused on levels no higher than 5% of the primary standard because of concerns that higher levels were found to result in unreasonably large amounts of increment being consumed by a single source. Within the range of impacts analyzed, we considered two factors that had an important influence on the choice of *de minimis* emissions levels: (1) cumulative effect on increment consumption of multiple sources in an area, each making the maximum *de minimis* emissions increase; and (2) the projected consequence of a given *de minimis* level on administrative burden. As explained in the preamble to the 1980 rulemaking and the supporting documentation,[5] EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO_2 to define the significant emissions rates (SERs) for those pollutants. It was noted that, at the time, only an annual NO_2 NAAQS existed. Thus, for reasons explained in the 1980 preamble, to define the SER for NOx emissions we used a design value of 2% of the annual NO_2 NAAQS. See 45 FR 52708. Looking now at a short-term NAAQS for NO_2, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour NO_2

[5] EPA evaluated de minimis levels for pollutants for which NAAQS had been established in a document titled "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants"; EPA-450/2-80-072, June 1980.

NAAQS. EPA will consider other possible alternatives for developing a 1-hour NO_2 SIL in a future rulemaking that will provide an opportunity for public participation in the development of a SIL as part of the PSD regulations.

Several state programs have already adopted interim 1-hour NO_2 SILs that differ (both higher and lower) from the interim value being recommended herein. The EPA-recommended interim 1-hour NO_2 SIL is not intended to supersede any interim SIL that is now or may be relied upon to implement a state PSD program that is part of an approved SIP, or to impose the use of the SIL concept on any state that chooses to implement the PSD program—in particular the ambient air quality analysis—without using a SIL as a screening tool. Accordingly, states that implement the PSD program under an EPA-approved SIP may choose to use this interim SIL, another value that may be deemed more appropriate for PSD permitting purposes in the state of concern, or no SIL at all. The application of any SIL that is not reflected in a promulgated regulation should be supported by a record in each instance that shows the value represents a *de minimis* impact on the 1-hour NO_2 standard, as described above.

In the event of questions regarding the general implementation guidance contained in this memorandum, please contact Raj Rao (rao.raj@epa.gov).

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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June 28, 2010

MEMORANDUM

SUBJECT: Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard

FROM: Tyler Fox, Leader
Air Quality Modeling Group, C439-01

TO: Regional Air Division Directors

INTRODUCTION

On January 22, 2010, EPA announced a new 1-hour nitrogen dioxide (NO_2) National Ambient Air Quality Standard (1-hour NO_2 NAAQS or 1-hour NO_2 standard) which is attained when the 3-year average of the 98th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 100 ppb at each monitor within an area. The final rule for the new 1-hour NO_2 NAAQS was published in the Federal Register on February 9, 2010 (75 FR 6474-6537), and the standard became effective on April 12, 2010 (EPA, 2010a). This memorandum clarifies the applicability of current guidance in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) for modeling NO_2 impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour NO_2 standard.

SUMMARY OF CURRENT GUIDANCE

While the new 1-hour NAAQS is defined relative to ambient concentrations of NO_2, the majority of nitrogen oxides (NOx) emissions for stationary and mobile sources are in the form of nitric oxide (NO) rather than NO_2. Appendix W notes that the impact of an individual source on ambient NO_2 depends, in part, "on the chemical environment into which the source's plume is to be emitted" (see Section 5.1.j). Given the role of NOx chemistry in determining ambient impact levels of NO_2 based on modeled NOx emissions, Section 5.2.4 of Appendix W recommends the following three-tiered screening approach for NO_2 modeling for annual averages:

- Tier 1 - assume full conversion of NO to NO_2 based on application of an appropriate refined modeling technique under Section 4.2.2 of Appendix W to estimate ambient NOx concentrations;
- Tier 2 - multiply Tier 1 result by empirically-derived NO_2/NOx ratio, with 0.75 as the annual national default ratio (Chu and Meyer, 1991); and

- Tier 3 - detailed screening methods may be considered on a case-by-case basis, with the Ozone Limiting Method (OLM) identified as a detailed screening technique for point sources (Cole and Summerhays, 1979).

Tier 2 is often referred to as the Ambient Ratio Method, or ARM. Site-specific ambient NO_2/NOx ratios derived from appropriate ambient monitoring data may also be considered as detailed screening methods on a case-by-case basis, with proper justification. Consistent with Section 4.2.2, AERMOD is the current preferred model for "a wide range of regulatory applications in all types of terrain" for purposes of estimating ambient concentrations of NO_2, based on NOx emissions, under Tiers 1 and 2 above. We discuss the role of AERMOD for Tier 3 applications in more detail below.

APPLICABILITY OF CURRENT GUIDANCE TO 1-HOUR NO_2 NAAQS

In general, the Appendix W recommendations regarding the annual NO_2 standard are also applicable to the new 1-hour NO_2 standard, but additional issues may need to be considered in the context of a 1-hour standard, depending on the characteristics of the emission sources, and depending on which tier is used, as summarized below:

- Tier 1 applies to the 1-hour NO_2 standard without any additional justification;
- Tier 2 may also apply to the 1-hour NO_2 standard in many cases, but some additional consideration will be needed in relation to an appropriate ambient ratio for peak hourly impacts since the current default ambient ratio is considered to be representative of "area wide quasi-equilibrium conditions"; and
- Tier 3 "detailed screening methods" will continue to be considered on a case-by-case basis for the 1-hour NO_2 standard. However, certain input data requirements and assumptions for Tier 3 applications may be of greater importance for the 1-hour standard than for the annual standard given the more localized nature of peak hourly vs. annual impacts. In addition, use of site-specific ambient NO_2/NOx ratios based on ambient monitoring data will generally be more difficult to justify for the 1-hour NO_2 standard than for the annual standard.

While Appendix W specifically mentions OLM as a detailed screening method under Tier 3, we also consider the Plume Volume Molar Ratio Method (PVMRM) (Hanrahan, 1999a) discussed under Section 5.1.j of Appendix W to be in this category at this time. Both of these options account for ambient conversion of NO to NO_2 in the presence of ozone, based on the following basic chemical mechanism, known as titration, although there are important differences between these methods:

$$NO + O_3 \rightarrow NO_2 + O_2 \qquad \text{(Eq. 1)}$$

As noted in Section 5.1.j, EPA is currently testing the PVMRM option to determine its suitability as a refined method. Limited evaluations of PVMRM have been completed, which show encouraging results, but the amount of data currently available is too limited to justify a designation of PVMRM as a refined method for NO_2 (Hanrahan, 1999b; MACTEC, 2005). EPA is currently updating and extending these evaluations to examine model performance for predicting hourly NO_2 concentrations, including both the OLM and PVMRM options, and results of these additional evaluations will be provided at a later date. A sensitivity analysis of the OLM and PVMRM options in AERMOD has been conducted that compares modeled concentrations based on OLM and PVMRM with Tiers 1 and 2 for a range of source characteristics (MACTEC, 2004). This analysis serves as a useful reference to understand how ambient NO_2 concentrations may be impacted by application of this three-tiered screening approach, and includes comparisons for both annual average and maximum 1-hour NO_2 concentrations.

Key model inputs for both the OLM and PVMRM options are the in-stack ratios of NO_2/NOx emissions and background ozone concentrations. While the representativeness of these key inputs is important in the context of the annual NO_2 standard, they will generally take on even greater importance for the new 1-hour NO_2 standard, as explained in more detail below. Recognizing the potential importance of the in-stack NO_2/NOx ratio for hourly NO_2 compliance demonstrations, we recommend that in-stack ratios used with either the OLM or PVMRM options be justified based on the specific application, i.e., there is no "default" in-stack NO_2/NOx ratio for either OLM or PVMRM.

The OLM and PVMRM methods are both available as non-regulatory-default options within the EPA-preferred AERMOD dispersion model (Cimorelli, *et al.*, 2004; EPA, 2004; EPA, 2009). As a result of their non-regulatory-default status, pursuant to Sections 3.1.2.c, 3.2.2.a, and A.1.a(2) of Appendix W, application of AERMOD with the OLM or PVMRM option is no longer considered a "preferred model" and, therefore, requires justification and approval by the Regional Office on a case-by-case basis. While EPA is continuing to evaluate the PVMRM and OLM options within AERMOD for use in compliance demonstrations for the 1-hour NO_2 standard, as long as they are considered to be non-regulatory-default options, their use as alternative modeling techniques under Appendix W should be justified in accordance with Section 3.2.2, paragraph (e), as follows:

> "e. Finally, for condition (3) in paragraph (b) of this subsection [preferred model is less appropriate for the specific application, or there is no preferred model], an alternative refined model may be used provided that:
>
> i. The model has received a scientific peer review;
> ii. The model can be demonstrated to be applicable to the problem on a theoretical basis;
> iii. The data bases which are necessary to perform the analysis are available and adequate;
> iv. Appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and
> v. A protocol on methods and procedures to be followed has been established."

Since AERMOD is the preferred model for dispersion for a wide range of application, the focus of the alternative model demonstration for use of the OLM and PVMRM options within AERMOD is on the treatment of NOx chemistry within the model, and does not need to address basic dispersion algorithms within AERMOD. Furthermore, items i and iv of the alternative model demonstration for these options can be fulfilled in part based on existing documentation (Cole and Summerhays, 1979; Hanrahan, 1999a; Hanrahan, 1999b; MACTEC, 2005), and the remaining items should be routinely addressed as part of the modeling protocol, irrespective of the regulatory status of these options. The issue of applicability to the problem on a theoretical basis (item ii) is a case-by-case determination based on an assessment of the adequacy of the ozone titration mechanism utilized by these options to account for NOx chemistry within the AERMOD model based on "the chemical environment into which the source's plume is to be emitted" (Appendix W, Section 5.1.j). The adequacy of available data bases needed for application of OLM and PVMRM (item iii), including in-stack NO_2/NOx ratios and background ozone concentrations, is a critical aspect of the demonstration which we discuss in more detail below. It should also be noted that application of the OLM or PVMRM methods with other Appendix W models or alternative models, whether as a separate post-processor or integrated within the model, would require additional documentation and demonstration that the methods have been implemented and applied appropriately within that context, including model-specific performance evaluations which satisfy item iv under Section 3.2.2.e.

Given the form of the new 1-hour NO_2 standard, some clarification is needed regarding the appropriate data periods for modeling demonstrations of compliance with the NAAQS vs. demonstrations of attainment of the NAAQS through ambient monitoring. While monitored design values for the 1-hour NO_2 standard are based on a 3-year average (in accordance with Section 1(c)(2) of Appendix S to 40 CFR Part 50), Section 8.3.1.2 of Appendix W addresses the length of the meteorological data record for dispersion modeling, stating that "[T]he use of 5 years of NWS [National Weather Service] meteorological data or at least 1 year of site specific data is required." Section 8.3.1.2.b further states that "one year or more (including partial years), up to five years, of site specific data . . . are preferred for use in air quality analyses." Although the monitored design value for the 1-hour NO_2 standard is defined in terms of the 3-year average, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data. The 5-year average based on use of NWS data, or an average across one or more years of available site specific data, serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS. Modeling of "rolling 3-year averages," using years 1 through 3, years 2 through 4, and years 3 through 5, is not required. Furthermore, since modeled results for NO_2 are averaged across the number of years modeled for comparison to the new 1-hour NO_2 standard, the meteorological data period should include complete years of data to avoid introducing a seasonal bias to the averaged impacts. In order to comply with Appendix W recommendations in cases where partial years of site specific meteorological data are available, while avoiding any seasonal bias in the averaged impacts, an approach that utilizes the most conservative modeling result based on the first complete-year period of the available data record vs. results based on the last complete-year period of available data may be appropriate, subject to approval by the appropriate reviewing authority. Such an approach would ensure that all available site specific data are accounted for in the modeling analysis without imposing an undue burden on the applicant and avoiding arbitrary choices in the selection of a single complete-year data period.

The form of the new 1-hour NO_2 standard also has implications regarding appropriate methods for combining modeled ambient concentrations with monitored background concentrations for comparison to the NAAQS in a cumulative modeling analysis. As noted in the March 23, 2010 memorandum regarding "Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS" (EPA, 2010b), combining the 98^{th} percentile monitored value with the 98^{th} percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98^{th} percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for $PM_{2.5}$, the modeled contribution to the cumulative ambient impact assessment for the 1-hour NO_2 standard should follow the form of the standard based on the 98^{th} percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled. A "first tier" assumption that may be applied without further justification is to add the overall highest hourly background NO_2 concentration from a representative monitor to the modeled design value, based on the form of the standard, for comparison to the NAAQS. Additional refinements to this "first tier" approach based on some level of temporal pairing of modeled and monitored values may be considered on a case-by-case basis, with adequate justification and documentation.

DISCUSSION OF TECHNICAL ISSUES

While many of the same technical issues related to application of Appendix W guidance for an annual NO_2 standard would also apply in the context of the new 1-hour NO_2 standard, there are some important differences that may also need to be considered depending on the specific application. This section discusses several aspects of these technical issues related to the new 1-hour NO_2 NAAQS, including a discussion of source emission inventories required for modeling demonstrations of compliance with the NAAQS and other issues specific to each of the three tiers identified in Section 5.2.4 of Appendix W for NO_2 modeling.

Emission Inventories

The source emissions data are a key input for all modeling analyses and one that may require additional considerations under the new 1-hour NO_2 standard is the source emissions data. Section 8.1 of Appendix W provides guidance regarding source emission input data for dispersion modeling and Table 8-2 summarizes the recommendations for emission input data that should be followed for NAAQS compliance demonstrations. Although existing NOx emission inventories used to support modeling for compliance with the annual NO_2 standard should serve as a useful starting point, such inventories may not always be adequate for use in assessing compliance with the new 1-hour NO_2 standard since some aspects of the guidance in Section 8.1 differs for long-term (annual and quarterly) standards vs. short-term ($\leq$ 24 hours) standards. In particular, since maximum ground-level concentrations may be more sensitive to operating levels and startup/shutdown conditions for an hourly standard than for an annual standard, emission rates and stack parameters associated with the maximum ground-level concentrations for the annual standard may underestimate maximum concentrations for the new 1-hour NO_2 standard. Due to the importance of in-stack NO_2/NOx ratios required for application of the OLM and PVMRM options within AERMOD discussed above, consideration should also be given to the potential variability of in-stack NO_2/NOx ratios under different operating conditions when those non-regulatory-default options are applied. We also note that source emission input data recommendations in Table 8-2 of Appendix W for "nearby sources" and "other sources" that may be needed to conduct a cumulative impact assessment include further differences between emission data for long-term vs. short-term standards which could also affect the adequacy of existing annual NOx emission inventories for the new 1-hour NO_2 standard. The terms "nearby sources" and "other sources" used in this context are defined in Section 8.2.3 of Appendix W. Attachment A provides a more detailed discussion on determining NOx emissions for permit modeling.

While Section 8.2.3 of Appendix W emphasizes the importance of professional judgment by the reviewing authority in the identification of nearby and other sources to be included in the modeled emission inventory, Appendix W establishes "a significant concentration gradient in the vicinity of the source" under consideration as the main criterion for this selection. Appendix W also indicates that "the number of such [nearby] sources is expected to be small except in unusual situations." See Section 8.2.3.b. Since concentration gradients will vary somewhat depending on the averaging period being modeled, especially for an annual vs. 1-hour standard, the criteria for selection of "nearby" and "other" sources for inclusion in the modeled inventory may need to be reassessed for the 1-hour NO_2 standard.

The representativeness of available ambient air quality data also plays an important role in determining which nearby sources should be included in the modeled emission inventory. Key issues to consider in this regard are the extent to which ambient air impacts of emissions from nearby sources are reflected in the available ambient measurements, and the degree to which emissions from those background sources during the monitoring period are representative of allowable emission levels under the existing permits. The professional judgments that are required in developing an appropriate inventory of background sources should strive toward the proper balance between adequately characterizing the potential for cumulative impacts of emission sources within the study area to cause or contribute to violations of the NAAQS, while minimizing the potential to overestimate impacts by double-counting of modeled source impacts that are also reflected in the ambient monitoring data. We would also caution against the literal and uncritical application of very prescriptive procedures for identifying which background sources should be included in the modeled emission inventory for NAAQS compliance demonstrations, such as those described in Chapter C, Section IV.C.1 of the draft *New Source Review Workshop Manual* (EPA, 1990), noting again that Appendix W emphasizes the importance of professional judgment in this process. While the draft workshop manual serves as a useful general reference regarding New Source Review (NSR) and PSD programs, and such procedures may play a useful role in defining the spatial extent of sources whose emissions may need to be considered, it should be recognized that "[i]t is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements." See, Preface.

Given the range of issues involved in the determination of an appropriate inventory of emissions to include in a cumulative impact assessment, the appropriate reviewing authority should be consulted early in the process regarding the selection and proper application of appropriate monitored background concentrations and the selection and appropriate characterization of modeled background source emission inventories for use in demonstrating compliance with the new 1-hour NO_2 standard.

Tier-specific Technical Issues

This section discusses technical issues related to application of each tier in the three-tiered screening approach for NO_2 modeling recommended in Section 5.2.4 Appendix W. A basic understanding of NOx chemistry and "of the chemical environment into which the source's plume is to be emitted" (Appendix W, Section 5.1.j) will be helpful for addressing these issues based on the specific application.

Tier 1:

Since the assumption of full conversion of NO to NO_2 will provide the most conservative treatment of NOx chemistry in assessing ambient impacts, there are no technical issues associated with treatment of NOx chemistry for this tier. However, the general issues related to emission inventories for the 1-hour NO_2 standard discussed above and in Attachment A apply to Tier 1.

Tier 2:

As noted above, the 0.75 national default ratio for ARM is considered to be representative of "area wide quasi-equilibrium conditions" and, therefore, may not be as appropriate for use with the 1-hour NO_2 standard. The appropriateness of this default ambient ratio will depend somewhat on the characteristics of the sources, and as such application of Tier 2 for 1-hour NO_2 compliance demonstrations may need to be considered on a source-by-source basis in some cases. The key technical issue to address in relation to this tier requires an understanding of the meteorological conditions that are likely to be associated with peak hourly impacts from the source(s) being modeled. In general, for low-level releases with limited plume rise, peak hourly NOx impacts are likely to be associated with nighttime stable/light wind conditions. Since ambient ozone concentrations are likely to be relatively low for these conditions, and since low wind speeds and stable atmospheric conditions will further limit the conversion of NO to NO_2 by limiting the rate of entrainment of ozone into the plume, the 0.75 national default ratio will likely be conservative for these cases. A similar rationale may apply for elevated sources where plume impaction on nearby complex terrain under stable atmospheric conditions is expected to determine the peak hourly NOx concentrations. By contrast, for elevated sources in relatively flat terrain, the peak hourly NOx concentrations are likely to occur during daytime convective conditions, when ambient ozone concentrations are likely to be relatively high and entrainment of ozone within the plume is more rapid due to the vigorous vertical mixing during such conditions. For these sources, the 0.75 default ratio may not be conservative, and some caution may be needed in applying Tier 2 for such sources. We also note that the default equilibrium ratio employed within the PVMRM algorithm as an upper bound on an hourly basis is 0.9.

Tier 3:

This tier represents a general category of "detailed screening methods" which may be considered on a case-by-case basis. Section 5.2.4(b) of Appendix W cites two specific examples of Tier 3 methods, namely OLM and the use of site-specific ambient NO_2/NOx ratios supported by ambient measurements. As noted above, we also believe it is appropriate to consider the

PVMRM option as a Tier 3 detailed screening method at this time. The discussion here focuses primarily on the OLM and PVMRM methods, but we also note that the use of site-specific ambient NO_2/NOx ratios will be subject to the same issues discussed above in relation to the Tier 2 default ARM, and as a result it will generally be much more difficult to determine an appropriate ambient NO_2/NOx ratio based on monitoring data for the new 1-hour NO_2 standard than for the annual standard.

While OLM and PVMRM are both based on the same simple chemical mechanism of titration to account for the conversion of NO emissions to NO_2 (see Eq. 1) and therefore entail similar technical issues and considerations, there are some important differences that also need to be considered when assessing the appropriateness of these methods for specific applications. While the titration mechanism may capture the most important aspects of NO-to-NO_2 conversion in many applications, both methods will suffer from the same limitations for applications in which other mechanisms, such as photosynthesis, contribute significantly to the overall process of chemical transformation. Sources located in areas with high levels of VOC emissions may be subject to these limitations of OLM and PVMRM. Titration is generally a much faster mechanism for converting NO to NO_2 than photosynthesis, and as such is likely to be appropriate for characterizing peak 1-hour NO_2 impacts in many cases.

Both OLM and PVMRM rely on the same key inputs of in-stack NO_2/NOx ratios and hourly ambient ozone concentrations. Although both methods can be applied within the AERMOD model using a single "representative" background ozone concentration, it is likely that use of a single value would result in very conservative estimates of peak hourly ambient concentrations since its use for the 1-hour NO_2 standard would be contingent on a demonstration of conservatism for all hours modeled. Furthermore, hourly monitored ozone concentrations used with the OLM and PVMRM options must be concurrent with the meteorological data period used in the modeling analysis, and thus the temporal representativeness of the ozone data for estimating ambient NO_2 concentrations could be a factor in determining the appropriateness of the meteorological data period for a particular application. As noted above, the representativeness of these key inputs takes on somewhat greater importance in the context of a 1-hour NO_2 standard than for an annual standard, for obvious reasons. In the case of hourly background ozone concentrations, methods used to substitute for periods of missing data may play a more significant role in determining the 1-hour NO_2 modeled design value, and should therefore be given greater scrutiny, especially for data periods that are likely to be associated with peak hourly concentrations based on meteorological conditions and source characteristics. In other words, ozone data substitution methods that may have been deemed appropriate in prior applications for the annual standard may not be appropriate to use for the new 1-hour standard.

While these technical issues and considerations generally apply to both OLM and PVMRM, the importance of the in-stack NO_2/NOx ratios may be more important for PVMRM than for OLM in some cases, due to differences between the two methods. The key difference between the two methods is that the amount of ozone available for conversion of NO to NO_2 is based simply on the ambient ozone concentration and is independent of source characteristics for OLM, whereas the amount of ozone available for conversion in PVMRM is based on the amount of ozone within the volume of the plume for an individual source or group of sources. The plume volume used in PVMRM is calculated on an hourly basis for each source/receptor combination, taking into account the dispersive properties of the atmosphere for that hour. For a low-level release where peak hourly NOx impacts occur close to the source under stable/light wind conditions, the plume volume will be relatively small and the ambient NO_2 impact for such cases will be largely determined by the in-stack NO_2/NOx ratio, especially for sources with relatively close fenceline or ambient air boundaries. This example also highlights the fact that the relative importance of the in-stack NO_2/NOx ratios may be greater for some applications than others, depending on the source characteristics and other factors. Assumptions regarding in-stack NO_2/NOx ratios that may have been deemed appropriate in the context of the annual standard may not be appropriate to use for the new 1-hour standard. In particular, it is worth reiterating that the 0.1 in-stack ratio often cited as the "default" ratio for OLM should not be treated as a default value for hourly NO_2 compliance demonstrations.

Another difference between OLM and PVMRM that is worth noting here is the treatment of the titration mechanism for multiple sources of NOx. There are two possible modes that can be used for applying OLM to multiple source scenarios within AERMOD: (1) apply OLM to each source separately and assume that each source has all of the ambient ozone available for conversion of NO to NO_2; and (2) assume that sources whose plumes overlap compete for the available ozone and apply OLM on a combined plume basis. The latter option can be applied selectively to subsets of sources within the modeled inventory or to all modeled sources using the OLMGROUP keyword within AERMOD, and is likely to result in lower ambient NO_2 concentrations in most cases since the ambient NO_2 levels will be more ozone-limited. One of the potential refinements in application of the titration method incorporated in PVMRM is a technique for dynamically determining which sources should compete for the available ozone based on the relative locations of the plumes from individual sources, both laterally and vertically, on an hourly basis, taking into account wind direction and plume rise. While this approach addresses one of the implementation issues associated with OLM by making the decision of which sources should compete for ozone, there is only very limited field study data available to evaluate the methodology.

Given the importance of the issue of whether to combine plumes for the OLM option, EPA has addressed the issue in the past through the Model Clearinghouse process. The general guidance that has emerged in those cases is that the OLM option should be applied on a source-by-source basis in most cases and that combining plumes for application of OLM would require a clear demonstration that the plumes will overlap to such a degree that they can be considered as "merged" plumes. However, much of that guidance was provided in the context of applying the OLM method outside the dispersion model in a post-processing mode on an annual basis. The past guidance on this issue is still appropriate in that context since there is no realistic method to account for the degree of plume merging on an hourly basis throughout the modeling analysis when applied as a post-processor. However, the implementation of the OLM option within the AERMOD model applies the method on a source-by-source, receptor-by-receptor, and hour-by-hour basis. As a result, the application of the OLMGROUP option within AERMOD is such that the sources only compete for the available ozone to the extent that each source contributes to the cumulative NOx concentration at each receptor for that hour. Sources which contribute significantly to the ambient NOx concentration at the receptor will compete for available ozone in proportion to their contribution, while sources that do not contribute significantly to the ambient NOx concentration will not compete for the ozone. Thus, the OLMGROUP option implemented in AERMOD will tend to be "self-correcting" with respect to concerns that combining plumes for OLM will overestimate the degree of ozone limiting potential (and therefore underestimate ambient NO_2 concentrations). As a result of these considerations, we recommend that use of the "OLMGROUP ALL" option, which specifies that all sources will potentially compete for the available ozone, be routinely applied and accepted for all approved applications of the OLM option in AERMOD. This recommendation is supported by model-to-monitor comparisons of hourly NO_2 concentrations from the application of AERMOD for the Atlanta NO_2 risk and exposure assessment (EPA, 2008), and recent re-evaluations of hourly NO_2 impacts from the two field studies (New Mexico and Palaau) that were used in the evaluation of PVMRM (MACTEC, 2005). These model-to-monitor comparisons of hourly NO_2 concentrations show reasonably good performance using the "OLMGROUP ALL" option within AERMOD, with no indication of any bias to underestimate hourly NO_2 concentrations with OLMGROUP ALL. Furthermore, model-to-monitor comparisons based on OLM without the OLMGROUP option do exhibit a bias to overestimate hourly NO_2 concentrations. We will provide further details regarding these recent hourly NO_2 model-to-monitor comparisons at a later date.

SUMMARY

To summarize, we emphasize the following points:

1. The 3-tiered screening approach recommended in Section 5.2.4 of Appendix W for annual NO_2 assessments generally applies to the new 1-hour NO_2 standard.
2. While generally applicable, application of the 3-tiered screening approach for assessments of the new 1-hour NO_2 standard may entail additional considerations, such as the importance of key input data, including appropriate emission rates for the 1-hour standard vs. the annual standard for all tiers, and the representativeness of in-stack NO_2/NOx ratios and hourly background ozone concentrations for Tier 3 detailed screening methods.
3. Since the OLM and PVMRM methods in AERMOD are currently considered non-regulatory-default options, application of these options requires justification and approval by the Regional Office on a case-by-case basis as alternative modeling techniques, in accordance with Section 3.2.2, paragraph (e), of Appendix W.
4. Applications of the OLM option in AERMOD, subject to approval under Section 3.2.2.e of Appendix W, should routinely utilize the "OLMGROUP ALL" option for combining plumes.
5. While the 1-hour NAAQS for NO_2 is defined in terms of the 3-year average for monitored design values to determine attainment of the NAAQS, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data.

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ATTACHMENT A

Background on Hourly NOx Emissions for Permit Modeling for the 1-hour NO_2 NAAQS

Introduction

The purpose of this attachment is to address questions about availability of hourly NOx emissions for permit modeling under the new NO_2 NAAQS. It summarizes existing guidance regarding emission input data requirements for NAAQS compliance modeling, and provides background on the historical approach to development of inventories for NO_2 permit modeling and computation of hourly emissions appropriate for assessing the new 1-hour NO_2 standard. Although the NAAQS is defined in terms of ambient NO_2 concentrations, source emission estimates for modeling are based on NOx.

Under the PSD program, the owner or operator of the source is required to demonstrate that the source does not cause or contribute to a violation of a NAAQS (40 CFR 51.166 (k)(1) and 40 CFR 52.21 (k)(1)) and/or PSD increments (40 CFR 51.166 (k)(2) and 52.21 (k)(2)). However, estimation of the necessary emission input data for NAAQS compliance modeling entails consideration of numerous factors, and the appropriate reviewing authority should be consulted early in the process to determine the appropriate emissions data for use in specific modeling applications (see 40 CFR 51, Appendix W, 8.1.1.b and 8.2.3.b)

Summary of Current Guidance

Section 8.1 of the *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, provides recommendations regarding source emission input data needed to support dispersion modeling for NAAQS compliance demonstrations. Table 8-2 of Appendix W provides detailed guidance regarding the specific components of the emission input data, including the appropriate emission limits (pounds/MMBtu), operating level (MMBtu/hr), and operating factor (e.g., hr/yr or hr/day), depending on the averaging time of the standard. Table 8-2 also distinguishes between the emission input data needed for the new or modified sources being assessed, and "nearby" and "other" background sources included in the modeled emission inventory.

Based on Table 8-2, emission input data for new or modified sources for annual and quarterly standards are essentially the same as for short-term standards ($\leq$ 24 hours), based on maximum allowable or federally enforceable emission limits, design capacity or federally enforceable permit conditions, and the assumption of continuous operation. However, there are a few additional considerations cited in Appendix W that could result in different emission input data for the 1-hour vs. annual NO_2 NAAQS. For example, while design capacity is listed as the recommended operating level for the emission calculation, peak hourly ground-level concentrations may be more sensitive than annual average concentrations to changes in stack parameters (effluent exit temperature and exit velocity) under different operating capacities. Table 8-2 specifically recommends modeling other operating levels, such as 50 percent or 75 percent of capacity, for short-term standards (see footnote 3). Another factor that may affect maximum ground-level concentrations differently between the 1-hour vs. annual standard is restrictions on operating factors based on federally enforceable permit conditions. While federally enforceable operating factors other than continuous operation may be accounted for in the emission input data (e.g., if operation is limited to 8 am to 4 pm each day), Appendix W also states that modeled emissions should not be averaged across non-operating time periods (see footnote 2 of Table 8-2).

While emission input data recommendations for "nearby" and "other" background sources included in the modeled emission inventory are similar to the new or modified source emission inputs in many respects, there is an important difference in the operating factor between annual and short-term standards. Emission input data for nearby and other sources may reflect actual operating factors (averaged over the most recent 2 years) for the annual standard, while continuous operation should be assumed for short-term standards. This could result in important differences in emission input data for modeled background sources for the 1-hour NO_2 NAAQS relative to emissions used for the annual standard.

Model Emission Inventory for NO_2 Modeling

For the existing annual NO_2 NAAQS, the permit modeling inventory has generally been compiled from the annual state emission inventory questionnaire (EIQ) or Title V permit applications on file with the relevant permitting authority (state or local air program). Since a state uses the annual EIQ for Title V fee assessment, the state EIQ typically requires reporting of unit capacity, total fuel combusted, and/or hours of operation to help verify annual emissions calculations for fee accuracy purposes. Likewise, Title V operating permit applications contain all of the same relevant information for calculating emissions. While these emission inventories are important resources for gathering emission input data on background sources for NAAQS compliance modeling, inventories which are based on actual operations may not be sufficient for short-term standards, such as the new 1-hour NO_2 NAAQS. However, appropriate estimates of emissions from background sources for the 1-hour NO_2 standard may be derived in many cases from information in these inventories regarding permitted emission limits and operating capacity.

Historically, it has not been a typical practice for an applicant to use the EPA's national emission inventory (NEI) as the primary source for compiling the permit modeling inventory. Since the emission data submitted to the NEI represents annual emission totals, it may not be suitable for use in NAAQS compliance modeling for short-term standards since modeling should be based on continuous operation, even for modeled background sources. Although the NEI may provide emission data for background sources that are more appropriate for the annual NO_2 standard, the utility of the NEI for purposes of NAAQS compliance modeling is further limited due to the fact that additional information regarding stack parameters and operating rates required for modeling may not be available from the NEI. While records exist in the NEI for reporting stack data necessary for point source modeling (i.e., stack coordinates, stack heights, exit temperatures, exit velocities), some states do not report such information to the NEI, or there are may be errors in the location data submitted to the NEI. Under such conditions, default stack information based upon SIC is substituted and use of such data could invalidate modeling results. Building locations and dimensions, which may be required to account for building downwash influences in the modeling analysis, may also be missing or incomplete in many cases.

A common and relatively straightforward approach for compiling the necessary information to develop an inventory of emissions from background sources for a permit modeling demonstration is as follows, patterned after the draft *New Source Review Workshop Manual* (EPA, 1990). The applicant completes initial modeling of allowable emission increases associated with the proposed project and determines the radii of impact (ROI) for each pollutant and averaging period, based on the maximum distance at which the modeled ambient concentration exceeds the Significant Impact Level (SIL) for each pollutant and averaging period. Typically, the largest ROI is selected and then a list of potential background sources within the ROI plus a screening distance beyond the ROI is compiled by the permitting authority and supplied to the applicant. The applicant typically requests permit applications or EIQ submittals from the records department of the permitting authority to gather stack data and source operating data necessary to compute emissions for the modeled inventory. Once the applicant has gathered the relevant data from the permitting authorities, model emission rates are calculated. While this approach is fairly common, it should be noted that the draft workshop manual "is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements" (see, Preface), and the appropriate reviewing authority should be consulted early in the process regarding the selection of appropriate background source emission inventories for the 1-hour NO_2 standard. We also note that Appendix W establishes "a significant concentration gradient in the vicinity of the source" under consideration as the main criterion for selection of nearby sources for inclusion in the modeled inventory, and further indicates that "the number of such [nearby] sources is expected to be small except in unusual situations." See Section 8.2.3.b.

As mentioned previously, modeled emission rates for short-term NAAQS are computed consistent with the recommendations of Section 8.1 of Appendix W, summarized in Table 8-2. The maximum allowable (SIP-approved process weight rate limits) or federally enforceable permit limit emission rates assuming design capacity or federally enforceable capacity limitation are used to compute hourly emissions for dispersion modeling against short-term NAAQS such as the new 1-hour NO_2 NAAQS. If a source assumes an enforceable limit on the hourly firing capacity of a boiler, this is reflected in the calculations. Otherwise, the design capacity of the source is used to compute the model emission rate. A load analysis is typically necessary to determine the load or operating condition that causes the maximum ground-level concentrations. In addition to 100 percent load, loads such as 50 percent and 75 percent are commonly assessed. As noted above, the load analysis is generally more important for short-term standards than for annual standards. For an hourly standard, other operating scenarios of relatively short duration such as "startup" and "shutdown" should be assessed since these conditions may result in maximum hourly ground-level concentrations, and the control efficiency of emission control devices during these operating conditions may also need to be considered in the emission estimation.

Emission Calculation Example

The hourly emissions are most commonly computed from AP-42 emission factors based on unit design capacity. For a combustion unit, the source typically reports both the unit capacity and the actual total amount of fuel combusted annually (gallons, millions of cubic feet of gas, etc.) to the permitting authority for the EIQ. Likewise, Title V operating permit applications will contain similar information that can be used to compute hourly emissions.

For example, assume you are modeling an uncontrolled natural gas package boiler with a design firing rate of 30 MMBtu/hr. The AP-42 emission factor for an uncontrolled natural gas external combustion source (AP-42, Section 1.4) for firing rates less than 100 MMBtu/hr is 100 lbs. NOx/10^6 SCF natural gas combusted. The hourly emission rate is derived by converting the emission factor expressed in terms of lbs. NOx/10^6 SCF to lbs. NOx/MMBtu. The conversion is done by dividing the 100 lbs. NOx/10^6 SCF by 1,020 to convert the AP-42 factor to lbs. NOx/MMBtu. The new emission factor is now 0.098 lbs. NOx/MMBtu.

For this example, the source has no limit on the hourly firing rate of the boiler; therefore, the maximum hourly emissions are computed by multiplying the design firing rate of the boiler by the new emission factor.

E_{hourly} = 0.098 lbs/MMBtu x 30MMBtu/hr = 2.94 lbs/hr

Thus 2.94 lbs/hr represents the emission rate that would be input into the dispersion model for modeling against the 1-hour NO_2 NAAQS to comport with emission rate recommendations of Section 8.1 of Appendix W.

It is important to note that data derived for the annual state emission inventory (EI) is based on actual levels of fuel combusted for the year, and is therefore different than how allowable emissions are computed for near-field dispersion modeling. For the annual EI report, a source computes their annual emissions based upon the AP-42 emission factor multiplied by the actual total annual throughput or total fuel combusted.

In the 30 MMBtu/hr boiler example, the annual NOx emissions reported to the NEI is computed by:

E_{annual} = (AP-42 emission factor) x (total annual fuel combusted)

E_{annual} = (100 lbs/10^6 SCF) x (100 10^6 SCF/yr) = 10,000 lbs. NOx/yr or 5 tons NOx/yr

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

AUG 23 2010

MEMORANDUM

SUBJECT: Guidance Concerning the Implementation of the 1-hour SO_2 NAAQS for the Prevention of Significant Deterioration Program

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards

TO: Regional Air Division Directors

On June 2, 2010, the U.S. Environmental Protection Agency (EPA) announced a new 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO_2 NAAQS or 1-hour SO_2 standard) of 75 ppb, which is attained when the 3-year average of the annual 99th-percentile of 1-hour daily maximum concentrations does not exceed 75 ppb at each monitor within an area. EPA revised the primary SO_2 NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour SO_2 NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520), and the standard becomes effective on August 23, 2010. In the same notice, we also announced that we are revoking both the existing 24-hour and annual primary SO_2 standards. However, as explained in this guidance, those SO_2 standards, as well as the 24-hour and annual increments for SO_2, remain in effect for a while further and must continue to be protected.

EPA interprets the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act and EPA regulations to require that any federal permit issued under 40 CFR 52.21 on or after that effective date must contain a demonstration of source compliance with the new 1-hour SO_2 NAAQS. We anticipate that some new major stationary sources or major modifications, especially those involving relatively short stacks, may experience difficulty demonstrating that emissions from proposed projects will not cause or contribute to a modeled violation of the new 1-hour SO_2 NAAQS. We also anticipate problems that sources may have interpreting the modeled 1-hour SO_2 impacts if the form of the hourly standard is not properly addressed. To respond to these and other related issues, we are providing the attached guidance, in the form of two memoranda, for implementing the new 1-hour SO_2 NAAQS under the PSD permit program.

The first memorandum, titled "General Guidance for Implementing the 1-hour SO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO_2 Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour SO_2 standard. That guidance memorandum sets forth a recommended interim 1-hour SO_2 significant impact level (SIL) that states may consider for carrying out the required PSD air quality analysis for SO_2, until EPA promulgates a 1-hour SO_2 SIL via rulemaking, and addresses the continued use of the existing SO_2 Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO_2 standard.. The second memorandum, titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard," includes specific modeling guidance for estimating ambient SO_2 concentrations and determining compliance with the new 1-hour SO_2 standard.

This guidance does not bind state and local governments and permit applicants as a matter of law. Nevertheless, we believe that state and local air agencies and industry will find this guidance useful for carrying out the PSD permit process and it will provide a consistent approach for estimating SO_2 air quality impacts from proposed construction or modification of SO_2 emissions sources. For the most part, the attached guidance focuses on how existing policy and guidance is relevant to and should be used for implementing the new 1-hour SO_2 NAAQS.

Please review the guidance included in the two attached memoranda. In the event of questions regarding the general implementation guidance contained in the first memorandum, please contact Raj Rao (rao.raj@epa.gov). For questions pertaining to the modeling guidance in the second memorandum, please contact Tyler Fox (fox.tyler@epa.gov). We are continuing our efforts to address permitting issues related to the implementation of new and revised NAAQS, and will issue additional guidance to address the NAAQS as appropriate.

Attachments:

1. Memorandum from Anna Marie Wood, Air Quality Policy Division, to EPA Regional Air Division Directors, "General Guidance for Implementing the 1-hour SO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO_2 Significant Impact Level" (August 23, 2010).
2. Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard" (August 23, 2010).

cc: Anna Marie Wood
Richard Wayland
Lydia Wegman
Raj Rao
Tyler Fox
Dan deRoeck
Roger Brode
Rich Ossias
Elliott Zenick
Brian Doster

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

August 23, 2010

MEMORANDUM

SUBJECT: General Guidance for Implementing the 1-hour SO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO_2 Significant Impact Level

FROM: Anna Marie Wood, Acting Director /s/
Air Quality Policy Division

TO: Regional Air Division Directors

INTRODUCTION

We are issuing the following guidance to explain and clarify the procedures that may be followed by applicants for Prevention of Significant Deterioration (PSD) permits, and permitting authorities reviewing such applications, to properly demonstrate that proposed projects to construct and operate will not cause or contribute to a modeled violation of the new 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO_2 NAAQS or 1-hour SO_2 standard) that becomes effective on August 23, 2010. The EPA revised the primary SO_2 NAAQS by promulgating a 1-hour SO_2 NAAQS to provide the requisite protection of public health. Under section 165(a)(3) of the Clean Air Act (the Act) and sections 52.21(k) and 51.166(k) of EPA's PSD regulations, to obtain a permit, a source must demonstrate that its proposed emissions increase will not cause or contribute to a violation of "any NAAQS."

This guidance is intended to (1) highlight the importance of a 1-hour averaging period for setting an emissions limitation for SO_2 in the PSD permit (2) reduce the modeling burden to implement the 1-hour SO_2 standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour SO_2 concentrations, and (3) identify approaches that allow sources and permitting authorities to mitigate, in a manner consistent with existing regulatory requirements, potential modeled violations of the 1-hour SO_2 NAAQS, where appropriate. Accordingly, the techniques described in this memorandum may be used by permit applicants and permitting authorities to perform an acceptable 1-hour SO_2 NAAQS compliance modeling assessment and/or properly configure projects and permit conditions in order that a proposed source's emissions do not cause or contribute to modeled 1-hour SO_2 NAAQS violations, so that permits can be issued in accordance with the applicable PSD program requirements.

This guidance discusses existing provisions in EPA regulations and guidance, and focuses on the relevancy of this information for implementing the new NAAQS for SO_2. Importantly, however, this guidance also sets forth a recommended interim 1-hour SO_2 significant impact level (SIL) that EPA will use when it evaluates applications and issues permits under the federal PSD program, and that states may choose to rely upon to implement their PSD programs for SO_2 if they agree that the value represents a reasonable threshold for determining a significant ambient impact, and they incorporate into each permit record a rationale supporting this conclusion. This interim SIL is a useful screening tool that can be used to determine whether or not the predicted ambient impacts caused by a proposed source's emissions increase will be significant and, if so whether the source's emissions should be considered to "cause or contribute to" modeled violations of the new 1-hour SO_2 NAAQS.

BACKGROUND

On August 23, 2010, the new 1-hour SO_2 NAAQS will become effective. Regulations at 40 CFR 52.21 (the federal PSD program) require permit applicants to demonstrate compliance with "any" NAAQS that is in effect on the date a PSD permit is issued. (See, e.g., EPA memo dated April 1, 2010, titled "Applicability of the Federal Prevention of Significant Deterioration Permit Requirements to New and Revised National Ambient Air Quality Standards.") Due to the promulgation of this short-term averaging period (1-hour) for the SO_2 NAAQS, we anticipate that some new major stationary sources or major modifications, especially those involving relatively short stacks may experience increased difficulty demonstrating that emissions from proposed project will not cause or contribute to a modeled violation.

We believe that, in some instances, preliminary predictions of violations could result from the use of maximum modeled concentrations that do not adequately take into account the form of the 1-hour standard. To the extent that is the case, ambient SO_2 concentrations in the form of the new 1-hour NAAQS should be estimated by applying the recommended procedures that account for the statistical form of the standard. See EPA Memorandum from Tyler Fox, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard" (August 23, 2010) for specific modeling guidance for estimating ambient SO_2 concentrations consistent with the new 1-hour SO_2 NAAQS.

It is EPA's expectation that currently available SO_2 guidance, including the guidance presented in this memorandum, will assist in resolving some of the issues arising from preliminary analyses that show potential exceedances of the new 1-hour SO_2 NAAQS that would not be present under more refined modeling applications. In addition, the techniques described in this memorandum may also help avoid violations of the standard through design of the proposed source or permit conditions, consistent with existing regulatory requirements. Moreover, the interim 1-hour SO_2 SIL that is included in this guidance will provide a reasonable screening tool for effectively implementing the PSD requirements for an air quality impact analysis.

The following discussion provides guidance for establishing a 1-hour emissions limitation to demonstrate compliance with the new NAAQS, and for possibly mitigating modeled violations using any of the following: air quality-based permit limits more stringent than what the Best Available Control Technology provisions may otherwise require, air quality offsets, "good engineering practice" (GEP) stack heights, and an interim 1-hour SO_2 SIL. The continued use of the existing SO_2 Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO_2 standard is also discussed.

SCREENING VALUES

In the final rule establishing the 1-hour SO_2 standard, EPA discussed various implementation considerations for the PSD permitting program. 75 FR.35520 (June 22, 2010). That discussion included the following statements regarding particular screening values that have historically been used on a widespread basis to facilitate implementation of the PSD permitting program:

> We agree with the commenters that there may be a need for EPA to provide additional screening tools or to revise existing screening tools that are frequently used under the NSR/PSD program for reducing the burden of completing SO_2 ambient air impact analyses. These screening tools include the SILs, as mentioned by the commenter, but also include the SER for emissions of SO_2 and the SMC for SO_2. The existing screening tools apply to the periods used to define the existing NAAQS for SO_2, including the annual, 24-hour, and 3-hour averaging periods. EPA intends to evaluate the need for possible changes or additions to each of these useful screening tools for SO_2 due to the revision of the SO_2 NAAQS to provide for a 1-hour standard. We believe it is highly likely that in order to be most effective for implementing the new 1-hour averaging period for NSR purposes, new 1-hour screening values will be appropriate.

75 FR 35579. EPA intends to conduct an evaluation of these issues and submit our findings in the form of revised significance levels under notice and comment rulemaking if any revisions are deemed appropriate. In the interim, for the reasons provided below, we recommend the continued use of the existing SER for SO_2 emissions as well as an interim 1-hour SO_2 SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour SO_2 NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour SO_2 SIL contained herein under the federal PSD program and offers states the opportunity to use it in their PSD programs if they choose to do so. EPA is not addressing the significant monitoring concentration (SMC) for SO_2 in this memorandum; the existing SMC for SO_2, at 40 CFR 52.21(i)(5)(i) should continue to be used.

SIGNIFICANT EMISSIONS RATE

The PSD regulations define SER for various regulated NSR pollutants. When a proposed new source's potential to emit a pollutant, or a modified source's net emissions increase of a pollutant, would be less than the SER, the source is not required to undergo the requisite PSD analyses (BACT and air quality) for that particular emissions increase. Under the terms of existing EPA regulations, the applicable SER for SO_2 is 40 tons per year (tpy). 40 CFR 52.21(b)(23); 40 CFR 51.166(b)(23). Each of the significant emissions rates defined in those regulations is specific to an individual pollutant with no differentiation by averaging time with regard to NAAQS. The NAAQS for SO_2 have included standards with 3-hour and 24-hour and annual averaging times for many years. The EPA has applied the 40 tpy SER for SO_2 across all of these averaging times, and we are aware of no reason why it should not be used for the 1-hour averaging period for the present time. Therefore, until the evaluation described above and any associated rulemaking are completed, we will use 40 tpy as the SER for the 1-hour standard.

Under existing regulations, an ambient air quality impact analysis is required for "each pollutant that [a source] would have the potential to emit in significant amounts." [40 CFR 52.21(m)(1)(i)(a); 40 CFR. 51.166(m)(1)(i)(a)]. For modifications, these regulations require this analysis for "each pollutant for which [the modification] would result in a significant net emissions increase." 40 CFR.52.21(m)(1)(i)(b); 40 CFR.51.166(m)(1)(i)(b). EPA construes this regulation to mean that an ambient impact analysis is not necessary for pollutants with emissions rates below the significant emissions rates in paragraph (b)(23) of the regulations. No additional action by EPA or permitting authorities is necessary at this time to apply the 40 tpy significant emissions rate in existing regulations to the hourly SO_2 standard.

INTERIM 1-HOUR SO_2 SIGNIFICANT IMPACT LEVEL

Under the PSD program, a proposed new major stationary source or major modification must, among other things, complete an air quality impact analysis that involves performing an analysis of air quality modeling and ambient monitoring data, where appropriate, to demonstrate compliance with applicable NAAQS. In order to implement this requirement, EPA traditionally has provided a screening tool known as the Significant Impact Level (SIL) to help applicants and permitting authorities determine whether a source's modeled ambient impact is significant so as to warrant a comprehensive, cumulative air quality analysis to demonstrate compliance with the NAAQS. Accordingly, where a proposed source's modeled impact is deemed insignificant, or *de minimis*, using the SIL as a threshold for significance, the applicant is not required to model anything besides its own proposed emissions increase to show that the proposed source or modification will not cause or contribute to a violation of the NAAQS.[1]

If, on the other hand, the source's modeled impact is found to be significant, based on the SIL, the applicant will need to complete a comprehensive, cumulative air quality impact analysis to demonstrate that the source's emissions will not cause or contribute to a modeled violation of any NAAQS. To make this demonstration, EPA has recommended that a cumulative analysis cover a circular area measuring out from the source to the maximum distance where the source's impact is equal to the SIL. Within this modeling area, the source should also model the impacts of other sources (existing and newly permitted), including applicable SO_2 sources located outside the circular area described above, to account for the cumulative hourly SO_2 air quality impacts

[1] When a proposed source's impact by itself is not considered to be "significant," EPA has long maintained that any further effort on the part of the applicant to complete a cumulative source impact analysis involving other source impacts would only yield information of trivial or no value with respect to the required evaluation of the proposed source or modification. The concept of a SIL is grounded on the *de minimis* principles described by the court in *Alabama Power Co. v. Costle*, 636 F.2d 323, 360 (D.C. Cir. 1980); See also *Sur Contra La Contaminacion v. EPA*, 202 F.3d 443, 448-49 (1st Cir. 2000) (upholding EPA's use of SIL to allow permit applicant to avoid full impact analysis); *In re: Prairie State Gen. Co.*, PSD Appeal No. 05-05, Slip. Op. at 139 (EAB 2006).

that are predicted to occur. The applicant may also have to gather ambient monitoring data as part of the total air quality analysis that is required for demonstrating compliance with the NAAQS.[2] Accordingly, the source will evaluate its contribution to any modeled violation of the 1-hour SO_2 NAAQS to determine whether the source's emissions contribution will cause or contribute to the modeled violation at any receptor. Note that in the accompanying modeling guidance memorandum we are providing recommended procedures and guidance for completing the modeling analysis to demonstrate compliance with the new 1-hour SO_2 NAAQS.

We plan to undertake rulemaking to adopt a 1-hour SO_2 SIL value. However, until such time as a 1-hour SO_2 SIL is defined in the PSD regulations, we are providing an interim SIL of 3 ppb, which we intend to use as a screening tool for completing the required air quality analyses for the new 1-hour SO_2 NAAQS under the federal PSD program at 40 CFR 52.21. We are also making the interim SIL available to States with EPA-approved implementation plans containing a PSD program to use at their discretion. To support the application of this interim 1-hour SO_2 SIL in each instance, a permitting authority that utilizes it as part of an ambient air quality analysis should include in the permit record the analysis reflected in this memorandum and the referenced documents to demonstrate that a modeled air quality impact is *de minimis,* and thereby would not be considered to cause or contribute to a modeled violation of the NAAQS.[3]

States may also elect to choose another value that they believe represents a significant air quality impact relative to the 1-hour SO_2 NAAQS. The EPA-recommended interim 1-hour SO_2 SIL is not intended to supersede any interim SIL that any state chooses to rely upon to implement a state PSD program that is part of an approved SIP, or to impose the use of the SIL concept on any state that chooses to implement the PSD program—in particular the ambient air quality analysis—without using a SIL as a screening tool. Accordingly, states that implement the PSD program under an EPA-approved SIP may choose to use this interim SIL, another value that may be deemed more appropriate for PSD permitting purposes in the state of concern, or no SIL at all. The application of any SIL that is not reflected in a promulgated regulation should be supported by a record in each instance that shows the value represents a *de minimis* impact on the 1-hour SO_2 standard, as described above.

As indicated above, using the interim 1-hour SO_2 SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in SO_2 emissions, a cumulative air quality analysis is required; (2) the area of impact within which a cumulative air quality analysis should focus; and (3) whether, as part of a cumulative air quality analysis, the proposed source's SO_2 emissions will cause or contribute to any modeled violation of the 1-hour SO_2 NAAQS.

[2] A screening tool known as the Significant Monitoring Concentration (SMC) for SO_2 already exists in the PSD regulations. EPA plans to evaluate the existing SMC in light of the new 1-hour SO_2 NAAQS; however, the existing value of 13 $\mu g/m^3$, 24-hour average, should continue to be used until and unless a revised value is issued through rulemaking.

[3] Where the cumulative air quality analysis identifies a modeled violation of the NAAQS or increments, and the proposed source is issued its permit by virtue of the fact that its proposed emissions increase is not considered to cause or contribute to the modeled violation, it is still the permitting authority's responsibility to address such modeled violations independently from the PSD permitting process to determine the nature of the problem and to mitigate it accordingly,

As mentioned above, we are providing an interim 1-hour SO_2 SIL value of 3 ppb to implement the federal PSD program. To determine initially whether a proposed project's emissions increase will have a significant impact (resulting in the need for a cumulative air quality analysis), this interim SIL should be compared to either of the following:

- The highest of the 5-year averages of the maximum modeled 1-hour SO_2 concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour SO_2 concentration predicted across all receptors based on 1 year of site-specific meteorological data, or the highest of the multi-year averages of the maximum modeled 1-hour SO_2 concentrations predicted each year at each receptor, based on 2 or more, up to 5 complete years of available site-specific meteorological data.

Additional guidance will be forthcoming for the purpose of comparing a proposed source's modeled impacts to the interim 1-hour SO_2 SIL in order to make a determination about whether that source's contribution is significant when a cumulative air quality analysis identifies violations of the 1-hour SO_2 NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour SO_2 SIL by using an impact equal to 4% of the 1-hour SO_2 NAAQS (which is 75 ppb). On June 29, 2010, we issued an interim 1-hour NO_2 SIL that used an impact equal to 4% of the 1-hour NO_2 standard. As explained in the June memorandum, we have chosen this approach because we believe it is reasonable to base the interim 1-hour SIL directly on consideration of impacts relative to the corresponding 1-hour NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676 (August 7, 1980) at 52705-52710. For PM and SO_2, we defined the SER as the emissions rate that resulted in an ambient impact equal to 4% of the applicable short-term NAAQS. The 1980 analysis focused on levels no higher than 5% of the primary standard because of concerns that higher levels were found to result in unreasonably large amounts of increment being consumed by a single source. Within the range of impacts analyzed, we considered two factors that had an important influence on the choice of the significant impact levels: (1) cumulative effect on increment consumption of multiple sources in an area, each making the maximum *de minimis* emissions increase; and (2) the projected consequence of a given significant impact level on administrative burden. As explained in the preamble to the 1980 rulemaking and the supporting documentation,[4] EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO_2 to define the significant emissions rates (SERs) for those pollutants. See 45 FR 52708. Looking now at a 1-hour NAAQS for SO_2, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour SO_2 NAAQS. EPA will consider other possible alternatives for developing a 1-hour SO_2 SIL in a future rulemaking that will provide an opportunity for public participation in the development of a SIL as part of the PSD regulations.

AIR-QUALITY BASED EMISSIONS LIMITATIONS

[4] EPA evaluated *de minimis* levels for pollutants for which NAAQS had been established in a document titled "Impact of Proposed and Alternative De Minimis Levels for Criteria Pollutants"; EPA-450/2-80-072, June 1980.

Once a level of control is determined by the PSD applicant via the Best Available Control Technology (BACT) top-down process, the applicant must model the proposed source's emissions at the BACT emissions rate(s) to demonstrate that those emissions will not cause or contribute to a violation of any NAAQS or PSD increment. However, the EPA 1990 Workshop Manual (page B.54) describes circumstances where a proposed source's emissions based on levels determined via the top-down process may not be sufficiently controlled to prevent modeled violations of an increment or NAAQS. In such cases, it may be appropriate for PSD applicants to propose a more stringent control option (that is, beyond the level identified via the top-down process) as a result of an adverse impact on the NAAQS or PSD increments. In addition, the use of certain dispersion techniques is permissible for certain proposed projects for SO_2 that may need to be considered where emissions limitations alone may not enable the source to demonstrate compliance with the new 1-hour SO_2 NAAQS. This is discussed in greater detail below in the section addressing GEP stack height requirements.

Because compliance with the new SO_2 NAAQS must be demonstrated on the basis of a 1-hour averaging period, the reviewing authority should ensure that the source's PSD permit defines a maximum allowable hourly emissions limitation for SO_2, regardless of whether it is derived from the BACT top-down approach or it is the result of an air-quality based emissions rate. Hourly limits are important because they are the foundation of the air quality modeling demonstration relative to the 1-hour SO_2 NAAQS. For estimating the impacts of existing sources, if necessary, existing SO_2 emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO_2 standards should serve as a useful starting point, and may be adequate in many cases for use in assessing compliance with the new 1-hour SO_2 standard. The PSD applicant's coordination with the reviewing authority is important in this matter to obtain the most appropriate estimates of maximum allowable hourly SO_2 emissions.

DEMONSTRATING COMPLIANCE WITH THE NAAQS AND INCREMENTS & MITIGATING MODELED VIOLATIONS WITH AIR QUALITY OFFSETS

A 1988 EPA memorandum provides procedures to follow when a modeled violation is identified during the PSD permitting process. [See Memorandum from Gerald A. Emison , EPA OAQPS, to Thomas J. Maslany, EPA Air Management Division, "Air Quality Analysis for Prevention of Significant Deterioration (PSD)." (July 5, 1988.)] In cases where the air quality analysis predicts violations of the 1-hour SO_2 NAAQS, but the permit applicant can show that the SO_2 emissions increase from the proposed source will not have a significant impact *at the point and time of any modeled violation*, the permitting authority has discretion to conclude that the source's emissions will not contribute to the modeled violation. As provided in the July 5, 1988 guidance memo, because the proposed source only has a *de minimis* contribution to the modeled violation, the source's impact will not be considered to cause or contribute to such modeled violations, and the permit could be issued. This concept continues to apply, and the significant impact level (described further below) may be used as part of this analysis. A 2006 decision by the EPA Environmental Appeals Board (EAB) provides detailed reasoning that demonstrates the permissibility of a finding that a PSD source would not be considered to cause or contribute to a modeled NAAQS violation because its estimated air quality impact was insignificant at the time and place of the modeled violations.[5] [See In re *Prairie State Gen. Co.*, 13 E.A.D. ___, ___, PSD Appeal No. 05-05, Slip. Op. at 137-144 (EAB 2006)]

However, where it is determined that a source's impact does cause or contribute to a modeled violation, a permit cannot be issued without some action to mitigate the source's impact. In accordance with 40 CFR 51.165(b)[6], a major stationary source or major modification (as defined at §51.165(a)(1)(iv) and (v)) that locates in a SO_2 attainment area for the 1-hour SO_2 NAAQS and would cause or contribute to a violation of the 1-hour SO_2 NAAQS may "reduce the impact of its emissions upon air quality by obtaining sufficient emission reductions to, at a minimum, compensate for its adverse ambient [SO_2] impact where the major source or major modification would otherwise cause or contribute to a violation ...." An applicant can meet this requirement for obtaining additional emissions reductions either by reducing its emissions at the source (e.g., promoting more efficient production methodologies and energy efficiency) or by obtaining air quality offsets (see below). [See, e.g., In re *Interpower of New York, Inc.*, 5 E.A.D. 130, 141 (EAB 1994)].[7] A State may also provide the necessary emissions reductions by imposing emissions limitations on other sources through an approved SIP revision. These approaches may also be combined as necessary to demonstrate that a source will not cause or contribute to a violation of the NAAQS.

Unlike emissions offset requirements in areas designated as nonattainment, in addressing the air quality offset concept, it may not be necessary for a permit applicant to fully offset the proposed emissions increase if an emissions reduction of lesser quantity will mitigate the adverse air quality impact where the modeled violation was originally identified. ("Although full emission offsets are not required, such a source must obtain emission offsets sufficient to compensate for its air quality impact where the violation occurs." 44 FR 3274, January 16, 1979, at 3278.) To clarify this, the 1988 guidance memo referred to above states that:

> offsets sufficient to compensate for the source's significant impact must be obtained pursuant to an approved State offset program consistent with State Implementation Plan (SIP) requirements under 40 CFR 51.165(b). Where the source is contributing to an existing violation, the required offset may not correct the violation. Such existing violations must be addressed [through the SIP].

Note that additional guidance for this and other aspects of the modeling analysis for the impacts of SO_2 emissions on ambient concentrations of SO_2 are addressed in EPA modeling guidance, including the attached August 23, 2010 Memorandum titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard."

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[5] While there is no 1-hour SO_2 significant impact level (SIL) currently defined in the PSD regulations, we believe that states may adopt interim values, with the appropriate justification for such values, to use for permitting purposes. In addition, we are recommending an interim SIL as part of this guidance for implementing the SO_2 requirements in the federal PSD program, and in state programs where states choose to use it.

[6] The same provision is contained in EPA's Interpretative Ruling at 40 CFR part 51 Appendix S, section III.

[7] In contrast to Nonattainment New Source Review permits, offsets are not mandatory requirements in PSD permits if it can otherwise be demonstrated that a source will not cause or contribute to a violation of the NAAQS. See, In re *Knauf Fiber Glass, GMBH*, 8 E.A.D. 121, 168 (EAB 1999).

Although EPA announced that it is revoking the annual and 24-hour SO_2 NAAQS, the June 22, 2010 preamble to the final rule announcing the new 1-hour SO_2 NAAQS explained that those standards will remain in effect for a limited period of time as follows: for current SO_2 nonattainment areas and SIP call areas, until attainment and maintenance SIPs are approved by EPA for the new 1-hour SO_2 NAAQS; for all other areas, for one year following the effective date of the initial designations under section 107(d)(1) for the new 1-hour SO_2 NAAQS. Accordingly, the annual and 24-hour SO_2 NAAQS must continue to be protected under the PSD program for as long as they remain in effect for a PSD area. There is a more detailed discussion of the transition from the existing SO_2 NAAQS to a revised SO_2 NAAQS in that preamble. Also, the same preamble includes a footnote listing the current nonattainment areas and SIP call areas. 75 FR 35520, at 35580-2.

In addition, the existing SO_2 increments (class I, II and III) for the annual and 24-hour averaging periods will not be revoked in conjunction with our decision to revoke the corresponding SO_2 NAAQS. Instead, the annual and 24-hour SO_2 increments (Class I, II and III increments) will remain in effect because they are defined in the Clean Air Act at title I, part C, section 163. The annual and 24-hour SO_2 increments in section 163 are considered part of the suite of statutory increments applicable to sulfur dioxide that Congress expressly included in the statutory provisions for PSD. As such, those increments cannot be revoked simply because we have decided to revoke the annual and 24-hour SO_2 NAAQS, upon which the SO_2 increments are based. Consequently, sources must continue to demonstrate that their proposed emissions increases of SO_2 emissions will not cause or contribute to any modeled violation of the existing annual and 24-hour SO_2 increments for as long as those statutory increments remain in effect. Increments for the 1-hour averaging period do not yet exist; the Act provides a specific schedule for the promulgation of additional regulations, which may include new increments, following the promulgation of new or revised NAAQS. EPA plans to begin that rulemaking process in the near future to consider the need for such increments.

"GOOD ENGINEERING PRACTICE" STACK HEIGHT AND DISPERSION TECHNIQUES

If a permit applicant is unable to show that the source's proposed emissions increase will not cause or contribute to a modeled violation of the new 1-hour SO_2 NAAQS, the problem could be the result of plume downwash effects causing high ambient concentrations near the source. In such cases, a source may be able to raise the height of its existing stacks (or designed stacks if not yet constructed) to a "good engineering practice" (GEP) stack height, or at least 65 meters, measured from the ground-level elevation at the base of the stack.

While not necessarily eliminating the full effect of downwash in all cases, raising stacks to GEP height may provide substantial air quality benefits in a manner consistent with statutory provisions (section 123 of the Act) governing acceptable stack heights to minimize excessive concentrations due to atmospheric downwash, eddies or wakes. Permit applicants should also be aware of the regulatory restrictions on stack heights for the purpose of modeling for compliance with NAAQS and increments. Section 52.21(h) of the PSD regulations currently prohibits the use of dispersion techniques, such as stack heights above GEP, merged gas streams, or intermittent controls for setting SO_2 emissions limits to meet the NAAQS and PSD increments.

However, stack heights in existence before December 31, 1970, and dispersion techniques implemented before then, are not affected by these limitations. EPA's general stack height regulations are promulgated at 40 CFR 51.100(ff), (gg), (hh), (ii), (jj), (kk) and (nn), and 40 CFR 51.118.

a. *Stack heights*: A source can include only the actual stack height up to GEP height when modeling to develop the SO_2 emissions limitations or to determine source compliance with the SO_2 NAAQS and increments. This is not a limit on the actual height of any stack constructed by a new source or modification, however, and there may be circumstances where a source owner elects to build a stack higher than GEP height. However, such additional height may not be considered when determining an emissions limitation or demonstrating compliance with an applicable NAAQS or PSD increment. Thus, when modeling, the following limitations apply in accordance with §52.21(h):

- For a stack height less than GEP, the actual stack height must be used in the source impact analysis for emissions;
- For a stack height equal to or greater than 65 meters the impact may be modeled using the greater of:
    - A *de minimis* stack height equal to 65 meters, as measured from the ground-level elevation at the base of the stack, without demonstration or calculation (40 CFR 51.100(ii)(1));
    - The refined formula height calculated using the dimensions of nearby structures in accordance with the following equation:

  GEP = H + 1.5L, where H is the height of the nearby structure and L is the lesser dimension of the height or projected width of the nearby structure (40 CFR 51.100(ii)(2)(ii)).[8]

- A GEP stack height exceeding the refined formula height may be approved when it can be demonstrated to be necessary to avoid "excessive concentrations" of SO_2 caused by atmospheric downwash, wakes, or eddy effects by the source, nearby structures, or nearby terrain features.
  (40 CFR 51.100(ii)(3), (jj), (kk));

- For purposes of PSD, "excessive concentrations" means a maximum ground-level concentration from a stack due in whole or in part to downwash, wakes, and eddy effects produced by nearby structures or nearby terrain features which individually is at least 40 percent in excess of the maximum concentration experienced in the absence of such effects and (a) which contributes to a total concentration due to emissions from all sources that is greater than the applicable NAAQS or (b) greater than the applicable PSD increments.
  (40 CFR 51.100(kk)(1)).

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[8] For stacks in existence on January 12, 1979, the GEP equation is GEP = 2.5 H (provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation for SO_2 (40 CFR 51.100(ii)(2)(i)

Reportedly, for economic and other reasons, many existing source stacks have been constructed at heights less than 65 meters, and source impact analyses may show that the source's emissions will cause or contribute to a modeled violation of the 1-hour SO_2 NAAQS. Where this is the case, sources should be aware that it is permissible for them to increase their stack heights up to 65 meters without a GEP demonstration.

b. *Other dispersion techniques*: The term "dispersion technique" includes any practice carried out to increase final plume rise, subject to certain exceptions (40 CFR 51.100(hh)(1), (2)(i) – (v)). Beyond the noted exceptions, such techniques are not allowed for getting credit for modeling source compliance with the NAAQS and PSD increments. One such exception is for sources of SO_2. Section 51.100(hh)(2)(v) provides that identified techniques that increase final exhaust gas plume rise are not considered prohibited dispersion techniques pursuant to section 51.100(hh)(1)(iii) "where the resulting allowable emissions of sulfur dioxide from the facility do not exceed 5,000 tons per year." Thus, proposed modifications that experience difficulty modeling compliance with the new 1-hour SO_2 NAAQS when relying on BACT or an air quality-based emissions limit alone may permissibly consider techniques to increase their final exhaust gas plume rise consistent with these provisions.

The definition of "dispersion technique" at 40 CFR 51.100(hh)(1)(iii) describes techniques that are generally prohibited, but which do not apply with respect to the exemption for SO_2. Accordingly, it is permissible for eligible SO_2 sources to make adjustments to source process parameters, exhaust gas parameters, stack parameters, or to combine exhaust gases from several existing stacks into one stack, so as to increase the exhaust gas plume rise. It is important to remember that the exemption applies to sources that have facility-wide allowable SO_2 emissions of less than 5,000 tpy resulting from the increase in final exhaust gas plume rise. Thus, proposed modifications should not base their eligibility to use dispersion on the amount of the proposed net emissions increase, but on the total source emissions of SO_2.

The EPA does not recommend or encourage sources to rely on dispersion to demonstrate compliance with the NAAQS; however, we acknowledge the fact that certain SO_2 sources may legally do so. For example, while increasing stack height is a method of dispersion, EPA's rules allow use of that approach to the extent the resulting height meets EPA's requirements defining "good engineering practice (GEP)" stack height. See 40 CFR 50.100(hh)(1)(i), 50.100(ii)(1)-(3). Nevertheless, EPA encourages PSD applicants to seek other remedies, including the use of the most stringent controls (beyond top-down BACT) feasible or the acquisition of emissions reductions (offsets) from other existing sources, to address situations where proposed emissions increases would result in modeled violations of the SO_2 NAAQS.

GENERAL START-UP CONDITIONS

We do not anticipate widespread problems associated with high short-term SO_2 emissions resulting from start-up/shutdown conditions. Many sources are capable of starting a unit with natural gas or low-sulfur fuel to avoid significant start-up emissions problems. However, some sources could experience short-term peaks of SO_2 during start-up or shutdown that could adversely affect the new 1-hour SO_2 NAAQS. The EPA currently has no provisions for exempting emissions occurring during equipment start-up/shutdown from the BACT requirements or for air quality analyses to demonstrate compliance with the SO_2 NAAQS and increments. Therefore, such emissions should be addressed in the required BACT and air quality analyses.

There are approaches to addressing issues related to start-up/shutdown emissions. For example, sources may be willing to accept enforceable permit conditions limiting equipment start-up/shutdown to certain hours of the day when impacts are expected to be lower than normal. Such permit limitations can be accounted for in the modeling of such emissions. Applicants should direct other questions arising concerning procedures for modeling start-up/shutdown emissions to the applicable permitting authority to determine the most current modeling guidance.

In the event of questions regarding the general implementation guidance contained in this memorandum, please contact Raj Rao (rao.raj@epa.gov).

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

August 23, 2010

MEMORANDUM

SUBJECT: Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard

FROM: Tyler Fox, Leader /s/
Air Quality Modeling Group, C439-01

TO: Regional Air Division Directors

INTRODUCTION

On June 2, 2010, EPA announced a new 1-hour sulfur dioxide (SO_2) National Ambient Air Quality Standard (1-hour SO_2 NAAQS or 1-hour SO_2 standard) which is attained when the 3-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations does not exceed 75 ppb at each monitor within an area. The final rule for the new 1-hour SO_2 NAAQS was published in the Federal Register on June 22, 2010 (75 FR 35520-35603), and the standard becomes effective on August 23, 2010 (EPA, 2010a). This memorandum clarifies the applicability of current guidance in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W) for modeling SO_2 impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour SO_2 standard.

SUMMARY OF CURRENT GUIDANCE

Current modeling guidance for estimating ambient impacts of SO_2 for comparison with applicable NAAQS is presented in Section 4 of Appendix W under the general heading of "Traditional Stationary Source Models." This guidance acknowledges the fact that ambient SO_2 impacts are largely a result of emissions from stationary sources. Section 4.2.2 provides specific recommendations regarding "Refined Analytical Techniques," stating that "For a wide range of regulatory applications in all types of terrain, the recommended model is AERMOD" (see Section 4.2.2.b). As described in Section 4.1.d, the AERMOD dispersion model "employs best state-of-practice parameterizations for characterizing the meteorological influences and dispersion" (Cimorelli, *et al.*, 2004; EPA, 2004; EPA, 2009).

Section 7.2.6 of Appendix W addresses the issue of chemical transformation for modeling SO_2 emissions, stating that:

> The chemical transformation of SO_2 emitted from point sources or single industrial plants in rural areas is generally assumed to be relatively unimportant to the estimation of maximum concentrations when travel time is limited to a few hours. However, in urban areas, where synergistic effects among pollutants are of considerable consequence, chemical transformation rates may be of concern. In urban area applications, a half-life of 4 hours may be applied to the analysis of SO_2 emissions. Calculations of transformation coefficients from site specific studies can be used to define a ''half-life'' to be used in a steady-state Gaussian plume model with any travel time, or in any application, if appropriate documentation is provided. Such conversion factors for pollutant half-life should not be used with screening analyses.

The AERMOD model incorporates the 4 hour half-life for modeling ambient SO_2 concentrations in urban areas under the regulatory default option.

General guidance regarding source emission input data requirements for modeling ambient SO_2 impacts is provided in Section 8.1 of Appendix W and guidance regarding determination of background concentrations for purposes of a cumulative ambient air quality impact analysis is provided in Section 8.2.

APPLICABILITY OF CURRENT GUIDANCE TO 1-HOUR SO_2 NAAQS

The current guidance in Appendix W regarding SO_2 modeling in the context of the previous 24-hour and annual primary SO_2 NAAQS and the 3-hour secondary SO_2 NAAQS is generally applicable to the new 1-hour SO_2 standard. Since short-term SO_2 standards ($\leq$ 24 hours) have been in existence for decades, existing SO_2 emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO_2 standards should serve as a useful starting point, and may be adequate in many cases for use in assessing compliance with the new 1-hour SO_2 standard, since issues identified in Table 8-2 of Appendix W related to short-term vs. long-term emission estimates may have already been addressed. However, the PSD applicant and reviewing authority may need to reassess emission estimates for very short-term emission scenarios, such as start-up and shut-down operations, for purposes of estimating source impacts on the 1-hour SO_2 standard. This is especially true if existing emission estimates for 3-hour or 24-hour periods are based on averages that include zero (0) or reduced emissions for some of the hours.

Given the form of the new 1-hour SO_2 standard, we are providing clarification regarding the appropriate data periods for modeling demonstrations of compliance with the NAAQS vs. demonstrations of attainment of the NAAQS through ambient monitoring. While monitored design values for the 1-hour SO_2 standard are based on a 3-year average (in accordance with Section 1(c) of Appendix T to 40 CFR Part 50), Section 8.3.1.2 of Appendix W addresses the length of the meteorological data record for dispersion modeling, stating that "[T]he use of 5 years of NWS [National Weather Service] meteorological data or at least 1 year of site specific data is required." Section 8.3.1.2.b further states that "one year or more (including partial years), up to five years, of site specific data . . . are preferred for use in air quality analyses." Although the monitored design value for the 1-hour SO_2 standard is defined in terms of the 3-year average, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data. The 5-year average based on use of NWS data, or an average across one or more years of available site specific data, serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS. Modeling of "rolling 3-year averages," using years 1 through 3, years 2 through 4, and years 3 through 5, is not required. Furthermore, since modeled results for SO_2 are averaged across the number of years modeled for comparison to the new 1-hour SO_2 standard, the meteorological data period should include complete years of data to avoid introducing a seasonal bias to the averaged impacts. In order to comply with Appendix W recommendations in cases where partial years of site specific meteorological data are available, while avoiding any seasonal bias in the averaged impacts, an approach that utilizes the most conservative modeling result based on the first complete-year period of the available data record vs. results based on the last complete-year period of available data may be appropriate, subject to approval by the appropriate reviewing authority. Such an approach would ensure that all available site specific data are accounted for in the modeling analysis without imposing an undue burden on the applicant and avoiding arbitrary choices in the selection of a single complete-year data period.

The form of the new 1-hour SO_2 standard also has implications regarding appropriate methods for combining modeled ambient concentrations with monitored background concentrations for comparison to the NAAQS in a cumulative modeling analysis. As noted in the March 23, 2010 memorandum regarding "Modeling Procedures for Demonstrating Compliance with $PM_{2.5}$ NAAQS" (EPA, 2010b), combining the 98^{th} percentile monitored value with the 98^{th} percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98^{th} percentile of the combined cumulative distribution and would, therefore, not be protective of the NAAQS. However, unlike the recommendations presented for $PM_{2.5}$, the modeled contribution to the cumulative ambient impact assessment for the 1-hour SO_2 standard should follow the form of the standard based on the 99^{th} percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled. A "first tier" assumption that may be applied without further justification is to add the overall highest hourly background SO_2 concentration from a representative monitor to the modeled design value, based on the form of the standard, for comparison to the NAAQS. Additional refinements to this "first tier" approach based on some level of temporal pairing of modeled and monitored values may be considered on a case-by-case basis, subject to approval by the reviewing authority, with adequate justification and documentation.

Section 8.2.3 of Appendix W provides recommendations regarding the determination of background concentrations for multi-source areas. That section emphasizes the importance of professional judgment by the reviewing authority in the identification of nearby and other sources to be included in the modeled emission inventory, and establishes "a significant concentration gradient in the vicinity of the source" under consideration as the main criterion for this selection. Appendix W also indicates that "the number of such [nearby] sources is expected to be small except in unusual situations." See Section 8.2.3.b.

The representativeness of available ambient air quality data also plays an important role in determining which nearby sources should be included in the modeled emission inventory. Key issues to consider in this regard are the extent to which ambient air impacts of emissions from nearby sources are reflected in the available ambient measurements, and the degree to which emissions from those background sources during the monitoring period are representative of allowable emission levels under the existing permits. The professional judgments that are required in developing an appropriate inventory of background sources should strive toward the proper balance between adequately characterizing the potential for cumulative impacts of emission sources within the study area to cause or contribute to violations of the NAAQS, while minimizing the potential to overestimate impacts by double counting modeled source impacts that are also reflected in the ambient monitoring data.

We would also caution against the literal and uncritical application of very prescriptive procedures for identifying which background sources should be included in the modeled emission inventory for NAAQS compliance demonstrations, including those described in Chapter C, Section IV.C.1 of the draft *New Source Review Workshop Manual* (EPA, 1990), noting again that Appendix W emphasizes the importance of professional judgment in this process. While the draft workshop manual serves as a useful general reference that provides potential approaches for meeting the requirements of New Source Review (NSR) and PSD programs, it is not the only source of EPA modeling guidance. The procedures described in the manual may be appropriate in some circumstances for defining the spatial extent of sources whose emissions may need to be considered, but not in others. While the procedures described in the NSR Workshop Manual may appear very prescriptive, it should be recognized that "[i]t is not intended to be an official statement of policy and standards and does not establish binding regulatory requirements." See, Preface.

Given the range of issues involved in the determination of an appropriate inventory of emissions to include in a cumulative impact assessment, the PSD applicant should consult with the appropriate reviewing authority early in the process regarding the selection and proper application of appropriate monitored background concentrations and the selection and appropriate characterization of modeled background source emission inventories for use in demonstrating compliance with the new 1-hour SO_2 standard.

SUMMARY

To summarize, we emphasize the following points:

1. Current guidance in Appendix W for modeling to demonstrate compliance with the previous 24-hour and annual primary SO_2 standards, and 3-hour secondary SO_2 standard, is generally applicable for the new 1-hour SO_2 NAAQS.
2. While the 1-hour NAAQS for SO_2 is defined in terms of the 3-year average for monitored design values to determine attainment of the NAAQS, this definition does not preempt or alter the Appendix W requirement for use of 5 years of NWS meteorological data or at least 1 year of site specific data.

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ATTACHMENT 4

Division of Air Quality $PM_{2.5}$ Design Values Report

West Virginia PM2.5

Design Values

data final and certified through 12/31/2016

		(NAAQS 24 hr 3 yr 98% = 35 ug/m^3)													(Annual NAAQS <= 12.0 ug/m^3)												
County	Site	02-04	03-05	04-06	05-07	06-08	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16	02-04	03-05	04-06	05-07	06-08	07-09	08-10	09-11	10-12	11-13	12-14	13-15	14-16
Berkeley	Martinsburg	37	36	34	33	31	29	31	30	31	26	27	26	27	16.1	16.2	15.8	15.8	14.9	14.0	12.9	11.8	11.6	10.7	10.4	10.3	9.9
Brooke	Follansbee	44	42	40	37	37	34	31	27	27	26	24	25	22	16.5	16.8	16.4	16.4	15.4	14.4	13.7	13.0	12.7	11.6	11.1	11.2	10.5
	Weirton-Marl. Hgts	47	45	43	44	41	37	31	29	27	26	24	24	23	15.8	16.4	15.7	16.1	14.9	14.0	13.1	11.6	11.1	10.1	10.4	10.3	9.8
Cabell	Huntington	37	35	34	37	32	30	26	25	24	21	21	21	20	15.8	16.3	16.1	16.6	15.2	14.3	13.1	12.1	11.6	10.4	9.8	9.2	8.7
Hancock	Weirton-Summit Circle												22	21												9.7	8.8
	Weirton-Oak St.	44	41	40	41	38	35	31	28	27	26	23			17.0	16.6	15.4	15.2	14.3	13.4	12.4	11.7	11.3	10.5	10.0	10.0	9.8
Harrison	Clarksburg	34	32	35	34	31	26	23	21	21	20	19	19	18	13.6	13.9	13.9	14.2	13.4	12.5	11.8	10.6	10.2	9.2	9.1	8.8	8.4
Kanawha	Charleston	34	34	35	36	34	29	25	24	23	21	18	18		14.8	15.1	15.0	15.4	14.2	13.1	11.8	11.0	10.7	9.7	9.1	8.6	8.6
	Charleston NCore													14													7.6
	So. Charleston	36	36	37	38	36	32	28	26	24	22	20	20	19	16.4	16.6	16.4	16.6	15.4	14.4	13.2	12.5	11.9	10.8	10.2	9.6	9.0
Marion	Fairmont	36	34	34	34	32	28	26	26	25	22	19	19	18	14.8	15.0	14.9	15.3	14.5	13.6	12.9	12.1	11.6	10.3	9.7	9.4	8.9
Marshall	Moundsville	36	33	34	35	34	31	29	29	29	25	23	23	22	15.1	15.3	15.0	15.2	14.2	13.4	13.1	13.0	12.8	11.6	11.1	10.7	10.2
Monongalia	Morgantown	39	36	34	36	34	30	25	25	24	22	18	19	18	14.5	14.5	14.1	14.4	13.6	12.7	11.5	10.9	10.3	9.5	8.8	8.6	8.1
Ohio	Wheeling	35	32	31	32	31	29	26	26	25	24	22	23	20	14.7	14.9	14.2	14.6	13.7	13.2	12.4	11.9	11.6	10.6	10.4	10.3	9.6
Raleigh	Beckley	32	31	31	30	28	24	21	20	20	19	14	11		12.6	12.9	12.8	13.0	11.9	11.0	10.1	9.6	9.3	8.3	6.6	5.9	5.1
Wood	Vienna	35	34	35	37	34	31	28	27	24	22	19	21	19	15.2	15.4	15.3	15.4	14.6	13.7	13.1	12.3	11.8	10.4	9.8	9.4	8.9

* Summit Circle sampling started 1/1/2015; therefore 3 yr 98% not complete
Charleston NCore sampling started 1/1/2016; therefore 3 yr 98% not complete

Oak Street site shut-down 12/31/2014
Charleston site shut-down 12/31/2015