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Pursuant to §45-14-17.2,

the Division of Air Quality presents the

PRELIMINARY DETERMINATION/FACT SHEET

for the

Construction of a Major Source

of

Monarch Cloud Campus, LLC

Point Pleasant Campus

Located near

Point Pleasant, Mason County, West Virginia

Permit Application Number: R14-0042

Facility Identification Number: 053-00136

Table of Content

1.0 BACKGROUND INFORMATION.....	3
2.0 ACTION SUMMARY.....	3
3.0 DESCRIPTION OF PROCESS.....	6
4.0 SITE INSPECTION.....	8
4.1 Sensitive Land Uses & Property Boundary Proximity.....	8
5.0 ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER.....	11
5.1 Methodologies and Sources of Information.....	11
5.2. Single Unit Potential-to-Emit Summary.....	13
5.3 Facility-Wide Potential-to-Emit Summary.....	17
6.0 REGULATORY APPLICABILITY.....	20
6.1 West Virginia Legislative Rules (45CSR2, 45CSR10, 45CSR13, 45CSR14, etc.).....	20
6.2 Federal New Source Performance Standards (40 CFR 60, Subparts Dc, IIII, JJJJ).....	22
6.3 Federal NESHAP/MACT Standards (40 CFR 63, Subparts ZZZZ, DDDDD).....	23
7.0 BACT REVIEW.....	23
7.1. Primary RICE (EU001-EU864) BACT Determination.....	24
7.2. BACT DETERMINATION FOR AUXILIARY AND FUGITIVE SOURCES.....	36
8.0 SUMMARY OF AIR QUALITY ANALYSIS.....	43
8.1 Significant Impact Level (SIL) Analysis.....	44
8.2. Secondary PM2.5 and Ozone Impacts (MERPs Analysis).....	44
8.3 National Ambient Air Quality Standards (NAAQS) Evaluation.....	44
8.3. Class II PSD Increment Consumption.....	45
8.4. Class I Area Impact Analysis.....	45
8.5 Additional Impacts Assessment.....	46
ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS.....	46
MONITORING and TESTING.....	51
RECOMMENDATION TO THE DIRECTOR.....	53
Attachment A: Memo of the Air Dispersion Modeling Report.....	54

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

ENGINEERING EVALUATION / FACT SHEET

1.0 BACKGROUND INFORMATION

Application No.: R14-0042
Plant ID No.: 053-00136
Applicant: Monarch Cloud Campus, LLC
Facility Name: Point Pleasant Campus
Location: Off Ohio River Road (WV-62), Point Pleasant, Mason County, West Virginia
NAICS Code: 518210 - Data Processing, Hosting, and Related Services
SIC Code: 7370- Services - Computer Programming, Data Processing, Etc.
Application Type: Major Source Construction (45 CSR 14)
Received Date: April 20, 2026
Revised Information Received: May 26, 2026 (Applicant response & updated PTE)
Engineer Assigned: Edward S. Andrews, P.E.
Fee Amount: \$14,500.00
Date Received: April 24, 2026
Applicant Ad Date: April 24, 2026
Newspaper: *River Cities Tribune & Register*
UTM Coordinates: Easting: 404.553 km | Northing: 4,307.900 km | Zone 17N
Latitude/Longitude: 38.914258° / -82.100935°
Description: Construction and operation of a 2.16 GW off-grid electric power generator microgrid to support a data center campus.

2.0 ACTION SUMMARY

Monarch Cloud Campus, LLC (MCC) proposes to construct and operate a new 2.16 gigawatt (GW) natural gas-fired off-grid electric power generation microgrid and data center campus located north of Point Pleasant in Mason County, West Virginia. The facility will be configured as 12 individual power nodes with seventy-two (72) 2.5 MW/3,513 hp generator sets to provide electric power, with four (4) power nodes supporting a data center hall. The campus will have three (3) data center halls for a total of 864 natural gas-fired reciprocating internal combustion engines (RICE), 12 diesel-fired emergency generator engines (1,000 kW), 6 diesel-fired firewater pump engines (400 hp), 6 natural gas-fired fuel gas heaters (15.25 MMBtu/hr each), eighteen (18) ultra-low sulfur diesel (ULSD) storage tanks, and associated fugitive emission sources.

Each power node will be configured with 8 engine halls with nine (9) engines in each hall. Emission points for these Primary RICEs will be clustered in groups of four (4), two engines from one hall will be clustered with two (2) adjacent engines from the near-by engine hall to

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

form the cluster. Note that these emissions points or stacks are not actually being merged into a single emission point. The stack for the ninth engine in the hall will be merged with the ninth engine in the nearby hall. To better illustrate the stack clusters, Figure 3 of the Modeling Protocol has been inserted below.

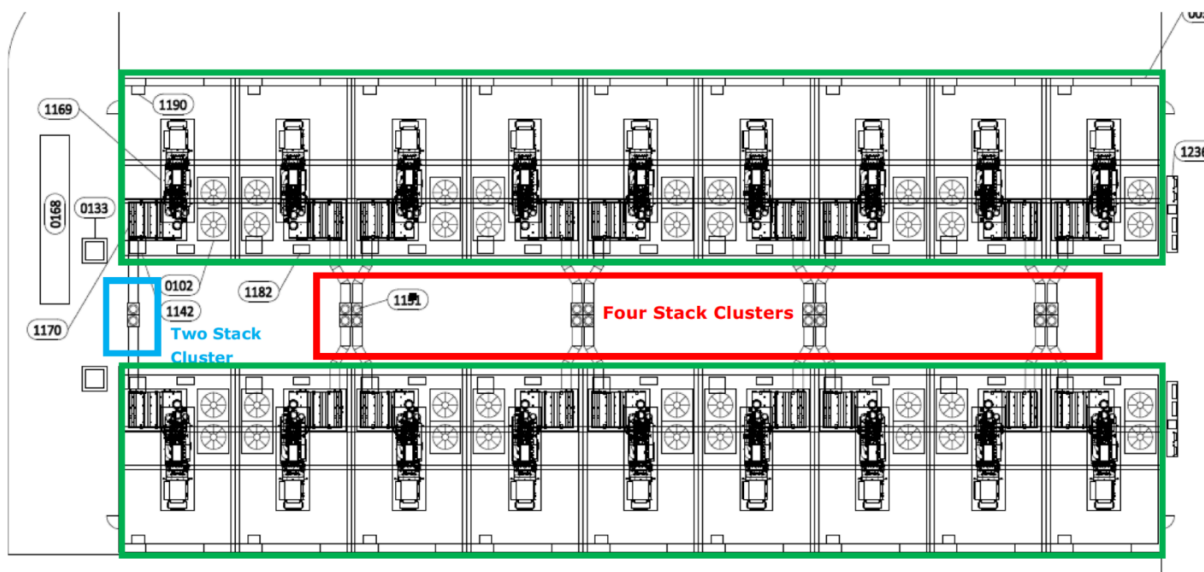


Figure 1 - Engine Hall Configuration

This project requires MCC to obtain a major source preconstruction permit pursuant to 45 CSR 14 (Prevention of Significant Deterioration) before commencing construction. As part of complying with 45 CSR 14, Best Available Control Technology (BACT) applies to each regulated pollutant for which the project represents a significant emissions increase (NO_x, CO, VOC, PM/PM₁₀/PM_{2.5}, SO₂, sulfuric acid mist, and GHGs).

Table 1 - Summary of BACT Technologies and Limits				
Emission Unit	Pollutant	Control Technology / BACT Standard	BACT Emission Limit	Averaging Period
864 Primary Power RICE (EU001 – EU864)	NO _x	SCR, Good Combustion Practice, Pipeline Quality Natural Gas	0.5 g/hp-hr (uncontrolled design) / 0.01 g/hp-hr (controlled)	3 hour
	CO	Oxidation Catalyst, Good Combustion	0.6 g/hp-hr (BACT cap) / 0.027 g/hp-hr	3 hour

Table 1 - Summary of BACT Technologies and Limits

		Practice, Pipeline Quality Natural Gas	(controlled)	
	VOC	Oxidation Catalyst, Good Combustion Practice, Pipeline Quality Natural Gas	0.3 g/hp-hr (BACT cap) / 0.02 g/hp-hr NMNEHC (controlled)	3 hour
	PM/PM₁₀/PM_{2.5}	Pipeline Quality Natural Gas, Good Combustion Practice	0.01 lb/hr filterable PM per engine + 10% Opacity Limit	6 hour & 6-min for VE
	SO₂	Pipeline Quality Natural Gas, Good Combustion Practice	Fuel Sulfur Content Specification (≤ 0.20 gr S/100 scf)	Continuous
	GHG (CO₂e)	High-Efficiency Lean-Burn Design, Pipeline Natural Gas, GCP	Heat Rate Limit of 9,800 Btu/kW	12-Month Rolling Total
12 Emergency Generators (EU865 – EU876)	NO_x / CO / VOC / PM	EPA Tier 2 Certified Engine, GCP, ULSD, ≤ 100 hr/yr	4.9 g/kW-hr (NO _x), 3.5 g/kW-hr (CO), 1.5 g/kW-hr (VOC), 0.2 g/kW-hr (PM)	Certified Engines
6 Firewater Pumps (EU877 – EU882)	NO_x / CO / VOC / PM	EPA Tier 3 Certified Engine, GCP, ULSD, ≤ 100 hr/yr	4.0 g/kW-hr (NMHC+NO _x), 3.5 g/kW-hr (CO), 0.2 g/kW-hr (PM)	Certified Engines
6 Fuel Gas Heaters (EU883 – EU888)	NO_x	Low-NO _x Burners, Good Combustion Practices	0.1 lb/MMBtu (1.50 lb/hr per heater)	3 hour
	CO	Good Combustion Practices	0.084 lb/MMBtu (1.26 lb/hr per heater)	3 hour
	VOC / PM	Good Combustion Practices, Pipeline Quality Natural Gas	0.005 lb/MMBtu (VOC), 0.005 lb/MMBtu (PM)	3 hour

Table 1 - Summary of BACT Technologies and Limits				
Storage Tanks & Fugitives	VOC / GHGs	Fixed Roof, Submerged Fill, Good Operating Practices, AVO/LDAR	Equipment design & work practice standards	Continuous

3.0 DESCRIPTION OF PROCESS

The proposed facility is designed as an off-grid (“island”), continuous-service microgrid engineered to supply dedicated, high-reliability electrical power to three co-located high-performance computing data center halls (DC). This configuration operates independently of the local public utility grid. The power generation infrastructure is partitioned into **12 independent power nodes (microgrids)**. Each data center hall (“H” shaped building) comprises eight (8) engine halls, these eight engine halls will support a wing of the “H” and collectively house 72 of the Caterpillar Model G3520K spark-ignition, 4-stroke lean-burn (4SLB) natural gas-fired reciprocating internal combustion engines (RICE). In total, the campus will utilize **864 primary power RICE units**.

Each primary RICE is coupled to a 2.5-megawatt (MW) electrical generator. To mitigate atmospheric emissions, each unit is outfitted with Selective Catalytic Reduction (SCR) for the control of nitrogen oxides (NO_x) and an Oxidation Catalyst (OxCat) to facilitate the reduction of carbon monoxide (CO), volatile organic compounds (VOCs), and hazardous air pollutants (HAPs). Furthermore, every node is integrated with a 70 MW / 140 MWh Battery Energy Storage System (BESS). Operating in a grid-forming capacity, the BESS is designed to dampen sub-second GPU power fluctuations, thereby permitting the primary engine fleet to maintain continuous operation at optimized, high-efficiency baseload setpoints.

One power node is dedicated to each of the four wings and the associated load of the central core of the data center building. Each wing and core require nominally 150 MW of power at peak data center demand. Power from the primary RICEs supports the entire data center load, including computing power, building power, and cooling loads. The cooling load of the data centers is provided by a closed-loop system with minimal makeup water. The total site peak power demand is expected to be approximately 1.8 GW, with the overall generator capacity of the primary RICEs being 2.1 GW.

The facility’s auxiliary equipment suite consists of 12 diesel-fired emergency house generators (1 MW each), six diesel-fired firewater pump engines (400 HP each), and six natural gas-fired fuel gas heaters utilized for dew-point conditioning (15.25 MMBtu/hr each).

The emergency generators are Generac SD1000 generator sets with Perkins compression ignition engines with a power output rating of 1,412 hp. The applicant refers to these generators as “house generators.” Four of these units are to be dedicated to each data center hall.

The applicant selected Clark JW6H-UFAD80 Firewater Pumps, which are equipped with John Deere Model 6090HFC47B engines. These John Deere engines are 9.0 liter, compression-ignition engines with a maximum power output rating of 400 hp.

Additional on-site sources include ultra-low sulfur diesel (ULSD) and aqueous urea storage tanks, along with fugitive emissions from natural gas infrastructure.

The proposed facility will consist of the following stationary emission units and operational activities:

- **Primary Power RICE Fleet (EU-001 through EU-864):** 864 natural gas-fired Caterpillar Model G3520K 4SLB engines, each possessing a site rating of 3,513 BHP (maximum heat input of 21.17 MMBtu/hr, HHV).
 - Power Node 1 (PN1) will be assigned EU-001 through EU-072.
 - PN2 will be assigned EU-073 through EU-144.
 - PN3 will be assigned EU-145 through EU-216.
 - PN4 will be assigned EU-217 through EU-288.
 - PN5 will be assigned EU-289 through EU-360
 - PN6 will be assigned EU-361 through EU-432
 - PN7 will be assigned EU-433 through EU-504
 - PN8 will be assigned EU-505 through EU-576
 - PN9 will be assigned EU-577 through EU-648
 - PN10 will be assigned EU-649 through EU-720
 - PN11 will be assigned EU-721 through EU-792
 - PN12 will be assigned EU-793 through EU-864
- **Emergency House Generators (EU865 through EU876):** 12 diesel-fired emergency generator sets, each possessing a site rating of 1,000 kW (1,412 HP).
- **Firewater Pump Engines (EU877 through EU882):** 6 diesel-fired engines for firewater suppression, each possessing a site rating of 400 HP.
- **Fuel Gas Heaters (EU883 through EU888):** 6 natural gas-fired heaters used for fuel gas dew-point stabilization, each possessing a maximum heat input of 15.25 MMBtu/hr.
- **Storage Tank Farm (EU889 through EU894 for the Firewater Pumps & EU895 through EU906 for the Emergency Generators):** Various storage vessels containing ultra-low sulfur diesel (ULSD) fuel and DEF (aqueous urea solution).

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Fugitive Emission Sources (FUG-01):** Ancillary piping components, including valves, connectors, and pressure relief devices, operating in natural gas and fuel gas service.

4.0 SITE INSPECTION

On August 26, 2026, Mr. Rex Compston, P.E., an engineer assigned to the Planning Section of the Division of Air Quality (DAQ), and the writer conducted a site inspection of the proposed facility. Mr. William “Jack” Calhoun, P.E., Vice-President of HSE with NSCALE (parent corporation of Monarch Cloud Campus, LLC); Mr. Thomas Cook, Director of Site Logistics with NSCALE; and Mr. Jerry Williams, P.E., Principal Consultant with ERM, accompanied DAQ personnel during the inspection.

The proposed site for the three data center halls is located on an approximate 2,300-acre parcel (with ~1,100 acres dedicated to facility development) formerly occupied by the Mason County Airport, located approximately four (4) miles north of Point Pleasant, WV, along the east side of Ohio River Road (State Route 62). The Mason County Airport officially closed in the first quarter of 2026.

Historically, this property was part of the larger 8,000-acre West Virginia Ordnance Works site. The proposed campus site is not located within the portion designated as a Superfund site. Two legacy fire water tanks from the former Ordnance Works remain on the site. According to Mr. Calhoun, MCC is seeking appropriate agency approvals to demolish both structures. During the inspection, the writer observed earth-moving (excavation) and soil stabilization (compaction) activities.

A GIS spatial proximity evaluation was performed for the proposed Monarch Cloud Campus (MCC) facility using QGIS and official West Virginia state spatial datasets (UTM Zone 17N, NAD83) to determine separation distances between facility emission points, sensitive receptors, and public lands.

4.1 Sensitive Land Uses & Property Boundary Proximity

Nearby Schools

Spatial analysis utilizing the official West Virginia Department of Education (WVDE) /West Virginia GIS Technical Center (WVGISTC) public school dataset confirmed that zero public schools fall within a 1-mile or 2-mile regulatory screening radius of the facility footprint:

- **Point Pleasant Jr/Sr High School:** Located approximately 2.29 miles (3,690 m / 12,107 ft) southwest of the primary facility coordinates.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Point Pleasant Intermediate School:** Located approximately 2.49 miles (4,008 m / 13,150 ft) southwest.
- **Point Pleasant Primary School:** Located approximately 3.37 miles (5,426 m / 17,802 ft) southwest.

McClintic Wildlife Management Area (WMA)

To evaluate proximity to protected state lands, the WVDNR Managed Lands polygon boundary was converted to a high-resolution vector line boundary and evaluated against all 906 stack points via nearest-neighbor spatial analysis:

- Distance calculations were evaluated from western perimeter stacks (**EP865 / EP895**) directly to the eastern boundary edge of McClintic WMA.

Nearby Dwellings

Proximity calculations were performed using QGIS [Join Attributes by Nearest](#) from perimeter focus stacks to off-site residential structures digitized from high-resolution aerial imagery:

- **North Boundary:** EP721 / EP722 (Northing: 4,308,302 m)
- **South Boundary:** EP888 (Northing: 4,307,045 m)
- **Southwest Boundary:** EP868/EP898 (Northing 4307563 m / Easting 403639)
- **East Boundary:** EP879 / EP891 (Easting: 405,244 m)
- **West Boundary:** EP865 / EP895 (Easting: 403,443 m)

Table 2 - Sensitive Locations & Boundary Proximity				
Land Use / Feature Category	Adjacent Resource	Focus Stack ID	Distance (Meters)	Distance (Feet / Miles)
Nearest Public School	Point Pleasant Jr/Sr High	Site Center / EP1	3,690 m	2.29 mi
Secondary School	Point Pleasant Intermediate	Site Center / EP1	4,008 m	2.49 mi

Table 2 - Sensitive Locations & Boundary Proximity

Land Use / Feature Category	Adjacent Resource	Focus Stack ID	Distance (Meters)	Distance (Feet / Miles)
Public Conservation Land	McClintic WMA Boundary	EP888	661 m	2,169 ft
Nearest Residence (North)	North Property Line	EP721 / EP722	457 m	1,509 ft
Nearest Residence (South)	South Property Line	EP888	397 m	1,303 ft
Nearest Residence (Southwest)	Southwest Property Line	EP868/EP898	152 m	499 ft
Nearest Residence (East)	East Property Line	EP879 / EP891	329 m	1,079 ft
Nearest Residence (West)	West Property Line	EP865 / EP895	227 m	745 ft



Figure 2: Photograph of the Two Existing Firewater Tanks

5.0 ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The potential to emit (PTE) calculations for the proposed Monarch Cloud Campus Point Pleasant Facility were established utilizing equipment design parameters supplied by the equipment manufacturers, applicable state and federal regulatory emission thresholds, and standard reference factors from U.S. EPA AP-42.

Note on Particulate Matter Calculations: In accordance with U.S. EPA NSR/PSD regulations, emission rates for PM_{10} and $PM_{2.5}$ include both the filterable and condensable particulate fractions. The emission rate for general PM includes only the filterable fraction. Because natural gas combustion generates a high ratio of condensable to filterable particulates, the facility's total calculated PM_{10} and $PM_{2.5}$ mass emission rates are mathematically higher than the filterable-only PM rate.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

The applicant had based the PM rates in the initial applicant on including both halves (filterable and condenseable) particulate matter, which the writer noted to the applicant through conversations during the application review process.

Note on Particulate Matter Public Notice Accounting: The published legal advertisement referenced an aggregate particulate output rate of 49.25 TPY, representing the applicant's preliminary submission incorporating filterable and condensable fractions. Technical evaluation by the reviewing engineer adjusted the regulatory standard to 21.68 TPY to isolate filterable particulate emissions pursuant to Division guidelines and EPA reference methods. The proposed permit conditions and engineering evaluation enforce the adjusted, enforceable 21.68 TPY limit.

5.1 Methodologies and Sources of Information

- **Primary Power Engines (Caterpillar G3520K):** Quantified baseline emission rates for NO_x, CO, Volatile Organic Compounds (VOCs), unburned methane (CH₄), and formaldehyde (HCHO) during routine steady-state operation rely upon manufacturer performance sheets (evaluated at 100% operating load and 95°F ambient conditions) combined with guaranteed reduction efficiencies for post-combustion control systems. Particulate matter (PM/PM₁₀/PM_{2.5}) emission metrics originate from U.S. EPA Region 5 natural gas combustion guidance. Emissions of sulfur dioxide (SO₂) and organic Hazardous Air Pollutants (HAPs) were calculated employing AP-42 Chapter 3.2 (*Natural Gas-fired Reciprocating Engines*, Table 3.2-2). Total greenhouse gas (CO₂e) rates incorporate default factors from 40 CFR Part 98 Subpart C (Tables C-1 and C-2) along with Global Warming Potentials from Table A-1.
- **Primary Engine Startup and Shutdown (SUSD):** During SUSD operating cycles, secondary control technologies (SCR and Oxidation Catalyst) are treated as inactive prior to reaching minimum effective thermal operating setpoints (>300°C for SCR and >450°F for OxCat). SUSD mass emission rates are calculated using uncontrolled engine-out emission rates specified by Caterpillar (0.50 g/bhp-hr NO_x, 1.35 g/bhp-hr CO, 0.29 g/bhp-hr VOC, and 0.19 g/bhp-hr HCHO).
- **Emergency Generators (Generac SD-1000):** Controlled emission rates for NO_x, CO, VOC, and PM adhere to EPA Tier 2 nonroad compression-ignition certified standards under 40 CFR Part 60 Subpart IIII. SO₂ totals assume 100% conversion of Ultra-Low Sulfur Diesel fuel (ULSD, ≤15 ppmw sulfur). HAP emissions were evaluated using AP-42 Chapter 3.4 (*Large Stationary Diesel and All Stationary Dual-fuel Engines*).
- **Firewater Pump Engines (Clarke 400 hp):** Mass emission rates for NO_x, CO, VOC, and PM are based upon EPA Tier 3 emergency fire pump certification standards per 40

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

CFR Part 60 Subpart III Table 4. Potential SO₂ and HAP releases are estimated utilizing AP-42 Chapter 3.3 (*Gasoline and Diesel Industrial Engines*).

- **Fuel Gas Heaters (EU883–EU888):** Criteria pollutant and HAP emissions are estimated using AP-42 Chapter 1.4 (*Natural Gas Combustion*) assuming continuous firing of pipeline-quality natural gas. Peak hourly SO₂ emissions account for a maximum fuel sulfur loading of 20 grains/100 scf.
- **Storage Tanks & Fugitives:** Working and breathing standing losses for the ULSD storage vessels were calculated utilizing *Emission Master* software. Piping component fugitive equipment leaks in natural gas service were evaluated with U.S. EPA's *Protocol for Equipment Leak Emission Estimates* (Table 2-1). Atmospheric system blowdown events (pigging operations, filter separator maintenance, ESD testing) were calculated via vessel volume depressurization formulas and gas chromatograph sample analysis. Particulate emissions from paved access roads were determined using AP-42 Section 13.2.1.

Key Operational Assumptions

- **Primary Engine Fleet (864 Caterpillar G3520K units):** Arranged as 12 independent Power Nodes (housing 72 engines per node). Each engine carries a site rating of 3,513 bhp (21.17 MMBtu/hr maximum design heat input, HHV) and drives a 2.5 MWe electrical generator. Individual units are limited to a maximum of 8,725 hours per year under controlled steady-state operation and 35 hours per year in SUSD mode (reflecting 70 annual SUSD events per engine at 30 minutes per occurrence).
- **Add-On Aftertreatment Efficiency:** Exhaust from each primary engine routes through a Clean Emission Module (CEM) system engineered for 98% NO_x reduction via Selective Catalytic Reduction (SCR), 98% CO control via Oxidation Catalyst, 80% NMNEHC/VOC reduction, and 95% formaldehyde destruction efficiency.
- **Emergency Equipment Hour Caps:** Operational schedules for the 12 emergency generator sets (1,412 hp each) and 6 firewater pump engines (400 hp each) are capped at 100 hours per calendar year per unit for maintenance checks and readiness testing.
- **Fuel Gas Heaters:** The 6 fuel gas heaters (15.25 MMBtu/hr maximum design heat input per unit) are permitted for continuous operation up to 8,760 hours annually.
- **Primary Power Engine (Caterpillar G3520K) Startup and Shutdown (SUSD) Emissions:** The facility's automated Energy Management System (EMS) restricts individual primary engine startup events to a maximum duration of 30 minutes,

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

corresponding to the time required to achieve active SCR operating temperatures (> 300°C) and a minimum mechanical load threshold of 50%. Annual startup and shutdown operations are capped at 70 SUSD cycles per engine, representing a cumulative total of 35.0 operating hours per year.

5.2. Single Unit Potential-to-Emit Summary

The following table summarizes the hourly and annual potential-to-emit (PTE) for individual emission units operating under normal base load conditions:

Table 3 - Emissions from the Emission Units on an Individual Basis				
Pollutant	Caterpillar G3520K RICE (Single Engine - Normal)	Generac SD-1000 Emergency Gen (Single Engine)	Clarke Firewater Pump (Single Engine)	Fuel Gas Heater (Single Unit)
Operating Basis	8,725 hrs/yr	100 hrs/yr	100 hrs/yr	8,760 hrs/yr
NO_x (lb/hr / tpy)	0.08 / 0.34	14.11 / 0.71	2.43 / 0.12	1.50 / 6.55
CO (lb/hr / tpy)	0.21 / 0.91	8.12 / 0.41	2.30 / 0.12	1.26 / 5.50
VOC (lb/hr / tpy)*	0.23 / 1.00	0.74 / 0.04	0.20 / <0.01	0.08 / 0.36
PM (lb/hr / tpy)	<0.01/0.02	0.47/0.02	0.13 / <0.01	0.03/0.12
PM₁₀ (lb/hr / tpy)	0.01 / 0.05	0.47 / 0.02	0.13 / <0.01	0.11 / 0.68

Table 3 - Emissions from the Emission Units on an Individual Basis				
Pollutant	Caterpillar G3520K RICE (Single Engine - Normal)	Generac SD-1000 Emergency Gen (Single Engine)	Clarke Firewater Pump (Single Engine)	Fuel Gas Heater (Single Unit)
PM _{2.5} (lb/hr / tpy)	<0.01 / 0.04	0.47 / 0.02	0.13 / <0.01	0.11 / 0.50
SO ₂ (lb/hr / tpy)	0.01 / 0.05	0.01 / <0.01	<0.01 / <0.01	<0.01 / <0.01
Sulfuric Acid Mist (SAM) (lb/hr/TPY)	0.002/0.008	N/A	N/A	N/A
Formaldehyde (lb/hr / tpy)	0.07 / 0.32	<0.01 / <0.01	<0.01 / <0.01	<0.01 / <0.01
Total HAPs (lb/hr / tpy)	0.16 / 0.68	0.01 / <0.01	0.01 / <0.01	<0.01 / 0.03
CO ₂ e (lb/hr / tpy)	2,905.91 / 12,677.05	1,595.35 / 79.77	564.51 / 28.23	1,784.40 / 7,815.68

* VOCs emissions include formaldehyde.

Sulfuric Acid Mist (SAM) Emissions: The applicant did not provide an actual numerical emission rate for sulfuric acid mist (SAM) emissions. Instead, the applicant lumped the SO₂ and SAM since these two pollutants are a function of the sulfur loading in the natural gas (fuel).

During combustion, fuel sulfur converts directly to sulfur dioxide (SO₂). Subsequent passage across the precious metal catalyst elements within the Selective Catalytic Reduction (SCR) post-combustion control architecture promotes partial secondary oxidation of SO₂ into sulfur

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

trioxide (SO₃). This gaseous SO₃ combines readily with exhaust stream moisture to form sulfuric acid mist (H₂SO₄).

EPA did not publish any SAM factors in AP-42 for internal combustion engines with SCR. The writer found a SAM factor for a large industrial engine of 8.17×10^{-4} lb per MMBtu using natural gas with a sulfur loading of 2 grains (gr) per 100 scf used in a Florida PSD Permit for the Arvah B. Hopkins Generating Station (PSD-FL-441).

Baseline SAM Factor (at 2.0 gr S / 100 scf) = 8.17×10^{-4} lb/MMBtu

Correction Factor = $[0.20 \text{ gr S}/100 \text{ scf (Permit Threshold)}] / [2.0 \text{ gr S}/100 \text{ scf (Precedent Basis)}]$
= 0.10

Corrected SAM Emission Factor = $8.17 \times 10^{-4} \times 0.10 = 8.17 \times 10^{-5}$ lb/MMBtu

The writer applied a correction factor of 0.1 to adjust the sulfur content from 2 gr to 0.20 gr for a corrected SAM emission factor of 8.17×10^{-5} lb/MMBtu, establishing a unit limit of 0.0023 lb/hr SAM per engine.

Primary Power Engine (Caterpillar G3520K) Startup and Shutdown (SUSD) Emissions

During startup and shutdown events, the engine exhaust temperature will be below the SCR and oxidation catalyst required to initial and sustain the reaction in order to reduce NO_x, CO, and VOC emissions from the engines. Thus, the applicant treated the emissions during these periods as uncontrolled emissions.

The automated Energy Management System (EMS) limits individual engine startup duration to no more than 30 minutes until active SCR dosing temperature (>300°C) and 50% mechanical load are established. Each engine is capped at 70 annual SUSD cycles (35.0 cumulative hours/year).

The table below contrasts hourly uncontrolled SUSD emission rates against controlled normal operating rates, and displays total annual SUSD emissions for a single engine, a single Power Node (72 engines), and the complete 864-engine campus fleet:

Table 4 - SUSD Emission for Primary RICEs

Pollutant	Single Engine Normal Rate (lb/hr)	Single Engine SUSD Rate (lb/hr)	Single Engine SUSD PTE (35 hr/yr) (tpy)	Single Power Node SUSD PTE (72 Engines) (tpy)	Campus Fleet SUSD Total (864 Engines) (tpy)
NO_x	0.08	3.87	0.068	4.88	58.51
CO	0.21	10.46	0.183	13.18	158.09
VOC	0.23	2.25	0.039	2.83	33.96
PM	0.01	0.01	<0.01	0.005	0.06
PM₁₀	0.01	0.01	<0.001	0.014	0.17
PM_{2.5}	<0.01	<0.01	<0.001	0.012	0.14
SO₂	0.01	0.01	<0.001	0.016	0.19
Formaldehyde (HCHO)	0.07	1.47	0.026	1.85	22.25
Total HAPs	0.16	1.89	0.033	2.38	28.58
CO₂e	2,594.49	2,594.49	50.86	3,661.92	43,938.84

5.3 Facility-Wide Potential-to-Emit Summary

The total potential emissions for the Point Pleasant Campus across all 12 Power Nodes (864 primary power engines), 12 emergency generators, 6 firewater pumps, 6 fuel gas heaters, storage vessels, blowdowns, fugitive piping components, and paved haul roads are presented below:

Table 5 - Facility-Wide Potential-to-Emit Summary								
Emission Source Category	NO_x (tpy)	CO (tpy)	VOC (tpy)	PM/PM₁₀ (tpy)	PM_{2.5} (tpy)	SO₂/SAM (tpy)	Total HAPs (tpy)	CO₂e (tpy)
864 Primary Engines (Normal Ops)	291.92	788.17	861.15	15.83/41.16	34.04	47.47/6.91	590.55	10,952,969.44
864 Primary Engines (SUSD Mode)	58.55	158.09	33.96	0.06/0.17	0.14	0.19/N/A	28.53	43,938.84
Subtotal (Primary Power Fleet)	350.47	946.26	895.11	15.89/41.33	34.18	47.66/6.91	619.08	10,996,908.28
12 Emergency Generators (Generac)	8.47	4.87	0.45	0.28	0.28	<0.01/N/A	<0.01	960.61
6 Firewater Pump Engines (Clarke)	0.73	0.69	0.06	0.04	0.04	<0.01/N/A	<0.01	169.35

Table 5 - Facility-Wide Potential-to-Emit Summary								
6 Fuel Gas Heaters (15.25 MMBtu/hr)	39.29	33.00	2.16	0.75	0.75	0.05/N/A	0.03	46,894.06
Storage Vessels (ULSD Tanks)	—	—	0.03	—	—	—	0.02	—
Equipment Blowdowns & ESD Testing	—	—	0.83	—	—	—	<0.01	4,992.19
Fugitive Component Leaks	—	—	0.25	—	—	—	<0.01	583.00
Paved Haul Roads	—	—	—	4.58/0.92	0.22	—	—	—
Total Facility Potential-to-Emit	398.96	984.83	898.89	21.54/43.31	35.46	47.68/6.91	619.16	11,050,507.13

6.0 REGULATORY APPLICABILITY

6.1 West Virginia Legislative Rules (45CSR2, 45CSR10, 45CSR13, 45CSR14, etc.)

45 CSR 2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

45CSR2 establishes a visible emission limit of ten percent (10%) opacity based on a six-minute block average pursuant to §45-2-3.1 and regulates weight particulate matter emissions from Type "b" fuel burning units per §45-2-4.1. For the six 15.25 MMBtu/hr fuel gas heaters (EU883 through EU888), the allowable PM limit is 1.37 lb/hr per heater (0.09 lb/MMBtu).

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

These fuel gas heaters burn pipeline-quality natural gas exclusively, resulting in a maximum potential PM emission rate of 0.12 lb/hr per unit (0.005 lb/MMBtu), which easily demonstrates compliance with the mass emission limit. Exclusive use of pipeline natural gas also satisfies the 10% opacity threshold without requiring add-on control technology.

45 CSR 10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

45CSR10 establishes a sulfur dioxide (SO₂) emission limit of 3.2 lb/MMBtu for Type "b" fuel burning units located in Priority Region III pursuant to §45-10-3.3.6. For each 15.25 MMBtu/hr heater, the maximum allowable SO₂ mass emission rate is 47.28 lb/hr.

Permit Condition 6.1.1.g.ii restricts total fuel sulfur content to no more than 0.20 grains per 100 scf on a 12-month rolling average basis, with a short-term limit of 0.50 grains per 100 scf. Firing pipeline-quality natural gas yields potential SO₂ emissions below 0.01 lb/hr per unit, assuring continuous compliance.

45 CSR 13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants

45CSR13 mandates that stationary sources obtain a preconstruction permit prior to constructing, modifying, or relocating equipment with the potential to emit regulated air pollutants.

Monarch Cloud Campus, LLC (MCC) submitted a major source construction permit application (R14-0042) on April 20, 2026, submitted the requisite \$14,500.00 application fee, and published a Class I Legal Advertisement in the *River Cities Tribune & Register* on April 24, 2026.

In accordance with established agency administrative practice, permit applications evaluated pursuant to 45 CSR 14 undergo simultaneous technical review under the provisions of 45 CSR 13; where overlapping regulatory standards or conflicting requirements exist, the Division applies the more stringent limitation.

For purposes of establishing limitations for hazardous air pollutants (HAPs), the DAQ must utilize its authority under 45 CSR 13. 45 CSR 14 only regulates NSR (New Source Review) pollutants and greenhouse gas (GHGs). Lead is the only HAP that is also classified as a NSR Pollutant.

45 CSR 14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration (PSD)

45CSR14 governs the preconstruction review of new major stationary sources located in attainment areas. The rule requires Best Available Control Technology (BACT) determinations and ambient air quality modeling for each regulated pollutant with potential emissions exceeding Significant Emission Rates (NO_x, CO, VOC, PM/PM₁₀/PM_{2.5}, SO₂, and GHGs).

BACT standards and emission limits have been set across all emission units at the facility. Comprehensive air dispersion modeling performed using AERMOD verified that facility emissions will not cause or contribute to a violation of any NAAQS or PSD Class I or Class II

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Increment. The following section will outline the DAQ's review and determination of BACT for the proposed emissions units.

45 CSR 16: Standards of Performance for New Stationary Sources

45CSR16 incorporates by reference the federal New Source Performance Standards (NSPS) codified under 40 CFR Part 60.

Compliance is met by adhering to 40 CFR 60 Subpart Dc for the fuel gas heaters, Subpart IIII for emergency generators and firewater pumps, and Subpart JJJJ for the primary power RICE fleet.

45 CSR 30: Requirements for Operating Permits (Title V)

45CSR30 establishes the Title V operating permit program for major stationary sources pursuant to Title V of the Clean Air Act.

The Point Pleasant Campus represents a major source subject to Title V. The permit requires MCC to submit a complete Title V operating permit application within twelve (12) months following initial facility startup.

45 CSR 34: Emission Standards for Hazardous Air Pollutants

45CSR34 incorporates by reference federal National Emission Standards for Hazardous Air Pollutants (NESHAP) codified under 40 CFR Part 63.

Compliance is established by meeting applicable requirements under 40 CFR 63 Subpart ZZZZ (RICE MACT) and Subpart DDDDD (Boiler MACT).

6.2 Federal New Source Performance Standards (40 CFR 60, Subparts Dc, IIII, JJJJ)

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

Subpart Dc applies to steam generating units and process heaters with heat input ratings between 10 MMBtu/hr and 100 MMBtu/hr constructed after June 9, 1989.

Fuel Gas Heaters EU883 through EU888 (15.25 MMBtu/hr each) burn natural gas exclusively. Natural gas-fired units are not subject to SO₂ or PM emission standards under Subpart Dc. MCC demonstrates compliance through monthly fuel consumption tracking and recordkeeping under Condition 6.2.1 pursuant to 40 CFR §60.48c(g).

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

Subpart IIII requires stationary emergency compression ignition engines to satisfy certified EPA nonroad emission standards.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Emergency house generators (EU865 through EU876) must meet Tier 2 standards (NMHC+NO_x ≤ 6.4 g/kW-hr, CO ≤ 3.5 g/kW-hr, PM ≤ 0.20 g/kW-hr). Emergency firewater pumps (EU877 through EU882) must satisfy Tier 3 fire pump standards (NMHC+NO_x ≤ 4.0 g/kW-hr, CO ≤ 3.5 g/kW-hr, PM ≤ 0.20 g/kW-hr). Non-emergency testing is capped at 100 hours per calendar year per engine, and fuel sulfur is restricted to 15 ppmw ultra-low sulfur diesel (ULSD).

MCC will install certified units. Condition 7.1.4 requires non-resettable hour meters, maintenance logs, fuel receipts, and restricts routine testing to between 9:00 AM and 4:00 PM.

40 CFR 60, Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Subpart JJJJ establishes emission limits for non-emergency spark ignition engines rating over 500 hp constructed after June 12, 2006 (NO_x ≤ 1.0 g/hp-hr, CO ≤ 2.0 g/hp-hr, VOC ≤ 0.7 g/hp-hr).

The 864 Caterpillar G3520K engines (EU001 through EU864) utilize SCR and Oxidation Catalysts to achieve BACT limits significantly more stringent than Subpart JJJJ (0.01 g/hp-hr NO_x, 0.027 g/hp-hr CO, 0.02 g/hp-hr VOC). Compliance is verified via initial performance testing, testing every 8,760 operating hours or 3 years (Condition 5.3.1), quarterly portable analyzer screenings (Condition 5.2.3), and continuous online gas chromatograph fuel monitoring (Condition 5.2.2) in conjunction with a “air fuel ratio controller”.

6.3 Federal NESHAP/MACT Standards (40 CFR 63, Subparts ZZZZ, DDDDD)

40 CFR 63, Subpart ZZZZ: NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE MACT)

This regulation has two applicability classifications, which are “major source” and “area source”. For the Point Pleasant Campus, the facility is a “major source” of HAPs and therefore the “major source” provisions of Subpart ZZZZ apply to the engines located at the campus.

Primary power engines (EU001 through EU864) must reduce CO emissions by 93% or more, or cap formaldehyde exhaust concentrations at 14.0 ppmvd at 15% O₂.

Emergency engines (EU865 through EU882) achieve compliance by satisfying Subpart IIII standards per 40 CFR §63.6590(c)(1).

Primary RICE utilizes oxidation catalysts designed for over 93% CO reduction and controlled formaldehyde levels of 4.3 ppmvd at 15% O₂. Condition 5.2.1 mandates continuous parameter monitoring (CPMS) tracking catalyst inlet temperatures (450°F to 1350°F) and daily pressure drop readings within ±2.0 inches H₂O.

40 CFR 63, Subpart DDDDD: NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (Boiler MACT)

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Subpart DDDDD only applies to sources that are classified as a “major source of HAPs”, while Point Pleasant is classified as “major source of HAPs.” Subpart DDDDD requires work practice standards (periodic tune-ups) for units rated over 10 MMBtu/hr in the gas 1 subcategory located at major HAP sources.

Fuel Gas Heaters EU883 through EU888 must perform initial tune-ups within 13 months of startup and annual tune-ups thereafter pursuant to Condition 6.1.1.g.ii and 40 CFR §63.7540(a)(10), submitting electronic reports via EPA CEDRI (EPA’s portal for reporting compliance data electronically).

7.0 BACT REVIEW

BACT Regulatory Framework and 5-Step Methodology

Under 45CSR14 Section 8.3 and 40 CFR § 51.166(j), any major stationary source undergoing major construction must apply Best Available Control Technology (BACT) for each regulated pollutant emitted in significant amounts. BACT is an emission limitation based on the maximum degree of reduction achievable, determined on a case-by-case basis considering energy, environmental, and economic impacts.

The DAQ evaluated BACT for the 864 primary power Caterpillar G3520K reciprocating internal combustion engines (RICE) using the U.S. EPA’s standard 5-Step Top-Down BACT methodology:

1. Step 1: Identify All Control Technologies — Compile all available process modifications, inherently lower-emitting technology, and add-on control systems.
2. Step 2: Eliminate Technically Infeasible Options — Evaluate engineering principles and commercial availability to eliminate unproven or infeasible technologies.
3. Step 3: Rank Remaining Technologies by Stringency — Order feasible control options by percentage reduction or output-based emission rate.
4. Step 4: Evaluate Economic, Energy, and Environmental Impacts — Perform site-specific cost-effectiveness (\$/ton) and adverse collateral impact evaluations for top-ranked options.
5. Step 5: Select BACT — Establish enforceable emission limits and operational parameters reflecting the top-performing, feasible control option.

7.1. Primary RICE (EU001-EU864) BACT Determination

7.1.2 Nitrogen Oxides (NO_x) BACT Determination

Step 1: Identify Control Options

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- Selective Catalytic Reduction (SCR) with Urea/DEF Injection
- Non-Selective Catalytic Reduction (NSCR) (*Rich-burn engines only*)
- Lean-Burn Air-Fuel Ratio Control (AFRC) with Pre-Combustion Chamber / Electronic Ignition
- Alternative Fuels / Water-Steam Injection

Step 2: Eliminate Infeasible Options

- NSCR: Technical infeasibility. The Caterpillar G3520K operates exclusively under lean-burn (>8% O₂ exhaust gas) conditions. NSCR requires rich-burn stoichiometric exhaust (<0.5% O₂) to reduce NO_x and is technically impossible on lean-burn platforms.

Step 3: Rank Remaining Technologies by Stringency

1. Lean-Burn AFRC + High-Efficiency SCR: 95%–98% reduction (0.01–0.05 g/bhp-hr)
2. Lean-Burn AFRC Alone: Engine-out baseline (0.50 g/bhp-hr)

Step 4: Impact Analysis

- Energy Impact: Minimal backpressure across the SCR catalyst bed (≤ 2.0 in. H₂O pressure drop).
- Environmental Impact: Unreacted ammonia slip (NH₃) controlled to ≤ 10 ppmvd at 15% O₂.

Step 5: Select NO_x BACT

Establishment of the proposed NO_x threshold at **0.01 g/bhp-hr** (0.08 lb/hr per unit, 3-hour average) reflects top-tier pollution control for large spark-ignition units nationwide. Achieving this stringent limit relies on pairing low engine-out emissions with advanced post-combustion control architecture:

- **Lean-Burn Architecture & Uncontrolled Baseline:** Each driver utilizes lean-burn combustion controlled by Caterpillar ADEM A6 electronics, restricting raw engine-out NO_x releases to a maximum of **0.50 g/bhp-hr**.
- **Active Feedforward Aftertreatment Controls:** Flue gas routes through high-efficiency Selective Catalytic Reduction (SCR) utilizing DEF reagent. The dosing system employs active feedforward controls coupled with downstream Smart NO_x sensors to modulate

urea injection during load swings, achieving **98% NO_x reduction** while restricting unreacted ammonia (NH₃) slip to ≤ 10 ppmvd at 15% O₂.

- **Empirical Field Demonstration (VoltaGrid SAT-1 Verification):** Technical defensibility of sub-1 ppmvd NO_x emission levels (0.01 g/bhp-hr) across large engine groups is verified by stack testing data from the VoltaGrid SAT-1 installation in Bexar County, Texas. Evaluation of 80 INNIO Jenbacher J620 spark-ignition units (3,310 kWe each) in microgrid service with SCR aftertreatment using reference methods (EPA Method 7E / CTM-030) confirmed steady-state exhaust NO_x concentrations below 1.0 ppmvd at 15% O₂ (< 0.01 g/bhp-hr).

To ensure the proper dosing rate of DEF with respect to compliance with the NO_x BACT limit, the permit will require conduct a 14-30 day long performance test to verify the DEF dosing algorithm for the SCR (Condition 5.3.1.b.) at 70%, 85%, and 100% loads for one engine of each of the power nodes.

7.1.2. Carbon Monoxide (CO) and VOC BACT Determination

Step 1: Identify Control Options

- Add-on Oxidation Catalyst (OxCat)
- Thermal Energy Recovery / Regenerative Thermal Oxidizers (RTO)
- Lean-Burn Combustion Optimization / Good Combustion Practices

Step 2: Eliminate Infeasible Options

- RTO: Technically infeasible due to extreme exhaust volumetric flow rates (>15,000 acfm per engine) and low VOC inlet concentrations causing thermal instability without continuous auxiliary fuel firing.

Step 3 & 4: Ranking and Impact Analysis

- Oxidation catalysts achieve ≥93% CO reduction, ≥80% non-methane/non-ethane VOC reduction, and ≥95% Formaldehyde (HCHO) destruction when operated within a catalyst temperature window of 450°F–1,350°F.

Step 5: Select CO and VOC BACT

- CO BACT Limit: 0.027 g/bhp-hr (0.21 lb/hr per engine, 3-hour average; ≥93% reduction).

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- VOC BACT Limit (non-HCHO): 0.02 g/bhp-hr (0.15 lb/hr per engine). Total VOC including HCHO: 0.23 lb/hr.
- Formaldehyde BACT Limit: 0.0095 g/bhp-hr (0.07 lb/hr per engine; <4.3 ppmvd at 15% O₂).
- Technology Basis: Integrated Oxidation Catalyst skid operating with exhaust gas temperatures $\geq 450^{\circ}\text{F}$. Field test data from VoltaGrid SAT-1 and similar Jenbacher/Caterpillar fleets confirm CO and HCHO destruction efficiencies exceeding 93% across oxidation catalyst beds.

7.1.3 Particulate Matter (PM/PM₁₀/PM_{2.5}), SO₂, and Sulfuric Acid Mist (SAM) BACT

Step 1 & 2: Control Evaluation

- Add-on PM Controls (DPF / Fabric Filters): Exhaust gas from natural gas combustion contains negligible filterable ash. Add-on particulate filters for gas-fired RICE are technically infeasible due to low ash loading failing to build a filter cake.
- Fuel Quality: Combusting gaseous fuel with minimal sulfur content inherently eliminates SO₂, SAM, and condensable sulfate PM formation.

Step 5: Select BACT Limits

- PM/PM₁₀/PM_{2.5} BACT Limit: 0.01 lb/hr per engine (PM₁₀ and PM_{2.5} include filterable + condensable fractions per EPA Method 201A/202); Opacity $\leq 10\%$.
- SO₂/SAM BACT Limit: 0.01 lb/hr SO₂ and 0.0023 lb/hr SAM per engine.
- Technology Basis: Exclusive combustion of pipeline-quality natural gas restricted to a maximum total sulfur content of ≤ 0.20 grains S/100 scf (3.4 ppmv), continuously verified via tariff sheets or laboratory sampling, coupled with good combustion engineering.

7.1.4 Greenhouse Gas (CO₂e) BACT Determination

Step 1: Identify Control Options

- Carbon Capture and Sequestration (CCS)
- High-Efficiency Engine Design / Lean-Burn Architecture
- Continuous Unburned Methane (CH₄) Slip Reduction (In-Cylinder Pressure Sensing / Misfire Detection)
- Methane Oxidation Catalyst

Step 2 & 4: Technical & Economic Evaluation of CCS & Methane

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Carbon Capture and Sequestration (CCS) Feasibility Evaluation:** Carbon capture and storage was assessed for the primary driver engine fleet. Due to low carbon dioxide concentrations in 4SLB natural gas exhaust streams (approximately 3% to 5% CO₂), capturing 11,000,000 tpy CO₂e across 864 individual discharge stacks would necessitate massive amine absorption contactors, heavy flue gas booster compression, and extensive pipeline transport networks. Consequently, add-on CCS is eliminated under Step 2 and Step 4 of the Top-Down BACT process based upon technical infeasibility and adverse economic impacts.
 - **Dilute Flue Gas CO₂ Partial Pressure:** Lean-burn spark-ignition engines operate with large quantities of excess combustion air to depress peak flame temperatures and minimize thermal NO_x generation. This operational requirement yields a highly dilute exhaust stream containing only 3% to 5% CO₂ by volume (compared to 12% to 15% for coal boilers or process heaters). The resulting low partial pressure drastically diminishes the thermodynamic driving force necessary for chemical absorption, requiring disproportionately large solvent absorber towers and an excessive reboiler steam duty to regenerate the amine reagent.
 - **Solvent Oxidation & Degradation:** The lean-burn combustion air-fuel ratio results in residual oxygen levels of 10% to 12% O₂ in the exhaust gas stream. High oxygen exposure induces rapid oxidative degradation of amine-based solvents (e.g., monoethanolamine), generating corrosive organic acids, heat-stable salts, and volatile organic decomposition products. This degradation accelerates equipment corrosion, elevates chemical solvent replacement expenses, and creates hazardous waste streams requiring specialized disposal.
 - **Engine Backpressure Limitations:** Reciprocating internal combustion engines exhibit extreme sensitivity to exhaust backpressure. Forcing large volumetric exhaust flows through dense packed absorption beds imposes elevated backpressure on engine manifolds, degrading brake specific fuel consumption, raising cylinder temperatures, increasing engine knock potential, and inducing mechanical stress. Installing auxiliary booster blowers to overcome this pressure drop imposes a severe parasitic electrical load that negates the net environmental benefits of carbon capture.
 - **Flue Gas Contaminants & Lubricating Oil Aerosols:** Engine flue gas contains unburned hydrocarbons (methane slip), trace NO_x species, and aerosolized lubricating oil carried over from cylinder wall lubrication. Oil mist and NO₂ react with amine solutions to form irreversible heat-stable salts, fouling active absorption sites, reducing CO₂ capture efficiency, and necessitating capital-intensive upstream gas conditioning equipment.
 - **Load Cycling & Multi-Stack Integration Constraints:** Chemical absorption systems require stable, continuous thermodynamic operating conditions. In an off-grid microgrid serving variable computing loads, primary engines cycle and modulate output dynamically, producing rapid thermal and flow fluctuations that

disrupt column hydraulic equilibrium and induce solvent flooding. Furthermore, manifolded low-pressure exhaust from 864 individual engine stacks into a centralized scrubbing unit creates complex backpressure balancing issues, thermal losses, and spatial layout conflicts.

In summary, low CO₂ partial pressure, solvent oxidation penalties, mechanical backpressure constraints, and operational load cycling render post-combustion CCS technically infeasible for large natural gas-fired 4SLB RICE fleets.

Methane oxidation catalysts were evaluated and determined to be technically infeasible for mitigating unburned methane (CH₄) slip from the Caterpillar G3520K driver fleet due to severe thermodynamic operational limits. Promoting effective catalytic oxidation of the stable C-H bonds in methane demands sustained catalyst bed inlet temperatures higher than 932°F (500°C). Under standard full-load operating setpoints, the Caterpillar G3520K primary engine discharge temperature reaches only about 750°F. Elevating flue gas temperatures to the required 932°F light-off threshold would necessitate supplemental fuel duct firing, increasing natural gas usage and generating secondary CO₂ releases that negate net greenhouse gas benefits. Additionally, combustion exhaust moisture actively competes with methane for active noble metal site adsorption at temperatures below 900°F, inducing rapid catalytic deactivation.

The combustion of natural gas inherently produces large volumes of water vapor. At the CAT 3520's cooler exhaust temperatures, water molecules actively compete with methane for adsorption on the catalyst's active sites. This leads to a rapid loss of catalyst activity and requires the system to run even hotter to boil off the hydroxyl species forming on the surface of the catalyst. It is viewed that methane oxidation catalysts are not technically feasible for controlling methane slip from lean-burn, natural gas-fired engines.

Step 5: Select GHG BACT

- Output-Based GHG Limit: 1,150 lb CO₂e/MWh gross electrical output (evaluated at the Power Node level on a 12-operating-month rolling average basis using 40 CFR Part 98 factors).
- Fleet Gross Heat Rate Cap: ≤9,800 Btu/kWh (HHV basis, 12-month rolling average across each 72-engine Power Node).
- Technology Basis: High-efficiency Caterpillar G3520K engines (46.0% electrical efficiency) equipped with the ADEM A6 control module, active In-Cylinder Pressure Sensing (ICPS), and misfire detection algorithms to suppress unburned methane slip.

Technical Basis for Power Node (72 Engines) Gross Heat Rate Cap (≤9,800 Btu/kWh, HHV)

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

To guarantee the technical defensibility and federal enforceability of the GHG BACT requirement while providing necessary operational flexibility for fluctuating computing loads, the DAQ structured the gross heat rate standard across each 72-engine Power Node fleet rather than imposing unit-specific thresholds. Mandatory single-engine limits would impede the facility's automated Energy Management System (EMS) from dynamically modulating or cycling individual drivers to operate active units at peak baseload efficiency setpoints. Given that high-efficiency design and optimized operation represent the only technically viable control strategy for greenhouse gas releases from 4SLB engines, applying the 9,800 Btu/kWh (HHV) gross heat rate cap at the Power Node level assures maximum site-wide thermal efficiency throughout real-world microgrid duty cycles.

To ensure the output-based BACT limit of **1,150 lb CO₂e/MWh** and the fleet gross heat rate limit of **9,800 Btu/kWh (HHV)** are federally enforceable and technically defensible, the DAQ conducted a detailed thermal efficiency evaluation across the operating envelope of the Caterpillar Model G3520K engines:

- **Baseline ISO Nominal Performance:** According to manufacturer specification sheet EM7209-08-001, the Caterpillar G3520K engine achieves a nominal full-load generator set heat rate of **7,749 Btu/ekW-hr** on a Lower Heating Value (LHV) basis under ISO 3046/1 conditions.
- **LHV to HHV Fuel Conversion:** Combusting pipeline-quality natural gas requires converting LHV heat rates to Higher Heating Value (HHV) metrics using the standard gas industry multiplier (HHV/LHV $\approx$ 1.108):

$$\text{Full-Load Baseline Heat Rate (HHV)} = 7,749 \text{ Btu/ekW-hr (LHV)} \times 1.108 = \mathbf{8,586 \text{ Btu/ekW-hr (HHV)}}$$

- **Operational Margin ($\approx$ 14.1% Compliance Buffer):** The delta between the baseline full-load rate (8,586 Btu/kWh, HHV) and the permitted fleet cap (9,800 Btu/kWh, HHV) represents an operational margin necessary to accommodate real-world microgrid duty cycles:
 1. *Ambient Air and Altitude Derates:* Site ambient temperatures reaching 95°F at 700 ft elevation reduce air charge density, increasing fuel consumption per kW generated.
 2. *Part-Load & Load-Following Dynamics:* High-performance data center computing loads (GPU clusters) fluctuate continuously. During part-load operation (50%–75% load), nominal engine fuel consumption increases from 5,716 Btu/bhp-hr up to 6,126 Btu/bhp-hr.

3. *Mechanical Wear & Aftertreatment Backpressure*: Engine degradation over 8,760 annual operating hours (spark plug erosion, valve recession) combined with exhaust backpressure across the SCR and Oxidation Catalyst beds (≤ 2.0 in. H₂O per bed) degrades thermal efficiency prior to major overhaul cycles.
- **Enforceability Mechanism**: Compliance with the 9,800 Btu/kWh (HHV) limit is verified on a 12-operating-month rolling average basis per Power Node using real-time SCADA fuel gas flow meters linked to the certified online Gas Chromatograph (Condition 5.2.1 & 5.2.2).

7.1.5 Startup, Shutdown (SUSD) and Commissioning Break-In BACT Work Practices

During startup/shutdown events and initial engine break-in, catalyst bed temperatures are below light-off thresholds ($<300^{\circ}\text{C}$ for SCR; $<450^{\circ}\text{F}$ for OxCat). Numerical BACT limits are replaced with enforceable work practice standards pursuant to 40 CFR § 51.166(b)(49):

- SUSD BACT Work Practices:
 - Duration Caps: Individual startups limited to ≤ 30 minutes; shutdowns limited to ≤ 15 minutes. Annual cumulative SUSD capped at 35.0 hours/year per engine.
 - Node Stagger Interlock: Operational EMS interlocks restrict startup events such that no more than one Power Node (72 engines) may operate in SUSD mode during any single calendar hour.
 - Automated Aftertreatment Interlock: Automated DEF injection initiates immediately upon exhaust temperature reaching 300°C .
- Initial Commissioning Break-In BACT:
 - Duration & Scope: One-time allowance of ≤ 50.0 operating hours per engine without catalysts installed to allow mechanical seating of piston rings and thermal stabilization.
 - Emissions Accounting: Mass emissions accrued during break-in are calculated using uncontrolled engine-out factors (0.50 g/bhp-hr NO_x, 1.35 g/bhp-hr CO) and tracked against the facility's 12-month rolling PTE caps.

7. Summary of BACT Emission Limitations

Table 6 - Primary RICE BACT Summary			
Regulated Pollutant	BACT Emission Limit	Averaging Period	Basis / Control Technology
NO _x	0.01 g/bhp-hr (0.08 lb/hr)	3-Hour Average	Lean-Burn AFRC + High-Efficiency SCR (≤10 ppm NH3 slip)
CO	0.027 g/bhp-hr (0.21 lb/hr)	3-Hour Average	Oxidation Catalyst (≥93% reduction)
VOC (excl. HCHO)	0.02 g/bhp-hr (0.15 lb/hr)	3-Hour Average	Lean-Burn AFRC + Oxidation Catalyst
PM/PM ₁₀ /PM _{2.5}	0.01 lb/hr (≤10% opacity)	6-Hour Average	Pipeline Natural Gas + Good Combustion Practices
SO ₂ /SAM	0.01 lb/hr SO ₂ / 0.0023 lb/hr SAM	3-Hour Average	Pipeline Natural Gas (≤0.20 grains S/100 scf)
Greenhouse Gases (CO ₂ e)	1,150 lb CO ₂ e/MWh gross	12-Month Rolling	Heat Rate ≤9,800 Btu/kWh + Misfire Detection

Highlights

- Top-of-the-Line NO_x Limit:** The 0.01 g/bhp-hr NO_x limit represents top-tier control nationwide for large spark-ignition engines, achieved by combining a low engine-out rate (0.50 g/bhp-hr) with an aggressive 98% post-combustion SCR dosing algorithm.

Fact Sheet R14-0042
 Monarch Cloud Campus LLC
 Point Pleasant Campus

- **CO/VOC/GHG BACT:** The selected model engine relies on the AFR controller to maintain good combustion of the fuel, which results in maintained engine performance/overall efficiency. The permit is requiring the fuel gas (incoming natural gas) to be analyzed on a continuous basis so that the representative heat value can be input into the control four (4) times a year during scheduled maintenance outage.
- **Greenhouse Gas Work Practice BACT:** BACT for CO₂e combines a fleet gross heat rate cap ($\leq 9,800$ Btu/kWh, HHV) with automated electronic air-fuel ratio control and misfire detection systems to suppress unburned methane (CH₄) slip.
- **Startup/Shutdown (SUSD) BACT:** Individual events are capped at 30 minutes, with annual SUSD capped at 35 hours/year per engine. Automated management restricts SUSD operation to no more than one Power Node (72 engines) per hour across the facility.

Establishment of the proposed NO_x threshold at **0.01 g/bhp-hr** (0.08 lb/hr per unit, 3-hour average) reflects top-tier pollution control for large spark-ignition units nationwide. Achieving this stringent limit relies on pairing low engine-out emissions with advanced post-combustion control architecture:

- **Lean-Burn Architecture & Uncontrolled Baseline:** Each driver utilizes lean-burn combustion controlled by Caterpillar ADEM A6 electronics, restricting raw engine-out NO_x releases to a maximum of **0.50 g/bhp-hr**.
- **Active Feedforward Aftertreatment Controls:** Flue gas routes through high-efficiency Selective Catalytic Reduction (SCR) utilizing DEF reagent. The dosing system employs active feedforward controls coupled with downstream Smart NO_x sensors to modulate urea injection during load swings, achieving **98% NO_x reduction** while restricting unreacted ammonia (NH₃) slip to ≤ 10 ppmvd at 15% O₂.
- **Empirical Field Demonstration (VoltaGrid SAT-1 Verification):** Technical defensibility of sub-1 ppmvd NO_x emission levels (0.01 g/bhp-hr) across large engine groups is verified by stack testing data from the VoltaGrid SAT-1 installation in Bexar County, Texas. Evaluation of 80 INNIO Jenbacher J620 spark-ignition units (3,310 kW each) in microgrid service with SCR aftertreatment using reference methods (EPA Method 7E / CTM-030) confirmed steady-state exhaust NO_x concentrations below 1.0 ppmvd at 15% O₂ (< 0.01 g/bhp-hr).

Regulatory Consistency of Primary Engine Startup and Shutdown (SUSD) Provisions with Federal EPA PSD Policy

1. EPA PSD SSM Permitting Policy Principles

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Pursuant to established U.S. EPA policy regarding Startup, Shutdown, and Malfunction (SSM) under Prevention of Significant Deterioration (PSD) permitting—including the 1999 Herman Memorandum (*State Implementation Plans: Policy Regarding Excess Emissions During Malfunctions, Startup, and Shutdown*), subsequent 2011/2015 guidance, and Environmental Appeals Board (EAB) administrative precedent—Best Available Control Technology (BACT) emission limitations must apply on a continuous basis, including during SUSD operating windows.

Federal guidance acknowledges that post-combustion control systems, such as Selective Catalytic Reduction (SCR) and Oxidation Catalysts, cannot achieve normal steady-state control efficiencies during initial thermal light-off or shutdown ramp-down. When an applicant demonstrates that primary BACT standards (e.g., 0.01 g/bhp-hr NO_x and 0.027 g/bhp-hr CO) are technically infeasible during startup or shutdown due to physical constraints, permitting authorities may establish secondary BACT limits or work practice standards applicable to SUSD periods.

To satisfy EPA PSD guidance, secondary SUSD BACT requirements must fulfill four core criteria:

- Demonstrated Technical Infeasibility of Main BACT: Technical justification demonstrating why primary add-on controls cannot operate during SUSD.
- Minimized Event Duration and Frequency: Restricting SUSD operating intervals to the minimum practical duration and capping annual operating hours.
- Enforceable Work Practice Standards: Mandatory automated operational procedures designed to minimize uncontrolled emissions during transient modes.
- Protection of NAAQS and PSD Increments: Demonstrating that short-term and annual emissions during SUSD will not cause or contribute to a violation of any ambient standard.

2. Technical Infeasibility of Normal Numerical BACT Limits During SUSD

During cold engine startup and mechanical ramp-up of the Caterpillar Model G3520K drivers, exhaust gas temperatures routing to the Clean Emission Module (CEM) remain below required catalytic light-off thresholds (< 300°C for SCR and < 450°F for Oxidation Catalyst).

Dosing aqueous urea (DEF) into the SCR reactor prior to reaching 300°C yields incomplete chemical decomposition, causing rapid formation of solid cyanuric acid and ammonium bisulfate deposits. These deposits foul catalyst pore structures, induce high exhaust backpressure, and deactivate active catalytic sites. Forcing urea injection prior to achieving 300°C permanently degrades long-term steady-state catalyst efficiency. Consequently, numerical BACT limits reflecting 98% post-combustion control are technically infeasible during startup and shutdown,

justifying secondary work practice standards pursuant to 40 CFR § 51.166(j) and 45 CSR § 14-8.3.

3. Justification of the 35.0-Hour Annual SUSD Cap and Duration Limits

The draft permit establishes strict temporal limits on primary engine SUSD operations (Condition 5.1.9) aligned with federal PSD permitting policy:

- Short Event Durations (30-Minute Startup / 15-Minute Shutdown Caps): Individual engine startups are restricted to a maximum of 30.0 minutes, and shutdowns are limited to 15.0 minutes. The 30-minute startup threshold matches the maximum duration specified in Table 2a of 40 CFR 63 Subpart ZZZZ (RICE MACT) for major source lean-burn engines.
- Minimally Contributing Annual Hour Cap (35.0 Hours/Year): Cumulative SUSD operation per driver is capped at 35.0 hours per rolling 12-month period (reflecting up to 70 annual SUSD cycles per unit). This 35.0-hour limit represents 0.40% of total potential annual operating hours ($35.0 / 8,760 \text{ hours} = 0.00399$).
- Minimal Contribution to Annual Potential Emissions: Because SUSD hours account for less than one-half of one percent of annual runtime, mass emissions generated during uncontrolled SUSD mode comprise a minor fraction of the facility's annual Potential to Emit (PTE):
 - NO_x SUSD PTE Contribution: 58.55 tpy SUSD vs. 350.47 tpy total engine fleet PTE (16.7% of overall NO_x PTE across 864 units).
 - CO SUSD PTE Contribution: 158.09 tpy SUSD vs. 946.26 tpy total engine fleet PTE (16.7% of overall CO PTE).
 - VOC SUSD PTE Contribution: 33.96 tpy SUSD vs. 895.11 tpy total engine fleet PTE (3.8% of overall VOC PTE).

Restricting SUSD operation to 35.0 hours annually ensures that startup releases remain a minor, bounded portion of total facility mass emission caps, satisfying EPA principles that secondary BACT standards must prevent SUSD periods from dominating annual site emissions.

4. Short-Term Air Quality Protection & Enforceable Work Practice BACT Suite

To ensure short-term SUSD releases do not endanger national ambient air quality standards, the permit pairs the 35-hour annual cap with automated operational interlocks and work practice BACT standards:

- Automated Node Staggering Interlock (Condition 5.1.9.c): Automated EMS programming restricts SUSD operation such that no more than one (1) Power Node (up to 72 primary engines) can operate in SUSD mode during any single calendar hour.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- NAAQS Modeling Integration: The 1-hour NO₂ AERMOD dispersion modeling evaluation explicitly modeled this worst-case SUSD scenario—combining 72 engines operating at 1.975 lb/hr NO_x (30 minutes uncontrolled + 30 minutes controlled) alongside 792 engines operating under steady-state controlled limits (0.08 lb/hr). The resulting peak modeled concentration of 112.21 µg/m³ (including ambient background) demonstrates compliance with the 188 µg/m³ 1-hour NO₂ NAAQS (59.69% of the standard).
- Secondary Work Practice BACT Suite (Condition 5.1.9.e):
 - *Idle & Transition Minimization*: Automated EMS controls manage startup sequences to advance mechanical loading and thermal light-off in the minimum time necessary.
 - *Automated Aftertreatment Interlock*: SCR dosing controls automatically initiate DEF injection immediately upon exhaust temperature reaching 300°C, ensuring immediate post-combustion control upon thermal light-off.
 - *Active Lean-Burn Control*: Closed-loop electronic air-fuel ratio controllers remain engaged during warm-up and ramp-down cycles to suppress incomplete combustion and unburned hydrocarbon slip.

5. Enforceability and Compliance Tracking

Compliance with SUSD hour limits, event duration caps, and mass emission accounting is verified continuously under Condition 5.2.1 and Condition 5.4.5:

- Automated CPMS Logging: The facility's Continuous Parameter Monitoring System (CPMS) logs exact start time, end time, elapsed duration, and engine load for every SUSD event across all 864 primary drivers.
- Mass Emissions Accounting: All mass emissions generated during SUSD mode are calculated using uncontrolled engine-out factors (0.50 g/hp-hr NO_x, 1.35 g/hp-hr CO, 0.29 g/hp-hr VOC, and 0.19 g/hp-hr HCHO) and tracked in monthly and 12-month rolling total PTE compliance logs.

7.2. BACT DETERMINATION FOR AUXILIARY AND FUGITIVE SOURCES

7.2.1 Fuel Gas Heaters (EU883 through EU888)

Pre-heating is supplied by six (6) natural gas-fired fuel gas heaters (EU883–EU888), with each unit rated at a maximum design heat input of 15.25 MMBtu/hr, to prevent hydrate formation and Joule-Thomson effect condensation across the three on-site pressure-reduction stations.

Nitrogen Oxides (NO_x) BACT Analysis

- **Step 1 — Identify Control Technologies:** Selective Catalytic Reduction (SCR), Low-NO_x Burners (LNB), Ultra Low-NO_x Burners (ULNB), and Good Combustion Practices (GCP).
- **Step 2 — Eliminate Technically Infeasible Options:** Post-combustion SCR is technically infeasible for small indirect fuel heaters rated below 20 MMBtu/hr. Lower flue gas temperatures, variable operating loads, and minimal mass emission rates result in inadequate catalyst thermal light-off and ammonia slip. Additionally, economic evaluation yields a cost-effectiveness exceeding \$25,000 per ton of NO_x removed.
- **Step 3/4 — Ranking and Impact Evaluation:** LNB systems manage air-fuel mixing to decrease peak combustion temperatures, attaining up to 60% NO_x control without introducing adverse energy or environmental impacts.
- **Step 5 — Select BACT Standard:** Low-NO_x Burners (LNB) in combination with Good Combustion Practices.
 - **BACT Emission Limits (Permit Conditions 6.1.1.a & 6.1.1.i):** NO_x ≤ 0.10 lb/MMBtu (1.50 lb/hr and 6.55 tpy per heater on a 12-month rolling total basis).

Carbon Monoxide (CO) and Volatile Organic Compounds (VOC) BACT Analysis

- **Step 1/2 — Technical Feasibility:** Add-on Oxidation Catalysts and Thermal Oxidizers were reviewed. These control systems are technically unsuited and economically prohibitive for small fuel gas heaters given the low exhaust concentrations, high equipment costs, and fuel penalties necessary to maintain required operating temperatures.
- **Step 5 — Select BACT Standard:** Good Combustion Practices, optimized Burner Management System (BMS) controls, and continuous firing of pipeline-quality natural gas.
 - **BACT Emission Limits (Permit Conditions 6.1.1.b & 6.1.1.d):**
 - CO ≤ 0.084 lb/MMBtu (1.26 lb/hr and 5.50 tpy per heater).
 - VOC ≤ 0.005 lb/MMBtu (0.08 lb/hr and 0.36 tpy per heater).

Particulate Matter (PM/PM₁₀/PM_{2.5}), SO₂, and Sulfuric Acid Mist (SAM) BACT Analysis

- **Step 1/2 — Technical Feasibility:** Add-on particulate equipment (baghouses, ESPs, wet scrubbers) is technically infeasible due to the negligible fuel sulfur and ash loading in natural gas exhaust.
- **Step 5 — Select BACT Standard:** Exclusive firing of pipeline-quality natural gas and implementation of Good Combustion Practices.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **BACT Emission Limits (Permit Conditions 6.1.1.c & 6.1.1.i.ii):**
 - $PM/PM_{10}/PM_{2.5} \leq 0.005$ lb/MMBtu (0.12 lb/hr and 0.50 tpy per heater, including filterable and condensable fractions).
 - Visible emissions limited to $\leq 10\%$ opacity on a 6-minute block average basis pursuant to 45 CSR §2-3.1.
 - Fuel sulfur content capped at ≤ 0.20 grains S/100 scf on a 12-month rolling average basis, with a short-term limit of ≤ 0.50 grains S/100 scf.

Greenhouse Gas (CO₂e) BACT Analysis

- **Step 1/2 — Technical Feasibility:** Carbon Capture and Sequestration (CCS) was ruled out as technically and economically infeasible because of the low CO₂ concentrations (< 8%) in diluted flue gas streams and small unit capacities.
- **Step 5 — Select BACT Standard:** Automated BMS thermal modulation limiting downstream gas temperatures to $\leq 10^{\circ}\text{F}$ above hydrate formation levels (maximum outlet temperature of $\leq 70^{\circ}\text{F}$), efficient burner engineering, and equipment insulation.
 - **BACT Emission Limits (Permit Conditions 6.1.1.f & 6.1.1.h):** CO₂e $\leq 7,816$ tpy per heater.

The BACT emission caps of **0.10 lb/MMBtu NO_x** (utilizing LNB) and **0.084 lb/MMBtu CO** (utilizing Good Combustion Practices) assigned to the six 15.25 MMBtu/hr fuel gas heaters (EU883 through EU888) at the Monarch Cloud Campus Point Pleasant facility reflect technically sound and achievable control levels. Establishing lower mass limits or mandating add-on aftertreatment technology is technically infeasible due to physical firetube flame dimensions, wide operational turndown needs, and rapid load swings.

Equipment Description and Operational Duty

Six natural gas-fired fuel gas heaters serve three fuel gas pressure letdown stations, elevating pipeline gas temperature from 1,200–1,400 psig down to <150 psig to counteract Joule-Thomson cooling effects, eliminate hydrocarbon condensation, and satisfy minimum fuel thermal requirements for the 864 primary power RICEs. To provide complete redundant capacity, these units do not fire at continuous high-load baseload setpoints; rather, they modulate dynamically to compensate for changing meteorological conditions and fluctuating data center electrical loads.

Technical Infeasibility of Ultra Low-NO_x Burners (ULNB) & Add-On Aftertreatment

- **Flame Geometry and Firetube Impingement:** Ultra Low-NO_x Burners (ULNB) employ heavy fuel/air staging or internal flue gas recirculation (FGR) to depress peak flame temperatures. Inside compact indirect bath firetube geometries, this expands the flame boundary, leading to direct flame impingement against internal firetube surfaces.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Such impingement produces severe thermal stresses, flame quenching, soot and unburned hydrocarbon generation, carbon monoxide spikes, and structural firetube failure.

- **Turndown Capability and Thermal Cycling:** the fuel gas conditioning for the primary RICES mandates wide operational flexibility (turndown ratios reaching 10:1) to match fluctuating gas volume demands. ULNB designs are generally restricted to 3:1 or 4:1 turndown ratios. Operating ULNB systems under low-fire setpoints destabilizes the combustion zone, causes air-to-fuel ratio excursions, causes flame blowout, and yields heavy CO and hydrocarbon emissions.
- **Technical Infeasibility of Add-On SCR:** Post-combustion Selective Catalytic Reduction (SCR) is technically infeasible for small indirect fuel heaters (15.25 MMBtu/hr). Rapid load fluctuations lower exhaust gas temperatures below the required 450°F to 650°F catalyst window, causing catalyst deactivation, ammonium bisulfate fouling, and unreacted ammonia slip. Additionally, installing SCR on small indirect heaters provides negligible mass emission reductions at extreme cost-effectiveness thresholds (\$/ton).
- **Infeasibility of Oxidation Catalyst for CO Control:** Add-on Oxidation Catalysts are not cost-effective or commercially demonstrated for small gas-fired process heaters under 50 MMBtu/hr. Driving CO lower via extreme excess air burner tuning increases thermal NO_x formation and risks flame detachment.

Multi-State Regulatory Precedents & Agency Determinations

State air permitting agencies consistently accept technical infeasibility demonstrations regarding narrow firetubes and variable heating duties, establishing BACT limits in the 0.036–0.10 lb NO_x/MMBtu and 0.037–0.084 lb CO/MMBtu range:

Table 7 - Other Agencies BACT for Flue Gas Heaters		
Permitting Authority	Industry Precedent & Technical Basis	Adopted BACT / BAT Standard
Texas Commission on Environmental Quality (TCEQ)	Recognizes that small line heaters (<20 MMBtu/hr) require high turndown capabilities. Accepts determinations that ULNB/FGR cause firetube impingement and low-fire instability.	Tier 1 BACT: 0.036 – 0.100 lb NO _x /MMBtu using LNB and Good Combustion Design.
Pennsylvania DEP (GP-5 & GP-5A)	Evaluated industry performance metrics on bath heaters and recognized that sub-15 ppm or sub-9 ppm NO _x thresholds induce flame instability and elevated CO during low-load operations.	BAT Standard: 30 ppmvd (~0.036–0.10 lb/MMBtu) or Good Combustion Practices for small indirect heaters.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Table 7 - Other Agencies BACT for Flue Gas Heaters		
Permitting Authority	Industry Precedent & Technical Basis	Adopted BACT / BAT Standard
Utah Division of Air Quality (UT DAQ)	BACT evaluations establish that add-on SCR and forced-draft ULNBs are technically infeasible for indirect heaters given small firetube volumes and rapid thermal cycling.	BACT Standard: Low-NO _x Burners firing pipeline natural gas with Good Combustion Practices.
Oklahoma DEQ (ODEQ)	Eliminates ULNB systems under Step 2 of Top-Down BACT reviews for midstream gas heaters due to dynamic heat duties and restricted firetube geometry.	BACT Standard: LNB with Good Combustion Practices (0.036–0.10 lb NO _x /MMBtu; 0.084 lb CO/MMBtu).

The proposed emission thresholds of 0.10 lb NO_x/MMBtu and 0.084 lb CO/MMBtu for EU883 through EU888 effectively balance maximum pollution reduction with required operational reliability. Requiring LNB along with Good Combustion Practices avoids firetube flame impingement, maintains required turndown capacity during low-load microgrid operation, and aligns with established state and federal PSD BACT determinations.

The applicant intends to operate these heaters as necessary to prevent hydrates from forming in the fuel gas supply lines to the primary RICEs. The rule of thumb (standard practice) is to maintain a gas temperature of 10°F above the dew point temperature of the incoming natural gas. The primary RICEs would operate with better performance with the cooler temperature fuel. Condition 6.1.1.h. limits the operations of the fuel gas heaters to maintain the fuel gas temperature to 10°F above the dew point temperature with a maximum gas temperature of 70°F.

7.2.2 Emergency House Generators (EU865 through EU876)

Facility house electrical power is supported by twelve (12) 1,000 kW (1,412 hp) Generac SD1000 emergency generator sets driven by Perkins 30.6-liter compression-ignition diesel engines.

Emergency Engine BACT Selection Decision Tree

Option 1: Add-On Controls (SCR / DPF) — [ELIMINATED]

- Thermal Light-Off Failure: Flue gas temperatures remain below catalyst activation thresholds (<300°C) during short testing runs.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- Intermittent / Quick-Start Operation: Emergency duty cycle (<100 hrs/yr) prevents stable catalyst operation.

Option 2: Selected BACT Suite — [40 CFR 60 SUBPART IIII COMPLIANT]

- EPA Tier 2 Certified Engine: Certified nonroad compression-ignition emergency driver.
- ULSD Fuel Specification: Fired exclusively on Ultra-Low Sulfur Diesel (≤ 15 ppm S).
- 100 hr/yr Maintenance Cap: Non-emergency readiness testing and maintenance restricted to 100 hours annually per unit.

Restricted Operating Window: Routine testing restricted exclusively to between 9:00 AM and 4:00 PM local time.

NO_x, CO, VOC, and PM BACT Determination

- **Add-On Control Evaluation:** Secondary add-on aftertreatment systems (SCR, Oxidation Catalysts, and Diesel Particulate Filters) were evaluated and eliminated as technically infeasible. Emergency engine operations require immediate starting and full load output within 10 seconds of a power disruption. Periodic readiness testing occurs during short intervals (30–60 minutes), keeping flue gas temperatures below catalyst activation thresholds ($> 300^{\circ}\text{C}$ for SCR and $> 450^{\circ}\text{F}$ for OxCat/DPF). Operating catalysts below effective thermal ranges results in severe catalyst fouling and particulate blinding.
- **Selected BACT and Work Practice Standards (Permit Conditions 7.1.1 & 7.1.4):**
 1. **EPA Tier 2 Certification:** Installation of EPA Tier 2 certified emergency compression-ignition engine units conforming to 40 CFR §60.4202(a)(2).
 2. **Operating Hour Limit:** Non-emergency maintenance and readiness testing operations capped at 100 hours per calendar year per unit.
 3. **Testing Time Window Restrictions:** Routine readiness testing restricted to 9:00 AM–4:00 PM local time, with interlocks preventing simultaneous testing across multiple emergency units within a single data center building.
 4. **Ultra-Low Sulfur Diesel Fuel:** Exclusive use of Ultra-Low Sulfur Diesel (ULSD) fuel (≤ 15 ppmw sulfur).
 5. **Maintenance Tune-Ups:** Required engine maintenance tune-ups performed at 5-year intervals.

Table 8 - Emergency Generator BACT Summary		
Regulated Pollutant	Subpart IIII Tier 2 Standard	BACT Mass Emission Limit (Table 7.1.1.c)
NMHC + NO _x	6.4 g/kW-hr (4.8 g/hp-hr)	NO _x ≤ 14.11 lb/hr per engine
CO	3.5 g/kW-hr (2.6 g/hp-hr)	CO ≤ 8.13 lb/hr per engine
PM/PM ₁₀ /PM _{2.5}	0.20 g/kW-hr (0.15 g/hp-hr)	PM ≤ 0.47 lb/hr per engine
VOC	Streamlined under NMHC cap	VOC ≤ 0.74 lb/hr per engine

7.2.3 Firewater Pump Engines (EU877 through EU882)

Fire protection system water supply is provided by six (6) 400 hp (298 kW) Clarke Model JW6H-UFAD80 emergency firewater pump packages driven by John Deere Model 6090HFC47B 9.0-liter diesel engines.

NO_x, CO, VOC, and PM BACT Determination

- **Add-On Control Evaluation:** Add-on SCR and DPF equipment were rejected for emergency firewater pumps due to potential safety interlock failures and insufficient thermal light-off during emergency operation.
- **Selected BACT and Work Practice Standards (Permit Conditions 7.1.2 & 7.1.4):**
 1. **EPA Tier 3 Fire Pump Certification:** Purchase of certified emergency fire pump engines satisfying 40 CFR §60.4205(c) and Subpart IIII Table 4 limits.
 2. **Operating Hour Limit:** Non-emergency testing operations limited to 100 hours per calendar year per unit.
 3. **Fuel and Maintenance Practices:** Exclusive use of ULSD fuel (≤ 15 ppmw sulfur) and required 5-year maintenance tune-ups.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Table 9 - Firewater Pump BACT Summary		
Regulated Pollutant	Subpart IIII Table 4 Tier 3 Standard	Corrected BACT Mass Emission Limit (Table 7.1.2.b)
NMHC + NO _x	4.0 g/kW-hr (3.0 g/hp-hr)	NO _x ≤ 2.43 lb/hr per engine
CO	3.5 g/kW-hr (2.6 g/hp-hr)	CO ≤ 2.30 lb/hr per engine
PM/PM10/PM2.5	0.20 g/kW-hr (0.15 g/hp-hr)	PM ≤ 0.13 lb/hr per engine
VOC	Streamlined under NMHC cap	VOC ≤ 0.20 lb/hr per engine

7.2.4 Fugitive Piping Component Leaks

Ancillary natural gas fuel piping components (including valves, flanges, pump seals, pressure relief valves, and open-ended lines) supplying the 864 primary engines and 6 fuel heaters emit fugitive Volatile Organic Compounds (VOC) and Greenhouse Gases (CH₄ / CO₂e).

Top-Down BACT Assessment

- **Step 1 — Identify Control Options:** Audio/Visual/Olfactory (AVO) routine inspections, Low-Leaking Valve packing technologies, EPA Method 21 Leak Detection and Repair (LDAR), and Optical Gas Imaging (OGI) LDAR programs.
- **Step 2/3 — Technical Feasibility and Ranking:** OGI and EPA Method 21 instrumental monitoring programs are technically feasible and achieve between 90% and 97% reduction in fugitive component emissions.
- **Step 5 — Select BACT Standard (Permit Conditions 4.1.2 through 4.1.8):** Implementation of an enhanced Leak Detection and Repair (LDAR) program combining instrumental surveys with Good Operating Practices.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Monitoring Protocol:** An initial leak survey must be performed within 6 months of startup for each node, followed by recurring annual monitoring surveys using OGI or EPA Method 21 (applying a 500 ppmv leak definition threshold).
- **Repair Deadlines:** Identified component leaks must be repaired within 30 calendar days of detection, with an initial repair attempt completed within 5 days. Delay of repair is permitted only for documented technical infeasibility or scheduled plant shutdowns.
- **Monitoring Plan Requirement:** Preparation and execution of a site-specific Monitoring Plan outlining facility maps, monitoring routes, daily instrument calibration protocols, and technician training requirements.

7.2.5 Fugitive Roadway Dust

Vehicle traffic servicing data center operations and material deliveries across on-site roadways generates fugitive particulate matter emissions (PM/PM₁₀/PM_{2.5}).

Top-Down BACT Assessment

- **Step 1/2 — Control Evaluation:** Vehicle speed controls, application of chemical dust palliatives, routine watering/sweeping, and roadway paving were evaluated.
- **Step 5 — Select BACT Standard (Permit Condition 4.1.1):**
 1. **Roadway Paving Standard:** All internal roadways utilized for daily data center and power node operations must be paved.
 2. **Unpaved Road Base Requirements:** Any active unpaved haul routes must be maintained with a stone base comprising at least 4 inches of crusher-run gravel.
 3. **Fugitive Dust Mitigation Plan:** Continuous application of water or chemical dust suppressants on unpaved roadway segments to prevent visible dust emissions beyond the property boundary.
 4. **Monthly Inspection Protocols (Permit Condition 4.2.2):** Monthly visual inspections covering all facility haul roads and parking lots, with corrective maintenance implemented within 10 days of identifying any surface deterioration.

8.0 SUMMARY OF AIR QUALITY ANALYSIS

An air dispersion modeling analysis was performed in accordance with 45 CSR 14 and 40 CFR Part 51, Appendix W, using AERMOD (version 24142) to evaluate criteria pollutant impacts for the proposed Monarch Cloud Campus (MCC) Point Pleasant facility.

8.1 Significant Impact Level (SIL) Analysis

Project-only emissions were evaluated against U.S. EPA Class II Significant Impact Levels (SIL). The proposed project resulted in predicted offsite impacts exceeding the SIL thresholds for the following pollutants and averaging periods, requiring a full cumulative modeling analysis:

- **Annual NO₂:** Peak impact of 4.88 µg/m³ (SIL: 1.0 µg/m³; Radius of Impact: 2.36 km).
- **1-Hour NO₂:** Peak impact of 59.25 µg/m³ (SIL: 7.5 µg/m³; Radius of Impact: 51.40 km).
- **Annual PM_{2.5} (NAAQS & PSD):** Peak impact of 0.24 µg/m³ (SIL: 0.13 µg/m³; Radius of Impact: 1.32–1.35 km).
- **24-Hour PM_{2.5} (PSD):** Peak impact of 1.45 µg/m³ (SIL: 1.2 µg/m³; Radius of Impact: 0.73 km).

Predicted impacts for CO, SO₂, and PM₁₀ across all averaging periods were below their respective Class II SIL thresholds; therefore, no cumulative modeling was required for these pollutants.

8.2. Secondary PM_{2.5} and Ozone Impacts (MERPs Analysis)

Secondary formation of Ozone and PM_{2.5} from project precursor emissions (NO_x, VOC, and SO₂) was evaluated using EPA's Modeled Emission Rates for Precursors (MERPs) guidance based on the representative Doddridge, WV hypothetical source (~128 km northeast). Estimated secondary air quality impacts are:

- **8-Hour Ozone:** 0.2301 ppb
- **Annual PM_{2.5}:** 0.000452 µg/m³
- **24-Hour PM_{2.5}:** 0.00114 µg/m³

8.3 National Ambient Air Quality Standards (NAAQS) Evaluation

Cumulative impact modeling incorporating nearby inventory sources and representative ambient background concentrations demonstrated compliance with all applicable NAAQS:

Table 10 - NAAQS Summary

Pollutant	Averaging Period	Modeled Impact (µg/m³)	Secondary Impact (µg/m³)	Background (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Percent of NAAQS
NO ₂	Annual	36.48	—	Included	36.48	100	36.48%
NO ₂	1-Hour (Normal)	108.45	—	Included	108.45	188	57.69%
NO ₂	1-Hour (SSM)	112.21	—	Included	112.21	188	59.69%
PM _{2.5}	Annual	0.57	0.000452	7.40	7.97	9.0	88.56%

8.3. Class II PSD Increment Consumption

Cumulative modeling of increment-consuming sources verified that maximum emissions from the project and surrounding industrial sources will not exceed Class II PSD increment thresholds:

Table 11 - Class II PSD Increment Summary

Pollutant	Averaging Period	Modeled Impact (µg/m³)	Secondary Impact (µg/m³)	Total Impact (µg/m³)	PSD Increment (µg/m³)	Degree of Increment Consumed
NO ₂	Annual	4.95	—	4.95	25	19.80%
PM _{2.5}	24-Hour	1.32	0.00114	1.32	9	14.67%
PM _{2.5}	Annual	0.24	0.000452	0.24	4	6.00%

8.4. Class I Area Impact Analysis

The nearest designated Class I areas are the Otter Creek Wilderness Area (~208 km northeast) and Dolly Sods Wilderness Area.

- **Class I Increment Screening:** Modeled concentrations along a 50-km ring receptor distance were all well below U.S. EPA Class I SIL thresholds (e.g., Annual NO₂

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

maximum of 0.0244 $\mu\text{g}/\text{m}^3$ vs. SIL 0.1 $\mu\text{g}/\text{m}^3$; 24-hr $\text{PM}_{2.5}$ maximum of 0.0527 $\mu\text{g}/\text{m}^3$ vs. SIL 0.27 $\mu\text{g}/\text{m}^3$). No adverse impact on Class I PSD increments will occur.

- **Air Quality Related Values (AQRV):** Based on FLAG (2010) guidance, total combined emissions of $Q = 489.94$ tpy ($\text{SO}_2 + \text{NO}_x + \text{PM}_{10} + \text{H}_2\text{SO}_4$) evaluated against distance $D = 208.5$ km yields a Q/D value of 2.35. Because $Q/D < 10$, project impacts on visibility and deposition in Class I areas are negligible.

8.5 Additional Impacts Assessment

- **Class II Visibility:** Visual plume impacts were evaluated for Tu-Endie-Wei State Park (~9 km south-southwest). A VISCREEN Level 2 analysis using site-specific meteorological conditions (2.0 m/s wind speed, Stability Class 6) yielded a maximum plume perceptibility $\Delta E = 1.679$ (threshold: 2.0) and green contrast $C_p = -0.006$ (threshold: ± 0.05), confirming no perceptible visual plume impacts inside the park.
- **Soils and Vegetation:** Maximum predicted ground-level concentrations are well below secondary NAAQS and screening thresholds established to protect public welfare, vegetation, and soil health.
- **Growth Impacts:** Industrial, commercial, and residential growth associated with the project will be minimal, as workforce requirements will predominantly be fulfilled by the local labor market.

Note: A formal modeling review memo is attached at the end of the preliminary determination.

ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides information on those regulated pollutants that are not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM_{10} and $\text{PM}_{2.5}$), and Sulfur Dioxide (SO_2). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect public health and welfare. Other pollutants of concern, although designated as non-criteria and without national air quality standards, are regulated through various state and federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutant (HAP) regulations promulgated under 40 CFR 61 and 40 CFR 63 (NESHAP/MACT), and WV Legislative Rule 45 CSR 27 that regulates certain HAPs as Toxic Air Pollutants (TAPs).

The majority of non-criteria regulated pollutants fall under the definition of HAPs, which are compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows, or suspects may cause cancer or other serious human health effects. These adverse health effects may be associated with a wide range of ambient

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

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. For a complete discussion of the known health effects of each compound, refer to the IRIS database located at www.epa.gov/iris.

Identification of Non-Criteria Pollutants (Air Toxics / HAPs)

Non-criteria air pollutants emitted by natural gas-fired reciprocating internal combustion engines (RICE) consist primarily of Hazardous Air Pollutants (HAPs) generated during partial hydrocarbon combustion. A facility is classified as a Major Source of HAPs under Section 112 of the Clean Air Act (CAA) if potential emissions exceed **10 tons per year (tpy) of any single HAP or 25 tpy of total combined HAPs**.

For the Monarch Cloud Campus (MCC) project, combustion of natural gas across the 864 Caterpillar Model G3520K 4-stroke lean-burn (4SLB) engines emits trace organic HAPs, including formaldehyde (HCHO or CH₂O), acrolein, acetaldehyde, benzene, toluene, xylenes, ethylbenzene, 1,3-butadiene, and n-hexane. Based on vendor guarantees and EPA AP-42 emission factors (Section 3.2), formaldehyde represents over **70% of the total organic HAP profile** emitted by lean-burn engines.

The single-unit and total campus potential emission rates for key non-criteria hazardous air pollutants are detailed below:

Table 12 - HAP Emissions From Primary RICEs						
Non-Criteria Pollutant (HAP)	CAS Number	Individual Engine Controlled Rate (lb/hr)	Individual Engine Controlled Rate (tpy)	Campus Total Fleet Rate (864 Engines) (lb/hr)	Campus Total Fleet Potential (864 Engines) (tpy)	Major HAP Threshold Exceeded?
Formaldehyde (HCHO or CH ₂ O)	50-00-0	0.07	0.34	63.57	299.1	Yes (Major HAP)
Acetaldehyde	75-07-0	0.04	0.18	30.94	137.71	Yes (Major HAP)

Table 12 - HAP Emissions From Primary RICEs

Acrolein	107-02-8	0.02	0.10	19.04	84.67	Yes (Major HAP)
Hexane	110-54-3	<0.01	<0.01	4.11	18.26	Yes (Major HAP)
Methanol	67-56-1	0.01	0.05	9.25	41.21	Yes (Major HAP)

Because facility-wide emissions of individual HAPs (specifically formaldehyde, acetaldehyde, acrolein, hexane, and methanol) exceed 10 tpy, and total combined HAPs exceed 25 tpy, MCC is categorized as a **Major Source of HAPs**.

Regulatory Applicability for Non-Criteria Air Toxics

Pursuant to Section 112(b)(6) of the Clean Air Act, hazardous air pollutants listed under CAA Section 112 are excluded from direct Prevention of Significant Deterioration (PSD) preconstruction review and BACT determinations under 45 CSR 14, unless the HAP is also regulated as a criteria pollutant or criteria precursor (e.g., volatile organic compounds).

Instead, non-criteria toxic emissions are governed by two distinct regulatory mechanisms:

1. **Federal NESHAP / MACT Standards:** National Emission Standards for Hazardous Air Pollutants under 40 CFR 63, Subpart ZZZZ (Reciprocating Internal Combustion Engines MACT).
2. **State Air Toxic Review (45 CSR 27 / Rule 13):** West Virginia Division of Air Quality toxic evaluation protocols ensuring ambient concentration impacts remain below established toxic health thresholds.

RICE MACT (40 CFR 63, SUBPART ZZZZ) FOCUS ON FORMALDEHYDE

+-----+
RICE MACT FORMALDEHYDE SURROGACY MODEL
+-----+
Primary Driver: Formaldehyde (HCHO) = 70%+ of Total Organic HAPs

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

MACT Subpart ZZZZ Compliance Options (New 4SLB RICE ≥ 250 HP):

- └─ Option A: Direct Cap --> ≤ 14 ppmvd HCHO @ 15% O₂
- └─ Option B: Surrogate Cap --> $\geq 93\%$ CO Reduction Across OxCat

Mechanism of Co-Control:

Oxidation Catalyst oxidizes C-H & C=O bonds simultaneously.
Achieving 93% CO / 14 ppmvd HCHO reduces Acrolein, Acetaldehyde,
and Benzene by $> 85\text{--}90\%$.

+-----+

1. Formaldehyde as the Organic HAP Surrogate

In promulgating 40 CFR 63, Subpart ZZZZ, the US EPA selected **formaldehyde (HCHO)** as the primary surrogate pollutant for quantifying and controlling all organic hazardous air pollutants emitted by stationary spark-ignition engines.

Formaldehyde is formed in 4-stroke lean-burn engines during the rapid cooling of unburned fuel-air mixture near cylinder wall boundary layers and piston ring crevice volumes. Because formaldehyde is the most thermodynamically stable and abundant intermediate hydrocarbon oxidation byproduct, an engine control system that successfully destroys formaldehyde will simultaneously achieve equivalent or greater destruction efficiencies for higher-weight aldehydes, polycyclic organic matter (POM), and volatile aromatics (benzene, toluene, xylene).

2. NESHAP Subpart ZZZZ Mandatory Emission Limitations

Under 40 CFR 63.6600(b) and Table 2a to Subpart ZZZZ, new or reconstructed 4-stroke lean-burn (4SLB) stationary RICE with a site rating > 500 BHP located at a major source of HAP emissions must satisfy one of two mandatory standards except during startup:

- **Direct Formaldehyde Concentration Cap (Option A):** Limit the exhaust concentration of formaldehyde to **14.0 ppmvd @ 15% O₂**; OR
- **Surrogate Carbon Monoxide Reduction (Option B):** Reduce carbon monoxide (CO) emissions across an add-on oxidation catalyst by **$<93\%$ or more**.

EPA established the 93% CO reduction option because CO serves as an effective, easily measurable real-time indicator of oxidation catalyst activity. Maintaining oxidation catalyst conditions sufficient to oxidize CO (450°F--1350°F catalyst inlet temperature) ensures high-efficiency catalytic destruction of formaldehyde and other HAPs across the platinum/palladium bed.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

3. Catalyst Co-Control Dynamics Across the MCC Fleet

For the 864 Caterpillar G3520K engines at the Monarch Cloud Campus, MCC elected to install precious-metal Oxidation Catalysts (OxCat) paired with Closed Crankcase Ventilation (CCV) systems.

- **Applicant:** The applicant based formaldehyde and CO emissions **95% destruction efficiency for formaldehyde** and **98% destruction efficiency for CO**.
- **Engine Exhaust Concentration:** Uncontrolled engine-out formaldehyde concentration is approximately 40--50 ppmvd @ 15% O₂ (0.38 g/bhp-hr). With the oxidation catalyst engaged, the controlled exhaust concentration drops to **4.3 ppmvd @ 15% O₂** (0.0425 g/bhp-hr).

4. Compliance Cushion Relative to MACT Cap

MCC's controlled stack concentration of **4.3 ppmvd @ 15% O₂** provides a **69.3% compliance margin** below the federal NESHAP Subpart ZZZZ regulatory limit of 14.0 ppmvd @ 15% O₂. Even under worst-case field aging conditions where catalyst performance degrades over the 3-year replacement cycle ($\mu + 2\sigma$ upper bound = 8.0 ppmvd @ 15% O₂), the engines maintain a continuous **43% compliance cushion** below the MACT cap.

The toxic risk evaluation confirms that maximum off-site impacts for all non-criteria pollutants remain well below state and federal toxic reference levels. Compliance with NESHAP Subpart ZZZZ operating limitations (continuous catalyst inlet temperature recording between 450°F – 1350°F and monthly differential pressure monitoring within ± 2.0 inches H₂O) ensures continuous destruction of formaldehyde and organic HAPs across the primary power generation fleet.

MONITORING and TESTING

Facility-Wide & Fugitive Emission Sources

- **Fugitive Natural Gas LDAR (Conditions 4.1.2–4.1.8 & 4.2.1):** The permittee must institute an annual Leak Detection and Repair program utilizing Optical Gas Imaging or Method 21 (employing a 500 ppmv threshold) for above-ground gas distribution lines, with initial surveys conducted within six months of startup for each node.
- **Facility Roadways & Fenceline (Conditions 4.2.2 & 4.2.3):** Monthly evaluations of fugitive particulate releases from paved and unpaved roadways are required between March and November, alongside semi-annual inspections of the ambient boundary fencing.
- **Equipment Blowdowns & Maintenance (Conditions 4.1.9 & 4.4.4):** Maintenance venting, pigging, and emergency shutdown events must be logged continuously in an electronic system that quantifies event-specific VOC and CO_{2e} mass emissions using real-time gas chromatography data and vessel pressure parameters.

Power Nodes (EU001–EU864: Caterpillar G3520K RICE Fleet)

- **Continuous Parameter Monitoring System (CPMS) (Condition 5.2.1):** Continuous SCADA recording of electrical production (kW), hourly natural gas usage, heat rate (Btu/kWh), oxidation catalyst inlet operating temperature (450°F to 1,350°F), SCR inlet temperature (>300°C interlock), catalyst pressure differential ($\Delta P \leq \pm 2.0$ in. H₂O), DEF injection rate, and startup/shutdown event durations.
- **Online Gas Chromatograph (Condition 5.2.2):** An online C₆+ gas chromatograph system must analyze fuel gas every 15 minutes to establish real-time Higher Heating Value and Lower Heating Value metrics, supported by daily automated single-point calibrations (within $\pm 1.0\%$ tolerance) and quarterly multi-point audits.
- **Periodic Emission Screening (Condition 5.2.3):** Rotational quarterly screenings of a minimum of six engines per power node (72 units per quarter; 288 units annually) using portable electrochemical analyzers (CTM-030/ASTM D6522) for NO_x, CO, and O₂, ensuring all primary engines are evaluated every three years.
- **Opacity Monitoring (Condition 5.2.4):** Semi-annual Method 22 visible emission evaluations (6-minute duration). Observed visible emissions of 30 seconds or longer require prompt corrective action or a formal Method 9 opacity evaluation within 72 hours to verify compliance with the 10% opacity limit.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Full Fleet Engine Testing (Condition 5.3.1):** Initial compliance testing across **all 864 primary power RICE** within 60 days of reaching maximum load (or 180 days after startup), with recurring testing conducted every 8,760 operating hours or three years per 40 CFR 60 Subpart JJJJ and 40 CFR 63 Subpart ZZZZ. Protocols require quantifying NO_x (Method 7E), CO (Method 10, verifying ≥93% reduction), VOCs (Method 25A/18), formaldehyde (Method 320/323), and unreacted ammonia slip (CTM-027, <10 ppmvd).

Note: The applicant sought approval for a revised testing schedule to supersede the routine performance testing requirements under 40 CFR 60, Subpart JJJJ. Upon regulatory evaluation, the writer determined that granting an alternative testing schedule pursuant to federal New Source Performance Standards (NSPS) falls outside the agency's delegated authority under West Virginia's delegation agreement with the U.S. EPA. Accordingly, the proposed alternative testing schedule was not considered, and continuous adherence to standard Subpart JJJJ testing mandates is required (Condition 5.3.1).

- **Lead Engine Verification (Condition 5.3.1.b):** Deployment of a portable CEMS on one designated Lead Engine per node for 14 to 30 days post-commissioning to validate urea injection algorithms and ammonia slip across 70%, 85%, and 100% operating loads.
- **Particulate & Ammonia Slip Testing (Condition 5.3.2):** Initial testing on one representative engine per power node (12 units total) within 180 days of startup to measure filterable PM₁₀/PM_{2.5} (Method 201A or Method 5), condensable PM (Method 202), and ammonia slip (CTM-027), incorporating a *High-Temperature Sampling Protocol* for 700°F exhaust gas.

The engine exhaust temperature will exceed that maximum allow for Method 5, and therefore the permit will not stipulate a Method 5 for PM.

Fuel Gas Heaters (EU883–EU888: 15.25 MMBtu/hr each)

- **Operational & SCADA Tracking (Conditions 6.2.1, 6.2.2, & 6.2.4):** Monthly fuel logging, Subpart DDDDD annual tune-up procedures, and SCADA monitoring of downstream fuel gas temperatures (maintained ≤10°F above hydrate formation thresholds and ≤70°F).
- **Periodic Screening & Performance Testing (Conditions 6.2.5 & 6.3.1):** Semi-annual portable analyzer screenings for NO_x, CO, and O₂ (corrected to 3% O₂). Concentration readings exceeding 81.0 ppmvd NO_x or 112.0 ppmvd CO necessitate maintenance tune-ups; uncorrected re-test failures mandate formal stack testing (Methods 7 and 10) within 100 days.

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

- **Opacity Evaluations (Condition 6.2.3):** Semi-annual 6-minute Method 22 opacity observations, with Method 9 evaluations required if visible emissions persist.

Emergency Generators & Firewater Pumps (EU865–EU882)

- **Operational Monitoring (Conditions 7.2.1 & 7.2.2):** Tracking runtime via non-resettable hour meters (capped at 100 hours per calendar year per unit for testing and maintenance, with routine testing restricted to between 9:00 AM and 4:00 PM). Monthly visual inspections of diesel storage tanks and secondary containment structures.

RECOMMENDATION TO THE DIRECTOR

Based on information provided in permit application R14-0042 (and any information or revisions subsequently submitted), the WVDAQ has made a preliminary determination that the proposed construction of Monarch Cloud Campus, LLC's Point Pleasant Campus to be located near Point Pleasant, Mason 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 regulations, including 45CSR14, the WV Legislative Rule implementing the Prevention of Significant Deterioration (PSD) program. A final determination regarding the DRAFT permit will not be made until all public comments are considered. Therefore, I recommend, 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 R14-0042

**Edward S.
Andrews**

Edward Andrews, P.E.
Engineer

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Virginia Department of Environmental
Protection OU = Division of Air Quality
Date: 2026.09.28 09:09:25 -04'00'

Date: September 28, 2026

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

Attachment A: Memo of the Air Dispersion Modeling Report

Monarch Cloud Campus LLC: Point Pleasant Campus

Permit Number: R14-0042

Facility ID 053-00136

Fact Sheet R14-0042
Monarch Cloud Campus LLC
Point Pleasant Campus

MEMO

To: Ed Andrews
From: Jon McClung
CC: Laura Jennings, Joe Kessler, Steve Pursley, Rex Compston
Date: September 15, 2026
Re: Air Quality Impact Analysis Review
Permit Number: R14-0042
Applicant: Monarch Cloud Campus, LLC
Facility: Point Pleasant Campus
Location: Point Pleasant, Mason County, WV
Facility ID Number: 053-00136

I have completed my review and replication of the air quality impact analysis submitted by Monarch Cloud Campus, LLC (MCC) in support of permit application R14-0042. Review and/or replication of various components of the modeling analysis was performed by Ed Andrews, Rex Compston, Joe Kessler, and Steve Pursley. This dispersion modeling analysis was performed and submitted by MCC to demonstrate that MCC will not cause or contribute to any violations of applicable NAAQS or PSD increment standards.

On April 15, 2026, MCC submitted an air dispersion modeling protocol to the WV DAQ and the WV DAQ provided comments on this protocol to MCC on April 28, 2026. MCC subsequently provided a revised modeling protocol on May 26, 2026. MCC proposes the use of the Tier 3 Ozone Limiting Method (OLM), which requires EPA Region 3 consultation. The WV DAQ conducted a consultation with EPA Region 3 on July 7, 2026. EPA Region 3 provided an email (Attachment 1) documenting that the consultation has been successfully made and completed on July 9, 2026. The WV DAQ approved the revised modeling protocol on July 9, 2026.

MCC submitted permit application R14-0042 on April 20, 2026 and was assigned to Ed Andrews for review. The air dispersion modeling report was submitted by MCC on May 29, 2026 and supporting electronic modeling files were submitted on June 5, 2026. Additional modeling information was submitted by MCC on June 16, 17, 25, & 30, July 7, and September 2, & 10, 2026.

Monarch Cloud Campus, LLC (MCC) is proposing to construct and operate a data center and power generation microgrid, referred to as the Point Pleasant Campus, located at a site in Mason County, West Virginia a few miles north of the Point Pleasant. This proposed project will be a new 2.16 gigawatt (GW) natural gas-fired off-grid electric power generation facility. The facility will consist of 864 primary power natural gas-fired reciprocating internal combustion engines (RICE), 12 diesel-fired emergency generators rated at 1 MW, six diesel-fired fire pump engines, six natural gas-fired fuel gas heaters, diesel fuel tanks and urea tanks, and fugitives. Each primary power RICE will provide power to a 2.5 megawatt (MW) electric generator. The electricity that will be generated by this facility will be used to provide power to three data

centers that will be located within the Point Pleasant Campus Facility.

MCC is proposing to construct and operate 864 RICEs at the facility. The engines are housed in engine halls each containing 9 engines per engine hall with the total facility consisting of 96 total power engine halls. Eight engine halls with the associated 72 RICE units form a power node which is dedicated to powering a portion of the data center. Four total power nodes will support one data center building. The data center buildings have four (4) wings and a central core to form an “H” building configuration. One (1) power node is dedicated to each of the four wings and the associated load of the central core of the data center building. Each engine has an individual exhaust stack, but stacks from adjacent buildings in the power node are clustered into groups of 4 (with a few groups of 2). A total of twelve power nodes are on property, and each node houses 72 RICE units.

As part of the review process, a permit applicant performs the air quality impact analysis and submits a report and the results to the WV DAQ. The WV DAQ then reviews and replicates the modeling analysis 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 complete administrative record for this modeling analysis for this permit application that contains communications with the applicant, the protocol, modeling analysis report, and electronic modeling files submitted by the applicant.

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 notified of this PSD permit application. Based on the emissions from the project and the distances to the Class I areas, the U.S. Forest Service has stated a Class I analysis for that project is not required. The emissions-to-distance ratios for this project are below the FLM action threshold. The potential-to-emit summary of site-wide criteria pollutant emissions are in Attachment 2.

Mason County, WV is in attainment or unclassifiable/attainment status for all criteria pollutants. The following pollutants were evaluated through dispersion modeling: NO_x , CO , SO_2 , PM_{10} , and $\text{PM}_{2.5}$. Also, MCC addressed secondary formation of $\text{PM}_{2.5}$ as a result of NO_x and SO_2 emissions as well as formation of ozone from NO_x and VOC emissions.

Table 1 presents a summary of the air quality standards that were addressed for the MCC Project. The pollutants, averaging times, increments, significant impact levels (SILs) and National Ambient Air Quality Standards (NAAQS) are listed. The NAAQS are incorporated by reference in WV Legislative Rule 45CSR8 and the PSD increments are found in 45CSR14. The SIL for 1-hour NO_2 and 1-hour SO_2 represents the values the WV DAQ has implemented as described in the memorandum included in Attachment 3.

Table 1. Ambient Air Quality Standards, SILs, and PSD Increments (µg/m3)

Pollutant	Averaging Period	SIL	Class II PSD Increment	NAAQS
Ozone	8-hr	1 ppb	-	70 ppb
CO	1-hour	2000	-	40,000
	8-hour	500	-	10,000
SO ₂	1-hr	7.8	-	196
	3-hr	25	512	-
	24-hr	5	91	-
	Annual	1	20	-
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	0.13	4	9

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 estimated 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 required. 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. 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 than the SIL, and the applicant may still receive a permit if all other requirements are met.

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 2, 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.

Table 2. NAAQS, Monitor Design Values, and Significant Impact Levels

Pollutant	Avg. Period	NAAQS (µg/m ³)	SIL (µg/m ³)	Background (µg/m ³)	NAAQS - Background difference (µg/m ³)	Greater than SIL?
PM _{2.5}	24-hr	35	1.2	17.0	18	Yes
PM _{2.5}	Annual	9	0.13	7.4	4.6	Yes

Modeling Basis

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

- MCC used the regulatory AERMOD modeling system (v24142).
- AERMET (v24142) was used to develop most recent complete five years (2020-2024) of surface data from the Huntington Tri-State Airport (KHTS, WBAN #3860) and five years of upper air data from the Pittsburgh International Airport (KPIT, WBAN# 94823).
- The building downwash inputs were determined using BPIP-PRIME (v04274).
- AERMAP (v24142) was used to develop and process an appropriate nested receptor grid.
- MCC developed an appropriate regional source inventory for use in the cumulative modeling analysis.
- MCC developed appropriate background monitoring data used in the cumulative modeling analysis.

Ozone Analysis and Secondary Formation of PM_{2.5}

For estimating the project impacts on secondary PM_{2.5} and ozone formation, MCC completed a Modeled Emission Rates for Precursors (MERPs) analysis. MCC addressed secondary formation of PM_{2.5} as a result of NO_x and SO₂ emissions as well as formation of ozone from NO_x and VOC emissions. The analysis requires identifying a representative hypothetical source (Doddridge County, WV) and using EPA's MERPs equation to estimate the project's air quality impacts for ozone and secondary PM_{2.5}:

$$\text{Project Air Quality Impact} = \text{Project emission rate} * \frac{\text{Modeled air quality impact from hypothetical source}}{\text{Modeled emission rate from hypothetical source}}$$

Table 3 shows the results of the ozone SIL analysis. The MCC project air quality impact on 8-hr ozone is 0.2301 ppb, which is less than the 8-hr ozone SIL of 1 ppb. Since the MCC project is less than the 8-hr ozone SIL, no further assessment of ozone is required.

Table 3 also lists the values for the secondary formation of PM_{2.5} from the MCC project. These values are added to the AERMOD-modeled direct impact of 24-hr PM_{2.5} and annual PM_{2.5}, respectively, in the SIL, NAAQS, and increment analyses.

Table 3. Class II Area Ozone and Secondary Formation of PM_{2.5} from MCC Project (from modeling report, May 2026)

Metric	Project Air Quality Impact
8-hr Ozone	0.2301 ppb
Annual PM _{2.5}	4.52E-04 µg/m ³
Daily PM _{2.5}	0.00114 µg/m ³

Class II SIL Analysis Results (Tier I)

The results of the Significant Impact Analysis for the MCC Project sources are included in Table 4 (from modeling report, May 2026). Secondary impacts of PM_{2.5} are added to the direct impacts of PM_{2.5} to compare to the PM_{2.5} SILs. Any pollutant/averaging time result exceeding the Significant Impact Level (SIL) must be addressed in a cumulative analysis. A pollutant/averaging time with a result below the SIL is considered insignificant and no further modeling analysis is required. A cumulative modeling analysis is required for the following pollutant(s)/averaging time(s): 1-hr and annual NO₂, 24-hr PM_{2.5} (PSD increment) and annual PM_{2.5}. No further modeling is required for the pollutants below the respective SILs.

To account for the start-up emissions the facility operations will involve a startup/shutdown approach. The annual tpy emissions account for 35 hours per year of startup and shutdown emissions and 8,725 hours per year of normal operation. The hourly emission rates represent the worst-case hourly emissions based on startup operation for the entire hour; this would be applied to one power node (72 engines) with the remainder of the site in normal operations.

Table 4. Class II SIL Analysis (from modeling report, May 2026)

Pollutant	Averaging Period	SIL Result (µg/m³)	Secondary PM_{2.5} (µg/m³)	Total (µg/m³)	SIL Threshold (µg/m³)	Radius of Impact (km)
NO ₂	Annual	4.88	-	4.88	1	2.36
NO ₂	1-hour	59.24	-	59.25	7.5	51.40
NO ₂	1-hour (SSM*)	59.24	-	59.24	7.5	51.40
PM _{2.5}	Annual (NAAQS)	0.24	0.000452	0.24	0.13	1.32
PM _{2.5}	Annual (PSD)	0.24	0.000452	0.24	0.13	1.35
PM _{2.5}	24-hour (NAAQS)	1.16	0.00114	1.16	1.2	-
PM _{2.5}	24-hour (PSD)	1.45	0.00114	1.45	1.2	0.73
PM ₁₀	Annual	0.28	-	0.28	1	-
PM ₁₀	24-hour	1.68	-	1.68	5	-
CO	1-hour	119.96	-	119.96	2000	-
CO	1-hour (SSM*)	1364.79	-	1364.79	2000	-
CO	8-hour	58.79	-	58.79	500	-
CO	8-hour (SSM*)	153.45	-	153.45	500	-
SO ₂	Annual	0.26	-	0.26	1	-
SO ₂	1-hour	6.13	-	6.13	7.9	-
SO ₂	3-hour	3.54	-	3.54	25	-
SO ₂	24-hour	1.92	-	1.92	5	-

*SSM labeled results were modeled using the startup/shutdown approach.

Cumulative Analysis Results (Tier II)

The cumulative analysis consists of both the NAAQS analysis and PSD increment analysis. The cumulative analysis for demonstrating compliance with the applicable NAAQS includes the modeled impacts from the MCC project sources, off-site existing sources, and representative monitored background concentrations. For off-site existing sources, the modeled emission rates

represent the two-year average actual emissions. MCC proposed and followed a procedure to identify the appropriate off-site sources to include in the NAAQS modeling source inventory. The background concentration data is summarized above with detailed information in the applicant's modeling report. Secondary impacts of PM_{2.5} are added to the direct impacts of PM_{2.5} to compare to the PM_{2.5} NAAQS.

The SIL analysis is based on the highest-first-high modeled concentration. The cumulative analysis is based on the modeled concentration in the form of the standard for each pollutant and averaging time and varies for NAAQS and PSD increments. The results of the NAAQS analysis are included in Table 5 (From MCC modeling report, May 2026). No modeled violations of the NAAQS are predicted.

Table 5. Class II NAAQS Analysis Results (from modeling report, May 2026)

Pollutant	Averaging Period	NAAQS Result (µg/m³)	Secondary PM _{2.5} (µg/m³)	Background (µg/m³)	Total (µg/m³)	NAAQS Threshold (µg/m³)	% of NAAQS
NO ₂	Annual	36.48	-	Included	36.48	100	36.48%
NO ₂	1-hour	108.45	-	Included	108.45	188	57.69%
NO ₂	1-hour (SSM*)	112.21	-	Included	112.21	188	59.69%
PM _{2.5}	Annual	0.57	0.000452	7.4	7.97	9	88.56%

*SSM labeled results were modeled using the startup/shutdown approach.

Table 6 shows the results of the Class II PSD Increment Analysis (From MCC modeling report, May 2026). Pursuant to 45CSR14, actual emissions from any major stationary source on which construction commenced after the major source baseline date and actual emissions increases at any stationary source occurring after the minor source baseline date affect the baseline concentration by consuming increment. The major source baseline dates applicable in this case are established by 45CSR14:

45CSR14 Section 2.42.b.2. In the case of NO₂, February 8, 1988; and
 45CSR14 Section 2.42.b.3. In the case of PM_{2.5}, October 20, 2010.

The minor source baseline dates for Mason County, WV are:

NO₂: July 8, 1994
 PM_{2.5}: March 23, 2022.

MCC used the screening procedure as above for NAAQS, paired with the baseline dates above, to determine the PSD increment cumulative modeling inventory. No increment standard has been established for 1-hr NO₂. No modeled exceedances of increment standards are predicted.

Table 6. PSD Class II Increment Analysis Results (from modeling report, May 2026)

Pollutant	Averaging Period	Increment Result (µg/m³)	Secondary PM_{2.5} (µg/m³)	Total (µg/m³)	Increment Threshold (µg/m³)	% of Increment Threshold
NO ₂	Annual	4.95	-	4.95	25	19.80%
PM _{2.5}	24-hour	1.32	0.00114	1.32	9	14.67%
PM _{2.5}	Annual	0.24	0.000452	0.24	4	6%

Summary

The air quality impact analysis prepared and submitted by MCC to the WV DAQ has been reviewed and replicated and conforms to 40 CFR 51 Appendix W, applicable guidance, and the modeling protocol. No modeled violations are predicted for the applicable NAAQS and PSD increment standards and MCC does not cause or contribute to any violations of the applicable NAAQS or PSD increments. No further modeling is required by MCC.

Attachment 1 - EPA Region 3 Consultation



McClung, Jon D <jon.d.mcclung@wv.gov>

RE: NO2 Tier 3 OLM Consultation - Appendix W 4.2.3.4.e

1 message

Leon-Guerrero, Tim <Leon-Guerrero.Tim@epa.gov>

Thu, Jul 9, 2026 at 8:08 AM

To: "McClung, Jon D" <jon.d.mcclung@wv.gov>

Cc: Laura M Jennings <laura.m.jennings@wv.gov>, "Kessler, Joseph R" <joseph.r.kessler@wv.gov>, "edward.s.andrews@wv.gov" <edward.s.andrews@wv.gov>, "Pursley, Steven R" <steven.r.pursley@wv.gov>, Rex E Compston <rex.e.compston@wv.gov>, "Fry, Jessica" <fry.jessica@epa.gov>, "Porter, Matthew" <Porter.Matthew@epa.gov>

Jon,

EPA Region 3 has completed its consultation with WV DEP in accordance with Appendix W. Section 4.2.3.4 states that Tier 3 NO₂ screening techniques, including OLM, are case-by-case methods whose use shall occur in consultation with the EPA Regional Office in addition to the appropriate reviewing authority, and section 3.0(b) provides that screening techniques are to be used in agreement with the reviewing authority.

EPA Region 3 and WV DEP discussed this proposal in some detail during an online Teams meeting on Wednesday, July 7th. We appreciate WV DEP's time and the information shared to help make this consultation possible. Based on the information provided, including the modeling protocol, the ozone data treatment, and the source-specific in-stack ratio selections, EPA Region 3 believes the proposed OLM Tier 3 approach is acceptable for use in this case.

Accordingly, EPA Region 3 believes the consultation requirement for the use of OLM in the NO₂ modeling analysis for this project has been successfully made and completed. Of course, the use of OLM is subject to implementation consistent with the submitted protocol and any additional requirements identified during permit review.

I have copied Jessica (Region 3) and Matt Porter (OSAP) so they are aware of this action. Please feel free to reach out to me if you have any questions regarding this matter and thanks again for reaching out to us.

Tim LG

From: McClung, Jon D <jon.d.mcclung@wv.gov>

Sent: Monday, July 06, 2026 10:12 AM

To: Leon-Guerrero, Tim <Leon-Guerrero.Tim@epa.gov>

Cc: Laura M Jennings <laura.m.jennings@wv.gov>; Kessler, Joseph R <joseph.r.kessler@wv.gov>; edward.s.andrews@wv.gov; Pursley, Steven R <steven.r.pursley@wv.gov>; Rex E Compston <rex.e.compston@wv.gov>; Fry, Jessica <fry.jessica@epa.gov>

Subject: Re: NO2 Tier 3 OLM Consultation - Appendix W 4.2.3.4.e

Caution: This email originated from outside EPA, please exercise additional caution when deciding whether to open attachments or click on provided links.

Tim,

Thank you for reviewing the protocol and providing meeting times. We are available on Tuesday, July 7, from 1 to 2pm. Please send a meeting invitation to myself, Ed Andrews, and Rex Compston.

Thank you,

Jon.

On Wed, Jul 1, 2026 at 7:49 AM Leon-Guerrero, Tim <Leon-Guerrero.Tim@epa.gov> wrote:

Jon,

I wanted to reach out to you to see if we can schedule a call sometime next week to discuss this project with you. I'd like Jessica to be on the call with me. I checked our schedules and Monday and Tuesday next week are open for us. We'd be available for a call between 9 am to 2 pm each of those days.

Let me know what dates and times next week work for you and if you'd like me to send out Teams meeting invites. Thanks and have a great holiday weekend.

Tim LG

From: McClung, Jon D <jon.d.mcclung@wv.gov>

Sent: Monday, June 22, 2026 2:18 PM

To: Leon-Guerrero, Tim <Leon-Guerrero.Tim@epa.gov>

Cc: Laura M Jennings <laura.m.jennings@wv.gov>; Kessler, Joseph R <joseph.r.kessler@wv.gov>; edward.s.andrews@wv.gov; Pursley, Steven R <steven.r.pursley@wv.gov>; Rex E Compston <rex.e.compston@wv.gov>

Subject: NO2 Tier 3 OLM Consultation - Appendix W 4.2.3.4.e

Caution: This email originated from outside EPA, please exercise additional caution when deciding whether to open attachments or click on provided links.

Tim,

WVDEP has received an air quality modeling protocol in support of a PSD permit application for the Monarch Cloud Campus, LLC (MCC) to be located in Mason County, WV. MCC is proposing to use the Ozone Limiting Method (OLM), a Tier 3 screening technique, to evaluate nitrogen dioxide. Per Section 4.2.3.4.e of Appendix W, usage of this technique usage shall occur in consultation with the appropriate EPA Regional office. WVDEP is hereby requesting EPA Region 3 consultation regarding MCC's proposed use of OLM.

Attached is the revised modeling protocol for MCC. Please review and then we can coordinate a call to discuss.

Thank you,

Jon

--

Jonathan D. McClung, P.E.

WV Division of Air Quality

[601 57th Street S.E.](#)

[Charleston, WV 25304](#)

Phone: 304-926-0499 ext. 41277

9/11/26, 11:15 AM

State of West Virginia Mail - RE: NO2 Tier 3 OLM Consultation - Appendix W 4.2.3.4.e

Phone Direct: 304-414-1277

FAX: 304-926-0479

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Jonathan D. McClung, P.E.

WV Division of Air Quality

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[Charleston, WV 25304](#)

Phone: 304-926-0499 ext. 41277

Phone Direct: 304-414-1277

FAX: 304-926-0479

Attachment 2 - MCC Site-Wide PTE

Monarch Cloud Campus, LLC
Point Pleasant Facility
Site Criteria Pollutant Potential-To-Emit Summary

Site Criteria Pollutant Emission Summary																		
Emission Sources	NO _x		CO		VOC		Total PM		Total PM-10		Total PM-2.5		SO ₂		Total HAPs		CO ₂ e	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Caterpillar G3520K RICE Normal OPS (EU1 - EU864)	66.91	291.92	180.67	788.17	197.40	861.15	9.43	41.16	9.43	41.16	7.80	34.04	10.88	47.47	135.37	590.55	2,510,709.33	10,952,969.44
Caterpillar G3520K RICE SSM (EU1 - EU864)	278.81	58.55	752.79	158.09	161.71	33.96	0.79	0.17	0.79	0.17	0.65	0.14	0.91	0.19	135.87	28.53	209,232.59	43,938.84
Generac SD1000 RICE (EU865 - EU876)	169.36	8.47	97.50	4.87	8.92	0.45	5.60	0.28	5.60	0.28	5.60	0.28	0.18	<0.01	0.18	<0.01	19,212.22	960.61
Firewater Pump Engines (EU925 - EU930)	14.60	0.73	13.81	0.69	1.18	0.06	1.58	0.08	0.79	0.04	0.79	0.04	0.03	<0.01	0.08	<0.01	3,387	169
Fuel Gas Heater (EU883 - EU888)	8.97	39.29	7.54	33.00	0.49	2.16	0.68	2.99	0.17	0.75	0.17	0.75	0.05	<0.01	<0.01	0.03	10,706.41	46,894.06
ULSD FW Pump Storage Tank (EU889 - EU894)	--	--	--	--	<0.01	<0.01	--	--	--	--	--	--	--	--	<0.01	<0.01	--	--
ULSD SD1000 EM Gen Storage Tank (EU895 - EU906)	--	--	--	--	<0.01	0.03	--	--	--	--	--	--	--	--	<0.01	0.02	--	--
Blowdowns	--	--	--	--	--	0.83	--	--	--	--	--	--	--	--	--	<0.01	--	4,992.19
Fugitive Leaks	--	--	--	--	0.06	0.25	--	--	--	--	--	--	--	--	<0.01	<0.01	133	583
Haulroads	--	--	--	--	--	--	1.04	4.58	0.21	0.92	0.05	0.22	--	--	--	--	--	--
Facility-Wide PTE	538.66	398.96	1,052.30	984.83	369.78	898.89	19.13	49.25	16.99	43.31	15.07	35.46	12.05	47.68	271.51	619.16	2,753,380.61	11,050,507.13

Attachment 3 - WV DAQ SIL Memo 1-hr NO₂ & 1-hr SO₂



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 (NO₂) and 1-hour sulfur dioxide (SO₂) 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 NO₂ and 1-hr SO₂ 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 NO₂ and 1-hr SO₂ 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 NO₂ and 1-hr SO₂.

Discussion

On February 9, 2010, EPA published a final rule, which became effective on April 12, 2010, establishing a new 1-hour NO₂ NAAQS at 100 ppb (188 µg/m³ at 25 °C and 760 mm Hg), based

Promoting a healthy environment.

on the 3-year average of the 98th-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 SO₂ NAAQS at 75 ppb (196 µg/m³ at 25 °C and 760 mm Hg), based on the 3-year average of the 99th-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 NO₂ and 1-Hour SO₂ SILs

This memo documents the establishment, for the West Virginia PSD program, of an interim 1-hour NO₂ SIL of 4 ppb (7.5 µg/m³), 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 NO₂ 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 SO₂ SIL of 3 ppb (7.8 µg/m³), 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 SO₂ 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 NO₂ NAAQS for the Prevention of Significant Deterioration Program

FROM: Stephen D. Page, Director *Stephen D. Page*
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 (NO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO₂ NAAQS or 1-hour NO₂ 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 NO₂ NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour NO₂ 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 NO₂ standard.

EPA is aware of reports from stakeholders indicating that some sources—both existing and proposed—are modeling potential violations of the 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour NO₂ standard. This guidance memorandum sets forth a recommended interim 1-hour NO₂ significant impact level (SIL) that states may consider when carrying out the required

PSD air quality analysis for NO₂, until EPA promulgates a 1-hour NO₂ SIL via rulemaking. The second memorandum, titled "Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard," includes specific modeling guidance for estimating ambient NO₂ concentrations and determining compliance with the new 1-hour NO₂ 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 NO₂ air quality impacts from proposed construction or modification of NO_x 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 NO₂ 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 NO₂ 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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ 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 NO₂ 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 NO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO₂ 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 (NO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour NO₂ NAAQS or 1-hour NO₂ standard) that became effective on April 12, 2010. EPA revised the primary NO₂ NAAQS by promulgating a 1-hour NO₂ 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 NO₂ concentrations that suggest potential violations of the new 1-hour NO₂ standard under some modeling and permitting scenarios; (2) help reduce the burden of modeling for the hourly NO₂ standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂. Importantly, however, this guidance also sets forth a recommended interim 1-hour NO₂ 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 NO_x 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 NO₂ 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 NO₂ NAAQS.

BACKGROUND

On April 12, 2010, the new 1-hour NO₂ 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 NO₂ 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 NO₂ NAAQS.

We are responding to reports from stakeholders which indicate that some sources, existing and proposed, are modeling high hourly NO₂ concentrations showing violations of the 1-hour NO₂ NAAQS—based only on the source's projected emissions of NO_x 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 NO₂ 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% NO_x-to-NO₂ conversion in the ambient air. To the extent that this is the case, it may be possible to provide more accurate projections of ambient NO₂ concentrations by applying current procedures which account for the statistical form of the 1-hour NO₂ standard, as well as more realistic estimates of the rate of conversion of NO_x emissions to ambient NO₂ 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 NO₂ National Ambient Air Quality Standard" (June 28, 2010) for specific modeling guidance for estimating ambient NO₂ concentrations consistent with the new 1-hour NO₂ 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 NO₂ assist in resolving some of the issues arising from preliminary analyses that are reportedly showing potential exceedances of the new 1-hour NO₂ 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 NO₂ standard. Moreover, the interim 1-hour NO₂ 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 NO₂ 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 NO₂ NAAQS are predicted, but the permit applicant can show that the NO_x 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 NO₂ attainment area, but would cause or contribute to a violation of the 1-hour NO₂ 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 [NO₂] 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 NO₂ 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 NO₂ 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 NO_x-NO₂ 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 NO_x emissions on ambient concentrations of NO₂ are addressed in EPA modeling guidance, including the June 28, 2010, Memorandum titled, "Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ 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 NO₂ 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 NO_x emissions limits or to meet the annual and 1-hour NAAQS and annual NO₂ 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 NO_x emissions limitations or to determine source compliance with the annual and 1-hour NO₂ NAAQS. It should be noted, however, that this limitation does not limit 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 NO_x emissions;

- For a stack height equal to or greater than 65 meters, the impact on NO_x 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 NO₂ 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 NO_x/NO₂), “excessive concentrations” means a maximum ground-level concentration of NO₂ due to NO_x 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 NO₂ concentration experienced in the absence of such effects and (a) which contributes to a total NO₂ concentration due to emissions from all sources that is greater than the annual or 1-hour NO₂ NAAQS or (b) greater than the PSD (annual) increment for NO₂. (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 NO₂ 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.

- 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 NO₂ NAAQS and annual NO₂ 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 NO_x (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 NO_x 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 NO₂ 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 NO₂ 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 NO₂ 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 NO_x and the significant monitoring concentration (SMC) for NO₂. EPA intends to evaluate the need for possible changes or additions to each of these important screening tools for NO_x/NO₂ due to the addition of a 1-hour NO₂ 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 NO_x emissions as well as an interim 1-hour NO₂ SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour NO₂ NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour NO₂ 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 NO₂ standard using an averaging time of less than one year, the NAAQS for SO₂ 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 SO₂ 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 NO₂ significant emissions rate any differently than EPA has historically applied the SO₂ 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 NO₂ standard.

INTERIM 1-HOUR NO₂ 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 NO₂ SIL for the new NAAQS for NO₂. 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 NO₂ 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 NO₂ 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 NO₂ SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in NO_x 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 NO_x emissions will cause or contribute to a modeled violation of the 1-hour NO₂ NAAQS.

In this guidance, EPA recommends an interim 1-hour NO₂ 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 NO₂ concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour NO₂ SIL by using an impact equal to 4% of the 1-hour NO₂ NAAQS (which is 100 ppb). We have chosen this approach because we believe it is reasonable to base the interim 1-hour NO₂ SIL directly on consideration of impacts relative to the 1-hour NO₂ NAAQS. In 1980, we defined SER for each pollutant subject to PSD. 45 FR 52676, August 7, 1980 at 52705-52710. For PM and SO₂, 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 SO₂ to define the significant emissions rates (SERs) for those pollutants. It was noted that, at the time, only an annual NO₂ NAAQS existed. Thus, for reasons explained in the 1980 preamble, to define the SER for NO_x emissions we used a design value of 2% of the annual NO₂ NAAQS. See 45 FR 52708. Looking now at a short-term NAAQS for NO₂, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour NO₂

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 NO₂ 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 NO₂ SILs that differ (both higher and lower) from the interim value being recommended herein. The EPA-recommended interim 1-hour NO₂ 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 NO₂ 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 NO₂
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 (NO₂) National Ambient Air Quality Standard (1-hour NO₂ NAAQS or 1-hour NO₂ 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 NO₂ 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 NO₂ impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour NO₂ standard.

SUMMARY OF CURRENT GUIDANCE

While the new 1-hour NAAQS is defined relative to ambient concentrations of NO₂, the majority of nitrogen oxides (NO_x) emissions for stationary and mobile sources are in the form of nitric oxide (NO) rather than NO₂. Appendix W notes that the impact of an individual source on ambient NO₂ 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 NO_x chemistry in determining ambient impact levels of NO₂ based on modeled NO_x emissions, Section 5.2.4 of Appendix W recommends the following three-tiered screening approach for NO₂ modeling for annual averages:

- Tier 1 - assume full conversion of NO to NO₂ based on application of an appropriate refined modeling technique under Section 4.2.2 of Appendix W to estimate ambient NO_x concentrations;
- Tier 2 - multiply Tier 1 result by empirically-derived NO₂/NO_x 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 NO₂/NO_x 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 NO₂, based on NO_x 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 NO₂ NAAQS

In general, the Appendix W recommendations regarding the annual NO₂ standard are also applicable to the new 1-hour NO₂ 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 NO₂ standard without any additional justification;
- Tier 2 may also apply to the 1-hour NO₂ 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 NO₂ 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 NO₂/NO_x ratios based on ambient monitoring data will generally be more difficult to justify for the 1-hour NO₂ 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 NO₂ in the presence of ozone, based on the following basic chemical mechanism, known as titration, although there are important differences between these methods:



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 NO₂ (Hanrahan, 1999b; MACTEC, 2005). EPA is currently updating and extending these evaluations to examine model performance for

predicting hourly NO₂ 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 NO₂ concentrations may be impacted by application of this three-tiered screening approach, and includes comparisons for both annual average and maximum 1-hour NO₂ concentrations.

Key model inputs for both the OLM and PVMRM options are the in-stack ratios of NO₂/NO_x emissions and background ozone concentrations. While the representativeness of these key inputs is important in the context of the annual NO₂ standard, they will generally take on even greater importance for the new 1-hour NO₂ standard, as explained in more detail below. Recognizing the potential importance of the in-stack NO₂/NO_x ratio for hourly NO₂ 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 NO₂/NO_x 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 NO₂ 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 NO_x 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 NO_x 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 NO₂/NO_x 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 NO₂ 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 NO₂ 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 NO₂ 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 NO₂ are averaged across the number of years modeled for comparison to the new 1-hour NO₂ 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 NO₂ 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 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th 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 NO₂ standard should follow the form of the standard based on the 98th 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 NO₂ 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 NO₂ standard would also apply in the context of the new 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ 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 NO_x emission inventories used to support modeling for compliance with the annual NO₂ 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 NO₂ standard since some aspects of the guidance in Section 8.1 differs for long-term (annual and quarterly) standards vs. short-term (≤ 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 NO₂ standard. Due to the importance of in-stack NO₂/NO_x 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 NO₂/NO_x 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 NO_x emission inventories for the new 1-hour NO₂ 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 NO_x 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 NO₂ 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 NO₂ standard.

Tier-specific Technical Issues

This section discusses technical issues related to application of each tier in the three-tiered screening approach for NO₂ modeling recommended in Section 5.2.4 Appendix W. A basic understanding of NO_x 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 NO₂ will provide the most conservative treatment of NO_x chemistry in assessing ambient impacts, there are no technical issues associated with treatment of NO_x chemistry for this tier. However, the general issues related to emission inventories for the 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO_x 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 NO₂ 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 NO_x concentrations. By contrast, for elevated sources in relatively flat terrain, the peak hourly NO_x 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 NO₂/NO_x ratios supported by ambient measurements. As noted above, we also believe it is appropriate to consider the

PVMMRM option as a Tier 3 detailed screening method at this time. The discussion here focuses primarily on the OLM and PVMMRM methods, but we also note that the use of site-specific ambient NO₂/NO_x 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 NO₂/NO_x ratio based on monitoring data for the new 1-hour NO₂ standard than for the annual standard.

While OLM and PVMMRM are both based on the same simple chemical mechanism of titration to account for the conversion of NO emissions to NO₂ (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-NO₂ 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 PVMMRM. Titration is generally a much faster mechanism for converting NO to NO₂ than photosynthesis, and as such is likely to be appropriate for characterizing peak 1-hour NO₂ impacts in many cases.

Both OLM and PVMMRM rely on the same key inputs of in-stack NO₂/NO_x 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 NO₂ standard would be contingent on a demonstration of conservatism for all hours modeled. Furthermore, hourly monitored ozone concentrations used with the OLM and PVMMRM 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 NO₂ 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 NO₂ 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 NO₂ 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 PVMMRM, the importance of the in-stack NO₂/NO_x ratios may be more important for PVMMRM 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 NO₂ 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 PVMMRM 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 PVMMRM 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 NO_x impacts occur close to the source under stable/light wind conditions, the plume volume will be relatively small and the ambient NO₂ impact for such cases will be largely determined by the in-stack NO₂/NO_x ratio, especially for sources with relatively close fence-line or ambient air boundaries. This example also highlights the fact that the relative importance of the in-stack NO₂/NO_x ratios may be greater for some applications than others, depending on the source characteristics and other factors. Assumptions regarding in-stack NO₂/NO_x 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 NO₂ compliance demonstrations.

Another difference between OLM and PVMRM that is worth noting here is the treatment of the titration mechanism for multiple sources of NO_x. 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 NO₂; 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 NO₂ concentrations in most cases since the ambient NO₂ 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 NO_x concentration at each receptor for that hour. Sources which contribute significantly to the ambient NO_x concentration at the receptor will compete for available ozone in proportion to their contribution, while sources that do not contribute significantly to the ambient NO_x 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 NO₂ 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 NO₂ concentrations from the application of AERMOD for the Atlanta NO₂ risk and exposure assessment (EPA, 2008), and recent re-evaluations of hourly NO₂ 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 NO₂ concentrations show reasonably good performance using the “OLMGROUP ALL” option within AERMOD, with no indication of any bias to underestimate hourly NO₂ concentrations with OLMGROUP ALL. Furthermore, model-to-monitor comparisons based on OLM without the OLMGROUP option do exhibit a bias to overestimate hourly NO₂ concentrations. We will provide further details regarding these recent hourly NO₂ 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 NO₂ assessments generally applies to the new 1-hour NO₂ standard.
2. While generally applicable, application of the 3-tiered screening approach for assessments of the new 1-hour NO₂ 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 NO₂/NO_x 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 NO₂ 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 NO_x Emissions for Permit Modeling for the 1-hour NO₂ NAAQS

Introduction

The purpose of this attachment is to address questions about availability of hourly NO_x emissions for permit modeling under the new NO₂ 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 NO₂ permit modeling and computation of hourly emissions appropriate for assessing the new 1-hour NO₂ standard. Although the NAAQS is defined in terms of ambient NO₂ concentrations, source emission estimates for modeling are based on NO_x.

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 (≤ 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 NO₂ 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 NO₂ NAAQS relative to emissions used for the annual standard.

Model Emission Inventory for NO₂ Modeling

For the existing annual NO₂ 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 NO₂ NAAQS. However, appropriate estimates of emissions from background sources for the 1-hour NO₂ 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 NO₂ 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 NO₂ 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 NO₂ 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. NO_x/10⁶ SCF natural gas combusted. The hourly emission rate is derived by converting the emission factor expressed in terms of lbs. NO_x/10⁶ SCF to lbs. NO_x/MMBtu. The conversion is done by dividing the 100 lbs. NO_x/10⁶ SCF by 1,020 to convert the AP-42 factor to lbs. NO_x/MMBtu. The new emission factor is now 0.098 lbs. NO_x/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.

$$E_{\text{hourly}} = 0.098 \text{ lbs/MMBtu} \times 30 \text{ MMBtu/hr} = 2.94 \text{ lbs/hr}$$

Thus 2.94 lbs/hr represents the emission rate that would be input into the dispersion model for modeling against the 1-hour NO₂ 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 NO_x emissions reported to the NEI is computed by:

$$E_{\text{annual}} = (\text{AP-42 emission factor}) \times (\text{total annual fuel combusted})$$

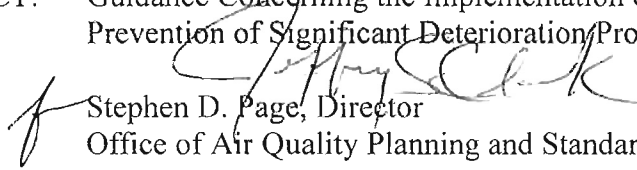
$$E_{\text{annual}} = (100 \text{ lbs}/10^6 \text{ SCF}) \times (100 \times 10^6 \text{ SCF/yr}) = 10,000 \text{ lbs. NO}_x/\text{yr or } 5 \text{ tons NO}_x/\text{yr}$$

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 SO₂ 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 (SO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO₂ NAAQS or 1-hour SO₂ 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 SO₂ NAAQS to provide the requisite protection of public health. The final rule for the new 1-hour SO₂ 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 SO₂ standards. However, as explained in this guidance, those SO₂ standards, as well as the 24-hour and annual increments for SO₂, 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 SO₂ 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 SO₂ NAAQS. We also anticipate problems that sources may have interpreting the modeled 1-hour SO₂ 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 SO₂ NAAQS under the PSD permit program.

The first memorandum, titled "General Guidance for Implementing the 1-hour SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ Significant Impact Level," includes guidance for the preparation and review of PSD permits with respect to the new 1-hour SO₂ standard. That

guidance memorandum sets forth a recommended interim 1-hour SO₂ significant impact level (SIL) that states may consider for carrying out the required PSD air quality analysis for SO₂, until EPA promulgates a 1-hour SO₂ SIL via rulemaking, and addresses the continued use of the existing SO₂ Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO₂ standard.. The second memorandum, titled “Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ National Ambient Air Quality Standard,” includes specific modeling guidance for estimating ambient SO₂ concentrations and determining compliance with the new 1-hour SO₂ 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 SO₂ air quality impacts from proposed construction or modification of SO₂ 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 SO₂ 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 SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ 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 SO₂ 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 SO₂ National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour SO₂ 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 (SO₂) National Ambient Air Quality Standard (hereinafter, either the 1-hour SO₂ NAAQS or 1-hour SO₂ standard) that becomes effective on August 23, 2010. The EPA revised the primary SO₂ NAAQS by promulgating a 1-hour SO₂ 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 SO₂ in the PSD permit (2) reduce the modeling burden to implement the 1-hour SO₂ standard where it can be properly demonstrated that a source will not have a significant impact on ambient 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂. Importantly, however, this guidance also sets forth a recommended interim 1-hour SO₂ 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 SO₂ 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 SO₂ NAAQS.

BACKGROUND

On August 23, 2010, the new 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ National Ambient Air Quality Standard" (August 23, 2010) for specific modeling guidance for estimating ambient SO₂ concentrations consistent with the new 1-hour SO₂ NAAQS.

It is EPA's expectation that currently available SO₂ 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 SO₂ 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 SO₂ 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 SO₂ SIL. The continued use of the existing SO₂ Significant Emissions Rate (SER) and Significant Monitoring Concentration (SMC) to implement the new 1-hour SO₂ standard is also discussed.

SCREENING VALUES

In the final rule establishing the 1-hour SO₂ 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 SO₂ ambient air impact analyses. These screening tools include the SILs, as mentioned by the commenter, but also include the SER for emissions of SO₂ and the SMC for SO₂. The existing screening tools apply to the periods used to define the existing NAAQS for SO₂, 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 SO₂ due to the revision of the SO₂ 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 SO₂ emissions as well as an interim 1-hour SO₂ SIL that we are setting forth today for conducting air quality impact analyses for the 1-hour SO₂ NAAQS. As described in the section titled Introduction, EPA intends to implement the interim 1-hour SO₂ 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 SO₂ in this memorandum; the existing SMC for SO₂, 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ standard.

INTERIM 1-HOUR SO₂ 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 SO₂ sources located outside the circular area described above, to account for the cumulative hourly SO₂ 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 SO₂ 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 SO₂ NAAQS.

We plan to undertake rulemaking to adopt a 1-hour SO₂ SIL value. However, until such time as a 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ NAAQS. The EPA-recommended interim 1-hour SO₂ 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 SO₂ standard, as described above.

As indicated above, using the interim 1-hour SO₂ SIL, the permit applicant and permitting authority can determine: (1) whether, based on the proposed increase in SO₂ 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 SO₂ emissions will cause or contribute to any modeled violation of the 1-hour SO₂ NAAQS.

² A screening tool known as the Significant Monitoring Concentration (SMC) for SO₂ already exists in the PSD regulations. EPA plans to evaluate the existing SMC in light of the new 1-hour SO₂ NAAQS; however, the existing value of 13 µg/m³, 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 SO₂ 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 SO₂ concentrations predicted each year at each receptor, based on 5 years of National Weather Service data; or
- The highest modeled 1-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ NAAQS (i.e., "causes or contributes to" a modeled violation).

We derived this interim 1-hour SO₂ SIL by using an impact equal to 4% of the 1-hour SO₂ NAAQS (which is 75 ppb). On June 29, 2010, we issued an interim 1-hour NO₂ SIL that used an impact equal to 4% of the 1-hour NO₂ 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 SO₂, 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 SO₂ to define the significant emissions rates (SERs) for those pollutants. See 45 FR 52708. Looking now at a 1-hour NAAQS for SO₂, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour SO₂ NAAQS. EPA will consider other possible alternatives for developing a 1-hour SO₂ 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 SO₂ that may need to be considered where emissions limitations alone may not enable the source to demonstrate compliance with the new 1-hour SO₂ NAAQS. This is discussed in greater detail below in the section addressing GEP stack height requirements.

Because compliance with the new SO₂ 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 SO₂, 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 SO₂ NAAQS. For estimating the impacts of existing sources, if necessary, existing SO₂ emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ NAAQS, but the permit applicant can show that the SO₂ 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 SO₂ attainment area for the 1-hour SO₂ NAAQS and would cause or contribute to a violation of the 1-hour SO₂ 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 [SO₂] 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 SO₂ emissions on ambient concentrations of SO₂ are addressed in EPA modeling guidance, including the attached August 23, 2010 Memorandum titled "Applicability of Appendix W Modeling Guidance for the 1-hour SO₂ National Ambient Air Quality Standard."

⁵ While there is no 1-hour SO₂ 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 SO₂ 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 SO₂ NAAQS, the June 22, 2010 preamble to the final rule announcing the new 1-hour SO₂ NAAQS explained that those standards will remain in effect for a limited period of time as follows: for current SO₂ nonattainment areas and SIP call areas, until attainment and maintenance SIPs are approved by EPA for the new 1-hour SO₂ 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 SO₂ NAAQS. Accordingly, the annual and 24-hour SO₂ 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 SO₂ NAAQS to a revised SO₂ 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 SO₂ 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 SO₂ NAAQS. Instead, the annual and 24-hour SO₂ 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 SO₂ 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 SO₂ NAAQS, upon which the SO₂ increments are based. Consequently, sources must continue to demonstrate that their proposed emissions increases of SO₂ emissions will not cause or contribute to any modeled violation of the existing annual and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ emissions limitations or to determine source compliance with the SO₂ 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 SO₂ 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)).

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 SO₂ (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 SO₂ 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 SO₂. 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 SO₂ 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 SO₂. Accordingly, it is permissible for eligible SO₂ 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 SO₂ 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 SO₂.

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 SO₂ 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 SO₂ NAAQS.

GENERAL START-UP CONDITIONS

We do not anticipate widespread problems associated with high short-term SO₂ 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 SO₂ during start-up or shutdown that could adversely affect the new 1-hour SO₂ 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 SO₂ 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 SO₂
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 (SO₂) National Ambient Air Quality Standard (1-hour SO₂ NAAQS or 1-hour SO₂ 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 SO₂ 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 SO₂ impacts in accordance with the Prevention of Significant Deterioration (PSD) permit requirements to demonstrate compliance with the new 1-hour SO₂ standard.

SUMMARY OF CURRENT GUIDANCE

Current modeling guidance for estimating ambient impacts of SO₂ 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 SO₂ 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 SO₂ emissions, stating that:

The chemical transformation of SO₂ 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 SO₂ 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 SO₂ concentrations in urban areas under the regulatory default option.

General guidance regarding source emission input data requirements for modeling ambient SO₂ 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 SO₂ NAAQS

The current guidance in Appendix W regarding SO₂ modeling in the context of the previous 24-hour and annual primary SO₂ NAAQS and the 3-hour secondary SO₂ NAAQS is generally applicable to the new 1-hour SO₂ standard. Since short-term SO₂ standards (≤ 24 hours) have been in existence for decades, existing SO₂ emission inventories used to support modeling for compliance with the 3-hour and 24-hour SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ 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 SO₂ are averaged across the number of years modeled for comparison to the new 1-hour SO₂ 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 SO₂ 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 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment could result in a value that is below the 98th 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 SO₂ standard should follow the form of the standard based on the 99th 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 SO₂ 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 SO₂ 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 SO₂ standards, and 3-hour secondary SO₂ standard, is generally applicable for the new 1-hour SO₂ NAAQS.
2. While the 1-hour NAAQS for SO₂ 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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MEMO

To: Ed Andrews
From: Jon McClung
CC: Laura Jennings, Joe Kessler, Steve Pursley, Rex Compston
Date: September 25, 2026
Re: Air Quality Impact Analysis Review - Revision to Memo Dated September 15, 2026
Permit Number: R14-0042
Applicant: Monarch Cloud Campus, LLC
Facility: Point Pleasant Campus
Location: Point Pleasant, Mason County, WV
Facility ID Number: 053-00136

I previously sent on September 15, 2026 the air quality impact analysis review memo for the air quality impact analysis submitted by Monarch Cloud Campus, LLC (MCC) in support of permit application R14-0042.

The potential-to-emit summary of site-wide criteria pollutant emissions table was included as Attachment 2 to the September 15, 2026 memo. On September 16, 2026 MCC submitted a revised site-wide criteria pollutant emissions table that changed some ID numbers (filling the numbering gap left by removing the 48 Caterpillar Emergency Generators). This change only altered some ID numbers with all emission rates remaining the same. The revised emissions table is included to this memo as Attachment 2. No changes to the modeling analysis are required and the conclusions from the air quality impact analysis review memo issued on September 15, 2026 remain the same.

Attachment 2 - MCC Site-Wide PTE

Monarch Cloud Campus, LLC
Point Pleasant Facility
Site Criteria Pollutant Potential-To-Emit Summary

Site Criteria Pollutant Emission Summary																		
Emission Sources	NO _x		CO		VOC		Total PM		Total PM-10		Total PM-2.5		SO ₂		Total HAPs		CO ₂ e	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Caterpillar G3520K RICE Normal OPS (EU1 - EU864)	66.91	291.92	180.67	788.17	197.40	861.15	3.63	15.83	9.43	41.16	7.80	34.04	10.88	47.47	135.37	590.55	2,510,709.33	10,952,969.44
Caterpillar G3520K RICE SSM (EU1 - EU864)	278.81	58.55	752.79	158.09	161.71	33.96	0.79	0.17	0.79	0.17	0.65	0.14	0.91	0.19	135.87	28.53	209,232.59	43,938.84
Generac SD1000 RICE (EU865 - EU876)	169.36	8.47	97.50	4.87	8.92	0.45	5.60	0.28	5.60	0.28	5.60	0.28	0.18	<0.01	0.18	<0.01	19,212.22	960.61
Firewater Pump Engines (EU877 - EU882)	14.60	0.73	13.81	0.69	1.18	0.06	1.58	0.08	0.79	0.04	0.79	0.04	0.03	<0.01	0.08	<0.01	3,387	169
Fuel Gas Heater (EU883 - EU888)	8.97	39.29	7.54	33.00	0.49	2.16	0.17	0.75	0.17	0.75	0.17	0.75	0.05	<0.01	<0.01	0.03	10,706.41	46,894.06
ULSD FW Pump Storage Tank (EU889 - EU894)	--	--	--	--	<0.01	<0.01	--	--	--	--	--	--	--	--	<0.01	<0.01	--	--
ULSD SD1000 EM Gen Storage Tank (EU895 - EU906)	--	--	--	--	<0.01	0.03	--	--	--	--	--	--	--	--	<0.01	0.02	--	--
Blowdowns	--	--	--	--	--	0.83	--	--	--	--	--	--	--	--	--	<0.01	--	4,992.19
Fugitive Leaks	--	--	--	--	0.06	0.25	--	--	--	--	--	--	--	--	<0.01	<0.01	133	583
Haulroads	--	--	--	--	--	--	1.04	4.58	0.20891	0.92	0.05	0.22	--	--	--	--	--	--
Facility-Wide PTE	538.66	398.96	1,052.30	984.83	369.78	898.89	12.81	21.68	16.99	43.31	15.07	35.46	12.05	47.68	271.51	619.16	2,753,380.61	11,050,507.13