



west virginia department of environmental protection

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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

**Nucor Steel West Virginia LLC
West Virginia Steel Mill**

proposed to be located near

Apple Grove, Mason County, WV.

**Permit Number: R14-0039
Facility Identification Number: 053-00085**

Date: March 29, 2022

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BACKGROUND INFORMATION

Application No.: R14-0039
Plant ID No.: 053-00085
Applicant: Nucor Steel West Virginia LLC
Facility Name: West Virginia Steel Mill
Location: Near Apple Grove, Mason County
SIC/NAICS Code: 3312/331110
Application Type: Major Source Construction
Received Date: January 21, 2022
Engineer Assigned: Joseph R. Kessler, PE
Fee Amount: \$14,500
Date Received: January 24, 2022
Complete Date: March 23, 2022
Due Date: September 19, 2022
Applicant Ad Dates: January 27, 2022
Newspaper: *Point Pleasant Register*
UTM's: Easting: 398.20 km • Northing: 4,278.87 km • Zone: 17
Latitude/Longitude: 38.65536/-82.16853
Description: Construction of a 3,000,000 tons per year sheet steel mill.

On January 21, 2022, Nucor Steel West Virginia LLC (Nucor), a subsidiary of Nucor Corporation, submitted a permit application to construct a new sheet steel mill near Apple Grove, Mason County, WV. The proposed facility is, pursuant to 45CSR14, Section 2.43, defined as a “major stationary source” and is, therefore, required to undergo Prevention of Significant Deterioration (PSD) review according to the requirements of 45CSR14. Based on DAQ procedure, the permit application will also be concurrently reviewed under the WV minor source program administered under 45CSR13.

The following document will outline the DAQ’s preliminary determination that the construction of Nucor’s West Virginia Steel Mill will meet the emission limitations and conditions set forth in the DRAFT permit and will comply with all currently applicable state and federal air quality rules and standards.

PUBLIC REVIEW PROCEDURES

The public review procedures for a new major construction application dual-reviewed under 45CSR13 and 45CSR14 require action items at the time of application submission and at the time a preliminary determination/draft permit is prepared by the DAQ. The following details compliance with the applicable rules and accepted procedures for public notification with respect to Permit Application R14-0039.

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Actions Taken at Application Submission

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

- *Point Pleasant Register* (January 27, 2022).

The DAQ sent a notice of the application submission and a link to the electronic version of the permit application to the following parties:

- The U.S. Environmental Protection Agency (USEPA) Region 3 [§45-14-13.1] - (January 24, 2022);
- The National Park Service [§45-14-13.2] - (January 24, 2022); and
- The US Forest Service [§45-14-13.2] - (January 24, 2022).

The permit application was also made available for review on DAQ's website and on DAQ's publically available database (AX).

Actions Taken at Completion of Preliminary Determination

Pursuant to §45-13-8.4 and §45-14-17.4, upon completion (and approval) of the preliminary determination and draft permit, a Class 1 legal advertisement will be placed in the following newspaper stating the DAQ's preliminary determination regarding R14-0039:

- *Point Pleasant Register*.

Pursuant to §45-13-8.7 and §45-14-13.3, a copy of the preliminary determination, draft permit, and public notice shall be forwarded to USEPA Region 3, the National Park Service (NPS) and the US Forest Service (USFS). A copy of the application, complete file, preliminary determination and draft permit will be available on DAQ's website and on DAQ's publically available database (if unable to review online, the documents will also, by request to the DAQ, be made available at one location in the region in which the source is proposed to be located or be provided within a reasonable time-frame). Additionally, pursuant to §45-14-17.5, a copy of the public notice will be sent to the County Clerk of Mason County, WV, and the Ohio Environmental Protection Agency (OHEPA). All other requests for information by interested parties for documents related to Permit Application R14-0039 shall be provided upon request.

Actions Taken at Completion of Final Determination

Pursuant to §45-14-17.7, and 17.8, upon reaching a final determination concerning R14-0039, the DAQ shall prepare a "Final Determination" document and make such determination available for review on the DAQ's website and on DAQ's publically available database (and available to any party upon request).

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DESCRIPTION OF PROPOSED FACILITY

Facility Overview

Nucor has submitted a permit application for the new construction of a sheet steel mill to be located near Apple Grove, Mason County, WV. The proposed facility will have the capacity to produce up to 3,000,000 tons of steel per year and the production process can be broken down into the following six (6) major components: Material Handling, Melt Shop, Hot Mill, Cold Mill, Slag Processing, and Auxiliary Processes/Equipment.

The basic steel producing process involves the melting of scrap steel (with other raw materials) in two (2) Electric Arc Furnaces (EAFs). The molten steel is then further refined in several additional processes prior to being sent to the casting area where the molten steel is formed into a continuous ribbon of steel and sent to the Hot Mill for sizing. In the Hot Mill, the ribbon of steel is cut and rolled (while heated) to achieve the desired size and thickness per customer specifications. As required, product refining can continue in the Cold Mill, where the cooled steel can be further sized, cleaned, annealed, and galvanized to meet additional customer specifications. Material handling and slag processing are needed at the facility to unload, store, and process feedstock materials and slag, respectively. Auxiliary operations and equipment include the use of storage tanks, cooling towers, an air separation unit, and emergency engines. The proposed steel mill will have a facility-wide potential-to-emit (PTE) as given in the following table:

Table 1: Facility-Wide Annual PTE

Pollutant	PTE (TPY)
CO	3,262.61
NO _x	701.59
PM _{2.5(1)}	570.10
PM ₁₀₍₁₎	617.54
PM ⁽²⁾	395.74
PM ⁽³⁾	690.89
SO ₂	361.48
VOCs	178.36
Total HAPs	7.48
CO _{2e}	673,848

- (1) Including condensables.
- (2) Filterable Only.
- (3) Total Particulate Matter including filterable and condensables.

Process Description

The following is a summary of a detailed process description given from Section 2.1 through Section 2.3 (pp 12 - 19) of the permit application.

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Raw Material Storage and Handling

The proposed facility will use various feedstocks in the steel making process: scrap steel, direct reduced iron (DRI), carbons, alloys, and lime. The purpose of each is give in the following:

- Scrap Steel is the primary iron feedstock used in the steel making process and can include sheet metal, rectangular scrap bundles, shredded scrap, plate scrap, structural scrap, pig iron, and miscellaneous scrap metal. It is melted in the EAFs and combined with certain purifying and strengthening additives as noted to produce the molten steel that is finally shaped into sheet steel.
- DRI is a secondary source of iron used in the steel making process and its purpose is to augment the scrap steel with residual-free iron to produce advanced grades of steel and control the alloy chemistry (Fines Content - 3%, Moisture Content - 0.30%).
- The carbons (coal, petroleum coke, powdered graphite, etc.) are materials added to the melting process as a fluxing agent to remove impurities from the steel through the formation of slag (Fines Content - 100%, Moisture Content - 0.20%).
- Alloys (manganese, nickel, chromium, molybdenum, vanadium, silicon, and boron, etc.) are added to improve specific properties such as strength, wear, and corrosion resistance and are used to vary the chemical composition of the steel to specific customer specifications (Fines Content - 100%, Moisture Content - 2.20%).
- Lime is added to the melting process as a fluxing agent to remove impurities from the steel through the formation of slag (Fines Content - 100%, Moisture Content - 0.20%).

The above materials will be brought to the facility via truck, railcar, and barge (see Table 2 below) and, depending on the material, will be stored in open stockpiles or in silos. Scrap steel will be direct loaded onto three (3) open storage piles (SCRPSKP1 through 3) each with a maximum area of 81,809 ft². Fugitive emissions from the open piles will be controlled by wetting the piles as necessary.

Each of the other material unloading processes have three (3) sources of potential emissions: (1) fugitive emissions from the dumping of the material into a hopper/bin, controlled emission points from (2) air evacuated from the enclosed conveying system, and from the (3) bin vents displaced air to exit the associated storage silos.

The DRI will be unloaded from barges via a clamshell crane located on the dock and transferred to a receiving hopper. The hopper will be equipped with side ventilation to capture particulate matter emissions and controlled by a dust collector (DRI-DOCK-BH). From the bottom of the hopper, the DRI will be conveyed to storage silos (DRI1 through 4). The conveying system will be enclosed and evacuated to a baghouse that controls the conveyers for each silo (DRI1-BH through DRI4-BH). Each silo will additionally have a bin vent (DRI1-BV through DRI4-BV) to capture particulate matter in air displaced from the silo while filling.

Lime, carbon, and alloy feedstocks are delivered by truck and unloaded through dump bins directly into fully enclosed conveyer systems and stored in storage silos (collectively given the Emission Unit ID of “LCB”). The conveying system for each material will be enclosed and emissions evacuated to an individual baghouse (LIME-BH, CARBON-BH, and ALLOY-BH). All the bin vents for the LCB silos are collectively exhausted to a single baghouse (LCB-BH).

Table 2: Feedstock Unloading & Storage

Material	Transport Method	Unloading Method	Unloading Emission Unit IDs	Annual Throughput (TPY)	Storage Method
Scrap Steel	Barge	Clamshell/Magnetic Crane	SCRAP-DOCK	1,443,750	Open Storage Piles
	Rail	Magnetic Crane	SCRAP-RAIL	192,500	
	Trucks	Direct Dump	SCRAP-BULK38	288,750	
DRI ⁽¹⁾	Barge	Clamshell Crane → Hopper → Conveyer	DRI-DOCK	557,500	Silos
Carbon	Truck	Truck Dump → Enclosed Conveyer or Direct Pneumatic Transfer	CARBON-DUMP	35,000	Silos
Alloys	Truck	Truck Dump → Enclosed Conveyer	ALLOY-HANDLE	62,000	Silos
Lime	Truck	Truck Dump → Enclosed Conveyer or Direct Pneumatic Transfer	LIME-DUMP	70,000	Silos

(1) DRI may include the following scrap substitutes: pig iron and hot briquetted Iron (HBI).

From the open storage piles, scrap steel will be dropped onto conveyers (SCRAP-BULK35, 37, and 39) and transported to the (enclosed) Melt Shop where it is transferred into charge buckets for delivery into the EAFs (SCRAP-BULK40). Overhead cranes then will maneuver the charge bucket into position over the EAF. Once in position, the charge bucket bottom opens, allowing scrap to fill the EAF.

DRI will be conveyed from the bottom of the storage silos to two (2) DRI Day Bins (DRI-DB1 and 2) located near the Melt Shop. From DRI Day Bins, the DRI will be transferred to the Melt Shop via conveyors where it will be added to the EAF charge through the roof of the EAF. The DRI conveying system (DRI-CONV) will be an enclosed system and controlled with a baghouse (DRI-CONV-BH), with the bins under a nitrogen purge "blanket" to minimize oxidation and to maintain the material's quality before charging. Air displaced from the day bins will be captured by each bin's baghouse (DRI-DB1-BH and DRI-DB2-BH). The DRI handling system will also include emergency bypass chutes located on DRI storage silos (DRI-EMG-1) and at the end of DRI conveyors (DRI-EMG-2). The emergency bypass chutes will be used to remove DRI from the system that cannot be fed to the furnaces (e.g., if the material is too wet) or if there is an emergency with the nitrogen purging system. Normal operation of the DRI Handling System will be shutdown if the emergency bypass chutes are needed to be used.

Carbons, lime, and Alloys are transported from their respective silos and into the Ladle Metallurgy Furnaces (LMF) and (Vacuum Degassers as well for the Alloys) as needed using an enclosed conveying system.

Melt Shop

The primary material processing (the melting of scrap steel and DRI) occurs in the Melt Shop. The Melt Shop contains two (2) 342,000 lbs/hr (171 TPH) Single Shell 123 mW DC Electric Arc Furnaces (EAF-1 and EAF-2) that will be charged with scrap steel and DRI (or with other scrap substitutes as may be needed) to each produce up to a maximum of 1,500,000 tons/year of steel. Electric arc steelmaking uses high-current electric arcs to melt steel scrap and DRI and convert it into liquid steel of a specified chemical composition and temperature (as opposed to using coke-fired blast furnaces).

During a cold startup, the steel will be preheated in each EAF through the use of a 22.18 mmBtu/hr natural gas-fired oxyfuel burner. In the oxyfuel burners, a pure or enriched oxygen stream is used instead of air for combustion. These burners result in more efficient combustion and lower emissions of NO_x. Once preheated, the furnace electrodes will be lowered into the charged material. Electrical power will be provided to induce arcing that will increase the temperature of the scrap to beyond the steel melting point of approximately 3,000 degrees Fahrenheit (°F). The oxyfuel burners will continue to operate after the electrodes are lowered to promote the post combustion of gases in the furnace vapor space and to introduce oxygen into the furnace for use in exothermic reactions within the molten steel.

EAF emissions are generated during charging, melting, and tapping. Pursuant to requirements in 40 CFR Subpart AAa, Nucor has proposed the use of a direct-shell evacuation control system (DEC system) for control of particulate matter emissions from the EAFs/LMFs. A DEC system is one that maintains a negative pressure within the EAF above the slag or metal and ducts emissions to the control device - in this case an pulse jet fabric filter baghouse for each EAF/LMF stack (EAF-1-BH and EAF-2-BH). The DEC is designed to achieve a minimum capture efficiency of 95% of all potential particulate matter emissions when the furnace roof is closed. During EAF charging (estimated to be a maximum of 4% of the time), when the furnace roof is open, particulate matter emissions are controlled by a canopy hood over the EAFs that is designed to capture a minimum of 95% potential particulate matter emitted by the units (and the LMFs and casting units as well). The canopy hood also evacuates the captured particulate matter to the EAF baghouses. Emissions that are not captured by the DEC system or the canopy hood are potentially released as fugitives from the Melt Shop building openings. The enclosed Melt Shop building, when openings are properly mitigated, is able to capture another 90% of the potential fugitive emissions. These emissions are considered to fall out inside the building.

When the steel melting in the EAF is complete, the contents of the furnace will be poured (tapped) into a refractory-lined chamber (ladle) which will transport the molten steel to the ladle metallurgy furnaces (LMF1 and LMF2) for further refining. After most tappings, a heel of molten steel is left in the furnace in order to assist in the melting of the subsequent scrap steel charges and to prevent damage to the furnace from thermal and mechanical shock during the next charge. The molten heel is, however, periodically also tapped out of the furnace so that the refractory lining can be inspected and repaired if needed. After this occurs, a cold startup is required.

As stated, the ladles of molten steel are transferred from the EAFs to the LMFs for final steel refining. During transportation, the ladle uses a 15.00 mmBtu/hr natural gas-fired Ladle Dryer (LD)

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and seven (7) 15.00 mmBtu/hr natural gas-fired Horizontal or Vertical Ladle Preheaters (LPHTR1 through 7). Each LMF will consist of a combined furnace and stirring station. The introduction of additional materials, such as carbons, metal alloys, or lime, will occur in the LMFs in order to produce steel to meet specific customer requirements.

EAF dust collected in the Melt Shop baghouses will be pneumatically transferred to two (2) storage silos (EAFVF1 and 2), each of which will be equipped with a fabric filter bin vent (EAFVF1-BV and EAFVF2-BV). The dust will be loaded into trucks or railcars beneath the silo to be transported to off-site disposal or reclamation facilities.

A portion of the steel will be further refined in the Vacuum Tank Degassing Operations (VTD) to reduce/eliminate dissolved gases (especially hydrogen, nitrogen, and carbon). Chosen ladles are placed directly into the VTD for processing. During the degassing process, material additions are made for deoxidation and alloying. These materials will be supplied to the VTGs by the Alloy Handling System. Once the ladle is enclosed in the VTD, mechanical pumps will be used to draw a vacuum on the ladle. The gas from the VTD is captured and first directed through a particulate filter to protect the mechanical pumps from particulate matter. The degassing process primarily generates CO emissions due to the release of carbon from the steel and partial oxidation to CO. A 12.37 mmBtu/hr Flare (Vacuum Tank Degasser Flares 1 and 2) is used to control the excess CO emissions, but will also provide control for any VOC emissions generated in the VTG process. The Flare will have a minimum destruction and removal efficiency (DRE) of 98% for CO.

Once the molten steel achieves the desired properties in the LMF and/or VTD, the ladle will be removed and transported by overhead crane to a continuous casting machine. In the caster, steel will flow via a bottom slide gate from the ladle into another refractory-lined chamber (tundish). From the tundish, the molten steel will flow through a specially designed tundish nozzle into a thin slab caster. A 6.00 mmBtu/hr natural gas-fired Tundish Dryer (TD) and two (2) 9.00 mmBtu/hr Tundish Preheaters (TPHTR1/2) are used in the process. As the steel travels through the Caster, it will be cooled with process water and formed into a continuous ribbon of steel.

The natural gas combustion emissions from the Ladle Preheaters and the Tundish Dryer and Preheaters all vent inside the Melt Shop building and are conservatively assumed to be emitted from openings in the Melt Shop building.

Hot Mill

As noted, the purpose of the Hot Mill is to take the steel coming from the Casters in the Melt Shop and size it for further processing in the Cold Mill. Therefore, after initial cooling, the ribbon of steel from the Casters is sheared to length to form individual slabs and sent to the 150 mmBtu/hr natural gas-fired Tunnel Furnace (TF1). In the Tunnel Furnace, the slabs are heated to achieve a consistent temperature prior to feeding to the 171 tons/hour Hot Rolling Mill (RM). In the Hot Rolling Mill, each slab thickness is reduced using great pressure to meet customer thickness specifications. Particulate matter emissions from the Hot Rolling Mill are controlled by a baghouse (RM-BH). The rolled steel is then cooled and coiled for further processing.

Cold Mill

The Cold Mill will receive steel coils from the Hot Mill and, as necessary, they will be sent first to the 342 tons/hour Scale Breaker (PKLSB), where a tension leveler type scale breaker will apply pressure to the steel slabs, elongating the slab to correct surface defects and breaking the iron oxide layer on the slab surface in order to prepare the slab for pickling. Particulate matter emissions generated from the scale breaking of the steel are controlled by a baghouse (PKLSB-BH).

After receiving steel from the Scale Breaker or directly from the Hot Mill, coils are chemically cleaned on the continuous pickling line using hydrochloric acid (HCl). The Pickling Line (PKL-1) cleans steel for shipment or further processing by removing scale and other deposits from the steel surface which may develop during the manufacturing process. Steel Coils received from the Melt Shop or the Scale Breaker will first be uncoiled and sent through a series of HCl baths that remove the oxides. The steel sheet is then rinsed and dried. A wet scrubber (PKL1-SCR) is used on the pickling line to control any potential HCl and particulate matter emissions generated from the process.

Pickled coils can be shipped to customers as finished product, or further processed in the 342 tons/hour Tandem Cold Mill (TCM) to further reduce the thickness of the coil. The Tandem Cold Mill uses an oiler that applies surface oiling electrostatically to both sides of the strips simultaneously to facilitate processing in the mill. This oiler can apply multiple grades of rolling oil with minimum transition times between oil types. Particulate matter emissions generated in the Tandem Cold Mill are controlled by a mist eliminator (TCM-ME).

Steel coils can also, per customer specifications, be sent to the galvanized lines for treatment. Galvanizing is the process of applying a protective coating to steel or iron. The coating is usually made from zinc and is used to halt the formation of rust. First, the steel will be uncoiled and go through a cleaning section (CGL1 and CGL2) that removes rolling oils and metal fines from the surface of the steel. Particulate matter emissions from the Galvanizing Cleaning Section are controlled by scrubbers (CGL-SCR1 - 4). The steel is then dipped into a molten zinc bath, resulting in the formation of zinc-iron alloy layers that combat corrosion. The final product is galvanized or “galvannealed” cold rolled steel intended for automotive applications. Two (2) 64.00 mmBtu/hr natural gas-fired Galvanizing Furnaces (GALVFN1 and GALVFN2) are used to provide heat to the galvanizing section.

The Cold Mill will also include an annealing section. Annealing is a heat treatment process which alters the micro-structure of the steel to reduce hardness, increase ductility, and help eliminate internal stresses. The heat for the process is supplied by twenty-two (22) 5.00 mmBtu/hr natural gas-fired Box Annealing Furnaces (BOXANN1 through BOXANN22).

Finally, the Cold Mill includes a 342 tons/hour Standalone Temper Mill (STM) and two (2) 114 tons/hour Skin Pass Mills (SPM1/2). These mills are cold-rolling mills which improve the surface finish on steel products. A variety of surface finishes are used to impart the desired finish to the product. Skin pass mills improve the final strip quality, including strip surface defects and roughness formed on the processing line. The Standalone Temper Mill utilizes a mist eliminator (STM-ME) and the Skin Pass Mills each utilize a dedicated baghouse (SPM1-BH and SPM2-BH) to control particulate matter emissions.

Slag Processing

As mentioned in the Melt Shop process discussion, a material called slag (a hard, stony material) is formed as lime and carbon is added to the molten steel bath to remove phosphorous and sulfur. This slag formation will occur in both the EAFs and in the LMFs when additional impurities are removed from the molten steel. The slag formed in the EAF falls to the bottom of the furnace and will be periodically emptied into slag pots beneath the furnace. After the slag pot is filled, it is taken to the slag dump station where it will be quenched using process water. After quenching, the slag is taken to the slag processing area.

The slag formed in the LMF will be emptied from the ladle after the LMF refining operation is complete and then will also be transported to the slag processing area after quenching. Slag processing equipment will be required to load, convey, crush, and screen the slag prior to use either on site as a road grading material or removal from the site as a saleable material. This area will include potential particulate matter emissions from truck dumps, conveyer transfer points, slag crushing, and slag screening (SCRAP-BULK1 through SCRAP-BULK33) operations. After sizing, the processed slag will be stored in four (4) open storage piles (SLGSKP1/4) each with a maximum area of 32,541 ft². Particulate matter emissions from the slag processing area will be mitigated primarily by using water sprays to keep the material wet enough to minimize emissions.

Natural Gas Combustion Units

The proposed facility includes various natural gas-fired combustion units providing direct process heat and indirect heat in many areas of the plant. As noted, some of the units emit directly inside the Melt Shop where the emissions then both get pulled into the canopy hood and emitted from the EAF Baghouses and are also emitted from the Melt Shop building openings (thus classified as fugitive emissions and identified as MSFUG). The following table identifies all the proposed natural gas combustion devices (with the exception of the oxyfuel burners within the EAFs and the Emergency Engines):

Table 3: Natural Gas Combustion Devices

Emission Unit ID(s)	Emission Point ID(s)	Number of Units	Unit Description	MDHI ⁽¹⁾ (mmBtu/hr)
LD	MSFUG ⁽²⁾	1	Ladle Dryer	15.00
LPHTR1-5	MSFUG ⁽²⁾	5	Horizontal Ladle Preheaters	15.00
LPHTR6-7	MSFUG ⁽²⁾	2	Vertical Ladle Preheaters	15.00
TD	MSFUG ⁽²⁾	1	Tundish Dryer	6.00
TPHTR1-2	MSFUG ⁽²⁾	2	Tundish Preheaters	9.00
SENPHTR1-2	MSFUG ⁽²⁾	2	Tundish Preheaters	1.00
GALVFN1-2	GALVFN(1-2)-ST	2	Galvanizing Furnaces	64.00
GALFUG	BOXANN1-22	22	Box Annealing Furnaces	5.00
TF1	TFST-1	1	Hot Mill Tunnel Furnaces	150.00

Emission Unit ID(s)	Emission Point ID(s)	Number of Units	Unit Description	MDHI ⁽¹⁾ (mmBtu/hr)
SLAG-CUT	SLAG-CUT-NG	1	Slag Cutting Torch	2.40
ASP	ASP-1	1	Water Bath Vaporizer	11.00

- (1) Individual unit MDHI. Aggregate MDHI of all units = 547.40 mmBtu/hr.
(2) Direct process heat: exhaust vents inside the Melt Shop.

Auxiliary Processes/Equipment

Air Separation Unit

The proposed facility will include an air separation plant to supply process gases, such as nitrogen and oxygen, to various facility operations. The air separation plant will include a 11.00 mmBtu/hr natural gas-fired Water Bath Vaporizer (ASP), an emergency generator, and a cooling tower (CT8). The Water Bath Vaporizer is a backup unit employed when the air separation plant is down, or the nitrogen or oxygen demand is more than the air separation plant is generating. During these events, liquefied gas maintained in storage tanks is passed through the Water Bath Vaporizer to vaporize the liquefied gas prior to distributing the gas to the process operations.

Storage Tanks

Nucor has proposed the use of twenty-four (24) fixed roof storage tanks 1,000 gallons or larger and five (5) open degreasing tanks as shown in the following table:

Table 4: Storage Tanks Information⁽¹⁾

Tank ID(s)	Material Stored	Tank Size (gallons)	Throughput (gallons/yr)	Pollutant	BACT	Subpart Kb? ⁽²⁾
T1	Diesel	5,000	365,000	VOCs	Submerged Fill White Shell ⁽³⁾	N
T2 - T4	Diesel	1,000	365,000	VOCs		N
T5 - T6	Diesel	2,000	365,000	VOCs		N
T7	Gasoline	1,000	365,000	VOCs		N
T8 - T9	Hydraulic Oil	5,000	365,000	VOCs		N
T10 - T15	HCl	26,400	1,200,000	HCl	n/a	N
T16 - T23	Spent Pickle Liquid	26,400	900,000	HCl	n/a	N
T24	Used Oil	5,000	365,000	VOCs	Submerged Fill White Shell ⁽³⁾	N
T25 - T29 ⁽⁴⁾	Cold Degreaser	80	n/a	VOCs	Work Practice Standards	N

- (1) The Tank Size and throughput are given on a per-tank basis where multiple tanks are grouped together.
(2) Shows if the requirements of 40 CFR 60, Subpart Kb are applicable to the storage tank.
(3) A white shell improves the heat radiation off the tanks from the sun thereby keeping the tanks cooler, lessening the volatilization of the stored material.
(4) These tanks are inside and open. Work Practice standards are given under 4.1.7(f) of the draft permit.

Emergency Engines

Nucor has proposed the use of six (6) 2,000 horsepower (hp) natural gas-fired Emergency Engines (EMGEN1 through EMGEN6) to generate backup power at the facility in the event of a power disruption. The specific make and model of these engines has not yet been determined, but will not exceed 2,000 hp and will be fired by pipeline-quality natural gas (PNG).

Cooling Towers

Nucor has proposed the use of eight (8) Cooling Towers (CT1 through CT8) that will provide contact and non-contact cooling water to various processes throughout the mill. A cooling tower extracts waste heat into the atmosphere through the evaporative cooling of a water stream to a lower temperature. A direct contact (or open-circuit) cooling tower (DCW) operates by having the cooling water come into direct contact with the material being cooled. A non-contact (or closed-circuit) cooling tower (ICW) operates without the cooling water coming into direct contact with the material being cooled. Emissions are possible with cooling towers as particulate matter may become entrained with the water droplets of the vapor cloud as it released into the ambient air. Each of the Cooling Towers will be constructed with a high efficiency drift eliminator (rated to limit the vapor escape of only 0.0005% of the total water vapor) to mitigate the drift of the entrained droplets (BACT control technology). The Cooling Towers proposed for the facility are shown in the following table:

Table 5: Cooling Tower Information

Emission ID No.	Description	Max Design Capacity Water Circulation Pump (gal/min)
CT1	Melt Shop ICW Cooling Tower	52,000
CT2	Melt Shop DCW Cooling Tower	5,900
CT3	Rolling Mill ICW Cooling Tower	8,500
CT4	Rolling Mill DCW Cooling Tower	22,750
CT5	Rolling Mill/Quench/ACC Cooling Tower	90,000
CT6	Light Plate DCW Cooling Tower	8,000
CT7	Heavy Plate DCW Cooling Tower	3,000
CT8	Air Separation Plant Cooling Tower	14,000

Haulroads

The proposed facility will include paved and unpaved haulroads and mobile work areas. The paved roads are calculated to be an aggregate of 3.21 miles as broken up into ten (10) sections. The unpaved roads are calculated to be an aggregate of 1.24 miles as broken up into nine (9) sections. The roads will be vacuum swept (paved) and watered (paved and unpaved) as needed to mitigate the emissions of road dust from their use.

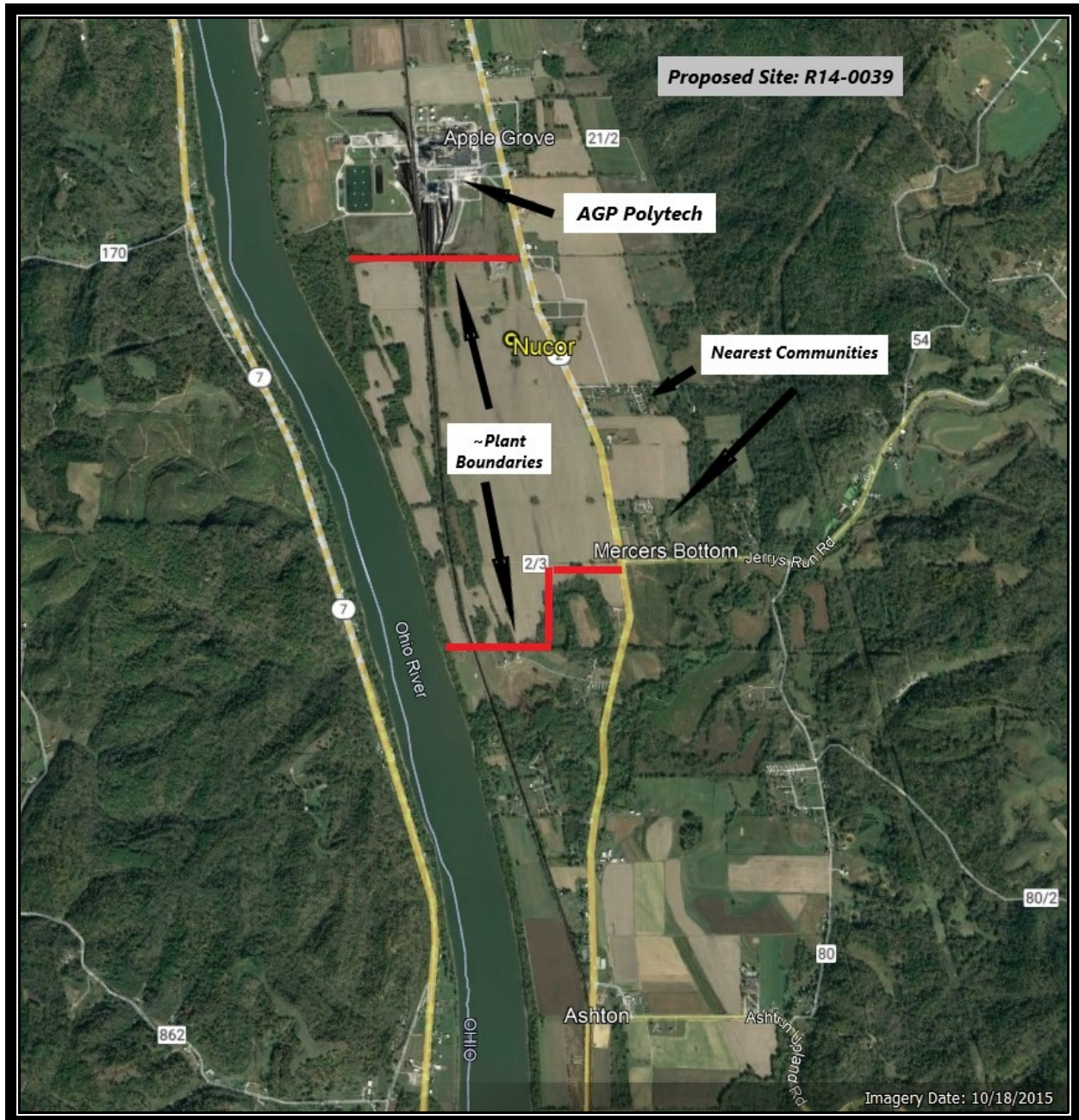
SITE INSPECTION

On February 10, 2022, the writer conducted an inspection of the proposed location of Nucor's West Virginia Steel Mill. The proposed site is located along the Kanawha River near the unincorporated community of Apple Grove, Mason County, WV approximately 13.5 miles south of Point Pleasant, Mason County, WV. The writer was accompanied on the inspection by Mr. Jon McClung and Rex Compston of the WVDAQ. Observations from the inspection include:

- The proposed location of the facility is just south of APG Polytech, LLC's Apple Grove Plant between the Ohio River to the west and WV State Route (SR) 2 to the east. South of the proposed location the Ohio River and SR 2 come close together to pinch off the site. At this point there is located the small unincorporated community of Ashton, WV;
- The Apple Grove location is a well-known 1,370 acre site owned by America Electric Power (AEP) long promoted for proposed development. More information concerning the site can be found on the Mason County Economic Development Authority website:
http://properties.masoncounty.org/site.php?site_id=2;
- As noted, the small communities of Apple Grove (25502), Mercer's Bottom (25502), and Ashton (25503) are the three (3) nearest residential areas to the proposed location with Apple Grove generally east, Mercer's Bottom southeast, and Ashton generally south-southeast of the location. The Ashton Elementary School is located approximately 1.5 miles south-southeast of the southern end of the proposed location;
- The topography of the proposed location is typical of Ohio River bottomland (with an approximate elevation of about 570 feet above sea-level) with the river to the west flowing from the north-northwest to south-southeast. The proposed location is generally flat between the river to the west and SR 2 to the east. Beyond SR 2, low hills begin rising to the east (the elevation of these hills generally don't exceed 850 feet above sea level within several miles of the location). Due to the river's gentle turn to the south east at this point, there is very little bottomland across the river in Ohio with low hills rising almost immediately (the elevation of these hills generally don't exceed 900 feet above sea level within several miles of the location);
- As noted, immediately north of the proposed site is APG Polytech, LLC's Apple Grove Plant (053-00054). This facility manufactures polyester resin and, according to the most recent Title V permit application, has a PTE of all pollutants of less than 100 TPY;
- The area around the proposed site is generally rural in nature with an industrial presence as noted just north of the proposed site and another industrial facility - ICL-IP America Inc's Gallopolis Ferry Facility - located approximately 8.21 miles north of the site;
- At the time of the inspection, a small drilling rig was on site presumably extracting samples for subsurface investigations. No construction of any permanent foundation work or similar activity was seen; and

- The nearest occupied residences will be directly east of the proposed facility across SR 2 along Hereford Lane (County Route 24).

The following is labeled satellite imagery of the proposed site of the West Virginia Steel Mill:



Directions: [Latitude/Longitude: 38.65536/-82.16853] From the junction of WV SR 35 and SR 2 just south of Point Pleasant, travel approximately 14.2 miles south on SR 2 and the proposed location will be on the right.

R14-0039
Nucor Steel West Virginia LLC
West Virginia Steel Mill

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Nucor included as Attachment N in the permit application (pp 171-237) detailed air emissions calculations for the proposed West Virginia Steel Mill. The following will summarize the calculation methodologies used by Nucor to calculate the PTE of the proposed facility. See Attachment N in the permit application for the complete and detailed PTE calculations.

Material Handling

Emissions of particulate matter may occur from the unloading, transporting, conveying, screening, crushing, and storing of raw materials, collected baghouse material, and slag from the steel manufacturing process. Where emission sources (silos, enclosed conveyer transfer points, crushing, etc.) are controlled by fabric filters/baghouses/bin vents, the filterable particulate matter emission estimate for the controlled source was based on the maximum outlet concentration of the filter. For uncontrolled emission sources, or where controlled through the use of enclosures or wet suppression, emissions were calculated using the appropriate section of AP-42 (AP-42 is a database of emission factors maintained by USEPA) or from other acceptable guidance. Controlled emissions were then calculated using a reasonable control efficiency based on the type of enclosure or other mitigating factor. See the following table for the source of various material handling emission factors used by Nucor:

Table 6: Material Handling PM Emission Factor Sources

Emission Source	Material	Emission Factors Source	Notes
Truck Dumps Conveyer Transfer Points & Other Drops Not Evacuated to a Filter	Various	AP-42, Section 13.2.4 (11/06)	Emission factor calculation includes material moisture content and average wind speed. ⁽¹⁾
Slag Loader/Truck Drops	Slag	AP-42, Table 12.5-4 (10/86)	Low-Silt Slag ⁽¹⁾
Slag Conveyer Drops	Slag	AP-42, Table 11.19.2-2 (8/04)	Uncontrolled Conveyer Transfer Point ⁽²⁾
Slag Crushing	Slag	AP-42, Table 11.19.2-2 (8/04)	Tertiary Factor + Drop ⁽²⁾
Slag Screening			Uncontrolled Factor + Drop ⁽²⁾
Open Storage	Scrap Slag	TCEQ Draft RG 058 Rock Crushing Plants, Section 5.	Considered Active Piles 365 days/yr ⁽¹⁾
Paved Haulroads & Mobile Work Areas	n/a	AP-42 Section 13.2.1 (1/11)	Based on average truck weights, surface material silt content, and number of precipitation days. A control percentage of 90% was used for sweeping/watering.
Unpaved Haulroads & Mobile Work Areas	n/a	AP-42 Section 13.2.2 (11/06)	Based on average truck weights, surface material silt content, and number of precipitation days. A control percentage of 90% was used for watering.
Sources Controlled by Baghouses/Fabric Filters	All	Maximum Outlet Loading Concentration ⁽¹⁾	Calculated with maximum outward airflow.

- (1) Uses control percentages from TCEQ Draft RG 058 Rock Crushing Plants, Table 7.
- (2) Uses uncontrolled emission factors and applies control percentage for wetted material as provided for in AP-42, Section 11.19.2.
- (3) As based on vendor information or vendor guarantees.

For sources not controlled by a fabric filter/baghouse/bin vent, maximum hourly emissions were based on the worst-case hourly throughput (either as limited by the bottlenecked process or by the capacity of the unit) and, unless otherwise noted, annual emissions were based on a reasonable worst-case estimate of annual throughput. Maximum hourly emissions from the fabric filters/baghouses were based on the maximum expected airflow through the units (in dcfm) and annual emissions were based on 8,760 hours a year of operation. Where appropriate, Nucor adjusted the emission rates of PM₁₀ and PM_{2.5} as based on appropriate particle size distribution.

EAfs/LMFs/Casters

Particulate Matter Emissions

As noted above, EAFs/LMFs particulate matter emissions are generated during charging, melting, and tapping processes. Pursuant to requirements in 40 CFR Subpart AAa, Nucor has proposed the use of a direct-shell evacuation control system (DEC system) for control of particulate matter emissions from the EAFs/LMFs. A DEC system is one that maintains a negative pressure within the EAF/LMF above the slag or molten metal and ducts emissions to the control device - in this case an pulse jet fabric filter baghouse for each EAF/LMF combo stack (EAF-1-BH and EAF-2-BH). The DEC is designed to achieve a minimum capture efficiency of 95% of all potential particulate matter emissions when the furnace roof is closed.

The Melt Shop also includes a negative pressure canopy hood inside the Melt Shop that is located over the EAFs/LMFs to capture any particulate matter that is not captured by the DEC. The canopy hood is designed to capture a minimum of 95% of the potential particulate matter emitted by the units and not captured by the DEC or during times of charging when the furnace roof is open (estimated to be a maximum of 4% of the time). The canopy hood also evacuates the captured particulate matter to the EAF baghouses.

Particulate matter that is not captured by the DEC system or the canopy hood is potentially released as fugitives from the Melt Shop building openings. The enclosed Melt Shop building, when openings are properly mitigated, is able to capture another 90% of the potential fugitive emissions. These emissions are considered to fall out inside the building. Therefore, of the total uncontrolled particulate matter emissions generated in the EAFs/LMS, 0.025% is calculated to be emitted as fugitive emissions from the Melt Shop building openings when the furnace roof is closed and 0.50% when during furnace charging.

The Casters also generate potential emissions inside the Melt Shop but are not connected to the DEC. However, the Casters do benefit from the 95% collection efficiency of the canopy hood and the 90% collection efficiency of the Melt Shop building enclosure. Therefore, of the total uncontrolled particulate matter emissions generated in the Casters, 0.50% is calculated to be emitted as fugitive emissions from the Melt Shop building openings.

Based on the configuration of the Melt Shop as described above, there are three emission points: EAF Baghouses (BHST-1/2) and the Melt Shop building openings (various points). The particulate matter emissions from the EAF Baghouses are based on the outlet grain loading of the

control devices (PM - 0.0018 gr/dscf, PM_{2.5}/PM₁₀ - 0.0052 gr/dscf). These limits are based on vendor guarantees in turn based on the emission limits given in 40 CFR 60, Subpart AAa and 40 CFR 63, Subpart YYYYY. Maximum hourly emissions from these emission points are then based on the volumetric flow rates being pulled through each of the baghouses when the EAFs are being operated at the normal maximum production rate of 171 tons-steel/hr. The annual emissions from these emission points are then conservatively based on the operation of the EAFs at that volumetric flow rate for 8,760 hours/yr.

The amount of fugitive emissions from the Melt Shop building openings are based on the total uncontrolled particulate matter generated in the EAFs/LMFs (MSFUG) and Casters (CASTFUG) with the control percentages applied as described above. The uncontrolled particulate matter emission factors (PM - 11.3 lbs/ton-steel, PM_{2.5}/PM₁₀ - 6.55 lbs/ton-steel) for the EAFs/LMFs are based on the Energy and Environmental Profile of the U.S. Iron and Steel Industry, U.S. Department of Energy (Aug. 2000), Table 5-3, for EAFs/LMFs (melting, refining, charging, tapping, and slagging alloy steel). The uncontrolled particulate matter emission factors for the Casters (PM - 0.12 lbs/ton-steel, PM_{2.5}/PM₁₀ - 0.12 lbs/ton-steel) are based on AP-42, Section 12.5.1 (04/2009) - "Steel Minimills," Table 12.5.1-2, for uncontrolled ladle heating and transfer and continuous casting.

Both the maximum hourly MSFUG and CASTFUG emissions are calculated based on a maximum processing rate of 342 tons-steel/hour and the maximum annual emissions are based on a maximum processing rate of 3,000,000 tons-steel/year.

Metals and Fluoride

The emissions of Lead (Pb) and Fluoride (F) from the EAFs/LMFs Baghouses are based on emission factors (0.00045 lb-Pb/ton-steel and 0.00350 lb-F/ton-steel, respectively) that are in turn based on the BACT determination for these pollutants. The emissions of other potential metal pollutants: Arsenic (Ar), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Mercury (Hg), Manganese (Mn), and Nickel (N), are based on emission factors taken from AP-42, Section 12.5.1 (04/2009) - "Steel Minimills"- Table 12.5.1-9. The maximum hourly emissions of Metals and Fluoride from the individual EAFs Baghouses are calculated based on a maximum production rate of 171 tons-steel/hour and the maximum annual emissions are based on a maximum production rate of 1,500,000 tons-steel/year. The fugitive emissions of Metals and Fluoride are conservatively based on a 5% escape of these pollutants with no credit taken for additional control from the canopy hood and the building enclosure.

Non-Particulate Pollutants (not GHGs)

Like the particulate matter emissions, the emissions of non-particulate pollutants (CO, NO_x, SO₂, VOCs, and GHGs) from the EAFs/LMFs (the Casters do not have any non-particulate matter emissions) are emitted from three (3) sources: both EAF Baghouses (BHST-1/2) and the Melt Shop building openings (various points). Different than the particulate matter emissions, however, the non-particulate pollutants do not benefit from any control efficiency based on capture and ducting to the baghouse. The uncontrolled emission factors for each of the listed pollutants, except for

GHGs, are based on the selected aggregate (EAF and LMF) BACT emission rates (CO - 2.02 lb-CO/ton-steel, NO_x - 0.35 lb-NO_x/ton-steel, SO₂ - 0.24 lb-SO₂/ton-steel, VOCs 0.098 lb-VOC/ton-steel) for each pollutant. A capture efficiency of 95% was used to calculate the amount of the emissions that were directed by the DEC to the Baghouse stacks. The remaining 5% were assumed to escape from the DEC and conservatively not captured by the canopy hood and released from the building openings as fugitive emissions (MSFUG).

The maximum hourly emissions from each Baghouse stack was based on a steel production rate of 171 tons-steel/hr in each EAF and the maximum annual emissions were based on an annual production rate in each EAF of 1,500,000 tons-steel/year.

GHGs

Greenhouse gases (GHGs) is collectively the air pollutant defined in 40 CFR 86, Section §86.1818-12(a)(1) as the aggregate group of six greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF₆). GHGs are quantified by determining the CO₂ equivalent emissions (CO₂e) and are computed by multiplying the mass amount of emissions for each of the six greenhouse gases by the gas's associated global warming potential published at Table A-1 of 40 CFR 98, Subpart A - "Global Warming Potentials."

The emissions of GHGs from the EAFs/LMFs, as calculated using CO₂e, is based on two sources of emissions in the EAFs: (1) natural gas-combustion in the EAF's 22.00 mmBtu/hr oxyfuel burners and (2) carbon atoms that are released from various materials present in the furnace during melting operations that are subsequently oxidized and emitted as CO₂.

Emission factors (CO₂ - 116.98 lb/mmBtu, CH₄ - 0.0022 lb/mmBtu, N₂O - 0.00022 lb/mmBtu) for the combustion of natural gas in the oxyfuel burners are taken from Tables C-1 ("Default CO₂ Emission Factors and High Heat Values for Various Types of Fuel") and C-2 ("Default CH₄ and N₂O Emission Factors for Various Types of Fuel") of 40 CFR Part 98 - "Mandatory Greenhouse Gas Reporting." The maximum hourly emissions from the oxyfuel burners were based on the MDHI of the units and the maximum annual emissions were based conservatively on the units operating 8,760 hours/year. As with the other non-particulate pollutants, a capture efficiency of 95% was used to calculate the amount of the CO₂e emissions that were directed by the DEC to the Baghouse stacks. The remaining 5% were assumed to escape from the DEC and conservatively not captured by the canopy hood and released from the building openings as fugitive emissions (MSFUG).

Oxidized carbon emissions (CO₂) from the various materials present in the EAFs/LMFs during melting operations are based on the weight fraction of carbon in each of the materials (DRI, Scrap, Fluxing Agents, the electrodes, carbon agents, the molten steel itself, slag, and residue material) used and maximum hourly and annual throughput of the materials. The maximum hourly emissions are then based on all of the carbon oxidizing to CO₂. As with the GHGs produced from natural gas combustion in the oxyfuel burners, a capture efficiency of 95% was used to calculate the amount of the CO₂e emissions that were directed by the DEC to the Baghouse stacks. The remaining 5% were assumed to escape from the DEC and conservatively not captured by the canopy hood and released from the building openings as fugitive emissions (MSFUG).

Finally, the CO₂e emissions from the EAF Baghouse stacks (BHST-1/2) and as emitted from the Melt Shop building openings (MSFUG) were a combination of the emissions from the two sources: the oxyfuel burners and the carbon released and oxidized from the charged materials.

Vacuum Tank Degassers

As discussed above, a portion of the steel will be further refined in the VTD operations to reduce/eliminate dissolved gases (especially hydrogen, nitrogen, and carbon). The offgases from each VTD is captured and first directed through a particulate matter filter (with a maximum outlet grain loading of 0.0083 gr/dscf) to protect the mechanical pumps from particulate matter prior to combustion in a 12.37 mmBtu/hr flare. The flare is used primarily to control CO, as the degassing process primarily generates CO emissions due to the release of carbon from the steel and partial oxidation to CO. Each flare will have a minimum DRE of 98% for CO. Additional NO_x and GHG emissions are generated from the products of combustion from each flare's combustion of the offgases and the use of natural gas in the flare's burners. Trace amounts of SO₂ and VOCs also may be emitted from the use of natural gas in the flare's burners. Emission factors for these pollutants are based on AP-42, Section 13.5 - "Industrial Flares," Table 13.5-1 (NO_x - 0.068 lb/mmBtu, VOCs - 0.14 lb/mmBtu), AP-42 Section 1.4. - "Natural Gas Combustion," Table 1.4-2 (SO₂ - 0.6 lb/mmscf), and 40 CFR Part 98 - "Mandatory Greenhouse Gas Reporting," Tables C-1 and C-2 (CO₂ - 116.98 lb/mmBtu, CH₄ - 0.0022 lb/mmBtu, N₂O - 0.00022 lb/mmBtu).

Natural Gas Combustion Exhaust Emissions

The proposed facility contains various natural gas-fired combustion devices (not including the Emergency Engines that will be discussed below) that provide direct and indirect process heat to the facility. With the exception of the NO_x emissions from the Box Annealing Furnaces, Galvanizing Furnaces, and the Hot Mill Tunnel Furnace, the emission factors for all units were based on the emission factors provided for natural gas combustion as given in AP-42 Section 1.4. - "Natural Gas Combustion," Tables 1.4-1/2 (CO - 84 lbs/mmscf, NO_x - 100 lbs/mmscf, PM_{2.5}/PM₁₀ (including condensables)- 7.6 lbs/mmscf, PM (filterable only)- 1.9 lbs/mmscf, SO₂ - 0.6 lb/mmscf, VOCs - 5.5 lb/mmscf, HAPs - various by speciated HAP), and 40 CFR Part 98 - "Mandatory Greenhouse Gas Reporting," Tables C-1 and C-2 (CO₂ - 116.98 lb/mmBtu, CH₄ - 0.0022 lb/mmBtu, N₂O - 0.00022 lb/mmBtu).

The AP-42 Section 1.4. emission factors were converted to lb/mmBtu using a natural gas heat content of 1,020 Btu/scf. A NO_x emission factor of 0.05 lb/mmBtu was used for the Box Annealing Furnaces and Galvanizing Furnaces and 0.07 lb/mmBtu was used for the Hot Mill Tunnel Furnace. These emission factors were based on the BACT emission limit for the units. Maximum hourly emissions for all units were based on the MDHI of the units and annual emissions were based on operation of 8,760 hours per year. All units utilize Low-NO_x Burner technology to limit NO_x emissions.

As noted, some of the units (see Table 3) emit directly inside the Melt Shop and are emitted from the Melt Shop building openings (identified as MSFUG) and are therefore classified as fugitive emissions. To be conservative, all combust exhaust emissions from units that emit directly inside the Melt Shop are considered to be emitted as fugitive emissions from the Melt Shop openings.

Hot and Cold Milling

Particulate matter emissions generated from the Rolling Mill (RM-BH), Tandem Cold Mill (TCMST), Standalone Temper Mill (STMST), and Skin Pass Mills (SPMST1/2) are captured by the associated baghouse or mist eliminator/scrubber prior to release. No other pollutants are emitted from these units. The controlled emissions from each unit were based on the BACT determinations for each unit set at the appropriate outlet grain loading rate. The outlet grain loading rates for each control device can be seen in Table A-4 of Appendix A attached to the draft permit. Maximum hourly emissions from these emission points are then based on the volumetric flow rates being pulled through each of the control devices when the associated mills are being operated at the maximum production rates. The annual emissions from these emission points are then conservatively based on the operation at that volumetric flow rate for 8,760 hours/yr.

Cleaning, Pickling and Galvanizing

Particulate matter emissions generated from the Pickling Line (PLST-1), Pickling Line Scale Breaker (PKLSB), the Cleaning Sections (CGL(1/2)-ST1), and the Passivation Sections (CGL(1/2)-ST2) are all captured by the associated baghouse or scrubber prior to release. The controlled emissions from each unit were based on the BACT determinations for each unit set at the appropriate outlet grain loading rate. The outlet grain loading rates for each control device can be seen in Table A-4 of Appendix A attached to the draft permit. Maximum hourly emissions from these emission points are then based on the volumetric flow rates being pulled through each of the control devices when the associated lines are being operated at the maximum production rates. The annual emissions from these emission points are then conservatively based on the operation at that volumetric flow rate for 8,760 hours/yr.

The emissions of HCl from the Pickling Line (PLST-1), as controlled and emitted after the Pickling Line Scrubber (PKL1-SCR), were based on a vendor guaranteed HCl outlet concentration in the scrubber that would not exceed 6 ppm_v. The maximum hourly HCl emission rate was again based on the volumetric flow rate being pulled through the Pickling Line Scrubber while being operated at the maximum production rate. The annual emissions from this emission point was then conservatively based on that volumetric flow rate for 8,760 hours/yr.

Slag Cutting

Larger pieces of slag may need to be cut prior to processing. This is done with the use of a 2.4 mmBtu/hr natural gas-fired slag torch (SLAG-CUT-NG). The combustion exhaust emissions generated by this torch are calculated using the methodology as described under Natural Gas Combustion Exhaust Emissions above. Particulate matter emissions generated from the Slag Cutting (SLAG-CUT-BH) are captured by a baghouse prior to release. The controlled emissions from Slag Cutting was based on an outlet grain loading limit of 0.001 gr/dscfm (all emissions considered PM_{2.5} or less). This limit was based on the BACT determination and will be guaranteed by the vendor. Maximum hourly emissions from the Slag Cutting was then based on the volumetric flow rate being

pulled through each the baghouse while cutting is being performed. The annual emissions from this emission point was then very conservatively based on operation at that volumetric flow rate for 8,760 hours/yr.

Storage Tanks

Nucor provided an estimate of the emissions of VOCs (Tanks T1-T9 and Tanks T24-T29) or HCl (Tanks T10 - T23) produced from each storage tank proposed for the facility. The emissions for all fixed roof tanks, excluding the open topped indoor Cold Degreaser tanks (T25-T29), were calculated using the methodology and equations for fixed roof tanks taken from AP-42, Section 7.1 - "Organic Liquid Storage Tanks." The total "routine" emissions from each fixed roof storage tank are the combination of the calculated "standing loss" and "working loss." The standing loss refers to the loss of vapors as a result of tank vapor space breathing (resulting from temperature and pressure differences) that occurs continuously when the tank is storing liquid. The working loss refers to the loss of vapors as a result of tank filling or emptying operations. Standing losses are independent of storage tank throughput while working losses are dependent on throughput. The equations use many variables based on the size and construction of the tank, the vapor pressure of the material that is stored, the throughput of that material (see Table 4), and the temperature data at the site of the tank.

The emissions of VOCs from the open topped Cold Degreaser tanks (T25-T29) are based on the equations from taken from the EPA document "Methods for Estimating Air Emissions from Chemical Manufacturing Facilities," Volume II, Chapter 16, Section 3.7.1 - "Evaporation from an Open Top Vessel or a Spill." The equations use the area of open material storage (in this case 3.14 ft² for each tank), the vapor pressure of the material being stored (0.019 lb/in²), and temperature data to determine the evaporation rate of the liquid being stored. The maximum evaporation rate is used to calculate the maximum hourly emission rate of each tank and the annual emissions are based on each tank emitting at this rate for 8,760 hours/year.

Cooling Towers

Nucor has proposed the use of eight (8) Cooling Towers (CT1 though CT8) that will provide contact and non-contact cooling water to various processes throughout the mill. Emissions are possible with cooling towers as particulate matter may become entrained within the water droplets of the vapor cloud as it released into the ambient air. Nucor calculated the potential emissions from the cooling towers based on the expected worst-case total dissolved solids (TDS - 1,500 ppm_w) in the cooling water, the maximum flow rate of water used in the cooling towers (varies by cooling tower, see Table 5), and the estimated maximum drift rate (0.0005% based on the use of the high-efficiency drift eliminators as BACT) of the plume. Annual emissions from the cooling towers are based on operations of 8,760 hours per year.

Emergency Engines

Potential emissions from the proposed six (6) 2,000 horsepower (hp) natural gas-fired Emergency Engines (EMGEN1 through EMGEN6) were based on the applicable limits as given

under 40 CFR 60, Subpart JJJJ (CO - 2.0 g/hp-hr, NO_x - 4.0 g/hp-hr, and VOCs - 1.0 g/hp-hr), worst-case emission factors obtained from AP-42, Section 3.2 - “Natural Gas-fired Reciprocating Engines”, Tables 3.2-1/2 (SO₂ - 0.000588 lb/mmBtu, PM_{2.5}/PM₁₀/PM - 0.0483 lb/mmBtu, speciated HAPs - varies by HAP), and 40 CFR Part 98 - “Mandatory Greenhouse Gas Reporting,” Tables C-1 and C-2 (CO₂ - 116.98 lb/mmBtu, CH₄ - 0.0022 lb/mmBtu, N₂O - 0.00022 lb/mmBtu).

The maximum hourly emissions were based on the rated horsepower of the engines and the MDHI of the engines (14.00 mmBtu/hr as based on a brake-specific fuel consumption of 7,000 Btu/hp-hr). Annual emissions were based on 100 hours per year of non-emergency operation.

Emissions Summary

Based on the above estimation methodology as submitted in Appendix A of the permit application, the facility-wide PTE of the proposed West Virginia Steel Mill is given below in Table 7. A more detailed facility-wide PTE is given in Attachment N of the permit application (p 180).

Table 7: West Virginia Steel Mill Annual PTE

Sources	PTE (ton/year)									
	CO	NO _x	PM _{2.5} ⁽¹⁾	PM ₁₀ ⁽¹⁾	PM ⁽²⁾	PM ⁽³⁾	SO ₂	VOC	HAPs ⁽⁴⁾	GHGs
Material Handling ⁽⁵⁾	0.00	0.00	16.34	30.59	74.98	74.98	0.00	0.00	0.000	0
Melt Shop	3,030.00	525.00	435.92	435.92	157.16	438.90	360.00	147.00	1.600	377,594
PNG Combustion	193.48	161.84	17.51	17.51	4.38	17.51	1.38	12.67	3.410	275,114
Hot & Cold Mill	29.87	7.38	96.42	129.61	155.58	155.58	0.06	15.19	1.290	15,007
Cooling Towers	0.00	0.00	3.36	3.36	3.36	3.36	0.00	0.00	0.000	0
Emergency Engines	5.29	2.65	0.20	0.23	0.20	0.20	0.003	1.32	0.340	492
Storage Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92	0.120	0
Other	3.97	4.72	0.36	0.36	0.09	0.36	0.06	0.26	0.090	5,642
Total⁽⁵⁾	3,262.61	701.59	570.11	617.58	395.75	690.89	361.50	178.36	6.850	673,849

- (1) Includes condensables where applicable.
- (2) Filterable only.
- (3) Includes filterable and condensable.
- (4) As the PTE of all individual HAPs are less than 10 TPY (the highest individual HAP emission rate is 4.43 TPY for n-Hexane) and the PTE of total HAPs is less than 25 TPY, the proposed WV Steel Mill is defined as a minor (area) source of HAPs for purposes of 45CSR30, 40 CFR 61, and 40 CFR 63.
- (5) Includes particulate emissions from the Slag Cutting operations.
- (6) Some small difference in total emissions may occur in comparison with those in the permit application due to rounding.

REGULATORY APPLICABILITY

The proposed West Virginia Steel Mill is subject to substantive requirements in the following state and federal air quality rules and regulations:

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Table 8: Applicable State and Federal Air Quality Rules

State Air Quality Rules	
<i>Emissions Standards</i>	
45CSR2	To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers
45CSR6	To Prevent and Control Particulate Air Pollution from Combustion of Refuse
45CSR7	To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations
45CSR10	To Prevent and Control Air Pollution from the Emission of Sulfur Oxides
<i>Permitting Programs and Administrative Rules</i>	
45CSR13	Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation
45CSR14	Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration
45CSR30	Requirements for Operating Permits
Federal Air Quality Rules	
<i>New Source Performance Standards (NSPS) - 40 CFR 60</i>	
Subpart Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units
Subpart AAa	Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 17, 1983
Subpart IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
<i>Maximum Achievable Control Technology (MACT) - 40 CFR 63</i>	
Subpart ZZZZ	National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
Subpart YYYYY	National Emission Standards for Hazardous Air Pollutants for Area Sources: Ferroalloys Production Facilities
Subpart CCCCC	National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities

Each applicable rule (and any rule with questionable non-applicability) and Nucor’s proposed compliance therewith will be summarized below. Nucor submitted a detailed regulatory applicability discussion as Section 3.0 in the permit application (p 20).

WV State Air Quality Rules

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

45CSR2 “establishes emission limitations for smoke and particulate matter which are discharged from fuel burning units.” A fuel burning unit is defined under 45CSR2 as any “furnace, boiler apparatus, device, mechanism, stack or structure used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer.” Additionally, the definition of “indirect heat exchanger” specifically excludes process heaters, which are defined as “a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst.” Based on these definitions, 45CSR2 will apply only to the 11 mmBtu/hr Water Bath Vaporizer (ASP). The other combustion units at the proposed facility do not use indirect heat transfer and are, therefore, not defined as fuel burning units under 45CSR2.

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the Water Bath Vaporizer are subject to an opacity limit of 10%. Proper maintenance and operation of the units (and the use of natural gas as fuel) should keep the opacity of the units well below 10% during normal operations.

45CSR2 Weight Emission Standard - Section 4.1(b)

The facility-wide allowable particulate matter emission rate for the applicable fuel burning unit noted above, identified as a Type “b” fuel burning unit, per 45CSR2, Section 4.1(b), is the product of 0.09 and the total design heat input of the applicable unit in million Btu per hour.

The maximum aggregate design heat input (short-term) of the applicable unit will be 11.00 mmBtu/Hr. Using the above equation, the 45CSR2 particulate matter emission limit will be 0.99 lb/hr. This limit represents filterable particulate matter only and does not include condensable particulate matter. The exemption of condensable particulate matter is located within the 45CSR2 Appendix - which establishes compliance test procedures - by not requiring measurement of the condensable particulate matter. The maximum potential hourly particulate matter emissions during normal operations from the unit (*including* condensables) is estimated to be 0.08 lb/hr. This conservative emission rate is 8.08% of the 45CSR2 limit.

45CSR2 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of 45CSR2 requires testing for initial compliance with the limits under Section 3 and 4, monitoring for continued compliance, and record-keeping of that compliance. The TMR&R requirements are clarified under 45CSR2A and discussed below.

45CSR2A Applicability - Section 3

Pursuant to 45CSR2, Section 3.1(b), the owner or operator of a “fuel burning unit(s) which combusts only natural gas shall be exempt from sections 5 and 6.” Therefore, there are no substantive performance testing or monitoring requirements under 45CSR2 for the proposed Water Bath Vaporizer.

45CSR2A Record-keeping and Reporting Requirements - Section 7

Section 7 sets out the record-keeping requirements that Nucor will have to meet under 45CSR2A for the Water Bath Vaporizer. For units that combust only natural gas, the record-keeping requirements (45CSR§2A-7.1(a)(1)) are limited to the date and time of start-up and shutdown, and the quantity of fuel consumed on a monthly basis.

45CSR6: To Prevent and Control Particulate Air Pollution from Combustion of Refuse

Nucor has proposed the use of a flare (Vacuum Tank Degasser Flares 1 and 2) for control of vapors pulled from each VTG during degassing operations. These flares each meet the definition of an “incinerator” under 45CSR6 and are, therefore, subject to the requirements therein. The substantive requirements applicable to the flare are discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Pursuant to §45-6-4.1, PM emissions from incinerators are limited to a value determined by the following formula:

$$\text{Emissions (lb/hr)} = F \times \text{Incinerator Capacity (tons/hr)}$$

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

<u>Incinerator Capacity</u>	<u>Factor F</u>
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

Nucor has stated that the maximum capacity of each flare is 397 lbs/hour (0.20 tons/hour). Using this value in the above equation produces a PM emission limit of 1.08 lbs/hour. Nucor has estimated that a maximum of 0.08 lbs/hour of particulate matter emissions will be emitted from each flare. This is easily in compliance with the 45CSR6 limit.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to §45-6-4.3, and subject to the exemptions under 4.4, the flares each will have a 20% limit on opacity during operation. Proper design and operation of the flares (in compliance with §60.18) should prevent any substantive opacity from the units.

45CSR7: To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations

45CSR7 has requirements to prevent and control particulate matter air pollution from manufacturing processes and associated operations. Pursuant to §45-7-2.20, a “manufacturing process” means “*any action, operation or treatment, embracing chemical, industrial or manufacturing efforts . . . that may emit smoke, particulate matter or gaseous matter.*” 45CSR7 has three substantive requirements potentially applicable to the particulate matter-emitting operations at the West Virginia Steel Mill. These are the opacity requirements under Section 3, the mass emission standards under Section 4, and the fugitive emission standards under Section 5. Each of these sections will be discussed below.

45CSR7 Opacity Standards - Section 3

§45-7-3.1 sets an opacity limit of 20% on all “process source operations.” Pursuant to §45-6-2.38, a “source operation” means the “*last operation in a manufacturing process preceding the emission of air contaminants [in] which [the] operation results in the separation of air contaminants from the process materials or in the conversion of the process materials into air contaminants and is not an air pollution abatement operation.*” This language would define all particulate matter emitting sources (excluding natural gas combustion exhaust sources) as “source operations” under 45CSR7 and, therefore, these sources would be subject to the opacity limit (after any applicable control device). Based on the Nucor’s proposed use of BACT-level particulate matter controls (such as baghouses, fabric filters, enclosures, water sprays, etc.), these measures shall, when maintained and operated correctly, allow the particulate matter emitting sources to operate in compliance with the 20% opacity limit.

45CSR7 Weight Emission Standards - Section 4

§45-7-4.1 requires that each manufacturing process source operation or duplicate source operation meet a maximum allowable “stack” particulate matter limit based on the weight of material processed through the source operation. As the limit is defined as a “stack” limit (under Table 45-7A), the only applicable emission units (defined as a type ‘a’ sources) are those that can be defined as non-fugitive in nature. Pursuant to §45-7-4.1, any manufacturing process that has “*a potential to emit less than one (1) pound per hour of particulate matter and an aggregate of less than one thousand (1000) pounds per year for all such sources of particulate matter located at the stationary source*” is exempt from Section 4.1.

For the purposes of Section 4.1, a source of particulate matter emissions that are solely the result of the combustion of natural gas is not considered a “source operation” as defined under §45-7-2.38. This is based on the definition that states a source operation is one that “*result in the separation of air contaminants from the process materials or in the conversion of the process materials into air contaminants.*” Natural gas when solely a fuel does not meet the reasonable definition of a process material. Additionally, the particulate matter limits given under 45CSR7 only address filterable particulate matter, which are only above 25% of total natural gas particulate matter

emissions. This determination excludes all natural gas combustion (only) sources from 45CSR7 applicability. See the following table for the 45CSR7 compliance demonstration.

Table 9: 45CSR7 Section 4.1 Compliance⁽¹⁾

Source Operation(s)	EP ID	Source Type	Aggregate PWR (lb/hr)	Table 45-7A Limit (lb/hr)	PTE (lb/hr)	Control Device
EAF/LMFs/Casters	BHST-1	B	684,000	34.78 ⁽²⁾	17.03	BH
EAF/LMFs/Casters	BHST-2	B		34.78 ⁽²⁾	17.03	BH
Rolling Machine	RM-BH	B	342,000	42.52	10.09	BH
VTG-1	VTGST1	B	684,000	34.78 ⁽²⁾	0.08	Filter
VTG-2	VTGST2	B		34.78 ⁽²⁾	0.08	Filter
Pickling Line 1	PLST-1	B	684,000	69.57	0.62	SCR
Skin Pass Mill 1	SPMST1	B	684,000	23.19 ⁽²⁾	2.11	BH
Skin Pass Mill 2	SPMST2	B		23.19 ⁽²⁾	2.11	BH
Pickle Line Scale Breaker	PKLSB	B	684,000	69.57	1.36	BH
Tandem Cold Mill	TCMST	B	684,000	69.57	17.33	BH
Standalone Temper Mill	STM-BH	B	684,000	69.57	0.96	BH
CGL1 - Cleaning Station	CGL1-ST1	B	684,000	34.78 ⁽²⁾	0.16	BH
CGL2 - Cleaning Station	CGL2-ST1	B		34.78 ⁽²⁾	0.16	BH
CGL1 - Passivation Station	CGL1-ST2	B	684,000	34.78 ⁽²⁾	0.24	BH
CGL2 - Passivation Station	CGL2-ST2	B		34.78 ⁽²⁾	0.24	BH
Slag Cutting	SLAG-CUT-BH	A	342,000	34.26	0.86	BH
All DRI Handling	Various	A	127,283	34.09	1.81	Various
Scrap Handling	Various	A	439,498	44.58	2.03	Various
Slag Processing	Various	A	716	0.86	0.86	Various
EAF Baghouse Dust Silo 1	EAFVF1	A	3,372	1.85 ⁽²⁾	0.09	Filter
EAF Baghouse Dust Silo 2	EAFVF1	A		1.85 ⁽²⁾	0.09	Filter
Lime/Carbon/Alloy Handling	Various	A	7,991	7.99	1.96	BHs
Cooling Towers	Various	A	1,501,200	50.00	0.77	DEs

(1) To be conservative, this analysis was done using “duplicate sources” under 45CSR7 and aggregating other sources. Nucor provided a 45CSR7 analysis using only individual sources, and there is a strong case to be made that duplicate source limits don’t apply. But as all the sources have more stringent BACT limits below even the more conservative methodology, it is a moot point.

(2) These sources, for a conservative compliance demonstration, are considered "duplicate sources" as defined in 45CSR7. As such, the PWR of all duplicate sources are aggregated and the resulting limit is distributed to each emission point relative to each source's contribution to the total PWR.

- (3) For simplicity, and to be extremely conservative, all identified sources (including some fugitive sources that otherwise would not be subject to Section 4.1) are included in this demonstration and only the lowest PWR of any source is used to determine the emission limit. This method is very conservative as 45CSR7 allows the use of the PWR on an emissions-unit basis to calculate the particulate matter limit for that specific emissions unit. As most processes are serial in nature, the aggregate limit (or a value near to it) would apply in most cases on an individual emission-unit basis and not on the aggregate emissions of a group of emission units. Therefore, using the smallest line PWR to determine an aggregate emission limit is considered a reasonable (and very conservative) methodology to determine §45-7-4.1 compliance with a large number of particulate matter sources.

As shown in Table 9, due to the large process weight-rates used in the production of steel and the BACT-level particulate matter controls on particulate matter-emitting units, most of the Table 45-7A limits will be easily met (even using the more conservative compliance demonstration methodology outline in the table).

§45-7-4.2 requires that mineral acids (including HCl) shall not be released from a manufacturing process source operation or duplicate source operation in excess of the quantity given in Table 45-7B. The Pickling Line has the potential to emit HCl from the controlling scrubber. The applicable limit under Table 45-7B for HCl is 210 mg/m³. The maximum concentration of HCl in the scrubber exhaust was determined to be 6 ppm_v, and the aggregate mass emission rate of HCl was 0.25 lbs/hr for the Pickling Line. Using the emission rate and the flow rate (7,185 dscfm), the calculated exhaust concentration is 9.29 mg/m³. The proposed emission rate is in compliance with the Table 45-7B limits.

45CSR7 Fugitive Emissions - Section 5

Pursuant to §45-7-5.1 and 5.2, each manufacturing process or storage structure generating fugitive particulate matter must include a system to minimize the emissions of fugitive particulate matter. The use of various BACT-level controls (where reasonable) on material transfer points, the use of a vacuum sweeping and watering on the haulroads, and the wetting and management of on-storage pile activity is considered a reasonable system of minimizing the emissions of fugitive particulate matter at the proposed facility.

45CSR7 Reporting and Testing - Section 8

Pursuant to §45-7-8.1, performance testing is only required per the Director's request. The required initial and continuing performance testing required for the proposed facility is given under Section 4.3 of the draft permit. Some 45CSR7 sources are included in the required testing.

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

The purpose of 45CSR10 is to “prevent and control air pollution from the emission of sulfur oxides.” 45CSR10 has requirements limiting SO₂ emissions from “fuel burning units,” limiting in-stack SO₂ concentrations of “manufacturing process source operations,” and limiting H₂S concentrations in “process gas” streams that are combusted. Each substantive 45CSR10 requirement is discussed below.

45CSR10 Fuel Burning Units - Section 3

As noted under the discussion of 45CSR2 applicability, based on the same definitions therein, the proposed 11 mmBtu/hr Water Bath Vaporizer (ASP) is defined as a “fuel burning unit” and is subject to 45CSR10 under Section 3.

The allowable SO₂ emissions from the applicable fuel burning unit noted above, identified as a Type “b” fuel burning unit in a Priority III Region (which includes Mason County), per 45CSR10, Section 3.3(f), is the product of 3.2 and the total design heat input of all applicable units in million Btus per hour. The maximum aggregate design heat input (short-term) of the Water Bath Vaporizer will be 11.00 mmBtu/hr. Using the above equation results in a SO₂ limit of 35.20 pounds per hour. As the Water Bath Vaporizer is fueled by natural gas, the PTE of this fuel burning unit will be far below this limit at 0.03 lbs-SO₂/hr. This emission rate represents only a trace of the 45CSR10 limit.

45CSR10 Manufacturing Process Source Operations - Section 4.1

Section 4.1 of Rule 10 requires that no in-stack SO₂ concentration exceed 2,000 parts per million by volume (ppm_v) from any manufacturing process source operation except as provided in subdivisions 4.1(a) through 4.1(e). The only emission points with substantive in-stack SO₂ emissions are the EAF Baghouse stacks (BHST-1 and BHST-2). All other emission points with stack SO₂ emissions are on sources where the SO₂ is entirely the product of natural gas combustion. Due to the low sulfur content of pipeline-quality natural gas (PNG), SO₂ emissions from natural gas combustion sources are minimal. All natural gas combustion sources with the exception of the Hot Mill Tunnel Furnaces have SO₂ emissions less than the exemption threshold of 500 lbs/year pursuant to 45CSR§10-4.1(e). However, natural gas combustion exhaust is not considered a “source operation” under 45CSR10 as natural gas is not considered by itself as a “process material.” Compliance with the limit for each of the identical EAF Baghouse stacks is given in the following table:

Table 10: 45CSR10, Section 4.1 Compliance Calculation (BHST-1/2)

Data Point	Value
Stack Emission Limit (lbs/hour)	40.36
Exit Gas Volumetric Flow (ACFM)	1,454,016
Exit Gas Temperature (°F)	225
Calculated Concentration (ppmv)	3.62
45CSR§10-4.1(e) Limit (ppmv)	2,000
% of Limit	0.18%

45CSR10 Combustion of Refinery Gas Streams - Section 5

Section 5.1 of Rule 10 prohibits the combustion of any “refinery process gas stream” that contains H₂S in excess of 50 grains for every 100 cubic feet of gas consumed. The offgases pulled

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from the Vacuum Tank Degassers could be considered a “refinery process gas stream” under 45CSR10 and are combusted in the VTG Flares. However, based on information from Nucor, these offgases are not expected to contain any detectable amount of H₂S or any other sulfur compounds.

45CSR10 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of Rule 10 requires performance testing for initial compliance with the limits therein, monitoring for continued compliance, and record-keeping of that compliance. The TMR&R requirements are clarified under 45CSR10A and discussed below.

45CSR10A Applicability - Section 3

Pursuant to §45-10A-3.1(b), for fuel burning units that combust “*natural gas, wood or distillate oil, alone or in combination,*” the units are not subject to the TMR&R Requirements under 45CSR10A. All the applicable fuel burning units under 45CSR10 combust natural gas and are, therefore, exempt from the TMR&R Requirements.

45CSR10A (Manufacturing Process Sources) - Sections 5.2 & 6.2

Pursuant to §45-10A-5.2(a), Nucor shall “*shall conduct or have conducted, compliance tests to determine the compliance of each manufacturing process source with the emission standards set forth in section 4 of 45CSR10.*” The SO₂ performance test required under 4.3.2 of the draft permit will satisfy this requirement.

Pursuant to §45-10A-6.2(a), Nucor shall “*submit, to the Secretary for approval, a monitoring plan for each manufacturing process source(s) that describes the method the owner or operator will use to monitor compliance with the applicable emission standard set forth in section 4 of 45CSR10.*”

Nucor has proposed the use of SO₂ CEMS for the applicable BHST-1/2 emission points. Pursuant to §45-10A-6.2(a), use of CEMS shall “*be deemed to satisfy all of the requirements of an approved monitoring plan.*”

45CSR10A (Combustion Sources) - Sections 5.3, 6.3, & 7.1(b)

As stated, as the offgases pulled from VTGs are not expected to contain any detectable levels of H₂S, these sections do not apply.

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

The proposed construction of the West Virginia Steel Mill has the potential to emit a regulated pollutant in excess of six (6) lbs/hour and ten (10) TPY (see Attachment N of the permit application) and, therefore, pursuant to §45-13-2.24, the proposed facility is defined as a “stationary source” under 45CSR13. Pursuant to §45-13-5.1, “[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct.” Therefore, Nucor is required to obtain a permit under 45CSR13 for the construction and operation of the proposed facility. It is noted that the proposed facility is also

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defined as a “major stationary source” under 45CSR14. Consistent with DAQ Policy, permitting actions reviewed under 45CR14 are concurrently reviewed under 45CSR13 and, where there is an additional or overlapping requirements, the DAQ will generally apply the stricter requirement.

As required under §45-13-8.3 (“Notice Level A”), Nucor placed a Class I legal advertisement in a “newspaper of *general circulation* in the area where the source is . . . located.” The legal ad ran on January 27, 2022 in the *Point Pleasant Register*. Verification that the legal ad ran was provided on February 15, 2022.

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

45CSR14 sets the requirements for the new construction of a “major stationary source” (as defined under §45-14-2.43) of air pollution, on a pollutant-by-pollutant basis, in areas that are in attainment with the National Ambient Air Quality Standards (NAAQS). A proposed facility is defined as a “major stationary source” if, pursuant to §45-14-2.43,

- (1) The source is listed as one of the source categories under §45-14-2.43(a) and has a PTE of any regulated pollutant in excess of 100 TPY (including fugitive emissions); or
- (2) The source is not a source listed under §45-14-2.43(a) and has a PTE of any regulated pollutant in excess of 250 TPY (not including fugitive emissions).

Additionally, if a proposed source is determined to be a major stationary source under either (1) or (2) above for any single pollutant (with the exception of GHGs), pursuant to §45-14-8.2, Best Available Control Technology (BACT) applies to any additional pollutant proposed to be emitted in “significant” (as defined under §45-14-2.74) amounts. Further, as a result of the Supreme Court’s decision in *Utility Air Regulatory Group v. Environmental Protection Agency*, GHGs may not trigger PSD alone, but are subject to PSD review if the emissions of CO₂e exceed a significance threshold of 75,000 TPY *and* if another pollutant triggers PSD review under (1) or (2) above (§45-14-2.80(d)).

The proposed West Virginia Steel Mill will be constructed in Mason County, WV, which is classified as in attainment with all NAAQS. As the proposed facility is listed as one of the source categories under §45-14-2.43(a) - “Iron and Steel Mill Plants” - the proposed facility is defined as a major stationary source based on the following pollutants exceeding a PTE of 100 TPY: Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Particulate Matter (PM₁₀, PM_{2.5}, and filterable particulate matter), Sulfur Dioxide (SO₂), and Volatile Organic Compounds (VOCs).

PSD review is additionally required for the pollutants of Greenhouse Gases (GHGs), Lead (Pb), and Fluorides (F) based on the individual significance thresholds for those pollutants (see Table 11 below). The substantive requirements of a PSD review includes a BACT analysis, an air dispersion modeling analysis (for applicable pollutants), a review of potential impacts on Federal Class 1 areas, and an additional impacts analysis. Each of these will be discussed in detail under the section PSD REVIEW REQUIREMENTS below.

Table 11: Pollutants Subject to PSD

Pollutant	Potential-To-Emit (TPY)	Significance Level (TPY)	PSD (Y/N)
CO	3,413	100	Y
NO _x	850	40	Y
PM _{2.5}	700	10	Y
PM ₁₀	731	15	Y
Filterable PM	489	25	Y
SO ₂	362	40	Y
VOCs	728	40	Y
GHGs (CO ₂ e)	859,430	75,000	Y
Lead	0.68	0.6	Y
Sulfuric Acid Mist	0.00	7	N
Flourides	5.25	3	Y
Vinyl Chloride	0.00	1	N
Total Reduced Sulfur	0.00	10	N
Reduced Sulfur Compounds	0.00	10	N

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The proposed West Virginia Steel Mill will meet the definition of a “major source under §112 of the Clean Air Act” as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. The proposed facility-wide PTE (see Table 7) of a regulated pollutant exceeds 100 TPY and, therefore, the source is a major source subject to 45CSR30. The Title V (45CSR30) application will be due within twelve (12) months after the commencement date of any operation authorized by this permit.

Federal Air Quality Rules***40 CFR 60, Subpart Db: Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units - (Non-Applicable)***

40 CFR 60, Subpart Db is the federal NSPS for industrial/commercial/institutional “steam generating units” (1) for which construction, modification, or reconstruction is commenced after June 19, 1984, (2) that have an MDHI greater than 100 mmBtu/hr, and (3) meet the definition of a “steam generating unit.” Subpart Db contains within it emission standards, compliance methods,

monitoring requirements, and reporting and record-keeping procedures for affected facilities applicable to the rule. Subpart Db defines a “steam generating unit” as “*a device that combusts any fuel or byproduct/waste and produces steam or heats water or heats any heat transfer medium.*” The definition also states that “[t]his term does not include process heaters as they are defined in this subpart.”

As noted under the 45CSR2 Regulatory Applicability discussion, only the 11 mmBtu/hr Water Bath Vaporizer (ASP) uses a heat transfer medium that would meet the definition of a “steam generating unit.” However, the MDHI of this unit is below the applicability threshold for Subpart Db. The other combustion unit at the proposed facility that does have an MDHI above the applicability threshold (TF1) does not use a heat transfer medium and is, therefore, not defined as a “steam generating unit” under Subpart Db.

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

40 CFR 60, Subpart Dc is the federal NSPS for small industrial/commercial/institutional “steam generating units” for which (1) construction, modification, or reconstruction is commenced after June 19, 1984, (2) that have a MDHI between 10 and 100 mmBtu/hr, and (3) meet the definition of a “steam generating unit.” Subpart Dc contains within it emission standards, compliance methods, monitoring requirements, and reporting and record-keeping procedures for affected facilities applicable to the rule. Pursuant to §60.41(c), “steam generating unit” under Subpart Dc means “*a device that combusts any fuel and produces steam or heats water or heats any heat transfer medium. . . This term does not include process heaters as defined in this subpart.*” As noted under the 45CSR2 Regulatory Applicability discussion, only the 11 mmBtu/hr Water Bath Vaporizer (ASP) uses a heat transfer medium that would meet the definition of a “steam generating unit.” Based on the MDHI of this unit, it is defined as an affected facility under Subpart Dc and is subject to the applicable requirements therein. The other combustion units at the proposed facility that have an MDHI that would potential subject the units to Subpart Dc do not use a heat transfer medium and are, therefore, not defined as a “steam generating unit” under Subpart Dc.

Subpart Dc does not, however, have any emission standards for units that combust only natural gas. Therefore, the proposed Water Bath Vaporizer is only subject to the nominal record-keeping and reporting requirements given under §60.48c.

40 CFR 60, Subpart Kb: Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 - (Non-Applicable)

40 CFR 60, Subpart Kb is the federal NSPS for storage tanks containing Volatile Organic Liquids (VOLs) which construction commenced after July 23, 1984. The Subpart applies to storage vessels used to store volatile organic liquids with a capacity greater than or equal to 75 m³ (19,813 gallons). However, storage tanks with a capacity greater than or equal to 151 m³ (39,890 gallons) storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure less than 15.0 kPa are exempt from Subpart Kb.

The only storage tanks proposed by Nucor that are in excess of 19,813 gallons (see Table 4), identified as Storage Tanks T10 - T15 (HCl) and T16 - T23 (Spent Pickle Liquid), will not store a material that is defined as a VOL under Subpart Kb. Therefore, Subpart Kb will not apply to any tanks at the proposed steel mill.

40 CFR 60, Subpart AAa: Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 17, 1983

40 CFR 60, Subpart AAa is the federal NSPS for steel plants that produce carbon, alloy, or specialty steels: electric arc furnaces, argon-oxygen de-carburization vessels, and dust-handling systems that commences construction, modification, or reconstruction after August 17, 1983. Nucor's proposed EAFs (EAF-1 and EAF-2) and associated dust-handling systems are defined as an "electric arc furnace" and therefore subject to the applicable provisions of Subpart AAa.

The substantive emission standards for EAFs are given under §60.272a and state that Nucor must not discharge or cause the discharge into the atmosphere from an EAF any gases which:

- Exit from a control device and contain particulate matter in excess of 12 mg/dscm (0.0052 gr/dscf);
- Exit from a control device and exhibit 3 percent opacity or greater;
- Exit from a shop and, due solely to the operations of any affected EAF(s) or AOD vessel(s), exhibit 6 percent opacity or greater; and
- Dust-handling systems prohibited from discharging any gases that exhibit 10 percent opacity or greater.

Nucor has proposed the use of a direct-shell evacuation control system (DEC system) for control of particulate matter emissions from the EAFs/LMFs combination stacks (EAF-1-BH and EAF-2-BH). A DEC system is one that maintains a negative pressure within the EAF above the slag or metal and ducts emissions to the control device - in this case an pulse jet fabric filter baghouse - for each EAF/LMF combo stack.

Nucor has proposed a combined (EAF/LMF) BACT emission rate for each unit as emitted from the associated controlling baghouse of the NSPS standard - 0.0052 gr/dscf. Initial compliance with this standard shall be based on the performance testing requirements given under §60.8. (and thereafter based on the periodic performance testing schedule given under 4.3.3 of the draft permit). Compliance with the opacity standard on the EAF/LMF combo stack may be achieved through the use of a continuous opacity monitoring system (COMS) or by performing daily Method 9 visible emissions testing pursuant to §60.273a(c) and installation and operation of a bag leak detection system pursuant to §60.273a(e) and (f). Nucor is proposing to meet this requirement by performing the Method 9 testing and is not proposing to install a COMS. As Nucor has proposed the use of a DEC, compliance with the opacity standard on the Melt Shop openings may be achieved through the use of a furnace static pressure monitoring device or by performing daily Method 9 visible emissions

testing pursuant to §60.273a(d). Nucor will choose one of these compliance methods at a later date. Additional operational monitoring is required under §60.274a.

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

40 CFR 60, Subpart JJJJ is the federal NSPS applicable to manufacturers, owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE). Nucor’s proposed six (6) 2,000 horsepower (hp) natural gas-fired Emergency Engines (EMGEN1 through EMGEN6) are each defined under 40 CFR 60, Subpart JJJJ as a stationary spark-ignition internal combustion engines (SI ICE) and are, pursuant to §60.4230(a)(4)(i), subject to the applicable provisions of the rule.

Pursuant to §60.4233(e): “Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE.” Therefore, as a new engine that is greater than 100 hp, each proposed engine must comply with the emission standards under Table 1 for “Emergency ≥130 hp manufactured after July 1, 2009:” NO_x - 2.0 g/HP-hr, CO - 4.0 g/HP-hr, and VOC - 1.0 g/HP-hr. The emission standards and the proposed compliance therewith of the engines are given in the following table:

Table 12: Subpart JJJJ Compliance

Pollutant	Standard (g/HP-hr)	Uncontrolled Emissions (g/hp-hr) ⁽¹⁾	Control Percentage ⁽¹⁾	Controlled Emissions (g/hp-hr) ⁽¹⁾	JJJJ Compliant?
NO _x	2.0	--	--	2.00	Yes
CO	4.0	--	--	4.00	Yes
VOC	1.0	--	--	1.00	Yes

(1) Make and model of the engines are TBD as of this writing. BACT was determined to be the Subpart JJJJ emission limits for applicable pollutants.

Compliance with the requirements above may be determined by either purchasing an engine certified to meet the above standards and demonstrating continuous compliance according to the procedures of §60.4243(a) or purchasing a non-certified engine and demonstrating compliance according to the requirements specified in §60.4244, as applicable, and according to paragraphs §60.4243(b)(2)(i) and (ii).

40 CFR 63, Subpart CCC: National Emission Standards for Hazardous Air Pollutants for Steel Pickling--HCl Process Facilities and Hydrochloric Acid Regeneration Plants - (Non-Applicable)

40 CFR 63, Subpart CCC is a federal MACT rule that includes requirements for new steel pickling facilities located at major sources of HAPs. As shown in Table 7, the proposed WV Steel Mill is not defined as a major source of HAPs and, therefore, Subpart CCC does not apply.

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

40 CFR 63, Subpart ZZZZ is a federal MACT that establishes national emission limitations and operating limitations for HAPs emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. As the West Virginia Steel Mill is defined as an area source of HAPs (see Table 7), the facility is subject to applicable requirements of Subpart ZZZZ. Pursuant to §63.6590(c):

An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part.

§63.6590(c)(1) specifies that “[a] *new or reconstructed stationary RICE located at an area source*” is defined as a RICE that shows compliance with the requirements of Subpart ZZZZ by “*meeting the requirements of . . . 40 CFR part 60 subpart JJJJ, for spark ignition engines.*” Pursuant to §63.6590(a)(2)(iii), a “[a] *stationary RICE located at an area source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12, 2006.*” The (6) 2,000 hp natural gas-fired Emergency Engines (EMGEN1 through EMGEN6) proposed for the West Virginia Steel Mill will each be defined as a new stationary RICE and, therefore, will show compliance with Subpart ZZZZ by meeting the requirements of 40 CFR 60, Subpart JJJJ. Compliance with Subpart JJJJ is discussed above.

40 CFR 63, Subpart DDDDD: National Emission Standards for Hazardous Air Pollutants for Hazardous Air Pollutants Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters - (Non-Applicable)

40 CFR 63, Subpart DDDDD is a federal MACT rule that establishes national emission limitations and work practice standards for HAPs emitted from industrial, commercial, and institutional boilers and process heaters located at major sources of HAPs. As shown in Table 7, the proposed West Virginia Steel Mill is not defined as a major source of HAPs and, therefore, Subpart DDDDD does not apply.

40 CFR 63, Subpart YYYYY: National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities

40 CFR 63, Subpart YYYYY is a federal MACT rule that applies to Electric Arc Furnace Steelmaking Facilities that are area sources of HAPs. Pursuant to §63.10692, an “Electric Arc Furnace Steelmaking Facilities” is defined as “*a steel plant that produces carbon, alloy, or specialty steels using an EAF. This definition excludes EAF steelmaking facilities at steel foundries and EAF facilities used to produce nonferrous metals.*” The EAFs proposed at the West Virginia Steel Mill meet this definition, and as shown in Table 7, the proposed facility is defined as an area source of HAPs. Therefore, Subpart YYYYY applies to the EAFs.

The applicable requirements of Subpart YYYYYY are targeted at (1) the management of the scrap that is charged into the EAF, and (2) the emissions standards of the EAF stacks. The requirements relating to the management of scrap are given under §63.10685 and require both a pollution prevention plan to minimize the amount of chlorinated plastics, lead, and free organic liquids that is charged to the furnace and a program to ensure that mercury switches are removed from any motor vehicle scrap charged into the EAFs.

The EAF emission standards are given under §63.10686(b) for EAFs that have a production capacity of greater than 150,000 tons/year (each Nucor EAF has a production capacity of 1,500,000 tons/year) and state that Nucor must not discharge or cause the discharge into the atmosphere from an EAF any gases which:

- Exit from a control device and contain particulate matter in excess of 12 mg/dscm (0.0052 gr/dscf); and
- Exit from a shop and, due solely to the operations of any affected EAF(s) or AOD vessel(s), exhibit 6 percent opacity or greater;

Compliance with the pollution prevention plan and the mercury switch removal program is determined by the requirements of Subpart YYYYYY. With respect to the emission standards, they are equivalent to those given under 40 CFR 60, Subpart AAa. The compliance demonstrations are also equivalent - see the discussion under Subpart AAa.

40 CFR 63, Subpart ZZZZZ: National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries Area Sources - (Non-Applicable)

40 CFR 63, Subpart DDDDD is a federal MACT rule that establishes requirements for iron and steel foundries that are area sources of HAPs. Pursuant to §63.10906, an “Iron and Steel Foundry” is defined as “*a facility or portion of a facility that melts scrap, ingot, and/or other forms of iron and/or steel and pours the resulting molten metal into molds to produce final or near final shape products for introduction into commerce. Research and development facilities, operations that only produce non-commercial castings, and operations associated with nonferrous metal production are not included in this definition.*” The proposed West Virginia Steel Mill will not have the capability to pour molten steel directly into molds to produce final or near final shape products. Therefore, Subpart ZZZZZ will not apply.

40 CFR 63, Subpart CCCCC: National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities

40 CFR 63, Subpart CCCCC is a federal MACT rule that establishes national emission limitations and management practices for HAPs emitted from the loading of gasoline storage tanks at gasoline dispensing facilities (GDF). GDF’s are defined under §63.11132 as “*any stationary facility which dispenses gasoline into the fuel tank of a motor vehicle, motor vehicle engine, nonroad vehicle, or nonroad engine, including a nonroad vehicle or nonroad engine used solely for competition. These facilities include, but are not limited to, facilities that dispense gasoline into on- and off-road, street, or highway motor vehicles, lawn equipment, boats, test engines, landscaping equipment, generators, pumps, and other gasoline-fueled engines and equipment.*” Nucor has

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proposed the use of a 1,000 gallon gasoline storage tank (T7) for storing gasoline to dispense to gasoline-fueled non-road engines and equipment. This storage tank and the associated dispensing operation is defined as a GDF under Subpart CCCCCC.

Nucor has proposed a maximum monthly GDF throughput of gasoline less than 10,000 gallons and, therefore, pursuant to §63.11111(b), Nucor must comply with the requirements given under §63.11116, which include the following:

- You must not allow gasoline to be handled in a manner that would result in vapor releases to the atmosphere for extended periods of time. Measures to be taken include, but are not limited to, the following: (1) Minimize gasoline spills; (2) Clean up spills as expeditiously as practicable; (3) Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use; and (4) Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.

40 CFR 63 Subpart JJJJJJ: National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources - (Not Applicable)

40 CFR 63, Subpart JJJJJJ is a federal MACT rule that establishes national emission limitations and work practice standards for HAPs emitted from industrial, commercial, and institutional boilers located at area sources of HAPs. The proposed West Virginia Steel Mill meets the definition of an area source of HAPs (see Table 7).

Pursuant to §63.11237, the definition of “boiler” covered under Subpart JJJJJJ is limited to “an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam or hot water.” This definition would only include the 11 mmBtu/hr Water Bath Vaporizer (ASP). However, pursuant to §63.11195(e), as this unit is exclusively “gas-fired,” it is exempt from Subpart JJJJJJ.

PSD REVIEW REQUIREMENTS

In 1977, Congress passed the Clean Air Act Amendments (CAAA), which included the Prevention of Significant Deterioration (PSD) program. This program was designed to allow industrial development in areas that were in attainment with the NAAQS without resulting in a non-attainment designation for the area. The program, as implied in the name, permits the deterioration of the ambient air in an area (usually a county) as long as it is within defined limits (defined as “increments”). The program, however, does not allow for a significant (as defined by the rule) deterioration of the ambient air. The program prevents significant deterioration by allowing concentration levels to increase in an area within defined limits - called pollutant increments - as long as the pollutants never increase enough to exceed the NAAQS. Projected concentration levels are calculated using complex computer simulations that use meteorological data to predict impacts from the source’s potential emission rates (see below). The concentration levels are then, in turn, compared to the NAAQS and pollutant increments to verify that the ambient air around the source does not significantly deteriorate (violate the increments) or violate the NAAQS. The PSD program

also requires application of best available control technology (BACT) to new or modified sources, protection of Class 1 areas, and analysis of impacts on soils, vegetation, and visibility.

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

As stated above under the 45CSR14 Regulatory Applicability Section, the proposed West Virginia Steel Mill is defined as construction of a "major stationary source" under 45CSR14 and PSD review is required for the pollutants of CO, NO_x, PM_{2.5}, PM₁₀, PM (filterable), SO₂, VOCs, Lead, Fluorides, and GHGs. The substantive requirements of a PSD review include a BACT analysis, an air dispersion modeling analysis, and an additional impacts analysis - each of which will be discussed below.

BACT Analysis - 45CSR14 Section 8.2

Pursuant to 45CSR14, Section 8.2, Nucor is required to apply BACT to each reasonable emission source that emits a PSD pollutant (CO, NO_x, PM_{2.5}, PM₁₀, PM (filterable), SO₂, VOCs, Lead, Fluoride, and GHGs) with a PTE in excess of the amount that is defined as "significant" for that pollutant. BACT is defined under §45-14-2.12 as:

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

Pursuant to USEPA and DAQ policy, the permit applicant determines an appropriate BACT emission limit by using a "top-down" analysis. The key steps in performing a "top-down" BACT analysis are the following: (1) Identification of all applicable control technologies; (2) Elimination of technically infeasible options; (3) Ranking remaining control technologies by control effectiveness; (4) Evaluation of most effective controls and documentation of results; and (5) the selection of BACT. Also included in the BACT selection process is, where appropriate, the review of BACT determinations at similar facilities using the RACT/BACT/LAER Clearinghouse (RBLC). The RBLC is a database of RACT, BACT, and LAER determinations maintained by EPA and

periodically updated by the individual permitting authorities (it is important to note, however, that the RBLC is not exhaustive as not all determinations are uploaded to the database).

Nucor included a BACT analysis in their permit application under Section 4 generally using the top-down approach as described above. For a detailed review of Nucor’s BACT, see Section 4 (p 30) of Permit Application R14-0039. The BACT determination is summarized below.

Nucor’s BACT Submission

Nucor included in the permit application a BACT Analysis reasonably performed in accordance with 45CSR14 and relevant guidance. For each pollutant, Nucor generally performed, for each source or logical grouping of sources, a top-down analysis for the emissions unit(s). Where applicable, Nucor included an economic analysis and data from the RBLC to support the final selection of BACT.

This section will summarize key points of the Nucor BACT determination (for the detailed and complete BACT Analysis, see the permit application) and the following table lists Nucor’s BACT selections (technology selection only, for tables/requirements containing BACT emission limits, see applicable permit section as cited in the below table).

Table 13: Nucor BACT Summary Table

Emission Unit ID	Pollutant	BACT Technology	Draft Permit Citation
<u>Raw Material Handling and Storage</u> <u>EAF Baghouse Dust Handling</u> <u>Slag Processing</u>			
SLGSK1-3 SCRPSK1-4	PM _{2.5} , PM ₁₀ , PM (filterable)	Wet Suppression, Good Housekeeping Practices	Appendix A, Table A-1, A-2
LIME-DUMP CARBON-DUMP ALLOY-HANDLE LCB EAFVF1/2	PM _{2.5} , PM ₁₀ , PM (filterable)	Enclosures (Dump Station) Enclosed Conveyers (w/ Baghouses) Storage Silo Fabric Filters Good Housekeeping Practices	
DRI-DOCK DRI1-4 DRI-DB1/2 BULK-DRI DRI-CONV	PM _{2.5} , PM ₁₀ , PM (filterable)	Enclosures (Dump Station) Storage Silo/Day Bin Fabric Filters Enclosed Conveyers (w/ Baghouses) Good Housekeeping Practices	
SCRAP-RAIL SCRAP-DOCK SCRAP-BULK34-40	PM _{2.5} , PM ₁₀ , PM (filterable)	Good Housekeeping Practices	
SCRAP-BULK1-33	PM _{2.5} , PM ₁₀ , PM (filterable)	Wet Suppression, Good Housekeeping Practices	
FUGD-UNPAVED-11U - 19U FUGD-PAVED-01P - 10P	PM _{2.5} , PM ₁₀ , PM (filterable)	Vacuum Truck (Paved) Wet Suppression	

Melt Shop			
EAF1/2 LMF1/2 (MSFUG)	CO	Good Combustion Practices	Table 4.1.4(a) Table 4.1.4(b) 4.14(e)(5)
	NO _x	LNBS, Oxy-Fuel Burners, Good Combustion Practices	
	PM _{2.5} , PM ₁₀ , (filterable) PM	DEC/Canopy Hood/Baghouse Fugitive Mitigation	
	SO ₂	Scrap Management Plan	
	VOCs	Good Combustion Practices	
	Lead	DEC/Canopy Hood/Baghouse Fugitive Mitigation	
	Fluoride	DEC/Canopy Hood/Baghouse	
	GHGs	Efficiency Requirements	
CAST1/2	PM _{2.5} , PM ₁₀ , (filterable) PM	Canopy Hood/Baghouse/ Fugitive Mitigation	Table 4.1.4(b)
VTG1/2	CO	Flare	Table 4.1.4(d)(3)
	PM _{2.5} , PM ₁₀ , (filterable) PM	Particulate Matter Filter	
Natural Gas Combustion			
LD LPHTR1-7 TD TPHTR1/2 SENPHTR1/2 GALVFN1/2 BOXANN1-22 TF1 SLAG-CUT ASP	CO	Good Combustion Practices	Table 4.1.5(a)
	NO _x	LNB	
	PM _{2.5} , PM ₁₀ , (filterable) PM	Use of Natural Gas, Good Combustion Practices	
	SO ₂	Use of Natural Gas	
	VOCs	Good Combustion Practices	
	GHGs	Use of Natural Gas, Good Combustion Practices	
Hot & Cold Mills			
RM PKL-1 PKLSB TCM STM SPM1/2 CGL1/2	PM _{2.5} , PM ₁₀ , (filterable) PM	Baghouses Scrubbers/Mist Eliminators	Appendix A, Table A-4
Storage Tanks			
T1 - T9	VOCs	White/Aluminum Shell Good Operating Practices	4.1.7(e)
T25 - T29	VOCs	Good Operating Practices	4.1.7(f)

<u>Cooling Towers</u>			
CT1 - CT8	PM _{2.5} , PM ₁₀ , (filterable) PM	Drift Eliminators	4.1.8(b)
<u>Emergency Engines</u>			
EMGEN1 - 6	CO	Subpart JJJJ Certification Annual Hrs of Op ⁽¹⁾ Limit	Table 4.1.9(b)
	NO _x	Subpart JJJJ Certification Annual Hrs of Op ⁽¹⁾ Limit	
	PM _{2.5} , PM ₁₀ , (filterable) PM	Use of Natural Gas Annual Hrs of Op ⁽¹⁾ Limit	
	SO ₂	Use of Natural Gas Annual Hrs of Op ⁽¹⁾ Limit	
	VOCs	Annual Hrs of Op ⁽³⁾ Limit	
	GHGs	Use of Natural Gas Good Combustion Practices	

(1) Limited to 100 hours a year of non-emergency operation.

Material Handling Operations

Nucor will utilize a variety of materials in the steel making process and has proposed suite of BACT control technologies/mitigation strategies for the different material handling operations. Where feasible, for most of the DRI, lime, carbon, and alloy handling operations, Nucor has proposed the use of enclosed conveying systems that exhaust to baghouses/fabric filters/bin vents to control particulate matter emissions from these sources. For the slag and steel scrap material handling operations (including open storage piles), for which the particulate matter emissions are fugitive in nature (and, therefore, the reasonable use of full enclosures and baghouses is not appropriate), Nucor has proposed the use of various enclosures and wet suppression as the BACT mitigation strategies. These control technologies/mitigation strategies are consistent with similar units in the RBLC database. BACT emission rates for the control devices are set at the outlet grain loading rates for the baghouses/fabric filters/bin vents and at the lb/hr emission rates for the fugitive sources.

Melt Shop Sources: EAF/LMFs and Casting Operations

The BACT determination on the EAFs/LMFs was based for all pollutants (with the exception of GHGs) on the most efficient control technology/strategy that was not considered technically infeasible for use on the specific source in question.

BACT for the EAFs/LMFs was driven primarily by two characteristics of the emission source: the potential for high particulate matter emissions and the need to account for the variability of the scrap source in the production of VOCs and SO₂ emissions. The control of particulate matter and the BACT technology is driven by the NSPS-defined use of the DEC (and canopy hood) to achieve a very high control of the emissions generated during electrode use in the EAFs. The use of the DEC and associated baghouses preclude the use of bolt-on NO_x and CO control technology such as

catalytic reduction and oxidation as the temperature profiles of these technologies do not align with the baghouse systems. There were no examples of these technologies being used on EAFs in the RBLC. The exclusion of these technologies was therefore appropriate.

VOCs and SO₂ emissions from the EAFs/LMFs are related to the characteristics of the scrap. For this reason, BACT is defined as the use of a the “Scrap Management Plan” as required under 40 CFR 63, Subpart YYYYYY and the use of commercially available low residue, pre-processed, and inspected scrap. The BACT emission rates were chosen so as to allow for this site-specific scrap variability while mitigating the emissions of VOCs and SO₂. The use of the Scrap Management Plan is consistently present on the RBLC entries, and it is important to note that Nucor has proposed the use of an SO₂ CEMS that will allow for real-time monitoring of the SO₂ emissions from the EAFs/LMFs.

In addition, Nucor has noted, in response to a comment provided by the NPS concerning the consideration of lime injection in the EAF baghouses, that the proposed WV Steel Mill will be a producer of lower sulfur steel that utilizes correspondingly lower sulfur feedstocks. These feedstocks result in lower SO₂ exhaust concentrations that are below the levels generally controlled by flue gas desulfurization systems such as lime injection. Nucor also has proposed the use of lime injection in the melting process to remove sulfur in the form of the slag. While the NPS was able to provide an example from the RBLC of use of a lime-injection baghouse (Gerdau Macsteel MI-0438), it was used on a producer of higher-sulfur steel. Nucor also notes that the BACT emission limit chosen for the Gerdau Macsteel EAF/LMFs (0.35 lb-SO₂/ton-steel) was higher than that of Nucor’s proposed EAF/LMFs (0.24 lb-SO₂/ton-steel). For these reasons, the DAQ agrees that lime injection in the baghouse is appropriately removed from consideration as BACT for Nucor’s proposed low-sulfur steel production process.

As stated, the particulate matter BACT is driven by use of the DEC (and canopy hood) that evacuates to a baghouse to achieve a very high control of the emissions generated during electrode use in the EAFs. This is consistent with most of the other similar facilities listed in the RBLC.

Non-Fugitive Particulate Matter Sources

Generally, Nucor chose the most effective control option for the many non-fugitive particulate matter sources - baghouses, fabric filters, and silo bin vents. These sources primarily include the particulate matter generated during steel slab milling, surface cleansing operations, and the non-fugitive material handling operations. Baghouses work by pulling process exhaust gas through a tightly woven or felted fabric arranged in sheets, cartridges, or bags that collects particulate matter via sieving and other mechanisms. The dust cake that accumulates on the filters increases collection efficiency. Various cleaning techniques include pulse-jet, reverse-air, and shaker technologies. Collected dust then falls into a collection area and is periodically removed for disposal. Baghouses are capable of capturing up to 99.9%+ of uncontrolled emissions and are relatively easy to install and maintain operational at these high levels.

Also chosen for sources with certain exhaust characteristics (such as the Cold Mill Pickling Line that also has HCl emissions and the steel cleaning sections) was the use of mist eliminators and

wet scrubbers. Wet scrubbers work when a scrubbing liquid is introduced into the process gas stream that captures and collects entrained particles. In the case of a venturi scrubber, the turbulent airflow atomizes the scrubbing liquid to increase droplet-particle interaction. The droplets containing particles are typically separated from the exhaust gas in a downstream cyclonic separator and/or mist eliminator. These particulate matter control devices are also capable of capturing up to 99.9%+ of uncontrolled emissions and are also relatively easy to install and maintain operation at this high levels.

Nucor provided information that showed the use of these control devices are strongly supported where data is available on the RBLC and that the chosen emission rates are at or exceed those chosen as BACT at most other similar facilities.

Natural Gas Combustion Sources

The most significant result of the BACT Analysis for the natural gas combustion sources (not including the RICE) was the determination that use of combustion exhaust technologies for control of NO_x (SCR, SNCR) and CO (oxidation catalysts) was either not technically feasible or was economically prohibitive. The elimination of these technologies were primarily based on the exhaust characteristics of the sources in question - either outside the temperature profile or used directly for heat and not captured and vented through a stack. Where these stack characteristics were not determinative, Nucor provided an economic analysis that showed the use of these technologies were cost prohibitive. For this reason, Nucor proposed the use of LNBs for the natural gas combustion devices as the NO_x BACT. This was consistent with the similar units in the RBLC database.

Again consistent with other units in the RBLC and conventional for natural gas combustion units of the size and characteristic of those proposed for the West Virginia Steel Mill, Nucor proposed the use of Good Combustion Practices and the use of natural gas as a fuel as BACT for the other pollutants including CO.

BACT emission rates were based on the AP-42, Section 1.4 for all pollutants (excluding GHGs) with the exception of NO_x from the following units: a NO_x emission factor of 0.05 lb/mmBtu was used for the Box Annealing Furnaces and the Galvanizing Furnaces and 0.07 lb/mmBtu was used for the Hot Mill Tunnel Furnace. These BACT emission limits were based on expected available vendor guarantees and consistency with recent RBLC data. GHG BACT was based on the TPY limits of the units in turn based on emission factors taken from 40 CFR Part 98 - "Mandatory Greenhouse Gas Reporting," Tables C-1 and C-2.

Additional GHG BACT Requirements

Nucor, under Section 4.8 of the permit application, provided a separate pollutant-specific GHG BACT analysis. This is appropriate as beyond unit-specific GHG BACT control technologies or pollution prevention strategies, as GHG BACT selections often involve plant-wide and systemic strategies that focus on energy efficiency or maintenance activities. Table 4-60 of the permit application (p 89) provides a suite of GHG BACT technologies for both plant-wide application and on specific units. This table is integrated into the draft permit under 4.1.11 and specific EAF/LMF GHG BACT requirements are also given under 4.1.4(c)(5).

DAQ Conclusion on BACT Analysis

The DAQ has concluded that Nucor reasonably conducted a BACT analysis using, where appropriate, the top-down analysis and eliminated technologies for valid reasons. The DAQ concludes that the selected BACT emission rates given in the draft permit are achievable, are consistent where appropriate with recent applicable BACT determinations, and are accepted as BACT. Further, the DAQ accepts the selected control technologies and control strategies as BACT.

Modeling Analysis - 45CSR14, Section 9 and Section 10

§45-14-9 and §45-14-10 contain requirements relating to a proposed major source's impact on air quality (Section 9) and the requirements for the air dispersion modeling used to determine the potential impact (Section 10). Specifically, §45-14-9.1 requires subject sources to demonstrate that *“allowable emission increases from the proposed source or modification, in conjunction with all other applicable emission increases or reductions (including secondary emissions), would not cause or contribute to”* (1) a NAAQS violation or (2) an exceedance of a maximum allowable increase over the baseline concentration in any area (exceed the increment).

Pursuant to the above, Nucor was required to do an air dispersion modeling analysis to determine the potential impacts on Class II areas only. To this end, Nucor provided a detailed Modeling Report submitted on March 23, 2022. Class I area modeling was not performed (as explained below). The pollutants required to be modeled were CO, NO_x, PM_{2.5}, PM₁₀, SO₂, and lead. GHGs are not modeled as part of the PSD application review process and VOC emissions (as a precursor to tropospheric ozone formation) were addressed in Section 7.1 of the modeling report. The results of the modeling analyses are summarized below. More detailed descriptions of these modeling analyses and quantitative results are contained in Attachment A prepared by Mr. Jon McClung of DAQ's Planning Section.

Class I Modeling

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

If an FLM demonstrates that emissions from a proposed source will cause or contribute to adverse impacts on the air quality related values (AQRV's) of a Class I area, and the permitting authority concurs, the permit will not be issued. The AQRVs typically reviewed, in the case of evaluating adverse impacts, are visibility (both regional and direct plume impact) and acid deposition (including both nitrogen and sulfur).

Additionally, the Class I Increments may not be exceeded. Class I Increments are limits to how much the air quality may deteriorate from a reference point (called the baseline). There are Class I Increments for NO₂, PM_{2.5}, PM₁₀, and SO₂. Based on EPA guidance, a full increment analysis is not required if the source's impacts alone do not exceed a calculated Class I Area Significant Impact Level (SIL) - based on the same ratio of the Class II increment levels and the associated Class II SILs as applied to the Class I Increment.

There are generally four Class I areas that may have to be considered when conducting PSD reviews in West Virginia. These are, in West Virginia, the Otter Creek Wilderness Area and the Dolly Sods Wilderness Area; both of which are managed by the US Forest Service. The Shenandoah National Park, managed by the National Park Service (NPS), and the James River Face Wilderness Area, managed by the US Forest Service (USFS), are in Virginia. The West Virginia Steel Mill is approximately 220 kilometers (km) from the Otter Creek Wilderness Area, 240 km from the Dolly Sods Wilderness Area, 302 km from the Shenandoah National Park, and 318 km from the James River Face Wilderness Area.

The FLMs responsible for evaluating affects on AQRVs for federally protected Class I areas were, through standard procedure, provided with information concerning the proposed facility upon the submission of the permit application. On February 4, 2022 (USFS) and on February 10, 2022 (NPS), the USFS and the NPS notified the DAQ that an AQRV analysis was not required for the proposed West Virginia Steel Mill.

Nucor evaluated the project related increase of NO₂, PM₁₀, PM_{2.5}, and SO₂ against the Class I SILs by placing an arc of receptors at a distance of 50 km in the direction each Class I area within 300 km, to demonstrate that impacts are below the Class I SILs. Using this methodology, the maximum modeled concentrations at the 50 km receptors were less than the Class I SILs for all modeled pollutants (see Table 5-3 of the Nucor Modeling Report), and it is therefore reasonable to assume that the project also had maximum potential impacts that were less than the Class I SILs at the much more distant Class I areas. As stated above, pollutants modeled below the Class I SILs are not required to perform a full Class I increment modeling analysis.

Class II Modeling

A Class II Modeling analysis can require up to three runs to determine compliance with Rule 14. First, the proposed source is modeled by itself, on a pollutant by pollutant basis, to determine if it produces a "significant impact" - an ambient concentration published by US EPA (the Class II SIL). If the dispersion model determines that the proposed source produces significant impacts, then the demonstration proceeds to the second stage. If the model finds that the proposed source produces "insignificant impacts", no further modeling is needed (on a pollutant-by-pollutant basis). The modeling, the results of which are given in Table 6-1 and 6-2 of the Modeling Report, indicated that CO (1-hr and 8-hr) and SO₂ (3-hr and annual) were not significant. No further modeling was therefore required for these pollutants and the associated averaging times. The other pollutants (NO₂ 1-hr and annual, PM_{2.5} 24-hr and annual, PM₁₀ 24-hr and annual, and SO₂ 1-hr and 24-hr) were "significant," thereby requiring the applicant to proceed to the next stage of the modeling process for those pollutants and the associated averaging times.

The next tier of the modeling analysis is to determine if the proposed facility, in combination with the existing sources, will produce an ambient impact that is less than the National Ambient Air Quality Standards (NAAQS). As shown in Table 6-3 of the Modeling Report, the total concentration of each pollutant is less than the NAAQS for all relevant averaging periods.

This final stage is usually to determine how much of the PSD Increment the proposed construction of the facility consumes, along with all other increment consuming sources. This value may not exceed the PSD Increment. PSD Increments are the maximum concentration increases above a baseline concentration that are allowed in a specific area. As shown in Table 6-4 of the Modeling Report, the total concentration is less than the PSD increment for each pollutant and all relevant averaging times.

Nucor, therefore, passes all the required Air Quality Impact Analysis tests as required for Class II Areas under 45CSR14. Attachment A to this evaluation is a report prepared by Jon McClung on March 28, 2022 (for the complete report with all the attachments, please see Nucor's Modeling Report) that discusses in depth the above summarized analysis.

Additional Impacts Analysis - 45CSR14, Section 12

§45-14-12 requires an applicant to provide “*an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification.*” Nucor provided an Additional Impacts Analysis in Section 8.1 of their Modeling Report submitted on March 23, 2022. The following is a summary of that analysis. It is important to note that no specific thresholds (other than indirectly the secondary NAAQS) have been promulgated by USEPA to determine if any quantified additional impacts are beyond those considered reasonable for a proposed source.

Growth Analysis

Nucor provided a qualitative growth analysis in determining the impact of the proposed operation of the facility. While they expect the Nucor facility to “increase full-time employment after the construction phase,” they state that the “proposed project . . . is anticipated to have a limited growth impact on Mason County, WV with the potential to contribute to adverse air quality impacts for the PSD triggering pollutants.” Further, Nucor expects most of the permanent employees to already reside in the area and that the “installation of the plant is not expected to significantly contribute to substantial residential or commercial growth that would cause quantifiable air quality impacts.” Finally, Nucor concluded that the proposed facility “would not expect any growth attributable to this proposed project to cause quantifiable air quality impacts.”

Soil and Vegetation Analysis

The USEPA developed the secondary NAAQS to represent levels that “provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.” Therefore, if the impacts from a source are found to be less than the

secondary NAAQS, emissions from that project may be reasonably determined to not result in harmful effects to either soils or vegetation. Based on the air dispersion modeling report, (see Attachment A), the facility has shown that the impacts from the facility will be below the secondary NAAQS.

Additional Visibility Analysis

In addition to Nucor’s visibility analysis contained within the review of a source’s secondary NAAQS impact, they also provided a specific screening analysis to determine the impact on visibility at Beech Fork State Park. Beech Fork State Park is located approximately 40 kilometers (km) to the south-southwest of the proposed location of the plant. Using VISCREEN - a conservative screening model to determine visibility impacts from a plume - Nucor determined that at Beech Fork State Park, the impact of the plume would not exceed the Level 1 screening thresholds that would indicate the need to perform a more refined Level 2 analysis. This indicates that even a conservative estimate of the visibility impact of the proposed source on this specific area shows that the impact would be nominal.

Conclusions Regarding Additional Impacts Analysis

As noted above, no quantified state or federal standards have been promulgated concerning the potential impacts analyzed under Section 12. In the absence of statutory thresholds, it is the role of the regulatory agency to make a qualitative assessment of the potential impacts on the values identified under Section 12. Based on the size, nature, and location of the proposed source, as well as the submitted analysis, the DAQ concludes that none of the metrics identified in Section 12 (visibility, soils, and vegetation) will be substantively impaired from the construction of the steel mill.

Minor Source Baseline Date - Section 2.42.b

On March 23, 2022, Permit Application R14-0039 was deemed complete. This action, pursuant to 45CSR14, Section 2.42(b), has triggered the minor source baseline date (MSBD) for the specific pollutants in the following areas:

Table 14: Minor Source Baseline Triggering

Pollutant	Mason County
NO ₂	n/a ⁽¹⁾
PM _{2.5}	Yes
PM ₁₀	n/a ⁽¹⁾
SO ₂	Yes

(1) Previously Triggered.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides information on those regulated pollutants that may be emitted from the proposed West Virginia Steel Mill and 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 (PM₁₀ and PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have NAAQS set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria *and without national concentration standards*, are regulated through various state and federal programs designed to limit their emissions and public exposure. These programs include federal source-specific HAP regulations promulgated under 40 CFR 61 and 40 CFR 63 (NESHAPS/MACT), and WV Legislative Rule 45CSR27 that regulates certain HAPs defined as Toxic Air Pollutants (TAPs). Any potential applicability to these programs is discussed above under REGULATORY APPLICABILITY.

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 affects, however, may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no applicable federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the potential health effects of each compound listed in this section, refer to the IRIS database located at www.epa.gov/iris. It is important to note that the USEPA does not divide the various HAPs into further classifications based on toxicity or if the compound is a suspected carcinogen.

Table 15 lists each HAP currently identified in the permit application as potentially emitted in an amount greater than 20 lbs/year (0.01 tons/year) from the proposed facility. Additionally, information concerning the pollutant, and the associated carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)), and any potentially applicable MACT is provided in Attachment B.

Table 15: Hazardous Air Pollutants

Pollutant	CAS #	PTE (tons/yr)
VOC-HAPs		
Acetaldehyde	75-07-0	0.035
Acrolein	107-02-8	0.033
Benzene	71-43-2	0.013
Formaldehyde	50-00-0	0.416
n-Hexane	110-54-3	4.427
Hydrochloric Acid (HCl)	7647-01-0	1.159
Methanol	67-56-1	0.013

Pollutant	CAS #	PTE (tons/yr)
Tetrachloroethylene	127-18-4	0.010
Toluene	108-88-3	0.012
PM-HAPs		
Lead ⁽¹⁾	7439-92-1	0.675
Manganese	7439-96-5	0.450
Mercury	7439-97-6	0.165

- (1) Although Nucor has stated that the lead emitted from the Melt Shop sources will be almost all elemental lead (which is not defined as a HAP), to be conservative, all lead is assumed to fall in the category of “Lead Compounds,” which are defined as HAPs.

Fluoride

Nucor has estimated a facility-wide PTE of Fluoride (16984-48-8) of 5.25 tons/year. Fluoride is not defined as a HAP under Section 112(b) but is defined under this section as a non-criteria regulated pollutant (regulated under 45CSR14). Fluoride is a naturally-occurring component of rocks and soil (the largest emitter of which is volcanoes) and is also found naturally in the air, water, plants, and animals. Fluoride in many areas is added to drinking water to promote healthy teeth. Anthropogenic sources of fluoride air emissions include many industrial sources including steel production. The fluorides emitted from the proposed Nucor facility are in the form of particulate matter and are emitted only from the EAFs. Particulate matter emissions of fluoride settle in the environment and may then be introduced into the ecosystem through absorption and consumption by animals. There is no entry in the IRIS database for fluoride. An article on the extant toxicology studies of fluoride is located at:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7261729/>.

As a pollutant subject to BACT, the emissions of fluoride are strongly controlled through the use of BACT-level particulate matter control technology as described above: the EAFs DEC system, canopy hood, and the EAF baghouses.

GHGs

GHGs (gases that trap heat in the atmosphere) is collectively the air pollutant defined in 40 CFR 86, Section §86.1818-12(a)(1) as the aggregate group of six greenhouse gases: carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF₆). GHGs are included in this section as they are regulated under 45CSR14 and are subject to the BACT requirements therein (see PSD Requirements above). GHGs as regulated collectively have no direct toxicity and have no entry in the IRIS database. For information on GHGs, see the information on EPA’s website:

<https://www.epa.gov/ghgemissions>.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

Monitoring and Compliance Demonstrations

The primary purpose of emissions monitoring is to determine continuous compliance with emission limits and operating restrictions in the permit over a determined averaging period. Emissions monitoring may include any or all of the following:

- Real-time continuous emissions monitoring to sample and record pollutant emissions (CEMS, COMS);
- Monitoring of plant-wide variables to limit the scope of the plant as applied for;
- Parametric monitoring of variables pre-determined to be proportional (at a known ratio) to emissions (recording of material throughput, fuel usage, production, etc.);
- Real-time tracking of materials and pollutant percentages used in processes where evaporation emissions are expected;
- Monitoring of control device performance indicators (pressure drops, liquid flow rates, oxidizer temperatures, etc.) to guarantee efficacy of pollution control equipment; and
- Visual stack observations to monitor opacity.

It is the permittee's responsibility to record, certify, and report the monitoring results so as to verify compliance with the emission limits. Where emissions are based on the maximum rated short and long-term capacity of units, generally no continuous emissions or parametric monitoring is required as compliance with the emission limits is based on the specific limited capacity of the units.

For the proposed West Virginia Steel Mill, a mix of the above methods are used to give a reasonable assurance that continuous compliance with emission limits is being maintained. Specifically, some examples include:

- Use of CEMS (for CO, NO_x, and SO₂) on the EAF Baghouses [4.2.4];
- Plant-wide monitoring of the production of steel [Table 4.2.3];
- Parametric throughput monitoring on selected material handling throughputs, storage tank throughputs, and hours of operation on the emergency engines [Table 4.2.3];
- Control device monitoring on selected baghouses and scrubbers [Table 4.2.11]; and
- Visible emissions monitoring, both based on statutory requirements and source specific requirements, will be required on all applicable sources with opacity requirements [Table 4.2.12].

In addition to site-specific monitoring and compliance demonstrations, Nucor is required to meet all applicable statutory requirements including those given under 40 CFR 60, Subpart AAa and 40 CFR 63, Subparts YYYYYY and CCCCCC.

Refer to Section 4.2 of the draft permit for all the unit-specific monitoring, compliance demonstration, reporting, and record-keeping requirements (MRR).

Record-Keeping

Nucor will be required to follow the standard record-keeping boilerplate language as given under Section 4.4 of the draft permit. This will require Nucor to maintain records of all data monitored in the permit and keep the information for a minimum of five years. All collected data will be available to the Director upon request. Nucor will also be required to follow all the record-keeping requirements as applicable under the variously applicable state and federal rules and regulations.

Reporting

Beyond the requirement to follow all reporting requirements as applicable under the variously applicable state and federal rules and regulations, Nucor will be required to submit the following substantive reports:

- The results of stack testing within sixty (60) days of completion of the test. The test report shall provide the information necessary to document the objectives of the test and to determine whether proper procedures were used to accomplish these objectives [3.3.1(d)];
- When necessary, any deviation of the allowable visible emission requirement for any emission source discovered during observation using 40CFR Part 60, Appendix A, Method 9 must be reported in writing to the Director of the DAQ as soon as practicable, but within ten (10) calendar days, of the occurrence and shall include, at a minimum, the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned [4.2.12(f)];
- A report detailing all required monitoring on or before September 15 for the reporting period January 1 to June 30 and March 15 for the reporting period July 1 to December 31. All instances of deviation from permit requirements must be clearly identified in such reports [4.5.1(a)]; and
- On or before March 15, a certification of compliance with all requirements of the draft permit for the previous calendar year ending on December 31 [4.5.1(b)].

PERFORMANCE TESTING OF OPERATIONS

Performance testing is required to verify, where reasonable and appropriate, the emissions or emission factors used to determine emission units' potential-to-emit and to show initial or periodic compliance with permitted emission limits. Performance testing must be conducted in accordance with accepted test methods and according to a protocol approved by the Director prior to testing (as

outlined under 3.3 of the draft permit). The following table details the initial (within 60 days after achieving the maximum permitted production rate of the emission unit in question, but not later than 180 days after initial startup of the unit) performance testing required of specific emission units:

Table 16: Performance Testing Requirements

Emission Unit(s)	Emission Point(s)	Pollutants	Limit ⁽¹⁾
EAF1/LMF1/CAST1	BHST-1 ⁽²⁾	All Pollutants under Table 4.1.4(a) with the exception of Total HAPs, and CO ₂ e.	PPH gr/dscf (PM)
EAF2/LMF2/CAST2	BHST-2 ⁽²⁾		
TF1	TFST-1	CO and NO _x	PPH
GALVFN1 GALVFN2 ⁽³⁾	GALVFN1-ST GALVFN2-ST		
ASP	ASP-1		
RM	RM-BH	PM _{2.5} , PM ₁₀ , PM ⁽⁴⁾	PPH gr/dscf
SPM1 SPM2 ⁽³⁾	SPMST1 SPMST2		

- (1) Where applicable, test results will also be used to show compliance with lb/ton, lb/mmBtu, or other BACT performance limits.
- (2) Initial and periodic performance testing on PM emitted from BHST-1 and BHST-2 shall be in accordance with the procedures outlined under §60.18 and §60.275a.
- (3) Permittee may choose one of the identical listed units to test.
- (4) Filterable Only.

Periodic testing will then be required as based on the schedule given in Table 4.3.3. of the draft permit. Refer to Section 4.3 of the draft permit for all performance testing requirements.

RECOMMENDATION TO DIRECTOR

The WVDAQ has preliminarily determined that the proposed construction of Nucor Steel West Virginia LLC’s West Virginia Steel Mill located near Apple Grove, 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 decision regarding the DRAFT permit will be made after consideration of all public comments. It is the recommendation of the undersigned, upon review and approval of this document and the DRAFT permit, that the WVDAQ, pursuant to §45-14-17, go to public notice on Permit Application R14-0039.

Joseph R. Kessler, PE
Engineer

R14-0039
Nucor Steel West Virginia LLC
West Virginia Steel Mill

Attachment A: Air Dispersion Modeling Report

Nucor Corporation: West Virginia Steel Mill

Permit Number R14-0039: Facility ID 053-00085

MEMO

To: Joe Kessler **Jonathan D. McClung**
From: Jon McClung
CC: David Fewell, Bev McKeone, Ed Andrews, Steve Pursley, Rex Compston
Date: March 28, 2022
Re: Air Quality Impact Analysis Review
Nucor Steel West Virginia LLC
West Virginia Steel Mill
PSD Permit Application: R14-0039
Plant ID: 053-00085

Digitally signed by: Jonathan D. McClung
DN: CN = Jonathan D. McClung email = JON.D.
MCCLUNG@WV.GOV C = AD O = Department of
Environmental Protection OU = Division of Air Quality
Date: 2022.03.28 15:32:05 -04'00'

I have completed my review and replication of the air quality impact analysis submitted by Nucor Steel West Virginia LLC (Nucor) in support of the PSD permit application (R14-0039) for the proposed construction of a steel making plant in Apple Grove, West Virginia, within Mason County. Review and replication of various components of the modeling analysis were performed by Ed Andrews, Joe Kessler, Steve Pursley, and Rex Compston. This dispersion modeling analysis is required pursuant to §45-14-9 (Requirements Relating to the Source's Impact on Air Quality). Nucor has demonstrated that the proposed project will not cause or contribute to any violations of applicable NAAQS or increment standards.

The protocol for the modeling analysis was submitted by Nucor on January 13, 2022 and approved by West Virginia Division of Air Quality (DAQ) on January 13, 2022. The initial PSD permit application, which did not contain a modeling analysis report, was received on January 21, 2022. A revised permit application with a modeling analysis report was received on March 23, 2022. A land-use sensitivity analysis and related electronic modeling files were submitted by Nucor on February 9, 2022. Additional electronic modeling files related to the land-use analysis were submitted on February 11, 2022. Multi-processor electronic modeling files were submitted by Nucor on March 8, 2022 and single-processor electronic modeling files were submitted on March 23, 2022.

As part of the review process, an applicant for a PSD permit performs the air quality impact analysis and submits a report and the results to the DAQ. The 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 that contains communications with the applicant, the protocol, modeling analysis reports, 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 318 km of the project site are: Dolly Sods Wilderness (WV), Otter Creek Wilderness (WV), James River Face Wilderness (Virginia), and Shenandoah National Park (Virginia). The Federal Land Managers (FLMs) responsible for evaluating potential affects on Air Quality Related

Values (AQRVs) for federally protected Class I areas were consulted. Based on the emissions from the proposed project and the distances to the Class I areas the National Park Service and U.S. Forest Service have stated a Class I analysis for this project is not required.

Nucor will manufacture sheets of steel primarily from scrap steel, direct reduced iron (DRI), and other scrap substitutes. Iron ore will not be processed at the proposed mill and the proposed mill will not utilize coke ovens or blast furnaces. The proposed West Virginia Steel Mill is expected to produce approximately 3 million tons of steel product per year. The following air emission units are proposed for the steel manufacturing plant:

Melt Shop

- Two (2) single shell DC EAFs and two (2) LMFs each with a maximum hourly capacity of 171 tph and annual capacity of 1.5 million tons per year; each controlled with a DEC system and negative pressure baghouses,
- One (1) ladle dryer firing natural gas with a rating of 15 MMBtu/hr
- Seven (7) ladle preheaters firing natural gas each with a rating of 15 MMBtu/hr
- One (1) tundish dryer firing natural gas with a rating of 6 MMBtu/hr
- Two (2) tundish preheaters firing natural gas each with a rating of 9 MMBtu/hr
- Two (2) subentry nozzle preheaters firing natural gas each with a rating of 1 MMBtu/hr
- Two (2) vacuum degassers each with a maximum hourly capacity of 171 tph and annual capacity of 0.875 million tons per year.
- One (1) continuous caster with a maximum hourly capacity of 171 tph and annual capacity of 1.5 million tons per year

Hot Mill

- One (1) tunnel furnace firing natural gas with a rating of 150 MMBtu/hr
- One (1) rolling mill with a rating of 342 tph and annual capacity of 3 million tons per year

Cold Mill

- One (1) scale breaker with a rating of 342 tph and annual capacity of 3 million tons per year
- One (1) pickling line and two (2) galvanizing lines each with a rating of 171 tpy and annual capacity of 1.5 million tons per year
- Two (2) galvanizing furnaces firing natural gas each with a rating of 83 MMBtu/hr
- Twenty-two (22) box annealing furnaces firing natural gas each with a rating of 10 MMBtu/hr
- One (1) tandem cold mill with a rating of 342 tph and annual capacity of 3 million tons per year
- One (1) temper mill with a rating of 342 tph and annual capacity of 3 million tons per year
- Two (2) skin pass mills each with a rating of 114 tph and annual capacity of 1 million tons per year

Raw Material Handling

- One (1) lime handling system consisting of dump station, conveyor systems, and silos
- One (1) carbon handling system consisting of dump station, conveyor systems, and silos
- One (1) alloy handling system consisting of dump station, conveyor systems, and silos
- One (1) DRI handling system consisting of dump station, conveyor systems, and silos
- One (1) scrap handling system

Slag Handling

- One (1) slag handling system consisting of various conveyors systems, screen, piles, and crushers.

Storage Piles

- Three (3) slag stockpiles
- Four (4) scrap metal stockpiles

Auxiliary Equipment

- One (1) air separation unit including a 10 MMBtu/hr water vaporizer bath
- Eight (8) contact and non-contact cooling towers with a total recirculation rate of 204,150 gallons per minute
- Six (6) natural gas fired emergency engines each with a rating of 2,000 hp
- Ten (10) storage tanks containing organic liquids (e.g., diesel, gasoline, hydraulic oil, used oil)
- Fourteen (14) storage tanks containing virgin or spent hydrochloric acid
- Five (5) cold degreasers
- Paved and unpaved roadways will be constructed in and around the facility

Mason County, WV is in attainment or unclassifiable/attainment status for all criteria pollutants. The following pollutants are emitted in excess of the significant emission rate and are subject to PSD review though dispersion modeling: Lead, NO_x, CO, SO₂, PM₁₀, and PM_{2.5}. Also, Nucor 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 facility wide maximum Project emission rates are in Table 1 (from Page 2-8 of the revised permit application, 3/23/2022).

Table 1. Project Emission Rates

	NO _x (tpy)	CO (tpy)	SO ₂ (tpy)	VOC (tpy)	PM (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	Lead (tpy)	Total HAPs (tpy)	CO ₂ e (tpy)
West Virginia Steel Mill PTE	702	3,263	361	178	396	618	570	0.68	7.50	673,848

Table 2 presents a summary of the air quality standards that were addressed for the Nucor 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 NO₂ and 1-hour SO₂ represents the values the Division of Air Quality has implemented as described in the memorandum included in Attachment A.

Table 2. 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
Lead	Rolling 3-month avg.	-	-	0.15
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	0.2	4	12

An air quality impact analysis, as a part of the PSD review process, is a two tiered process. First, a proposed facility is modeled by itself, on a pollutant-by-pollutant and averaging-time basis, to determine if ambient air concentrations 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 3, for both the 24-hr and annual averaging time for PM_{2.5}, this difference is greater than the SIL and it is appropriate to use the SIL as a screening tool.

Table 3. NAAQS, Monitor Design Values, and Significant Impact Levels

Pollutant	Avg. Period	NAAQS ($\mu\text{g}/\text{m}^3$)	SIL ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	NAAQS - Background difference ($\mu\text{g}/\text{m}^3$)	Greater than SIL?
PM _{2.5}	24-hr	35	1.2	15.57	19.43	Yes
PM _{2.5}	Annual	12	0.2	7.7	4.3	Yes

Modeling Basis

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

- Nucor used the regulatory dispersion model and supporting programs: AERMOD (version 21112), AERMET (version 21112), AERMINUTE (version 15272), AERMAP (version 18081), AERSURFACE (version 20060), and BPIPPRM (version 04274). The AERMOD modeling system (AERMOD, AERMET, AERMAP) is the regulatory default modeling system for near-field (<50km) regulatory dispersion modeling.
- AERMET was used to process five years of surface meteorological data from the

Huntington Tri-State, WV Airport (ICAO code: KHST; WBAN Station ID 3860). Upper air data from Pittsburgh, PA airport (ICAO code: KPIT; WBAN Station ID 94823) were used.

- AERSURFACE was used to develop appropriate surface characteristic (albedo, Bowen ratio, surface roughness length) inputs to AERMET.
- A nested receptor grid was developed and AERMAP was used to determine terrain heights and hill height scales for use by AERMOD to determine maximum modeled concentrations.
- The background monitoring data used in the cumulative modeling analysis is in Table 4 (from Page 2-5 of the Nucor modeling report, 3/23/2022). The 1-hr NO₂ background concentrations vary by season-and-hour-of-day.

Table 4. Background Monitor Design Values

Pollutant	Averaging Period	Monitor	Background Concentration (µg/m ³)
SO ₂	1-Hour	Ashland (21-019-0017)	14.83
NO ₂	1-Hour	Ashland (21-019-0017)	Varies
	Annual	Ashland (21-019-0017)	8.91
PM _{2.5}	24-Hour	Ashland (21-019-0017)	15.57
	Annual	Ashland (21-019-0017)	7.70
PM ₁₀	24-Hour	Ironton (39-087-0012)	25.33
Lead	Rolling 3-Month Avg.	--	--
Ozone	8-Hour	Ashland (21-019-0017)	61 ppb

Ozone Analysis and Secondary Formation of PM_{2.5}

In April 2019, EPA released a guidance memorandum¹ (MERP Memorandum) that describes how modeled emission rates of precursors (MERPs) could be calculated as part of a Tier 1 ozone and secondary PM_{2.5} formation analysis to assess a project’s emissions of precursor pollutants. The MERPs may be used to describe an emission rate of a precursor that is expected to result in ambient ozone (O₃) or fine particulate matter (PM_{2.5}) impact that would be less than a specific air quality concentration threshold for O₃ or PM_{2.5} that a permitting authority chooses to use to determine whether an impact is significant. Additionally, the methods in this guidance can be used to quantify an estimate of impact to perform a cumulative impact analysis. Based on this guidance, Nucor has quantified the potential secondary formation of PM_{2.5} from NO_x and SO₂ and the quantified the impact of the Project’s NO_x and VOC emissions on ozone.

¹Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program (4/30/19)

The MERP Memorandum defines a MERP as:

$$\text{MERP} = \text{Critical Air Quality Threshold} * (\text{Modeled emission rate from hypothetical source} / \text{Modeled air quality impact from hypothetical source})$$

For ozone, EPA has proposed a Significant Impact Level (SIL) of 1 ppb and this value can be used to represent the critical air quality threshold. Table 5 shows the ozone SIL analysis for the Project (from Page 7-2 of the Nucor modeling report, 3/23/2022). Since the estimated ozone impacts from the proposed Nucor facility exceed the SIL, a cumulative analysis for ozone was performed.

Table 5. Ozone SIL Analysis Results

Averaging Period	Precursor	Critical Air Quality Threshold (ppb)	Modeled ER from Hypo. Source ^a (tpy)	Modeled Impact from Hypo. Source ^a (ppb)	Ozone MERP (tpy)	Net Emissions Increase (tpy)	% of Critical Air Quality Threshold	Ozone Project Impact (ppb)	SIL (ppb)
8-hour	NO _x	1.0	1,000	3.794	264	760.7	288.6	2.89	1.0
	VOC	1.0	500	0.170	2,939	183.5	6.2	0.06	
Total								2.95	

^a Hypothetical source is lower release height source located in Boyd County, Kentucky from EPA's MERPs View Qlik website. Hypothetical source emission rate represents the closest value available in MERPs View Qlik to the source-wide PTE for NO_x and VOC for the project.

Table 6 presents the results of the ozone NAAQS analysis for Nucor (from Page 7-3 of the Nucor modeling report, 3/23/2022). This analysis demonstrates that Nucor's estimated impact on ozone combined with a representative background concentration of ozone will be below the 8-hr ozone NAAQS.

Table 6. Ozone NAAQS Analysis Results

Averaging Period	Pollutant	Ozone Project Impact (ppb)	Ozone Background Conc. ^a (ppb)	Cumulative Ozone Impact (ppb)	NAAQS (ppb)
8-hour	Ozone	2.95	61	63.9	70

^a Three-year average for 2018-2020 of the annual 4th highest daily maximum 8-hour concentrations measured at the Ashland, KY monitor (21-019-0017).

Nucor utilized EPA's website at <https://www.epa.gov/scram/merps-view-qlik> to obtain information necessary to assess the Project's formation of secondary PM_{2.5} from NO_x and SO₂. The USEPA model results for the hypothetical source in Boyd County, KY are representative the area of the proposed Nucor facility and were used to assess secondary formation of PM_{2.5} concentrations from direct emissions of NO_x and SO₂ as shown in Table 7 (from Page 7-4 of the

Nucor modeling report, 3/23/22). The total secondary 24- hr PM_{2.5} project impact is 0.06013 µg/m³ + 0.12404 µg/m³ = 0.18417 µg/m³. This value is added to the AERMOD-modeled direct impact of 24-hr PM_{2.5} in the SIL, NAAAQS, and increment analyses. The total secondary Annual PM_{2.5} project impact is 0.00343 µg/m³ + 0.00269 µg/m³ = 0.00612 µg/m³. This value is added to the AERMOD-modeled direct impact of Annual PM_{2.5} in the SIL, NAAAQS, and increment analyses.

Table 7. Class II Assessment of Secondary Formation of PM_{2.5}

Averaging Period	Precursor	Critical Air Quality Threshold (µg/m ³)	Modeled			Net Emissions Increase (tpy)	% of Critical Air Quality Threshold	Secondary PM _{2.5} Project Impact (µg/m ³)
			Modeled ER from Hypo. Source ^a (tpy)	Impact from Hypo. Source ^a (µg/m ³)	PM _{2.5} MERP (tpy)			
24-hour	NO _x	1.2	1,000	0.079	15,183	760.7	5.010	0.06013
24-hour	SO ₂	1.2	1,000	0.343	3,502	362.0	10.337	0.12404
Annual	NO _x	0.2	1,000	0.005	44,419	760.7	1.713	0.00343
Annual	SO ₂	0.2	1,000	0.007	26,874	362.0	1.347	0.00269

^a Hypothetical source is lower release height source located in Boyd County, Kentucky from EPA's MERPs View Qlik website. Hypothetical source emission rate represents the closest value available in MERPs View Qlik to the source-wide PTE for NO_x and SO₂ for the project.

SIL Analysis Results (Tier I)

The results of the Significant Impact Analysis for the Nucor Project sources are included in Tables 8a. and 8b. (from Page 6-1 of the Nucor report, 3/23/2022). 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 and annual PM₁₀, 24-hr and Annual PM_{2.5}, 1-hr and 24-hr SO₂. No further modeling is required for 1-hr and 8-hr CO and 3-hr and Annual SO₂. No SIL exists for lead so a cumulative analysis was performed by Nucor.

Tables 8a. and 8b. SIL Analysis Results

Table 8a. Class II Significance Results for CO, PM₁₀, SO₂, and NO₂

Pollutant	Averaging Period	SIL (µg/m ³)	Maximum Impact (µg/m ³)	Exceed SIL?	SIA (km)
PM ₁₀	24-hr	5	28.9	Yes	3.15
	Annual	1	5.6	Yes	2.01
CO	1-hr	2,000	1,138.7	No	--
	8-hr	500	106.7	No	--
NO ₂	1-hr	7.5	92.1	Yes	29.22
	Annual	1	5.4	Yes	2.62
SO ₂	1-hr	7.8	19.1	Yes	3.38
	3-hr	25	12.5	No	--
	24-hr	5	5.5	Yes	0.73
	Annual	1	0.9	No	--

Table 8b. Class II Significance Results for PM_{2.5}

Pollutant	Averaging Period	SIL (µg/m ³)	Maximum Impact (µg/m ³)	Secondary Impact (µg/m ³)	Total Impact (µg/m ³)	Exceed SIL?	SIA (km)
PM _{2.5}	24-hr	1.2	7.94	0.184	8.1	Yes	9.71
	Annual	0.2	2.77	0.006	2.8	Yes	8.55

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 Nucor 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. Nucor 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 9. No modeled violations of the NAAQS are predicted.

Table 9. Class II NAAQS Analysis Results

Pollutant	Averaging Period	Modeled Concentration ($\mu\text{g}/\text{m}^3$)	Background Concentration ($\mu\text{g}/\text{m}^3$)	Secondary Impact ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)	Exceeds NAAQS?
PM ₁₀	24-hr	33.44	25.33	--	58.78	150	No
PM _{2.5}	24-hr	10.27	15.57	0.184	26.02	35	No
	Annual	2.86	7.70	0.006	10.56	12	No
NO ₂	1-hr	140.72	Incl. in Model	--	140.72	188	No
	Annual	8.54	8.91	--	17.45	100	No
SO ₂	1-hr	14.79	14.83	--	29.62	196	No
Lead	Rolling 3-Month Avg.	2.37E-03	--	--	2.37E-03	0.15	No

Table 10 shows the results of the Class II PSD Increment Analysis. 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 are: January 6, 1975 for PM₁₀ and sulfur dioxide; February 8, 1988 for NO₂; and October 20, 2010 for PM_{2.5}. All major sources of these pollutants in the maximum impact area were constructed prior to the earliest major source baseline date and are included in the baseline concentration and do not consume increment.

The minor source baseline date in Mason County, WV for PM_{2.5} and SO₂ has been set by Nucor’s complete PSD application on March 23, 2022. The minor source baseline date for Mason County, WV for TSP, NO₂, and PM₁₀ is July 8, 1994. Both APG Polytech, LLC and ICL-North America Inc - Gallipolis Ferry Plant had their original permits (issued in 1975 and 1978, respectively) approved prior to the the minor source baseline date for TSP, NO₂ and PM₁₀.

Accordingly, Nucor is the only source consuming increment and is the only source included in the increment analysis.

Table 10. PSD Class II Increment Analysis Results

Pollutant	Averaging Period	Cumulative Model Impact ($\mu\text{g}/\text{m}^3$)	Secondary Impact ^a ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	Class II PSD Increment ($\mu\text{g}/\text{m}^3$)	Exceeds PSD Increment?
PM ₁₀	24-hr	28.00	--	28.00	30	No
	Annual	5.59	--	5.59	17	No
PM _{2.5}	24-hr	8.15	0.184	8.34	9	No
	Annual	2.89	0.006	2.90	4	No
NO ₂	Annual	5.45	--	5.45	25	No
SO ₂	24-hr	3.96	--	3.96	91	No

Summary

The air quality impact analysis prepared and submitted by Nucor to the 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, accordingly, Nucor does not cause or contribute to any violations of the applicable NAAQS or PSD increments. No further modeling is required by Nucor.

ATTACHMENT A

Division of Air Quality Memorandum regarding Interim 1-Hour Significant
Impact Levels for Nitrogen Dioxide and Sulfur Dioxide



west virginia department of environmental protection

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

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

MEMORANDUM

To: Jay Fedczak
Fred Durham

Cc: John Benedict
Bev McKeone
Joe Kessler
Steve Pursley

From: Jon McClung *JDM*

Date: January 28, 2014

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

Summary

As a follow-up to our discussions regarding the use of interim significant impact levels (SILs) for the 1-hour nitrogen dioxide (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

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 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.

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

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

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:

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

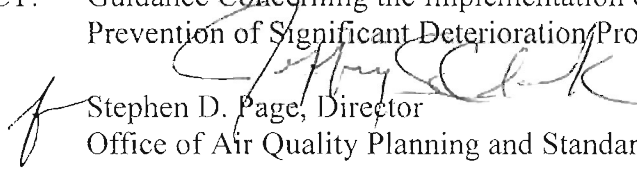
$$E_{annual} = (100 \text{ lbs}/10^6 \text{ SCF}) \times (100 \times 10^6 \text{ SCF/yr}) = 10,000 \text{ lbs. NO}_x/\text{yr or } 5 \text{ tons NO}_x/\text{yr}$$

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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Attachment B: Non-Criteria Regulated Pollutant Information

Nucor Corporation: West Virginia Steel Mill
Permit Number R14-0039: Facility ID 053-00085

Pollutant	CAS #	PTE (tons/yr)	Source	Known/Suspected Carcinogen	Classification	MACT ⁽¹⁾
Acetaldehyde	75-07-0	0.035	RICE	Yes	B2 - Probable Human Carcinogen ⁽²⁾	ZZZZ
Acrolein	107-02-8	0.033	RICE	No	Inadequate Data ⁽³⁾	ZZZZ
Benzene	71-43-2	0.013	RICE PNG Combustion	Yes	A - Known Human Carcinogen ⁽⁴⁾	ZZZZ
Formaldehyde	50-00-0	0.416	RICE PNG Combustion	Yes	B1 - Probable Human Carcinogen ⁽⁵⁾	ZZZZ
n-Hexane	110-54-3	4.427	RICE PNG Combustion	No	Inadequate Data ⁽⁶⁾	ZZZZ
Hydrochloric Acid	7647-01-0	1.159	Pickling T10-T23	No	Not Assessed ⁽⁷⁾	None
Methanol	67-56-1	0.013	RICE	No	Not Assessed ⁽⁸⁾	ZZZZ
Tetrachloroethylene	127-18-4	0.010	T25-T29	Yes	Likely to be Carcinogen ⁽⁹⁾	None
Toluene	108-88-3	0.012	RICE PNG Combustion	No	Inadequate Data ⁽¹⁰⁾	ZZZZ
Lead	7439-92-1	0.675	EAFs	No	Not Assessed ⁽¹¹⁾	YYYYYY
Manganese	7439-96-5	0.450	EAFs	No	D - Not Classifiable ⁽¹²⁾	YYYYYY
Mercury	7439-97-6	0.165	EAFs	No	D - Not Classifiable ⁽¹³⁾	YYYYYY

- (1) Does a MACT apply to one of the emission units contributing emissions of this specific HAP? See “Regulatory Applicability” section for discussion.
- (2) [**Acetaldehyde**] From IRIS: “Based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.”
- (3) [**Acrolein**] From IRIS: “Under the Draft Revised Guidelines for Carcinogen Risk Assessment (U.S. EPA, 1999), the potential carcinogenicity of acrolein cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure. There are no adequate human studies of the carcinogenic potential of acrolein. Collectively, experimental studies provide inadequate evidence that acrolein causes cancer in laboratory animals.”

- (4) **[Benzene]** From IRIS: *“Benzene is classified as a “known” human carcinogen (Category A) under the Risk Assessment Guidelines of 1986. Under the proposed revised Carcinogen Risk Assessment Guidelines (U.S. EPA, 1996), benzene is characterized as a known human carcinogen for all routes of exposure based upon convincing human evidence as well as supporting evidence from animal studies. (U.S. EPA, 1979, 1985, 1998; ATSDR, 1997).”*
- (5) **[Formaldehyde]** From IRIS: *“Based on limited evidence in humans, and sufficient evidence in animals. Human data include nine studies that show statistically significant associations between site-specific respiratory neoplasms and exposure to formaldehyde or formaldehyde-containing products. An increased incidence of nasal squamous cell carcinomas was observed in long-term inhalation studies in rats and in mice. The classification is supported by in vitro genotoxicity data and formaldehyde’s structural relationships to other carcinogenic aldehydes such as acetaldehyde.”*
- (6) **[n-Hexane]** From IRIS: *“Under the Guidelines for Carcinogen Risk Assessment, there is inadequate information to assess the carcinogenic potential of n-hexane.”*
- (7) **[Hydrochloric Acid]** No entry in the IRIS Database. Information on HCl toxicity at: <https://www.ncbi.nlm.nih.gov/books/NBK230426/>.
- (8) **[Methanol]** From IRIS: *“Not assessed under the IRIS Program.”*
- (9) **[Tetrachloroethylene]** From IRIS: *“Following EPA (2005a) Guidelines for Carcinogen Risk Assessment, tetrachloroethylene is “likely to be carcinogenic in humans by all routes of exposure.”*
- (10) **[Toluene]** From IRIS: *“Under the Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), there is inadequate information to assess the carcinogenic potential of toluene because studies of humans chronically exposed to toluene are inconclusive, toluene was not carcinogenic in adequate inhalation cancer bioassays of rats and mice exposed for life (CIIT, 1980 NTP, 1990 Huff, 2003), and increased incidences of mammary cancer and leukemia were reported in a lifetime rat oral bioassay at a dose level of 500 mg/kg-day but not at 800 mg/kg-day (Maltoni et al., 1997).”*
- (11) **[Lead]** No entry in the IRIS Database. Information on Lead toxicity at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4961898/>.
- (12) **[Manganese]** From IRIS: *“Existing studies are inadequate to assess the carcinogenicity of manganese.”*
- (13) **[Mercury]** From IRIS: *“Based on inadequate human and animal data. Epidemiologic studies failed to show a correlation between exposure to elemental mercury vapor and carcinogenicity; the findings in these studies were confounded by possible or known concurrent exposures to other chemicals, including human carcinogens, as well as lifestyle factors (e.g., smoking). Findings from genotoxicity tests are severely limited and provide equivocal evidence that mercury adversely affects the number or structure of chromosomes in human somatic cells.”*