Missouri Department of NATURAL RESOURCES
dnr.mo.gov
Michael L. Parson, Governor
Carol S. Comer, Director

SEP 1 2 2018

Mr. John Kinter
Environmental Manager
Nucor Steel - Sedalia, LLC
P.O. Box 1346
Sedalia, MO 65302

RE: New Source Review Permit - Project Number: 2018-03-048

Dear Mr. Kinter:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application and with your operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

This permit may include requirements with which you may not be familiar. If you would like the department to meet with you to discuss how to understand and satisfy the requirements contained in this permit, an appointment referred to as a Compliance Assistance Visit (CAV) can be set up with you. To request a CAV, please contact your local regional office or fill out an online request. The regional office contact information can be found at the following website: http://dnr.mo.gov/regions/. The online CAV request can be found at http://dnr.mo.gov/cav/compliance.htm.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to Sections 621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the administrative hearing commission, whose contact information is: Administrative Hearing Commission, United States Post Office Building, 131 West High Street, Third Floor, P.O. Box 1557, Jefferson City, Missouri 65102, phone: 573-751-2422, fax: 573-751-5018, website: www.oa.mo.gov/ahc.

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If you have any questions regarding this permit, please do not hesitate to contact me, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Darcy A. Bybee
Director

SH:shj

Enclosures

c: Kansas City Regional Office
PAMS File: 2018-03-048

Permit Number: 092018-002

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 092018-002 Project Number: 2018-03-048

Installation Number: 159-0078

Parent Company: Nucor Corporation

Parent Company Address: 1915 Rexford Road, Charlotte, NC 28211

Installation Name: Nucor Steel - Sedalia, LLC

Installation Address: 500 Rebar Road, Sedalia, MO 65301

Location Information: Pettis County, S27, T46N, R21W

Application for Authority to Construct was made for:
A new steel mill using an electric arc furnace to produce rebar from scrap. This review was conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required.*

☐ Standard Conditions (on reverse) are applicable to this permit.

☐ Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

Director or Designee
Department of Natural Resources

SEP 1 2 2018

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within 18 months from the effective date of this permit. Permittee should notify the Enforcement and Compliance Section of the Air Pollution Control Program if construction or modification is not started within 18 months after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the Enforcement and Compliance Section of the Department's Air Pollution Control Program of the anticipated date of start up of this (these) air contaminant source(s). The information must be made available within 30 days of actual startup. Also, you must notify the Department's regional office responsible for the area within which you are located within 15 days after the actual start up of this (these) air contaminant source(s).

A copy of the permit application and this permit and permit review shall be kept at the installation address and shall be made available to Department's personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant source(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit using the contact information below.

Contact Information:
Missouri Department of Natural Resources
Air Pollution Control Program
P.O. Box 176
Jefferson City, MO 65102-0176
(573) 751-4817

The regional office information can be found at the following website:
http://dnr.mo.gov/regions/

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Nucor Steel - Sedalia, LLC
Pettis County, S27, T46N, R21W

1. Production Limit
   A. Nucor Steel – Sedalia, LLC (herein Nucor) shall not produce more than 450,000 tons of cast steel in any consecutive 12 month period, monthly rolling total.

   B. Nucor shall not produce more than 44,640 tons of cast steel in any calendar month.

   C. Nucor shall demonstrate compliance by measuring and recording daily the amount of cast steel.

2. Carbon Sulfur Content Limit
   A. Nucor shall not input any carbon source (i.e. injection carbon) containing more than 3.0% weight sulfur to the EAF (EU08A) or LMF (EU08C).

   B. Nucor shall demonstrate compliance by keeping records of all injection carbon source inputs and their respective sulfur content to the EAF (EU08A) and LMF (EU08C). Nucor shall obtain the sulfur content from annual certification by a supplier or conduct sampling onsite for each shipment using ASTM D4239 or other method preapproved by the Air Pollution Control Program's Compliance/Enforcement Section.

3. Shredder Limit
   A. Nucor shall not input to the shredder (EP-06) more than 180,000 tons of material in any consecutive 12 month period, monthly rolling total.

   B. Nucor shall demonstrate compliance by keeping monthly records of all material input tonnage.

4. EAF, LMF, and Meltshop Capture Devices
   A. EAF (EU08A)
      1) Nucor shall capture emissions from the EAF during melting and refining periods using a DEC system (including startup, shutdown, and malfunction) and a roof canopy system, except the DEC cannot be used during bucket charging. The DEC shall be integrated into the ECS conveyor used to convey charge materials into the EAF.
      2) Nucor shall record fan amperes and damper positions continuously

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

to demonstrate that the DEC system is operating normally and consistent with the fan ampere and damper position ranges established in accordance with the provisions of 40 CFR 60.274a(b). Compliance of these parameters will be based on a 4 hour rolling average. The initial range before the first compliance test shall be established based on engineering judgment.

B. LMF (EU08C)
1) Nucor shall capture emissions from the LMF using a side draft hood assembly during all periods of LMF operation (including startup, shutdown and malfunction).
2) Nucor shall duct the LMF side draft hood to the Baghouse.
3) Nucor shall record damper positions once per shift to demonstrate that the side draft hood is operating normally and consistent with damper position ranges established pursuant to condition 4.D. The initial damper positions before the first compliance test shall be established based on engineering judgment.

C. EAF, LMF, and Meltshop Fugitives
1) Nucor shall capture emissions from the following emission units using a canopy hood and the meltshop building.

Table 1: Emission Units Captured by Canopy Hood and Meltshop Enclosure

Emission Unit	Description
EU09A	EAF, fugitive portion
EU08B	EAF sidewall lance burners
EU08C	EAF service torches
EU08D	LMF, fugitive portion
EU08E	EAF refractory repair
EU08F	Ladle preheater
EU08G	Ladle dryer
EU08H	Ladle dump
EU08I	Ladle refractory repair
EU08J	Ladle skull cutting
EU08K	Tundish preheater
EU08L	Tundish dryer
EU08M	Tundish dump
EU08N	Tundish refractory repair
EU08O	Tundish skull cutting
EU08Q	Meltshop alloy transfer
EU08R	Caster
EU11	Caster spray chamber, fugitive portion

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

2) Nucor shall duct the canopy hood to the baghouse.
3) Nucor shall demonstrate compliance with the fugitive capture requirements as follows:
   a) Nucor shall install electronic interlocks that ensure that the baghouse ramps up to high flow when the EAF is in tapping/slagging or bucket charging phases. This condition shall apply except during emergencies, when action may be taken before ramp up so long as ramp up is completed as expeditiously as possible. High flow shall be maintained so long as the EAF is in tapping/slagging or bucket charging phases.
   b) Nucor shall continuously monitor the total air flow exiting the baghouse with a flow monitoring device.
   c) Nucor shall minimize openings into the meltshop building above the EAF furnace deck level. No permanent openings shall be made above the furnace deck except as set forth in the application or approved by the Air Pollution Control Program's Compliance and Enforcement Section. Doors above the furnace deck shall be of the self-closing type. Temporary or maintenance opening may be made, but shall be kept closed or covered except when the EAF, LMF and Caster are not in operation.
   d) Nucor shall survey the meltshop building on a semiannual basis for significant cracks, gaps, openings or other circumstances that could cause emissions to exit the meltshop building. Nucor shall fix such cracks, gaps and other openings at the next available opportunity. Records of inspection and corrective action shall be maintained and include the date of inspection, the inspector's name, corrective action required, the date of corrective action, and the name of the inspector verifying that the corrective action was completed.
4) During each performance test under Special Condition 16 Nucor shall establish damper positions for the EAF canopy, LMF, Caster and ECS conveyor capture system. In addition to the EAF damper positions required under Special Condition 16, Nucor shall establish damper positions for the EAF canopy, LMF, Caster and ECS conveyor that minimize visible emissions and check the seal along the ECS conveyor to minimize emissions. The dust minimization checks at the LMF, Caster and ECS conveyor and resulting damper and seal positions shall be recorded in the compliance test report.

5. EAF, LMF, Meltshop Practices and Control Devices
   A. Nucor shall install and operate the following as BACT control for GHGs.
      1) Adjustable speed drives,

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

2) Transformer efficiency-ultra-high power transformers,
3) Bottom stirring / stirring gas injection
4) Foamy slag practice
5) Oxy-fuel burners
6) Post combustion of the flue gases
7) Scrap preheating
8) Engineered refractories,
9) Eccentric bottom tapping on the furnace
10) Energy monitoring and management system.

B. Nucor shall develop an operating and maintenance manual and log for the EAF (EU08A), LMF (EU08C), and all emission units in Table 1 to ensure that good operating practices occurs as a routine practice and to ensure work practices associated with the items above are used to maximize energy efficiency.

C. The operating and maintenance manual and log shall include, but is not limited to:
1) Manufacturer's specifications for good operation;
2) Any site specific parameters deemed appropriate to ensure efficient operation
3) Criteria for monitoring, inspecting, preventative maintenance, and training.
4) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
5) Recommended frequency and dates performed of all above schedules, incidents, activities, and actions.

D. The manuals shall be finalized within 30 days of reaching full scale production or no later than 90 days from the date of initial startup. "Initial startup" for the purposes of this permit is defined as the period beginning with the first charge of material to the EAF and production of molten steel. The manuals shall be kept on site and be made available upon request by Department of Natural Resources' personnel.

E. Baghouse (CD08)
1) The baghouse shall be operated and maintained in accordance with the manufacturer's specifications which shall be kept on site.
2) The baghouse shall be operated with a bag leak detection system.
3) At least 10% of the total number of required bags shall be kept on hand at all times. The bags shall be made of material appropriate for operating conditions expected to occur (e.g. temperature limits, acidic and alkali resistance, and abrasion resistance). The replacement filter material type and weight shall meet or exceed the specifications of the existing filter.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

a) The baghouse flowrate shall be in accordance with the manufacturer's specifications. If the final manufacturer's specifications note different flow rates for low and high flow from what was in the permit application, Nucor shall act in accordance with Special Condition 17.

b) Nucor shall maintain an operating and maintenance log for the baghouse which shall include the following:
   i. Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
   ii. Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
   iii. Dates of all above schedules, incidents, activities, and actions.

6. Emission Limits - EAF/Meltshop Stack (EP08)
   A. Nucor shall not exceed the following BACT limits for the EAF/Meltshop Stack (EP-08), each inclusive of startup and shutdown.
      1) PM, 0.0015 gr/dscf, test method average
      2) PM_{10} total, 0.0024 gr/dscf, test method average
      3) $PM_{2.5}$ total, 0.0024 gr/dscf, test method average
      4) SO_2, 0.5 lb/ton steel, 30 day rolling average
      5) NO_X, 0.3 lb/ton steel, 30 day rolling average
      6) VOC, 0.3 lb/ton steel, 30 day rolling average
      7) CO, 3.5 lb/ton steel, 30 day rolling average
      8) GHG (CO_2e), 438.2 lb/ton steel, 12 month rolling average

   B. Nucor shall not exceed the following (non-BACT) limits for the EAF/Meltshop Stack (EP08).
      1) PM_{10} total, 14.05 lb/hr, test method average
      2) $PM_{2.5}$ total, 14.05 lb/hr, test method average
      3) Mercury compounds, 0.039 lb/hr, test method average

   C. Nucor may request at any time an increase to the values in Special Condition 6.B based upon submittal and approval of compliant modeling with ambient air quality standards.

7. Emission Limits Compliance – EAF/Meltshop Stack (EP-08)
   A. Nucor shall demonstrate compliance with the PM, PM_{10}, and $PM_{2.5}$ emission limits in Special Conditions 6.A. and 6.B. by using the required emission tests.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

B. Nucor shall operate CERMS for SO_2, NO_X, CO, and CO_2 and all necessary auxiliary monitoring equipment. Nucor shall certify the CERMS pursuant to the applicable performance specification in 40 CFR Part 60, Appendix B.

C. Nucor shall demonstrate compliance with the SO_2 emission limits in Special Conditions 6.A. by using the required SO_2 CERMS.

D. Nucor shall demonstrate compliance with the NO_X emission limits in Special Conditions 6.A. by using the required NO_X CERMS.

E. Nucor shall demonstrate compliance with the CO emission limits in Special Conditions 6.A. by using required CO CERMS.

F. Nucor shall demonstrate compliance with the respective HAP emission limits in Special Condition 6.B. by using the required emission tests.

G. Nucor shall demonstrate compliance with the GHG emission limit in Special Condition 6.A. by using the required CO_2 CERMS for determining CO_2 emissions and calculating all other applicable GHG emissions (i.e. CH_4, N_2O) per 40 CFR 98, Subparts A and C.

H. Nucor shall demonstrate compliance with the VOC emission limit in Special Condition 6.A. by using the required emission tests.

8. Emission Limit – Meltshop Natural Gas Combustion

A. Nucor shall not emit more than 0.03 lb NO_X / MMBtu heat input from the ladle preheaters, ladle dryers, tundish preheaters and tundish dryers.

B. Nucor shall demonstrate compliance with the NO_X limit using manufacturer's specification.

C. The low NOx burners associated with the ladle preheaters, ladle dryers, tundish preheaters and tundish dryer shall be operated and maintained in accordance with manufacturer' specifications.

D. Nucor shall control all emissions from the meltshop natural gas combustion using good operating practices. Nucor will demonstrate compliance by maintaining an operating and maintenance manual and log. The manual and log shall contain, at minimum, the following:

1) The manufacturer's specifications for any low NOx burners,
2) Criteria for monitoring, inspecting, preventative maintenance, and training to ensure proper operation.
3) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

4) Recommended frequency and dates performed of all above schedules, incidents, activities, and actions.

9. Shredder (EP-06) Control Device
   A. Nucor shall control the shredder (hammermill) using wet spray devices.

   B. The water spray shall be operated and maintained in accordance with the manufacturer's specifications, e.g. spray pattern, droplet size, spray angle, nozzle placement, water pressure, etc. The manufacturer's specifications shall be kept on site.

   C. During freezing conditions water control shall not be curtailed. An antifreeze not exceeding 0.5% VOC may be used. A copy of the additive SDS indicating VOC content shall be kept on site.

10. Emergency Engines
   A. Nucor shall operate Fire Pump Engine (EP-16), Emergency Engine 1 (EP-17), and Emergency Engine 2 (EP-18) in non-emergency mode (i.e. testing and maintenance purposes) no more than 24 hours of per year per engine .

   B. Nucor shall operate EP-16, EP-17, and EP-18 in non-emergency mode only from 7:00 AM to 5:00 PM.

   C. Nucor shall demonstrate compliance by keeping a log of each engine's operation date, times, and mode. Nucor shall operate each engine with a non-resettable hour meter.

11. Slag/Mill Scale Control Devices

   A. Nucor shall operate a water spray (or other dust suppressant or control method such as processing only wetted slag) emission control system for the slag yard at all times the screens or steel ball crusher are operating in order to minimize fugitive particulate emissions.

   B. The water spray shall be operated and maintained in accordance with the manufacturer's specifications, e.g. spray pattern, droplet size, spray angle, nozzle placement, water pressure, etc. The manufacturer's specifications shall be kept on site.

   C. During freezing conditions water control shall not be curtailed. An antifreeze not exceeding 0.5% VOC may be used.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

D. Nucor shall keep records of dates and times the water or other dust suppressant is not applied to slag screening operations when the screening plant is operating. The records shall indicate why water or other dust suppressant was not applied while the screen plant was operating and to document corrective actions taken.

12. Cooling Towers

A. The cooling towers (EP-13, EP-14, EP-15) shall be operated and maintained in accordance with the manufacturer's specifications, which shall be kept on site.

B. The drift loss from each cell shall not exceed 0.001 percent of the water circulation rate. Verification of drift loss shall be by manufacturer's guaranteed drift loss, which shall be kept on site.

C. The TDS concentration in each cell's circulated cooling water shall not exceed 2,500 milligrams per liter (2,500 parts per million weight) per sampling event.

D. Nucor shall maintain an operating and maintenance log for each cooling tower cell which shall include the following:
   1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions;
   2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.; and
   3) Dates of all above schedules, incidents, activities, and actions.

E. Nucor shall conduct testing on each cooling tower quarterly to determine respective TDS concentration in milligrams per liter. Complete testing reports shall be kept on site.

F. Testing shall be conducted using an Air Pollution Control Program preapproved method.

G. A TDS concentration above the limit will be considered an exceedance and corrective actions shall be implemented within 48 hours. An exceedance does not necessarily indicate a violation of the limit.

H. If all the TDS concentration measurements in the first two years are less than 2,500 ppm, TDS testing may be reduced to annual. If TDS is above 2,500 ppm during the first two years, testing shall be continued on a quarterly basis until there are 4 consecutive compliant tests. If TDS is above 2,500 ppm after the first two years, testing shall revert back to a quarterly basis until there are 4 consecutive compliant tests.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

I. When the number of exceedances of all tests exceeds 5 in a twelve month period and corrective actions fail to return the emission units to level below the limit, then the permittee shall submit a complete Application for Authority to Construct to the Air Pollution Control Program within 90 days of the last exceedance.

J. Nucor may request at any time an increase to the values in Special Condition 12.C based upon submittal and approval of compliant modeling with ambient air quality standards.

13. Silos

A. Nucor shall control emissions from carbon silo (EP-03), carbon hopper (EP-03A), flux silo 1 (EP-04), flux silo 2 (EP-04A), flux hopper (EP-04B), EAF dust silo (EP-05), and EAF dust silo loadout (EP-05A) using exhaust filters.

B. Nucor shall conduct EAF dust silo loadout in a sealed chute, with air displaced from the shipping container routed to the silo.

C. The filters shall be operated and maintained in accordance with the manufacturer's specifications which shall be kept on site.

D. The filters shall be equipped with a pressure drop gauge. Pressure drop shall be maintained in accordance with filter manufacturer's specifications, which shall be kept on site. Pressure drop shall be recorded at least once daily. Days of no operation shall be indicated.

E. Replacement filters shall be kept on hand at all times. The filters shall be made of material appropriate for operating conditions expected to occur (e.g. temperature limits, acidic and alkali resistance, and abrasion resistance). The replacement filter material type and weight shall meet or exceed the specifications of the existing filter.

F. Nucor shall maintain an operating and maintenance log for the filters which shall include the following:
   1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
   2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
   3) Dates of all above schedules, incidents, activities, and actions.

G. Nucor shall not exceed 0.005 grains per dscf PM, PM_{10} filterable, and $PM_{2.5}$ filterable BACT emission limits on each filter. Nucor shall demonstrate compliance using the filter manufacturer's guarantee, which shall be kept on site.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

14. Haul Roads
    A. Haul Road Controls
        1) Nucor shall establish and follow a haul roads cleaning, watering, and/or vacuum-sweeping SOP for both paved and unpaved haul roads. A copy of the SOP report shall be submitted to the Air Pollution Control Program's Compliance/Enforcement Section within 60 days of the submittal of the initial test report in Special Condition 14.B. The report shall include but is not limited to the following information, haul road segment/location, cleaning method/water application rate, and schedule for each road type.
        2) The SOP for the unpaved road shall include the following:
            a) Application of documented watering at a minimum rate of 0.1 gallons per square foot of unpaved haul road surface area per day.
            b) Water shall be applied at least once per twenty-four hours or whenever condition exist which would cause visible emissions to enter the ambient air beyond the property boundary.
        3) Watering on haul roads may be suspended under the following conditions reasons:
            a) A quarter inch or more of rainfall, during the preceding twenty-four hours shall substitute for one daily water application.
            b) Watering may be suspended when the ground is frozen, during periods of freezing conditions when watering would be inadvisable for traffic safety reasons, or when there will be no traffic on the roads.
            c) Watering/cleaning may be suspended when there is no traffic on the roads for a 24-hour period.
        4) Logs of watering, sweeping and/or surfactant application shall be maintained for both paved roads and unpaved road. The log shall include, at a minimum, the following :
            a) The haul road being watered,
            b) Date and volume of water application,
            c) Surface area of each road being watered,
            d) Watering rate in gallons per square foot of unpaved haul road surface area, and
            e) Rationale if water is not applied.
        5) Unpaved Haul Road- Speed Limit
            a) Nucor shall control fugitive emissions from all unpaved haul roads by limiting its average truck speed to no more than 25 miles per hour.
            b) Nucor shall show compliance with Special Condition 14.A.5)a) by posting speed limits on all affected roads.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

B. Paved Haul Road Testing

1) Silt loading for the paved haul roads shall not exceed 0.3 grams per square meter (g/m^2) on the paved haul road individual sample.
2) Compliance with the silt loading limitation in Special Condition 14.B.1), shall be demonstrated by conducting silt loading sampling (as defined in Appendix C.1 and C.2 of *AP-42 Compilation of Air Pollution Emission Factors,* Fifth Edition).
   a) Silt loading sampling shall be conducted using a vacuum equipped with HEPA filtration.
   b) Each sample area shall be large enough to obtain 100 grams of material.
3) Sampling shall be conducted between the midpoint and end of the watering/cleaning cycle, or immediately before and after a watering/cleaning cycle. If the after/before option is chosen, then the results are averaged for comparison to the silt loading limit.
4) The watering/cleaning method and frequency shall be conducted, at a minimum, at the same method and frequency as stated in the SOP report from Special Condition 14.A.1) that corresponds to a compliant test.
5) Analysis of samples shall be conducted in accordance with ASTM C 136 method. The silt calculation shall add all mass retained in the vacuum bag to the mass passing the #200 sieve.
6) Testing shall be conducted once a quarter for four quarters following the issuance of this permit. The initial test shall be conducted within 60 days after achieving the maximum capacity. Initial testing shall be performed no later than 180 days after initial start-up for commercial operation. "Initial startup for commercial operation" is defined as the date that the plant first manufactures a product for the purpose of selling it to a customer.
7) Once Nucor demonstrates four consecutive compliant testing in accordance with this special condition, then no further testing will be required as long as the haul road SOP as established and verified by testing is maintained. If any test exceeds the limit in Special Condition 14.B, or there are any changes to the SOP, then Nucor will need to revert to testing quarterly until four consecutive compliant tests are achieved.
8) An electronic copy of the full test report and results for the initial silt content testing shall be submitted to the Air Pollution Control Program Compliance/Enforcement Section at StackTesting@dnr.mo.gov within 60 days of completion of the initial testing. At a minimum, the report shall include sample road segment locations, recent weather conditions, HEPA vacuum bag model number, cleaning method and schedule, sampling date/time, tons of material shipped on the sampling day compared to the

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

permitted capacity, legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required EPA Method for at least one sample run. Subsequent test results/reports shall be kept on site.

9) If the results show that the silt loading exceeds the limits in Special Condition 14.B. on two consecutive tests (i.e. if one or more of the three required samples per test shows a deviation, then the entire test shows a deviation, but two consecutive tests are needed to show an exceedance of the limit), then Nucor shall evaluate what effects the exceedance would have had on the permit applicability of this project. Nucor shall submit the results of any such evaluation, in a complete Application for Authority to Construct to the Permits Section within 90 days of completing the silt loading test results report required in this special condition.

C. Nucor shall pave roads as indicated in the document, modeling memo, *Ambient Air Quality Impact Analysis (AAQIA) for Nucor Steel Sedalia, LLC- Prevention of Significant Deterioration (PSD) Air Quality Impact Analysis*, dated July 12, 2018, with materials such as concrete or asphalt. If additional unpaved roads are paved by Nucor, then paved road special conditions apply to the paved roads and prior approval from the Air Pollution Control Program is not required.

15. Restriction of Public Access

A. Nucor shall preclude public access to property that is considered within the non-ambient air zone with respect to the air quality impact analysis conducted for this permit. Installation and maintenance of a fence or other physical barrier shall be the means to preclude public access. A map showing property boundary (precluded areas) can be found in modeling memo, *Ambient Air Quality Impact Analysis (AAQIA) for Nucor Steel Sedalia, LLC- Prevention of Significant Deterioration (PSD) Air Quality Impact Analysis*, dated July 12, 2018.

B. Nucor shall complete construction of the physical barrier to enclose the area prior to initial startup for commercial operation. "Initial startup for commercial operation" is defined as the date that the plant first manufactures a product for the purpose of selling it to a customer.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

16. Emission Testing

A. Nucor shall test each pollutant and location as indicated in Table 2.

Table 2: Emission Testing

Pollutant	EAF/Meltshop Stack (EP-08)
PM	x
PM_{10} total	x
$PM_{2.5}$ total	x
SO_2	x
NO_X	x
VOC	x
CO	x
Fluorides (minus HF)	as required by Special Condition 18
CO_2	x
Mercury Compounds	x

B. Nucor shall test emissions for the duration or volume specified in the test method.

C. Nucor shall test each emission from the EAF/Meltshop Stack (EP08) for an integral number of complete tap-to-tap times. Nucor shall record the respective times and durations for start of tapping, charging, melting/refining, and start of next tapping.

D. Nucor shall test VOC from the EAF/Meltshop Stack (EP08) using EPA Method 25A, with methane and ethane subtracted. Methane and ethane shall be determined using EPA Method 18.

E. Nucor shall conduct all EP08 tests at the maximum capacity, 60 tph of cast steel. If it is impractical to test at maximum capacity, emission units may be tested at less than the maximum capacity; in this case, subsequent operation of the emission unit(s) is limited to 110 percent of the test rate until a new test is conducted. Once the emission units are so limited, operation at higher capacities is allowed for no more than 15 total days for the purpose of additional compliance testing to regain the authority to operate at the maximum capacity.

F. Nucor shall conduct initial testing within 60 days after achieving the maximum capacity. Initial testing shall be performed not later than 365 days after initial start-up for commercial operation and shall be conducted in accordance with the procedures in this permit and the approved test plan.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

G. Nucor may request an extension to conduct the performance testing required by Special Condition 16. Nucor shall submit any requests for extension in writing to StackTesting@dnr.mo.gov no later than 90 days prior to the date the testing is required to occur and shall include Nucor's reason for requesting the extension. The Air Pollution Control Program will review and either approve or disapprove Nucor's request within 30 days of receipt.

H. Nucor shall conduct subsequent testing for the locations and pollutants in Table 2 according to the following,
   1) EP-08 –as needed for CERMS RATA for SO_2, NO_X, CO, and CO_2
   2) EP-08 – once annually for PM, PM_{10} total, $PM_{2.5}$ total, VOC and mercury
   3) Mercury testing frequency
      a) If the initial annual testing for mercury has a test method average rate below 0.020 lb/hr, then no further annual testing for mercury will be required.
      b) If each of three consecutive annual tests for mercury show a test method average rate below 0.030 lb/hr, then no further annual testing for mercury will be required

I. Nucor shall not conduct any annual tests within four calendar months of each other for the same pollutant at the same location

J. Nucor shall submit a completed Proposed Test Plan Form (enclosed) to the Air Pollution Control Program's Compliance/Enforcement Section at StackTesting@dnr.mo.gov at least 60 days prior to the proposed test date so that the Air Pollution Control Program may arrange a pretest meeting, if necessary, and assure that the test date is acceptable for an observer to be present. The Proposed Test Plan may serve the purpose of notification and must be approved by the Director prior to conducting the required emission testing. Each proposed test method shall be approved by the Air Pollution Control Program prior to conducting the respective test. If retesting of an emission unit is necessary, then the prior approved testing protocol for the failed test may be used for the retest.

K. Nucor shall submit one copy of the full test report to the Air Pollution Control Program's Compliance/Enforcement Section at StackTesting@dnr.mo.gov within 60 days of the completion of any required testing. The report shall include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required test method for at least one sample run. The report shall include the following values present during each test:
   1) Cast steel rate (tph); Nucor shall calculate short term production rate as follows:

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

a) Calculate the production rate for each heat by taking the total tons of steel tapped during the heat and dividing by the number of minutes during that heat. This gives a value in tons per minute. If tapped tons are not directly measured, they should be calculated from the cast tons for the heat.
b) Repeat this process for each heat for the period of the test run
c) Calculate the production rate for a test run by summing the values in Special Condition 16.K.1)a. and b. for each heat or partial heat from the EAF for the period of the test run, dividing the sum by the total number of minutes of the test run, and then multiplying the result by 60 to determine the steel production rate in tons per hour for the test run.

2) Tap to tap time, time for charging, melting/refining, tapping (minutes),
3) Charge rate of each respective scrap material (e.g. shred, turnings, HM1, HM2, etc.) (tph), and
4) Control device operation log.

L. The test reports are to fully account for all operational and emission parameters addressed both in the permit conditions as well as in any other applicable state or federal rules or regulations. Applicable NSPS and MACT standards may have separate test requirements than this permit.

17. As-Built Evaluation

A. Nucor shall notify the Air Pollution Control Program's Permits Section in writing before the initial startup for commercial operation of any emission unit in this permit of any changes to the as-built design rate, location, or model release parameters compared to this permit's application or the modeling memo, *Ambient Air Quality Impact Analysis (AAQIA) for Nucor Steel Sedalia, LLC- Prevention of Significant Deterioration (PSD) Air Quality Impact Analysis*, dated July 12, 2018

B. Nucor shall submit an as-built report to the Permits Section within 180 days of initial startup for commercial operation. For the purpose of this permit condition, "Initial startup for commercial operation" is defined as the date that the plant first manufactures a product for the purpose of selling it to a customer. The report shall contain at minimum the updated design rates, equipment model numbers, locations, and ambient impact analysis release parameters for the installation.

C. In the event that the Program determines that the changes are significant, Nucor shall submit an updated AAQIA to the Program that continues to demonstrate compliance with NAAQS and PSD increment Standards

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

18. Fluorides (excluding hydrogen fluoride)

A. Within 60 days of achieving maximum production, Nucor shall conduct stack testing for EP-08 to determine emission factors for fluorides. The stack testing shall be conducted for the duration of a complete tap-to-tap time.

B. During the testing, Nucor shall monitor:
   1) Charge rate of all scrap materials and steel production rate, tph
   2) All fluoride containing material, usage rates (tph), and fluoride weight percent.

C. Nucor shall submit one copy of the full test report to the Air Pollution Control Program's Compliance/Enforcement Section at StackTesting@dnr.mo.gov within 60 days of completion of the testing required in Special Condition 18.A. The report shall include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required test method for at least one sample run.

D. Nucor shall submit to the Air Pollution Control Program's Permit Section potential fluoride emissions calculations for the installation utilizing the emission factors developed through the stack testing in Special Condition18.A. The revised PTE calculations are due within 30 days of receiving approval of the stack test report.

E. If the installation wide fluoride emissions exceed 3.0 tpy, Nucor shall submit within to the Air Pollution Control Program's Permit Section within 90 days of the fluoride potential emissions submittal (Special Condition 1.D):
   1) A BACT analysis for each fluoride emitting emission unit,
   2) An air quality analysis for fluorides;
   3) An ambient air quality monitoring plan for fluorides if the air quality analysis shows fluoride concentrations in excess of 0.25 micrograms per cubic meter ($\mu g/m^3$), 24-hour average.

F. Nucor shall not utilize any fluoride containing materials, excluding scrap metal, that was not utilized during the testing Special Condition 18.A or whose fluoride weight percent exceeds that which was used during testing. If Nucor wishes to utilize materials which contain a higher weight percent fluoride, it must repeat Special Condition 18.A through 18.E.

SPECIAL CONDITIONS:
The permittee is authorized to construct and operate subject to the following special conditions:

19. Record Keeping Requirements
Nucor shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request. These records shall include MSDS/SDS or certified product data sheets for all materials used.

20. Reporting Requirements:
Nucor shall report to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than 10 days after the end of the month during which any record required by this permit shows an exceedance of a limitation imposed by this permit.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (8) REVIEW
Project Number: 2018-03-048
Installation ID Number: 159-0078
Permit Number: 092018-002

Installation Address:
Nucor Steel - Sedalia, LLC
500 Rebar Road
Sedalia, MO 65301

Parent Company:
Nucor Corporation
1915 Rexford Road
Charlotte, NC 28211

Pettis County, S27, T46N, R21W

REVIEW SUMMARY

- Nucor Steel - Sedalia, LLC has applied for authority to construct a new steel mill using an electric arc furnace to produce rebar from scrap.
- The application was deemed complete on April 26, 2018.
- HAP emissions are expected from the proposed installation. The PTE of each individual HAP is below 10.0 tpy. The PTE of combined HAPs is below 25.0 tpy.
- 40 CFR 60 Subpart AAa, *Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983* (NSPS AAa) applies to the installation.
- 40 CFR 60 Subpart JJJJ, *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines* (NSPS JJJJ) applies to fire pump engine (EP16), emergency engine 1 (EP17), and emergency engine 2 (EP18).
- None of the NESHAPs under 40 CFR 61 apply to this installation.
- 40 CFR 63 Subpart YYYYY, *National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities* (MACT YYYYY) applies to the installation.
- 40 CFR 63 Subpart ZZZZ, *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines* (MACT ZZZZ) applies to fire pump engine (EP16), emergency engine 1 (EP17), and emergency engine 2 (EP18).
- A baghouse is being used to control filterable particulate matter emissions from the EAF, LMF and meltshop. Water spray is being used to control various outdoor fugitive emissions.

- This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. The installation is major for CO and SO_2. The installation is above the PSD significant emission rate / de minimis level for PM, PM_{10}, $PM_{2.5}$, SO_2, NO_X, VOC, CO, and fluorides (excluding hydrogen fluoride). The installation is subject to regulation for GHG.

- This installation is located in Pettis County, an attainment/unclassifiable area for all criteria pollutants.

- This installation is on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2. The installation is classified as item *5. Iron and steel mills*. The installation's major source level is 100 tons per year and fugitive emissions are counted toward major source applicability.

- Ambient air quality modeling was performed to determine the ambient impact of PM_{10}, $PM_{2.5}$, SO_2, NO_X, fluorides (excluding hydrogen fluoride), acrolein, hexavalent chromium compounds, hydrogen fluoride, lead compounds, manganese compounds, and mercury compounds. An impact analysis on soils and vegetation was performed for several metallic compounds. A visibility analysis was performed.

- Emissions testing is required for this permit. NSPS AAa and MACT YYYYY also require emission/opacity testing.

- Submittal of a Part 70 operating permit application is required for this installation within 1 year of commencement of operations. 10 CSR 10-6.020(2)(C)43. defines commence operation as *initially set into operation air pollution control equipment or process equipment*.

- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

Nucor Steel – Sedalia, LLC (herein Nucor) has applied for authority to construct a steel mill. Nucor will use an EAF to produce rebar from scrap. Nucor is a NSR major source of CO and SO_2, and above de minimis for several pollutants. Nucor will have a Part 70 operating permit. No permits have previously been issued to Nucor from the Air Pollution Control Program.

PROJECT DESCRIPTION

Scrap steel is received by truck and rail to the outdoors. Large pieces and whole cars are shredded onsite or cut with torches. Sized scrap is trucked from outdoor storage piles to the scrap building. Scrap may be loaded directly from railcars to the scrap building. Cranes will load scrap onto a conveyor, which will feed the EAF. The EAF is an endless scrap charging (ESC) system design and the EAF is a three electrode AC design. Initial charging to the EAF is performed by bucket. Then the EAF direct-shell evacuation control (DEC) is closed and electrodes are inserted. Afterwards the EAF is charged continuously using the ESC design conveyor. Electrical energy is supplemented with natural gas and oxygen injection. Carbon, alloys, and fluxes are introduced. Once specific parameters are met, slag is poured off, and desired molten steel is tapped to a ladle. Ladles are sent to the ladle metallurgy facility (LMF) where additional energy, alloys, and flux are added to customer specifications. Then molten steel from the ladles are tapped to the tundish. The tundish meters to a continuous one-strand caster. Casted strand is further cooled in the caster spray chamber with contact water before being processed into rebar at the hot rolling mill. The process is continuous from the caster to the rolling mill.

A baghouse directly controls the EAF and LMF. EAF fugitives, LMF fugitives, and meltshop emissions are captured by a large canopy hood and also routed to the baghouse. The baghouse operates in two modes, low flow and high flow. Low flow is 286,160 dscfm. This occurs when the EAF DEC is closed during ESC charging, melting, and refining. Low flow occurs 75% of the time. High flow is 599,000 dscfm; this occurs during bucket charging, tapping, and slagging and occurs the remaining 25% of the time.

Slag and mill scale waste/byproducts are processed then shipped offsite. Auto shredder residue is shipped offsite. Cooling towers recycle contact and non-contact cooling water back to the plant. Refractory surfaces are rebuilt and cured on-site. Emergency engines will provide fire protection and power as needed. Equipment travel is on paved and unpaved roads.

Initially, injection oxygen is trucked to the site. If an oxygen plant is constructed onsite, then it will be subject to permit applicability and may be subject to PSD through project aggregation.

The cast steel design capacity is 60 tph. Long-term production is limited at 450,000 tpy.

The following is an emission unit summary for this project.

Table 3: Emission Unit Summary

Emission Unit ID	Description	Design Capacity	Emission Point ID
EU08A	Electric Arc Furnace (EAF)	60 tph cast steel	EP08 EAF/ meltshop baghouse, EP09 meltshop fugitives
EU08B	EAF sidewall lance burners		
EU08C	EAF service torches		
EU08D	Ladle Metallurgy Facility (LMF)		
EU08E	EAF refractory repair		EP08 EAF/meltshop baghouse, EP09 meltshop fugitives, EP10 caster vent
EU08F	Ladle preheater		
EU08G	Ladle dryer		
EU08H	Ladle dump		
EU08I	Ladle refractory repair		
EU08J	Ladle skull cutting		
EU08K	Tundish preheater		
EU08L	Tundish dryer		
EU08:	Tundish dump		
EU08N	Tundish refractory repair		
EU08O	Tundish skull cutting		
EU08P	Slag dump		
EU08Q	Meltshop alloy transfer		
EU08R	Caster		
EU08S	Caster torches		
EP11	Caster spray chamber		EP11, EP08, EP09
EP12	Rolling mill		EP12
EP19	Alloy pile outdoors		EP19
EP07	Scrap torches		EP07
EP16	Engine-fire pump		EP16
EP17	Engine-emergency 1		EP17
EP18	Engine-emergency 2		EP18
EP01	Two scrap piles outdoors		EP01
EP06	Shredder: load-in, screen/separation, finished piles		EP06
EP02	Scrap building: drop into pile, crane drop to conveyor, piles		EP02
EP20	Slag and mill scale yard: drop from meltshop to yard, slag ball crusher, crushers (except ball crusher), screens, piles, conveyors		EP20
EP03	Silo-carbon injection		EP03
EP03A	Carbon injection hopper		EP03A
EP04	Silo-flux 1		EP04
EP04A	Silo-flux 2		EP04A
EP04B	Flux hopper		EP04B
EP05	Silo-baghouse collected EAF dust		EP05
EP05A	EAF dust loadout fugitives		EP05A
EP13	Cooling tower 1		EP13
EP14	Cooling tower 2		EP14
EP15	Cooling tower 3		EP15
EP23	Diesel tank		EP23
EP24	Gasoline tank		EP24
EP-21/ EP-22	Paved and unpaved roads		EP-21/ EP-22

EMISSIONS/CONTROLS EVALUATION

Emission calculations are provided in the attached confidential Excel document, *2018-03-062 Nucor PTE calculations.xlsx* and redacted public Excel document, *2018-03-048 Nucor PTE calculations.xlsx*. Nucor requested confidentiality for the electronic emission calculations. The same information such as production rates, emission factors, and capture/control efficiencies, minus the calculation equations, exists in the public hardcopy permit application. The Air Pollution Control Program granted confidentiality for the electronic calculations according to 10 CSR 10-6.210 *Confidential Information*, and created public project 2018-03-048 and confidential project 2018-03-062. As the production rates, emission factors, and capture/control efficiencies are public, then the program is issuing one version of this permit.

The following table provides an emissions summary for this project.

Table 4: Emissions Summary (tpy)

Pollutant	*De Minimis* Level / SMAL	Potential Emissions of the Installation	EP08	EP09	EP10	EP11	EP12
PM	25.0	66.85	20.52	0.87	17.50	3.01	3.80
PM_{10}	15.0	60.23	32.83	0.86	13.85	0.48	4.01
$PM_{2.5}$	10.0	49.68	32.83	0.83	10.86	0.06	1.56
SO_2	40.0	112.77	112.50	0.09	0.09	0.08	N/A
NO_X	40.0	80.18	67.50	0.17	4.70	0.03	N/A
VOC	40.0	100.62	67.50	0.08	0.94	1.78	3.72
CO	100.0	816.87	787.50	0.92	12.36	2.16	N/A
Lead, NSR Pollutant	0.6	0.11	0.08	6.5E-03	1.2E-02	1.1E-03	6.7E-04
Fluorides (excluding HF)	3.0	13.57	13.28	1.3E-02	2.5E-01	2.2E-02	1.4E-02
Sulfuric Acid Mist	7.0	N/A	N/A	N/A	N/A	N/A	N/A
Reduced Sulfur Compounds	10.0	0.10	N/A	1.1E-05	4.7E-04	3.2E-02	6.6E-02
Total Reduced Sulfur	10.0	N/A	N/A	N/A	N/A	N/A	N/A
GHG (mass)	N/A	118,198	98,550	498.06	17,607	2.72	5.68
GHG (CO_2e)	75,000	118,484	98,595	500.59	17,711	67.99	141.97
Combined HAPs	25.0	4.57	1.71	6.1E-02	0.39	0.36	0.72
Combined POM/PAH	10.0	0.27	2.2E-01	3.5E-02	1.4E-04	2.3E-03	4.8E-03
Acrolein	0.04	0.14	N/A	9.2E-06	3.9E-04	2.6E-02	5.4E-02
Benzene	2	0.85	0.65	5.3E-04	3.7E-04	3.9E-03	8.0E-03
Dioxins/Furans	6E-07	4.0E-07	3.8E-07	1.4E-08	N/A	N/A	N/A
Formaldehyde	2	0.60	5.8E-04	6.3E-04	2.6E-02	N/A	N/A
Hexane	10	0.54	1.4E-02	6.3E-03	0.27	7.4E-02	0.16
Hydrogen Chloride	10	0.27	0.27	2.2E-04	N/A	N/A	N/A
Hydrogen Fluoride	0.1	0.18	0.18	1.4E-04	N/A	N/A	N/A
PCB	0.009	1.3E-03	1.1E-03	1.8E-04	N/A	N/A	N/A
Phenol	0.1	7.8E-02	N/A	1.8E-03	7.6E-02	N/A	N/A
Styrene	1	8.7E-02	2.0E-03	2.2E-06	2.3E-05	1.5E-03	3.2E-03
Antimony Compounds	5	1.2E-03	5.3E-04	2.2E-05	4.4E-04	3.9E-05	2.4E-05
Arsenic Compounds	0.005	1.1E-03	4.5E-04	1.9E-05	4.0E-04	3.3E-05	2.1E-05
Beryllium Compounds	0.008	9.1E-05	3.4E-05	1.5E-06	3.0E-05	2.5E-06	1.6E-06
Cadmium Compounds	0.01	2.3E-03	9.2E-04	4.2E-05	9.2E-04	6.8E-05	4.3E-05
Chromium VI Compounds	0.002	7.3E-04	5.8E-06	1.0E-05	4.1E-04	4.3E-07	2.7E-07
Chromium Compounds	5	6.8E-02	1.3E-02	5.8E-04	1.1E-02	9.7E-04	6.1E-04
Cobalt Compounds	0.1	1.9E-03	8.2E-04	3.4E-05	6.9E-04	6.0E-05	3.8E-05
Lead Compounds	0.01	0.11	7.9E-02	6.5E-03	1.2E-02	1.1E-03	6.7E-04
Manganese Compounds	0.8	0.71	0.12	5.4E-03	0.10	9.0E-03	5.7E-03
Mercury Compounds	0.01	0.23	0.11	4.3E-03	8.6E-02	7.7E-03	4.8E-03
Nickel Compounds	1	2.32E-02	9.1E-03	3.9E-04	7.8E-03	6.7E-04	4.2E-04
Selenium Compounds	0.1	5.0E-03	2.2E-03	9.1E-05	1.8E-03	1.6E-04	1.0E-04

N/A = Not Applicable; N/D = Not Determined; Other HAPs are potentially emitted.

APPLICABLE REQUIREMENTS

Nucor Steel - Sedalia, LLC shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- *Operating Permits*, 10 CSR 10-6.065
- *Start-Up, Shutdown, and Malfunction Conditions,* 10 CSR 10-6.050
- *Submission of Emission Data, Emission Fees and Process Information,* 10 CSR 10-6.110
- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170
- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220 applies to caster vent EP10, caster spray stack EP11, and rolling mill vent EP12.
- *Restriction of Emission of Odors*, 10 CSR 10-6.165

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400. All emission units are either in compliance with the rule limit based upon potential emission calculations, or the rule does not apply to the remainder of emission units.
- *New Source Performance Regulations*, 10 CSR 10-6.070
    - *Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983,* 40 CFR 60 Subpart AAa.
    - *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines,* 40 CFR 60 Subpart JJJJ applies to fire pump engine (EP16), emergency engine 1 (EP17), and emergency engine 2 (EP18).

- *Maximum Achievable Control Technology Regulations,* 10 CSR 10-6.075
    - *National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities,* 40 CFR 63 Subpart YYYYY.

    - *National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines,* 40 CFR 63 Subpart ZZZZ applies to fire pump engine (EP16), emergency engine 1 (EP17), and emergency engine 2 (EP18).

- *Control of Sulfur Dioxide Emissions*, 10 CSR 10-6.261 applies to EP08, however the rule does not contain an applicable limit.

- *Restriction of Emission of Sulfur Compounds*, 10 CSR 10-6.260 applies to EP08. This rule was rescinded from the Missouri CSR on November 30, 2015. It was replaced by 10 CSR 10-6.261. However, 6.260 remains in the Missouri SIP. Potential emission calculations show the SO_2 concentration from EP08 is below the rule limit by a wide margin.

AMBIENT AIR QUALITY IMPACT ANALYSIS

For details see the attached modeling memo, *Ambient Air Quality Impact Analysis (AAQIA) for Nucor Steel Sedalia, LLC- Prevention of Significant Deterioration (PSD) Air Quality Impact Analysis*, dated July 12, 2018

BACT

Nucor conducted a BACT analysis for PM, PM_{10} $PM_{2.5}$, SO_2, NO_X, VOC, CO, fluorides (excluding hydrogen fluoride) and GHG (CO_2e). The analysis can be found in the application and addendums, which are incorporated by reference into this permit. The following items were changed or in addition to what was in the BACT analysis section of the permit application

Further discussion follows.

EPA guidance states,
"In determining the appropriate limit, the permitting authority can consider a range of factors, including the ability of the control option to consistently achieve a certain emissions rate, available data on past performance of the selected technology, and special circumstances at the specific source under review which might affect the range of performance. In setting BACT limits, permitting authorities have the discretion to select limits that do not necessarily reflect the highest possible control efficiencies but that will allow compliance on a consistent basis based on the particular circumstances of the technology and facility at issue, and thus may consider safety factors unique to those circumstances in setting the limits...Finally, the permitting authority bears the responsibility in Step 5 to fully justify the BACT decision in the permit record. Regardless of the control level proposed by the applicant as BACT, the ultimate determination of BACT is made by the permitting authority after public review is complete. The applicant's role is primarily to provide information on the various control options and, when it proposes a less stringent control option, provide a detailed rationale and supporting documentation for eliminating the more stringent options. It is the responsibility of the permitting authority to review the documentation and rationale presented in order to: (1) ensure that the applicant has addressed all of the most effective control options that could be applied and; (2) determine that the applicant has adequately demonstrated that energy, environmental, or economic impacts justify any proposal to eliminate the more effective control options. Where the permitting authority does not accept the basis for the proposed elimination of a control option, the permitting authority may inform the applicant of the need for more information regarding the control option. However, the BACT selection essentially should default to the highest level of control for which the applicant could not adequately justify its elimination based on energy, environmental and economic impacts. If the applicant is unable to provide to the permitting authority's satisfaction an adequate demonstration for one or more control alternatives, the permitting authority should proceed to establish BACT and prepare a draft permit based on the most effective control option for which an adequate justification for rejection was not provided."

EP08: PM filterable

The permit application addendum includes the following analysis for PM at step 5,

> "The efficiency of the controls depends on the nature of the material being emitted. For an incinerator to achieve a reduction in particulate matter, the particulate matter must be combustible. (Running a metallic fume through a combustion unit would change metals into metal oxides, increasing emissions rather than decreasing them.) Electrostatic precipitators work best on high-resistivity particulate matter. Inertial separators such as cyclones and wet scrubbers work best on large-diameter particles but have only modest efficiencies on smaller (5 micron and below) particulate matter. The $PM_{10}/PM_{2.5}$ rate should include both front and back half; therefore, RBLC entries for PM front half only are not appropriate for comparison for PM_{10} and $PM_{2.5}$. Nucor proposes to install a baghouse to control $PM/PM_{10}/PM_{2.5}$ emissions from the combined exhaust from the EAF and LMF. NSPS Subpart AAa mandates control to at least 0.0052 gr/dscf. Nucor proposes an outlet grain loading for the combined EAF and LMF emissions of 0.0018 gr PM/dscf (filterable only), 0.0052 gr PM_{10}/dscf (filterable plus condensable), and 0.0052 gr $PM_{2.5}$/dscf (filterable plus condensable). Additionally, Nucor proposes an opacity limit of 3 percent measured at the baghouse exit and 6 percent opacity from the meltshop represents BACT for the proposed plant. This approach is also consistent with NSPS Subpart AAa. As shown in Table 1-3, EAF BACT limits range as follows for the various types of particulate, however since the RBLC listing is for "EAF" it is unknown if they limit includes emissions from the LMF, caster, and meltshop fugitives:
>
> • PM (filterable only) 0.0008 to 0.0032 gr/dscf
> • PM (filterable plus condensable) 0.0052 to 0.0054 gr/dscf
> • PM_{10} (filterable only) 0.0018 gr/dscf
> • PM_{10} (filterable plus condensable) 0.0052 to 0.0054 gr/dscf
> • PM_{10} (unspecified) 0.0008 to 0.0052 gr/dscf
> • $PM_{2.5}$ (filterable only) 0.0018 gr/dscf
> • $PM_{2.5}$ (filterable plus condensable) 0.0049 to 0.0054 gr/dscf
> • $PM_{2.5}$ (unspecified) 0.0008 to 0.0052 gr/dscf
>
> RBLC listings show lower $PM/PM_{10}/PM_{2.5}$ BACT limits for continuous caster, LMFs, or meltshop fugitives (IN-0196, OK-0128, OH-0328, OH-0316, AR-0140, SC-0129, MI-0404, MI-0417, LA-0309). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 0.0052 gr/dscf and are not appropriate for comparison. The RBLC listings for OK-0128 and IN-0196 are obviously only for natural gas combustion since these values match the AP-42 rates for natural gas combustion in Chapter 1.4. The remaining RBLC listings that are lower than the proposed BACT are not ESC processes like at Sedalia, except for CMC Durant (OK-0173). Sedalia is requesting a limit higher than CMC Durant due to expected variability in the process."

There are 38 RBLC entries for PM at an EAF/meltshop stack from 1998 to 2018. Half of the entries are in the range of 0.0014 to 0.0018 gr/dscf. The lowest entry is for a Nucor facility located in Norfolk, Nebraska. The limit is 0.0008 gr/dscf.

Nucor addressed the Norfolk limit in the following correspondence:

> "The 0.0008 gr/dscf is an outlier in the RBLC database; no other steel mills have permitted BACT rates as low as 0.0008 gr/dscf. The two baghouses at Norfolk are different: the existing baghouse is positive pressure with a flow rate of 965,000 dscfm and the new baghouse is negative pressure with a flow rate of 630,000 dscfm. Sedalia's average flowrate is 364,360 dscfm, which is much lower than the flow through each of the baghouses at Nebraska. Even with these two baghouses, the hourly emissions of PM is 10.9 lb/hr with annual emissions of 47.9 tpy for particulate emissions, which is more than double the PM hourly and annual emission rate from the proposed Nucor Sedalia micro mill. Therefore, the loading and level of particulate emissions at Norfolk are much, much higher and with the two baghouses, therefore necessitating two baghouses with more control efficiency. It is also unclear whether a baghouse can maintain the highest level of efficiency over its 20 year or greater life span. Over time, vibration and fatigue will affect the "tightness" of the baghouse structure, creating small gaps that may allow some particulate to escape even though rigorous maintenance is practiced. A limit of 0.0015 gr/dscf is more likely to be achievable over the long-term than a limit of 0.0008 gr/dscf given the aging expected of baghouse materials. Accordingly, Nucor requests that the limit be maintained at a level of no lower than 0.0015 gr/dscf to reflect both the cleaning and aging cycles."

The Air Pollution Control Program offers the further discussion. The Norfolk 0.0008 limit is a combined limit for two parallel baghouses controlling the EAF and meltshop, one with a limit of 0.0004 and the other at 0.0018. The 0.0004 value was set by analyzing the mean of on-site stack test results from 2007 to 2012, including three standard deviations and an added margin of safety. The 0.0018 value was set by comparing to other EAF limits. The combined limit was set in 2013. Filterable particulate matter is stack tested annually.

The Air Pollution Control Program obtained test results from two separate facilities, CMC Mesa and Gerdau Charlotte. Each of these facilities operates an ESC EAF. The Program identified another ESC EAF at Nucor Darlington, however the Program was unable to obtain test results from the respective air agency during this review. Annual test results from CMC Mesa are 0.0002, 0.0006, and 0.0004 gr/dscf from 2016-2018. In 2002, Gerdau Charlotte tested 0.00004 gr/dscf. The BACT limit is in units of lb/ton steel, and other tests were reported as such.

The Department selects 0.0015 gr/dscf as the limit for PM filterable, test method average. Only one limit is lower, is not for an ESC EAF, and not enough data is available to say the limit is directly comparable to Sedalia. The single Gerdau test may be an outlier.

EP08: PM_{10} total and $PM_{2.5}$ total

The permit application includes the following analysis for PM_{10} total and $PM_{2.5}$ total at step 5,

> "Nucor proposes to install a baghouse to control $PM_{10}/PM_{2.5}$ emissions from the combined exhaust from the EAF and LMF. Nucor proposes that a $PM_{10}/PM_{2.5}$ outlet grain loading for the combined EAF and LMF emissions of 0.0052 gr/dscf along with opacity limits of 3 percent measured at the baghouse exit and 6 percent opacity from the meltshop represents BACT for the proposed plant. This approach is also consistent with NSPS Subpart AAa. The $PM_{10}/PM_{2.5}$ rate should include both front and back half, therefore RBLC entries for PM, which is front half only, are not appropriate for comparison. Recently permitted $PM_{10}/PM_{2.5}$ BACT limits for EAFs range from 0.15 to 0.50 lb/ton. Several RBLC listings show lower $PM_{10}/PM_{2.5}$ BACT limits for continuous caster, LMFs, or meltshop fugitives (IN-0196, OK-0128, OH-0328, OH-0316, AR-0140, SC-0129, MI-0404, MI-0417, LA-0309). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 0.0052 gr/dscf and are not appropriate for comparison. The RBLC listings for OK-0128 and IN-0196 are obviously only for natural gas combustion since these values match the AP-42 rates for natural gas combustion in Chapter 1.4. The remaining RBLC listings that are lower than the proposed BACT are not ESC processes like at Sedalia, except for CMC Durant (OK-0173). Sedalia is requesting a limit higher than CMC Durant due to expected variability in the process."

There are 18 RBLC entries for PM_{10} at an EAF/meltshop baghouse stack from 1998 to 2018. Some of the earliest entries are not PM_{10} total, just filterable. Of the recent entries, the lowest limits are 0.0024 and 0.0034. There are 14 RBLC entries for $PM_{2.5}$ at an EAF/meltshop baghouse stack from 1998 to 2018. Some of the earliest entries are not $PM_{2.5}$ total, just filterable. Of the recent entries, the lowest limits are 0.0024 and 0.0033.

Nucor provided the following:

> "Nucor has proposed a $PM_{10}/PM_{2.5}$ limit of 0.0045 gr/dscf. MDNR staff has queried whether the limit should be set at the lower levels of 0.0024 gr/dscf set at the CMC Mesa facility and CMC Durant facility. Once again, the lowest limit in RBLC is not determinative, as outlined by the EPA in the Prairie State decision. Instead, the permit writer must properly balance fluctuations and variability in the underlying process, the control device with the ability to maintain consistent compliance with a well-maintained unit. Variability in the case of $PM_{10}/PM_{2.5}$ is relatively greater than for PM. Condensable fraction emissions have ranged from 1.6 to 13.6 times the filterable fraction, with a standard deviation of 3.3. Condensable testing from EAFs has ranged from 0.0003 to 0.0035 gr/dscf, with the mean plus one standard deviation being approximately 0.0022 gr/dscf for the condensable fraction alone. It is also not clear how well the condensable fraction is controlled, particularly as it usually is < 1 micron and hence more susceptible to cleaning cycle impacts than the filterable fraction discussed above in the particulate matter section. Accordingly, the Prairie State decision counsels that the permit writer carefully weigh the variability, fluctuations, and ability of the control technology to control the stream in setting the BACT limit. In this case,

BACT set at the filterable level (0.0015 gr/dscf) plus the mean and two standard deviations (appropriate given the observed variability) for the condensable fraction (0.00303) gives a value of 0.00453 gr/dscf, which Nucor recommends rounding to 0.0045 gr/dscf."

Nucor further states, "Page 7 of the attached presentation supports the data behind the $PM_{10}/PM_{2.5}$ filterable plus condensable emissions and variations that were discussed previously with MDNR. In developing Nucor's proposed BACT proposal at 0.0045 gr/dscf for $PM_{10}/PM_{2.5}$ filterable+condensable, Nucor looked to EAF information presented at the 2009 EUEC conference that collected PM filterable and PM condensable data from 16 tests at 8 different EAFs. The plants were anonymized as part of the presentation. Nucor started with the 0.0015 gr/dscf for the filterable fraction from RBLC. For the condensable fraction, results are highly variable, ranging from a low of 0.0003 gr/dscf to a high of 0.0032 gr/dscf, with over half being in excess of 0.001 gr/dscf. Nucor then took the mean (0.00135) and added two times the standard deviation (0.00084) to calculate a condensable fraction value of 0.0030 gr/dscf. These values were added together to arrive at 0.0045 gr/dscf for PM filterable+condensable. While the use of a mean plus two standard deviations suggests that Nucor would be out-of-compliance 5% or more of the time, there is some safety built into the filterable value, so the final value is likely continuously achievable if good practice is followed."

$PM_{10}/PM_{2.5}$ limits ranging from 0.0024 to 0.0034 are found in permits for six different facilities, with three in operation and a 4th under construction. The facilities in operation include CMC Mesa, CMC Durant, and Big River Steel.

- The Program obtained test results from CMC Mesa. This is an ESC EAF. The Program identified another ESC EAF at Nucor Darlington, however the Program was unable to obtain test results from the respective air agency during this review. Annual test results from CMC Mesa have shown compliance for three years, since the 0.0024 gr/dscf PM_{10} limit was issued.
- Big River Steel's limit is 0.0024 gr/dscf. Nucor commented on this permit that derivation of the rate was not adequately explained and said 0.0052 should be used. Arkansas disagreed and issued the permit at 0.0024. Nucor petitioned to appeal the limit, however the limit was upheld.

As a 0.0024 gr/dscf limit has been issued elsewhere, for ESC EAF, and upheld through testing, then the Department selects 0.0024 gr/dscf as separate limits for each PM_{10} total and $PM_{2.5}$ total, test method average.

EP08: SO_2

The permit application includes the following analysis for SO_2 at step 5,

> "Nucor proposes the use of natural gas fuel, low-sulfur carbon-based feed and charge material as well as good combustion and/or process operation as BACT for SO_2 control from the EAF and LMF. Recently permitted SO_2 BACT limits for EAFs range from 0.15 to 0.50 lb/ton. Several RBLC listings show lower SO_2 BACT limits (0.05-0.33 lb/ton) for continuous caster, LMFs, or meltshop fugitives (OK- 0128, AR-0138, AR-0140, MI-0417, MI-0404, SC-0112, OH-0328, and IN-0196). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 0.6 lb SO_2/ton and are not appropriate for comparison. The RBLC listings for OK-0128 and IN-0196 are 0.00006 lb/MMBtu or 0.6 lb/MMcf and are obviously only for natural gas combustion since these values match the AP-42 rates for natural gas combustion in Chapter 1.4. The RBLC listings that are lower than the proposed BACT are for CO-0066, AR-0140, FA-0142, OH-0328, OK-0128, AL-0309, AL-0323, TX-0705, AL-0319, and OH-0341. However, none of these facilities have an ESC process like at Sedalia. Nucor is proposing the emission rate limit for the combined EAF/LMF exhaust of 0.60 pounds per ton of steel produced. This proposed emission rate is higher than the average emission rate but not the highest. If a scrap preheating process were not used at the Nucor facility, the proposed emission rate would be at the low end of the emission rate range from the RBLC search results, but Nucor is anticipating that the slightly higher proposed SO_2 emission rate will be required due to oxidation of the scrap as it is preheated prior to entering the EAF. The CMC Durant BACT limit is the same as that proposed for Sedalia."

There are 61 RBLC entries for SO_2 at an EAF/meltshop stack from 1998 to 2018. The average is 0.47 lb/ton. The mode is 0.25 lb/ton. The 10th percentile is 0.15 lb/ton. Fourteen entries range from 0.15 to 0.20 lb/ton.

> Nucor proposed to lower the limit from 0.6 to 0.5 lb/ton, with the following justification, "SO_2 emissions are directly related to the amount of sulfur charged to the EAF. Scrap metal has inherently low sulfur content (0.003 to 0.07 percent), whereas injection coal and petroleum which will be used by Nucor can have sulfur contents in the 2.5 to 3 percent range and potentially higher. Based on review of other Nucor facility BACT rates, the type of scrap/metal that they process, the declining availability of low sulfur carbon inputs, and the type of materials that will be produced, Nucor believes that an SO_2 rate of 0.5 lb/ton is achievable for Nucor Sedalia. The Nucor Nebraska Fact Sheet for Permit Number CP12-027 (October 7, 2013) states that pet coke carbon supplies that is available is in the 3% sulfur range now. Based on knowledge of the pet coke composition and the process at this facility (not producing resulfurized steel, such as at Nucor Norfolk), Nucor believes that limit of 0.5 lb/ton for SO_2 is achievable on a 30-day average."
>
> Nucor further states, "Sulfur is introduced to the EAF process as a component of the scrap steel, injection carbon, lime, and dolomite. Sulfur is present in the finished steel product, the EAF exhaust gas, and potentially in the EAF slag. A mass balance has been performed on sulfur in the system to determine SO_2

emissions from the steelmaking process. See the attached document. In a realistic scenario representing BACT emissions, an assumed value of 0.085% sulfur retained in the finished steel results in SO_2 emissions of 0.5 lbs per ton of steel produced. Although the sulfur content of the scrap steel varies, and different grades of steel will be produced at the facility, Nucor believes that a BACT rate of 0.5 lbs SO_2 per ton of steel produced is an achievable emission rate based on their experience with other steel mills and based on the expected sulfur content of the ingredients. The original SO_2 BACT in the March 2018 PSD air permit application addressed the lower BACT rates in the RBLC. See the yellow highlighting below. The Nucor Nebraska Fact Sheet for Permit Number CP12-027 (October 7, 2013) states that pet coke carbon supplies that is available is in the 3% sulfur range. Sedalia expects a similar sulfur content for carbon injection."

Nucor's mass balance is provided:

	Tons	Lbs		
Annual Steel Production	450,000	900,000,000		
Annual Scrap	481,500	963,000,000		
Scrap Type	**% of mix**	**Annual lbs Mix**	**% of Sulfur in Mix**	**Annual lbs Sulfur**
Mixed HM	50.0%	481,500,000	0.0315%	151,673
Std. Shredded	40.0%	385,200,000	0.02%	77,040
Turnings	10.0%	96,300,000	0.07%	67,410
Other Additions	**tpy**	**lbs per year**	**% of Sulfur in Mix**	**Annual lbs Sulfur**
Injection Carbon (Pet Coke)	8,550.00	17,100,000	3%	513,000
Lime	10,350.00	20,700,000	0.2%	41,400
Dolomite	6,750.00	13,500,000	0.2%	27,000
TOTAL ANNUAL SULFUR from SCRAP + INJECTION CARBON + FLUXES (lbs)				**877,523**

Realistic Sulfur Content of 0.085% in finished steel product (rebar), remainder of sulfur to air				
	Tons	**Lbs**	**% Sulfur**	**Annual lbs Sulfur**
Steel Produced	450,000	900,000,000	0.0850%	765,000
Slag	54,000	108,000,000	0%	0.00
			ANNUAL SULFUR LBS/TON STEEL PRODUCED*	**0.25**
			Annual SO2 Emissions (lbs/ton steel)**	**0.50**

The Air Pollution Control Program offers the further discussion. A mass balance approach should not be relied upon solely to arrive at a limit in this case. Small changes in sulfur content of raw materials, product, or waste result in large variations in the predicted emission limit.

- Nucor used 0% weight sulfur in the slag produced. However, several references show the sulfur content is not zero, rather 0.1% to 0.2%. One of most thorough references, journal published, available on the National Slag Association's website shows a mean of 0.1891%, with a 95% UCL value of 0.2069% from 45 EAF slag samples. Holding all other variables constant, and changing the slag sulfur content very conservatively to 0.05%, which may be 50% to 25% of the

actual amount, results in a predicted limit of 0.26 lb/ton. A slag sulfur content of 0.07% results in a predicted limit of 0.16 lb/ton.

- Holding all other variables constant, changing the injection carbon's sulfur content from 3.0% to 2.9% results in a predicted limit of 0.42 lb/ton. Coupled with 0.05% slag sulfur content results in 0.18 lb/ton.
- Holding all other variables constant, changing the rebar product from 0.085% sulfur to 0.090% sulfur decreases the predicted limit to 0.30 lb/ton. Coupled with a slag sulfur content of 0.05% results in a predicted limit of 0.06 lb/ton. Change slag to 0.07% sulfur and the predicted limit is a negative value.
- Holding all other variables constant, changing the slag production rate from the 54,000 tpy value in the mass balance to 57,780 tpy obtained from the permit application, and a slag sulfur content to 0.10% as the low end of the range, the predicted limit is a negative value.

Nucor confirmed pet coke will be the injection carbon source. The Nucor-provided injection carbon SDS does not show a sulfur content. The sulfur content of injection grade green pet coke can range from 1.25 to 3.00 wt%. However, the Program did not confirm what materials were actually available.

Several facilities have limits lower than 0.5 lb/ton, three of which are ESC, with one of the ESC producing rebar.

- Nucor Darlington has a limit of 0.35 lb/ton. This is an ESC EAF.
- CMC Mesa's limit is 0.3 lb/ton. Testing and CEMS RATA conducted in 2016, 2017, and 2018 shows compliance. This is an ESC EAF.
- Gerdau Ameristeel's limit in 1999 was 0.23 lb/ton. Testing showed compliance. The limit was later lowered to 0.16 lb/ton. Testing in 2004 and 2013 showed compliance. This is an ESC EAF that produces rebar. Sedalia will be an ESC EAF that produces rebar.
- Big River Steel's limit is 0.18 lb/ton from the EAFs and 0.02 lb/ton from the LMFs.
- Nucor Decatur has 2% sulfur injection carbon with an SO_2 limit of 0.35 lb/ton.
- Nucor Birmingham has 1% sulfur injection carbon with an SO_2 limit of 0.39 lb/ton.

The Department selects 0.5 lb/ton as the SO_2 limit, 30 day rolling. This limit was selected due to material variability.

EP08: NO_X

The permit application includes the following analysis for NO_X at step 5,

> "The emissions of the EAF are routed through the baghouses along with the LMF, caster, and other meltshop sources. The monitoring system for the EAF is after the baghouse and thus includes emissions from the LMF and the meltshop. Recently permitted NO_X BACT limits for EAFs range from 0.2159 to 0.90 lb/ton. Several RBLC listings show lower NO_X BACT limits (0.05-0.20 lb/ton) for continuous caster, LMFs, or meltshop fugitives (OK-0128, TX-0729, OH-0316, OH-0328, MI-0417, and MI-0404). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 0.3 lb NO_X/ton and are not appropriate for comparison. The RBLC listings for OK-0128 and IN-0196 are 0.01 lb/MMBtu or 100 lb/MMcf and are obviously only for natural gas combustion since these values match the AP-42 rates for natural gas combustion in Chapter 1.4. The RBLC listings that are lower than the proposed BACT are for TX-0705, CO-0066, and NE-0055 and have limits of 0.2159, 0.28, and 0.28 lb/ton and annual capacities of 1.3, 1.35, and 1.35 million tons of steel per year, respectively. All three of these facilities are EAFs without an ESC process like at Sedalia and are all much larger than Sedalia, which has a capacity of 450,000 tons of steel per year. The CMC Durant BACT limit is the same as that proposed for Sedalia. In addition, NO_X emission rates can vary between facilities due to individual process characteristics and differences in the types of steel products produced at each facility. Product specifications at one facility may require greater use of oxygen lancing and longer melt times resulting in higher per ton NO_X emissions. Further, NO_X emissions can spike due to process variations. Therefore, a longer averaging period is necessary. The proposed NO_X BACT limit is 0.3 lb/ton with the DEC and baghouse controls. This limit includes all four sources: EAF, LMF, caster, and the meltshop. This limit is consistent with many of the other determinations made at similar facilities, as shown in the RBLC for all of these sources combined. As stated previously, due to the varying types of steel products and required processes to make the various products, this limit is consistent with the limits in the RBLC for other steel mills with the same level of control."

The Air Pollution Control Program offers the further discussion,

- The RBLC contains 58 entries for NO_X at an EAF/meltshop stack from 1998 to 2018. There are 13 entries below 0.3, with several at 0.2 lb/ton.
- The 0.3 lb/ton proposal matches the limit at CMC Durant and CMC Mesa.
- CMC Mesa CEMS RATA and test results show 0.24, 0.24, 0.24, 0.22, and 0.187 lb/ton from 2016 to 2018. This is an ESC EAF.
- Nucor Darlington has a slightly higher limit at 0.35, but again test results were not available during the Sedalia review. This is an ESC EAF.
- Gerdau Charlotte's limit is 0.20. This is an ESC EAF that produces rebar. Test results from 1999, 2004, and 2013 show 0.09, 0.16, and 0.16 lb/ton.

A NO_X limit of 0.3 lb/ton, 30 day rolling was selected. This is not the lowest limit available, but it has been achieved in practice at an ESC EAF equipped with CEMS. Sedalia will have CERMS.

EP08: CO

The permit application includes the following analysis for CO at step 5,

> "As stated previously, the BACT limit needs to consider the EAF, LMF, caster, and meltshop. Daily variations in the lb/ton CO emissions occur depending the type of steel produced and how much charge and injection carbon is added to the steel. Because the ESC system starts with a flat bath and the charge is conveyor fed continuously, foamy slag is needed early in the heat, and carbon injection and oxy-fuel burners are operated 100 percent of the power on time, as compared to conventional EAF carbon injection about 40 percent of the power on time. While a conventional furnace practice may use 15 to 25 pounds of injection carbon per ton of steel, the ESC charged furnace practice may require 40 to 50 pounds per ton. This results in significantly more CO generation with the ESC system. In a conventional EAF it is desirous to utilize post-combustion in the head space of the furnace by injecting oxygen to recover energy by the combustion of CO to CO_2 within the furnace. The hot CO gases laden exit the conventional furnace through the fourth hole direct evacuation control (DEC), where air is inspired by the negative draft at the gap and high CO destruction efficiency is provided by the high temperature and violent mixing of the gases and air. In the ESC system it is desirous to carry the CO out of the furnace into the ESC energy recovery unit where air is introduced along the length of the recovery conveyor to transfer energy to the scrap. Recently permitted CO BACT limits for EAFs range from 1.327 to 9.0 lb/ton. Several RBLC listings show lower CO BACT limits (0.02 – 2.0 lb/ton) for continuous caster, LMFs, or meltshop fugitives (AR-0140, AR-0138, OK-0128, TX-0651, MI-0417, MI-0404, IN-0196, and SC-0112). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 4.0 lb CO/ton and are not appropriate for comparison. The RBLC listings for OH-0331, OK-0128, OH-0342, and IN-0196 are 0.084 lb/MMBtu or 84 lb/MMcf and are obviously only for natural gas combustion since these values match the AP-42 rates for natural gas combustion in Chapter 1.4. The RBLC listings that are lower than the proposed BACT are TX-0705, GA-0137, AR-0096, AR-0140, CO-0066, GA-0142, NE-0055, OH-0350, AL-0319, OH-0341, TX-0651, AL-0309, OK-0128, NE-0063, and OH-0342. However, none of these facilities have an ESC process like at Sedalia. The ESC process, as explained above, increases the CO emissions. A 4.0 lb CO/ton of steel expressed as a 30-day rolling average is proposed as BACT for CO from the EAF. These CO emissions account for emissions from the EAF, LMF, caster, and meltshop. The CMC Durant BACT limit is the same as that proposed for Sedalia."

Later Nucor proposed a CO limit of 3.5 lb/ton.

The Air Pollution Control Program offers the following discussion.

- The RBLC contains 60 entries for CO at an EAF/meltshop stack from 1998 to 2018. The average is 3.16 lb/ton. The mode is 2.0 lb/ton, 21 entries. The 10th percentile is 2.0 lb/ton.
- The 4.0 lb/ton original proposal matches the limit at CMC Durant and CMC Mesa.
- CMC Mesa CEMS RATA and test results show 3.4, 3.1, 2.6, 2.5, 2.3, and 2.2 lb/ton from 2016 to 2018. This is an ESC EAF.

- Nucor Darlington has limits of 3.01 and 3.13 lb/ton. This is an ESC EAF.
- Gerdau Charlotte has a limit of 4.4 lb/ton. Testing in 2003 showed 3.36 lb/ton. Testing in 2004 showed 3.44 lb/ton. A 2007 facility internal study showed 2.4 to 3.2 lb/ton. Testing in 2013 showed 4.06 lb/ton. This is an ESC EAF that produces rebar.

A CO limit of 3.5 lb/ton, 30 day rolling was selected. This is not the lowest available, however other ESC EAF show testing and CEMS data just below 3.5 lb/ton. Sedalia will have CERMS.

EP08: VOC

The permit application includes the following analysis for VOC at step 5,

> "Recently permitted VOC BACT limits for EAFs range from 0.10 to 0.43 lb/ton. Several RBLC listings show lower VOC BACT limits (0.09-0.13 lb/ton) for continuous caster, LMFs, or meltshop fugitives (IN-0196, MI-0404, SC-0112, OK-0128, OH-0328). These limits do not encompass the EAF, LMF, caster, and meltshop fugitives like the proposed 0.3 lb VOC/ton and are not appropriate for comparison. The RBLC listings for OK-0128, IN-0196, TX-0651, and AR-0410 are very close to the natural gas combustion values in AP-42 for natural gas combustion (Chapter 1.4), and are not appropriate for comparison. The RBLC listings that are lower than the proposed BACT are for OH-0350, CO0066, AL-0309, OH- 0341, AL-0319, AR0096, OH-0342, OH-0328, and TX-0705. However, none of these facilities have an ESC process like at Sedalia. Nucor proposes good combustion practice and process control along with a scrap management plan as BACT for VOC control from the EAF and LMF. Nucor is anticipating that higher than normal VOC emissions may be generated due to volatilization during the scrap preheating process. As a result, Nucor is proposing a VOC emission rate of 0.30 lb/ton as BACT which is within the range of approved BACT emission rate limits. This is somewhat higher than limitations shown on RBLC due to the preheating process. When hot gases from the furnace contacts residual organic material on the scrap being charged to the furnace, most of the residual organic material which is not oxidized would be evaporated. Higher VOC emissions are being traded for energy efficiency. The CMC Durant BACT limit is the same as that proposed for Sedalia."

The Air Pollution Control Program offers the following discussion.

- The RBLC contains 50 entries for VOC at an EAF/meltshop stack from 1998 to 2018. The average is 0.21 lb/ton. The mode is 0.13 lb/ton, 14 entries.
- The 0.3 lb/ton proposal matches the limit at CMC Durant and CMC Mesa.
- CMC Mesa test results show 0.159, 0.16, 0.155 and 0.17 lb/ton from 2016 to 2018. This is an ESC EAF.
- Nucor Darlington has a slightly higher limit at 0.35, but again test results were not available during the Sedalia review. This is an ESC EAF.
- Gerdau Charlotte's limit is 0.34. This is an ESC EAF that produces rebar. Testing in 1999 showed 0.33 lb/ton, when the limit was 0.5 lb/ton. Testing in 2004 showed 0.34. Testing in 2013 showed 0.28. A 2007 facility internal study showed 0.148 to 0.205 lb/ton.

A VOC limit of 0.3 lb/ton, test method average was selected. This is not the lowest available, however some ESC EAF have higher limits and tested values.

EP08: GHG

The permit application includes the following analysis for GHG at step 5,

> "Nucor proposes the following measures to be considered as BACT for the control of GHGs from the EAF and LMF:
>
> - Adjustable speed drives
> - Transformer efficiency-ultra-high power transformers
> - Bottom stirring/stirring gas injection
> - Foamy slag practice
> - Oxy-fuel burners
> - Post combustion of the flue gases
> - Scrap preheating
> - Engineered refractories
> - Eccentric bottom tapping on furnace
> - Energy monitoring and management system
>
> Nucor proposes the above technologies and work practices as BACT for GHG emissions with an emission rate of 535 lb/ton. The CMC Durant BACT limit is the same as that proposed for Sedalia."

The Air Pollution Control Program identified a lower limit at Nucor Norfolk, 438.2 lb/ton CO_2e. Nucor then proposed the Norfolk limit for Sedalia.

> Nucor states, "As MDNR is aware very little data is available on CO_2 BACT emission rate due to the recent addition of CO_2 as a criterion pollutant. As some data does exist from our Nucor Nebraska facility, we feel it's appropriate to use the 438 lb/ton number for this permit. We understand CMC Mesa does have a lower limit, but for comparison purposes ambient temperature can impact the amount of energy needed to melt a ton of steel (warmer scrap less energy...colder scrap more). CMC Mesa and Nucor Sedalia are located in two completely different climates and the limit should reflect this accordingly. Nucor Sedalia proposed a CO_2 BACT rate for greenhouse gases of 438 lb/ton on an annual basis. This is the same limit that was selected as BACT for Nucor Norfolk, which is also an annual average limit. Nucor Norfolk determined this BACT value based on an average emission rate from the CEMs plus two standard deviations. Similar to Nucor Norfolk, fluctuations in natural gas usages in addition to variations in the product and scrap mix require a 12-month average for CO_2. Since there is very little information on CO_2 (greenhouse gas) emissions, this is the best information available for Nucor Sedalia."

The Air Pollution Control Program offers the following discussion.

- The RBLC contains just three entries for GHG at an EAF/meltshop stack from 1998 to 2018. Values are 320 Gerdau, 438.2 Nucor Norfolk, and 535.0 lb/ton CMC Durant.
- In this case, the RBLC should not be heavily relied upon when setting a new GHG limit. CO_2 is almost 100% of the total GHG composition for this emission point. CO_2 content is measured at almost all stack tests for other pollutants, similar to oxygen or moisture content. Likewise, there are CO_2 CEMS. A large amount of CO_2 actual emission data should be available from Nucor's fleet, not just the Norfolk, Nebraska plant.
- The CMC Mesa 2015 permit application lists 260 lb/ton as the 40 CFR 98 site specific value. This is an ESC EAF. However, GHG were not subject to PSD in that permit.
- It is unknown the effects of climate differences between Arizona and Missouri have on GHG emissions. The RBLC value of 320 lb/ton is from a facility located in Michigan, which is located further north than CMC Durant with a limit of 535.0 lb/ton.

A GHG CO_2e limit of 438.2 lb/ton, 12-month rolling was selected. .

EP08: Fluorides

The permit application includes the following analysis excerpt for fluorides,

> "Some meltshops add fluorides to the process:
>
> - Fluorspar (calcium fluoride) is added to certain grades of steel at the LMF as a slag conditioner.
> - Mold powder, which contains calcium fluoride, is added to the process at the caster.
>
> However, Nucor does not currently plan to add fluoride to its process at Sedalia. Since fluoride is difficult to enumerate, Nucor has conservatively assumed that it will be present in the emissions. Nucor Nebraska, which is not a continuous feed facility, and which injects fluoride into its EAF has a limit of 0.059 pound per ton of steel produced."
>
> Specific to step 5, the permit application states, "The use of a baghouse is selected as BACT. Nucor proposes a BACT rate of 0.059 lb/ton steel produced, as verified by stack testing. If stack testing shows that the emissions are low enough to not trigger PSD review, Nucor will petition MDNR to remove the fluoride BACT from the permit, since fluoride emissions are unknown from the steel process proposed for Nucor Sedalia."

The Air Pollution Control Program offers the following discussion.

- The RBLC contains just eight entries for fluorides at an EAF/meltshop stack from 1998 to 2018. Values range from 0.003 to 0.075 lb/ton. The average is 0.027 lb/ton. The second highest value is 0.059.
- Nucor claims it will not add fluoride to its process at Sedalia. However, the SDS provided with the application show the caster mold powder contains up to 20% weight fluorspar and up to 10% weight sodium hexafluoroaluminate.

The permit requires stack testing to verify a more accurate fluoride emission rate and to utilize the emission rates to determine a new fluoride potential emissions total. The permit requires Nucor to provide a BACT analysis utilizing the stack tested fluoride emission rates or accept de minimis limits based upon the testing.

EP10 Caster Vent
Nucor did not propose a dedicated, add-on emission control device for the caster vent. Nucor stated that the Nucor Huger facility has a caster hood venting to a baghouse. During EP08 baghouse low flow time, which is 75% of the time, caster emissions will emit uncontrolled to EP10 and to building fugitives. During EP08 baghouse high flow time, 99% of the caster emissions will route to that baghouse.

EP11 Caster Spray Stack
Nucor did not propose an add-on emission control device for the caster spray stack. This stack has its own dedicated, powered flow. The Air Pollution Control Program asked Nucor to provide a cost analysis. A cost analysis was provided for a wet ESP, which claimed costs to be prohibitive. A cost analysis was not performed for other controls such as a scrubber or mist eliminator.

EP12 Rolling Mill Vent
Nucor did not provide a BACT analysis for the rolling mill. Nucor Tuscaloosa's 2017 permit application proposes to control the hot rolling mill by using a scrubber. The Program was unable to locate, as of July 6, 2018, the corresponding issued permit on the Alabama Department of Environmental Management's website nor EPA Region 4's website.

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated March 28, 2018, received March 30, 2018, designating Nucor Corporation as the owner and operator of the installation.
- Modeling files, received April 2, 2018.
- Nucor Roads for Modeling.xlsx, received April 4, 2018.
- Nucor Steel Sedalia Haul Road Route Clarification Request April 4 2018_BMCD.pptx, received April 4, 2018.
- Nucor Volume Source Information.xlsx, received April 5, 2018.
- Nucor Replacement Form 2.0.pdf, received April 11, 2018.
- Nucor Pre-construction Monitoring Data Assessment.pdf, received April 23, 2018/
- Revised Particulate BACT Analysis – Nucor Sedalia LLC 04 26 2018.pdf, received April 26, 2018.
- SDS, received April 26, 2018.
- Nucor Replacement Form 2.0 EP08.pdf, received June 21, 2018.

The following documents are permit references:

- U.S. EPA RBLC website. https://cfpub.epa.gov/rblc/index.cfm?action=Search.BasicSearch&lang=en
- U.S. EPA AP-42 website. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors
- Nucor Steel Hertford County Steel Mill Air Quality Permit No. 08680T20. March 8, 2016.
- Nucor Steel Berkeley Plant Part 70 Air Quality Permit Number TV-0420-0060. Issue Date December 29, 2000.
- Nucor Steel Birmingham Title V Major Source Operating Permit 4-07-0260-03. Issuance Date January 28, 2013.
- Nucor Steel Crawfordsville Title V Significant Permit Modification 107-39473-00038. May 22, 2018.
- Nucor Steel Corporation – Darlington Plant. Permit Number TV-0820-0001. Issue Date September 15, 2014.
- Nucor Steel Decatur, LLC Preliminary Determination 712-0037.
- Nucor Steel Jewett, Texas Division Steel Works Federal Operating Permit. Permit No. 01289. Revised 01/2017.
- Nucor Steel Louisiana Public Comments Response Summary. Part 70 Operating Permit 3086-V0. PSD Permit PSD-LA-751. Part 70 Operating Permit Modification 2560-00281-V1.
- Nucor Steel Louisiana Petition to Object. Zen-Noh Grain Corporation. January 30, 2009.
- Nucor Steel Marion Final Air Pollution Permit-To-Install. Permit P0122542. August 29, 2017.
- Nucor Steel Seattle Air Operating Permit. Permit 10281. Date of issuance October 29, 2015.
- Nucor Tuscaloosa Prevention of Significant Deterioration Permit Application for a Proposed Modification of the Tuscaloosa Steel Mill. Environmental Resources Management. January 20, 2017. http://www.adem.alabama.gov/newsEvents/notices/feb17/pdfs/2nucor.pdf
- Nucor Steel Utah BACM/BACT Response. March 22, 2017.
- Canada-Wide Standard for Dioxins and Furans. Progress Report 2009. Canadian Council of Ministers of the Environment.
- Iron and Steel Production. European Environment Agency, Air Pollutant Emission Inventory Guidebook. 2016.
- Best Available Techniques (BAT) Reference Document for Iron and Steel Production. European Commission, Joint Research Centre. 2013.
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 4.1.
- An Investigation of Air Emission Levels from Distinct Iron and Steel Production Processes with the Adoption of Pollution Control and Pollution Prevention Alternatives. Federal University of Rio de Janeiro. 1999.
- A Guidance Note on the Best Practicable Means for Iron and Steel Works. Environmental Protection Department, Air Policy Group. Hong Kong. July 2009.
- EAF dust: An overview on the influences of physical, chemical and mineral features in its recycling and waste incorporation routes. Universidade Federal do Rio Grande do Sul. 2016.
- Environmental Compliance and Profitable Steelmaking – Always a Challenge! Millennium Steel. 2011.
- Memorandum, Notice of PSD Permit Decision for Steel Dynamics. Indiana DEM. January 10, 2001.
- Economic Impact Analysis of Final Iron and Steel Foundries NESHAP, Final Report. RTI International for EPA. 2003.
- The Treatment of Disposal of Electric Arc Furnace Dust in North America. Marc Liebman. AIM Market Research.
- Locating and Estimating Air Emissions from Sources of Polycyclic Organic Matter. EPA. 1988.
- Control of Mercury Emissions from Coal-Fired Electric Utility Boilers. EPA
- SDS. Duferco 45EURBI resin bonded magnesia carbon refractory brick without antioxidant. December 2011.
- SDS. Plenco 07070 phenolic molding compound. January 13, 2017.
- Oxides of nitrogen in welding, cutting and oxy-acetylene heating processes- A review of emission rates, exposure levels and control measures. Hansen and Thernoe.
- Fume emissions testing for plasma arc cutting. Hypertherm, Inc. 1998.
- Aerosol Measurements from Plasma Torch Cuts on Stainless Steel, Carbon Steel, and Aluminum. Novick et al. Argonne National Laboratory.
- Size Distribution and Rate of Production of Airborne Particulate Matter Generated During Metal

Cutting" HCET-2000-D052-001-04. Ebadian. Florida International University. 2001.
- Physical and Chemical Characteristics of Blast Furnace, Basic Oxygen Furnace, and Electric Arc Furnace Steel Industry Slags. D.M. Proctor et al. Environ. Sci. Technol. 2000.
- Slag Analysis by X-ray Fluorescence Spectrometry. Bruker AXS, Inc.
- Chemical, Mineralogical, and Morphological Properties of Steel Slag. Yildirim and Prezzi. 2011.
- Wind speed obtained from Columbia, Missouri 1984 to 2016. https://www.ncdc.noaa.gov/cdo-web/search
- WRAP Fugitive Dust Handbook. Western Governors' Association, prepared by Countess Environmental, 9/7/2006, Chapter 9. Storage Pile Wind Erosion, Section 9.3 Emission Estimation: Alternate Methodology
- Designer's Database, Generator Power Factor. Cashman Caterpillar Power Solutions.
- Title V Applicability Workbook. Institute of Scrap Recycling Industries. 1996.
- City of Albuquerque, Environmental Health Department, Air Quality Division, Interoffice Memo, August 12, 2016. Albuquerque Metals Recycling, Inc. Table A, citing stack test results.
- Minnesota Pollution Control Agency, Environmental Assessment Worksheet for Northern Metals Application for Major Permit Amendment, November 10, 2011.
- New Jersey Department of Environmental Protection, Division of Water Quality, Bureau of Nonpoint Pollution Control, Fact Sheet for Scrap Metal Processing and Recycling Industrial Stormwater General Permit, NJ0163261.
- Automobile Shredder Material presentation by John Skelley of Gerdau, to Missouri Waste Control Coalition, PCB Workshop, April 25, 2013.
- EAF dust: An overview on the influences of physical, chemical and mineral features in its recycling and waste incorporation routes. Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil. 2016.
- Assessing the Management of Lead in Scrap Metal and Electric Arc Furnace Dust. U.S.EPA April 2009. Tables 6.8.3-1 and 6.8.3-2.
- Characterization of Steel Mill Electric-Arc Furnace Dust. Valahia University. Published in Advances in Waste Management. Table 6, USA values.
- Zn and Fe Recovery from Electric Arc Furnace Dusts. University of Sao Paulo. Published in Materials Transactions. 2014. Table 2.
- Characterization Study of Electric Arc Furnace Dust Phases. Published in Materials Research 2006.
- Steel Technology Roadmap Chapter 3. USDOE 2013. https://www.energy.gov/sites/prod/files/2013/11/f4/roadmap_chap3.pdf
- New EAF Dust Treatment Process: ESRF. JP Steel Plantech Company.
- ArcelorMittal MSDS 9964. January 20, 2012.
- Carbothermic reduction of electric arc furnace dust and Calcination of Waelz oxide by semi-pilot scale rotary furnace. published in J. Min. Metall. 2012.
- Secondary zinc as part of the supply chain and the rise of EAF dust recycling. International Lead and Zinc Study Group. 2015.
- Recycling of Electric Arc Furnace Dust. Hazardous Waste Research & Information Center. IIT Research Institute. May 1990.
- Calculating TSP, PM10 and PM2.5 from Cooling Towers. New Mexico Environment Department, Air Quality Bureau, Technical Memorandum, September 9, 2013.
- Control of Open Fugitive Dust Sources" EPA, Sept 1988, page 27 of 308, Table 2-4.
- Emissions Inventory Guidance Mineral Handling and Processing Industries. Mojave Desert Air Quality Management District Antelope Valley Air Pollution Control District. page 26 of 31 pdf.
- Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States. NOAA Technical Report NWS 34. December 1982.
- Transmittal of the Haul Road Fugitive Dust Suppression Plan for Holcim (US) Inc. – Lee Island Facility: 186-0044. Missouri Air Pollution Control Program memo. May 15, 2009.
- Steel dynamics Indiana remand
- CMC Mesa document
- Gerdau charlotte test data, permit Gerdau Ameristeel Charlotte permit 18-01C-567, page 15.
- Big river steel document
- ESC details
- EPA BACT guidance 2011

The following documents are permit references received from Nucor:

- Water System for Scrap Piles Cost Analysis.pdf, received May 22, 2018.
- MDNR Confidentiality request 5-2-18 Signed.pdf, received May 2, 2018.
- EAF SNCR Final Report.pdf, received May 14, 2018.
- DSI Economic Analysis Tables.pdf, received May 15, 2018.
- Hiser EUEC 2009—Condensable Particulate Matter and NSR.pdf, received June 7, 2018.
- PSD SO_2 Mass Balance.pdf, received June 7, 2018.
- Response to MDNR 06 07 2018.docx, received June 7, 2018.
- Email communication between Nucor and staff

APPENDIX A

Abbreviations and Acronyms

% ..... percent
°F..... degrees Fahrenheit
AAQIIA..... Ambient Air Quality Impact Analysis
acfm ..... actual cubic feet per minute
BACT ..... Best Available Control Technology
BMPs ..... Best Management Practices
Btu ..... British thermal unit
CAM..... Compliance Assurance Monitoring
CAS ..... Chemical Abstracts Service
CEMS..... Continuous Emission Monitor System
CERMS..... Continuous Emission Rate Monitoring System
CFR ..... Code of Federal Regulations
CO ..... carbon monoxide
CO_2 ..... carbon dioxide
CO_2e ..... carbon dioxide equivalent
COMS ..... Continuous Opacity Monitoring System
CSR ..... Code of State Regulations
DEC ..... direct-shell evacuation control
dscf..... dry standard cubic feet
EAF ..... electric arc furnace
EIQ ..... Emission Inventory Questionnaire
EP ..... Emission Point
EPA ..... Environmental Protection Agency
ECS..... endless scrap charging
EU..... Emission Unit
fps ..... feet per second
ft..... feet
GACT..... Generally Available Control Technology
GHG ..... Greenhouse Gas
gpm..... gallons per minute
gr..... grains
GWP..... Global Warming Potential
HAP..... Hazardous Air Pollutant
hr ..... hour
hp..... horsepower
lb ..... pound
lbs/hr ..... pounds per hour
LMF..... ladle metallurgy facility
MACT ..... Maximum Achievable Control Technology
$\mu g/m^3$ ..... micrograms per cubic meter
m/s ..... meters per second
Mgal..... 1,000 gallons
MW..... megawatt
MHDR..... maximum hourly design rate
MMBtu..... Million British thermal units
MMCF..... million cubic feet
MSDS ..... Material Safety Data Sheet
NAAQS ..... National Ambient Air Quality Standards
NESHAPs National Emissions Standards for Hazardous Air Pollutants
NO_x ..... nitrogen oxides
NSPS..... New Source Performance Standards
NSR ..... New Source Review
PM ..... particulate matter
$PM_{2.5}$..... particulate matter less than 2.5 microns in aerodynamic diameter
PM_{10}..... particulate matter less than 10 microns in aerodynamic diameter
ppm..... parts per million
PSD..... Prevention of Significant Deterioration
PTE..... potential to emit
RACT ..... Reasonable Available Control Technology
RAL..... Risk Assessment Level
RATA ..... Relative Accuracy Test Audit
SCC ..... Source Classification Code
scfm ..... standard cubic feet per minute
SDS ..... Safety Data Sheet
SIC..... Standard Industrial Classification
SIP ..... State Implementation Plan
SMAL..... Screening Model Action Levels
SO_x..... sulfur oxides
SO_2..... sulfur dioxide
SOP..... Standard Operating Procedure
SSM ..... Startup, Shutdown & Malfunction
TDS..... Total Dissolved Solids
tph..... tons per hour
tpy..... tons per year
VMT ..... vehicle miles traveled
VOC..... Volatile Organic Compound

Response to Public Comments on the
New Source Review Permit for
Nucor Steel Sedalia LLC (County Plant-ID: 159-0078)
Project 2018-03-048

This document is a response to comments made on the draft Prevention of Significant Deterioration (PSD) New Source Review Permit, Project 2018-03-048, for a new steel mill using an electric arc furnace to produce rebar from scrap. The Nucor Steel Sedalia LLC (Nucor) PSD permit was placed on public notice as of July 28, 2018, for a 40-day comment period. The public notice was published on the Missouri Department of Natural Resources' Air Pollution Control Program's web page at: https://dnr.mo.gov/env/apcp/permit-public-notices.htm.and in the July 28th, 2018 issue of the *Sedalia Democrat.*

In some cases, comments have been abbreviated or paraphrased here for the sake of clarity or brevity. The original comments may be read in full in the Attachments. Please note that the numbers of Special Conditions from the draft permit may have changed. The numbers referenced in the response reflect the final Special Condition numbering.

On August 27, 2018, the Air Pollution Control Program received comments from Leslye E. Werner, Acting Chief Air Permitting and Compliance Branch EPA Region 7. The Program also received comments from Nucor on August 29, 2018. The Air Pollution Control Program did not receive any other comments on the draft PSD while it was on public notice.
The comments from EPA and Nucor are addressed below.

The following comments were submitted to the Air Pollution Control Program by **EPA Region 7** on August 27, 2018.

EPA – Comment #1 (paraphrased) EPA finds this approach taken in the draft permit to be awkward and confusing.EPA has requested that BACT portion of the permit be more robust in that the 5-step approach for each pollutant is summarized as presented by the permittee with changes and / or additions proposed by MoDNR, are· included in the technical support portion of the draft permit to construct. This will assist in a more logical, reasonable and methodical review.

> **MoDNR Response:** The MoDNR appreciates EPA's comment in this regard. Our intent is to clearly and succinctly explain our technical review and determinations. To the degree that our permit review has failed to accomplish this, we will take EPA's comments into account for future permitting actions and try to better explain our thought processes more completely to eliminate any confusion and increase the public's understanding of the determinations made.

EPA – Comment #1 cont'd

Additionally, for the 5-step BACT analysis, Nucor appears to have eliminated many control technologies at step 2 of the BACT analysis on the grounds of technical infeasibility. EPA' s believes many of these technologies for NOx, SO_2, VOC and CO are available and technically feasible for the described process. Furthermore, for technically feasible technologies, the BACT top-down analysis requires the applicant to complete the analysis by compiling the technologies under step 4 and analyzing them in step 5. Several of the technologies Nucor eliminates in step 2 may result in effective control if placed further upstream or downstream of the impediment that makes such technologies technically infeasible. For example, if high dust loading is used to eliminate selective catalytic reduction for NOx control, it may be possible to move the controls to the tail end of the process following particulate removal.

We realize that additional equipment and fuel may be necessary, such as for gas-reheat, but these are costs rather than technical impediments that should be considered at step 4 of the BACT analysis. It's possible that such costs ultimately render the technology economically infeasible, but this should be evaluated at steps 4 and 5. This top down approach is described in a number of EPA guidance documents and Environmental Appeal Board rulings and forms the basis for a complete administrative record. EPA believes the record in this case would benefit from a comprehensive BACT analysis following the 5-step, top down BACT process.

> **MoDNR's response:** MoDNR uses the 5-step BACT as a guideline for conducting the BACT analysis in a PSD permit. We generally follow the 5 step process outlined by EPA. However, MoDNR does use discretion to not follow the 5-step process precisely when we believe that technical judgement can be used in its place. One example of such use of discretion is when to eliminate a control technology based on technically feasibility and cost. For example, a baghouse to control particulate on the caster baghouse is not practically feasibility due to the very large airstream and the very low loading levels. Even though one can design a baghouse to handle the flowrate, it would never be considered due to the impracticality of designing a system to remove xxx tons of year of particulate for what would inevitably be millions of dollars. In such case, the department reserves the discretion to not have a facility undergo a cost analysis, when there is industry and regulatory knowledge that such controls will not be required.

Nucor's response: Pages 1-2 – BACT analysis – EPA suggests that MDNR follow the complete 5-step BACT analysis. It is Nucor's understanding that as a SIP-authorized program, MDNR is not required to exactly follow the 5-step top-down BACT analysis, as long as it considers all of the facts appropriately. Thus, if MDNR believes that the cost renders the technology infeasible, it may rule it out at either location (step 2 or step 4 or 5). Cost is also a matter of degree. If the cost is clearly unreasonable for the application under discussion, the technology is essentially technically infeasible. If the cost is debatable, then it should be discussed in step 4. In this case, it is a very reasonable determination that attempting to reheat or reduce the heat of the massive meltshop baghouse gas stream (approximately 370,000 to 700,000 actual cubic feet per minute (ACFM)) by hundreds degrees would not make sense considering economic and environmental impacts (collateral emissions increases). This is further justified by reviewing the RBLC and the absence of these add-on controls at other steel mills. (See Comment 3. below for information on potential impacts from reheating the exhaust gas.)

EPA – Comment #1 cont'd

Additional suggestions for pollutant-specific technologies are described under paragraphs (a)-(d) below:

(a) Results of the carbon monoxide (CO) BACT analysis proposes the use of direct injection control (DEC) with an air gap and effective use of a scrap management plan. However, the details of the "effective scrap management plan" are not presented in the BACT analysis and EPA suggests MoDNR consider having Nucor provide their detailed explanation of an effective scrap management plan for review. The effective scrap management plan should include sufficient detail such that compliance verification is easily determined.

MoDNR's response:

With regards to the development of a scrap management plant, MoDNR would normally agree with EPA that a scrap management plan should be supplied as a part of the BACT. In this case, it is MoDNR's opinion that pollution prevention plans required by NESHAP Subpart YYYYY was equivalent to BACT and that no further requirements were needed as part of the permit. In addition, most other PSD permits for steel mills do not contain separate requirements for a scrap management and therefore presumably rely on Subpart YYYYY to accomplish the best available control.

Nucor's response:

Page 2, (a) – Carbon Monoxide BACT - Nucor should submit their scrap management plan for review. Nucor is required to prepare a scrap management plan per NESHAP Subpart YYYYY. EPA has identified EAF facilities as potential sources of HAP emissions and, on December 28, 2007, promulgated final regulations (codified at 40 CFR Part YYYYY) intended to control or minimize such emissions. The regulations require EAF facilities, among other things, to restrict the use of certain scrap or follow a Pollution Prevention Plan (PPP) for scrap purchased as production feedstock to minimize the amount of specified contaminants in such scrap.

Accordingly, Nucor has adopted and will comply with the provisions of this PPP designed to control the presence of such contaminants in scrap that is consumed in the EAF by adopting:

1. A specification for scrap that addresses contaminants identified by EPA, including prohibiting excessive oil or plastic that may generate CO.

2. Procedures for verifying compliance with the specification.
3. Procedures for taking corrective action against vendors who do not comply with the specification.

This PPP must be approved by USEPA or a delegated authority. Any deficiencies identified by the permitting authority must be addressed within 60 days of disapproval of the PPP. A copy of the plan and supportive documentation must remain onsite. The plan will be prepared prior to operation of the facility.

EPA – Comment #1 cont'd

(b) In the Nucor discussion of nitrogen oxide (NOx) BACT technologies considered, there is no mention or discussion on the use of tail end selective catalytic reduction (SCR) which can be installed downstream of the particulate control device. Also, Nucor's NOx BACT analysis makes no mention of the control / optimization of oxy injection. EPA suggests MoDNR consider requesting additional NOx BACT determination and analysis discussion from Nucor.

MoDNR's response: Nucor provided a study "Report on the Feasibility Evaluation of using Selective Non Catalytic Reduction (SNCR) Technology to reduce NOx emissions from Electric Arc Furnaces" that was conducted by Fuel Tech, Inc. and provided to EPA. A study was performed on the SNCR technology. Within the report, Fuel Tech, Inc. came to the conclusion that the SNCR technology is not technically feasible. Much of the rationale for determining the infeasibility of SNCR applies to the SCR technology: rapid fluctuating nature of the process with regards to temperature, flowrate and NO_x concentration profiles. In addition, as a result of consent decree, Nucor's fleet was investigated by EPA for the possible addition of SCR to its steel plants. None of these plants have had to add SCR. This coupled with the reasons outlined below in Nucor's response to EPA's comment gave MoDNR the rationale for determining that the technology was not technically feasible.

Although a quantitative economic evaluation of the use of SCR was not conducted, MoDNR concluded that the relatively low NOx concentration, the large air flowrate, and reduced control due to the wide process variability would have almost certainly caused the technology to be economical unviable.

Nucor's response: Page 2(b) – NO_x BACT - More discussion on SCR and oxy injection optimization. The PSD air permit application and additional information provided on SCR shows that an SCR is not technically feasible for many reasons:

"SCR systems require a relatively stable gas stream flow rate and relatively stable temperatures ranging from 500°F to 700°F to provide adequate NO_x reduction. SCR systems are generally designed based on a given NO_x concentration range or emission rate in the gas stream and provide optimal control of steady and consistent NO_x emissions. EAF exhaust stream flow rate, temperature, and NO_x concentrations vary substantially due to the cyclical nature of EAF operations (tap/charge/melt cycles), making effective SCR operation difficult. Additionally, SO_2 present in the EAF exhaust will react with the ammonia to form ammonium sulfate deposits that will foul the catalyst, rendering the catalyst ineffective. The catalyst in SCR systems (which can consist of various platinum, palladium, vanadium, or titanium compounds) is also susceptible to

"poisoning" due to the presence of various iron, nickel, zinc, and chrome compounds in the EAF exhaust stream that can bind to the catalyst, rendering it ineffective."

Adding an SCR after the particulate control devices does not remove the other reasons that an SCR is not feasible, such as cycling and condensable poisoning. The exhaust temperature would need to be increased in order for the SCR to be effective, in addition to problems listed above. Increasing the exhaust temperature from approximately 150 degrees Fahrenheit (°F) to 500 °F would require an approximately 225 million British thermal units per hour (MMBtu/hr) heater which would produce an additional 118,000 tons of CO_2, 82 tons of CO, 5 tons of VOC and 7 tons of PM. There are no known meltshops at mini-mills or micro-mills that have installed SCRs.

Adding oxygen to a gas stream is unproven on steel micro-mill meltshops. Once the NO_x is present, adding additional O_2 would change NO to NO_2, which would not affect the amount of NO_x present in the gas stream.

EPA – Comment #1 cont'd

(c) The sulfur dioxide (SO_2) BACT discussion from Nucor rejects the use of a wet gas scrubber due to technical difficulties, such as high temperature. EPA believes that this is not justifiable because temperatures can be cooled, prior to the scrubber, through such ways as the use of a preheater. So again, EPA suggests MoDNR consider requiring Nucor to undertake a more thorough review and analysis of SO_2 BACT control technology.

MoDNR's response: Due to the high volumes of air, coupled with the low SO_2 concentrations, it is highly unlikely that the wet gas scrubber will have any meaningful SO2 removal. Taking into account the additional demands associated with a wet scrubber as stated below and in Nucor's BACT analysis, MoDNR decided not to make Nucor go through the other steps.

Nucor's response: Page 2(c) SO_2 BACT – More discussion on rejection of wet gas scrubber. In addition to the temperature issue that prevents a scrubber from use on the meltshop, there are many other issues that EPA's comment does not address. For instance, the SO_2 concentrations are low and vary widely over the course of the EAF cycle precluding efficient application of wet scrubbing techniques. Other important issues to consider are an increased use of energy, associated energy costs, and the generation of sludge byproducts. The sludge byproducts must be disposed of properly, meaning Nucor would be trading an air pollution issue for water and land pollution issues. Similar to the SCR, Nucor is not aware of any mini-mills or micro-mills that have installed wet scrubbers on the meltshop.

EPA – Comment #1 cont'd

(d) The volatile organic compound (VOC) BACT discussion, presented by Nucor, considers the use of carbon adsorption, however, Nucor rejects this technology because of high temperature and particulate loading. EPA believes Nucor failed to consider the use of high temperature granular activated carbon located downstream from the particulate control baghouse. The VOC BACT determination also discounts the use of a condenser because it is outside the economic

range. However, as stated in the BACT analysis introduction above, Nucor does not present an economic feasibility assessment to justify their position.

MoDNR's response: Please see Nucor's response below.

Nucor's response: Page 2(d) - VOC BACT. Further discussion on carbon adsorption and condenser. The application stated that carbon adsorption is typically designed for streams of 1,000 ppm or greater and does not achieve great efficiency on lower quantity streams, such as the meltshop emission point. In addition, the gas stream would need to be cooled to less than 130 degrees in order for the carbon to work appropriately. Further, the particulate loading would cause the beds to become saturated and require excessive replacement of the carbon adsorptive material, in addition to the added backpressure caused to the exhaust stream on the system. Clearly, since carbon adsorption has never been listed as BACT for the meltshop sources, it is not considered feasible for the reasons stated here.

As stated in the application BACT analysis, condensers require regular maintenance and inspection which may require shutdown of the condenser as well as shutdown of the facility. Fouling is also a concern, especially with the high particulate loading, requiring even more maintenance and shutdowns even if located after the baghouse. Typically, condensers work best between flowrates of 100,000 to 200,000 standard cubic feet per minute (SCFM) and this range is where the condensers are considered economically feasible. The exhaust gas flow rate will be significantly higher than 200,000 SCFM further emphasizing the point that condensers are not technically or economically feasible for the project.

EPA – Comment #2

Second, the draft Permit to Construct includes several abbreviations and acronyms which are not included in Appendix A and are not obviously otherwise defined. This makes for a difficult document review and EPA encourages MoDNR consider reviewing the acronyms within the permit and include definitions as appropriate.

MoDNR's response: MoDNR has added all acronyms used in the permit to the acronym list located Appendix A of the permit.

Nucor's response: Page 2 – abbreviations and acronyms. Nucor agrees that the abbreviations and acronyms be reviewed, and include definitions as appropriate.

EPA – Comment #3

Third, Special Condition 4. A. 2) and Special Condition 4. B. 3) require Nucor to record damper positions once per shift. EPA believes that damper position is a measurement which could easily be automated and suggests MoDNR consider automatic monitoring of damper position. Additionally, fan amperage, required in Special Condition 4. A. 2), is easily recorded and trended on a continuous basis. As such, EPA recommends MoDNR consider the use of continuous fan amperage monitoring for the DEC.

MoDNR's response: Nucor has agreed to add continuous monitoring for damper position and fan amperage monitoring for the DEC. MoDNR has revised Special Conditions 4.A.2) and 4.B.3) accordingly.

Nucor's response: Special Conditions 4.A.2) and 4.B.3) – EPA states that MDNR should consider automatic monitoring of damper position and continuous fan amperage monitoring for the DEC. Nucor agrees that continuous measurement of damper position and fan amperage is possible and will agree to do so with compliance based on a 4 hour rolling average; however, compliance with these measurements will still be achieved per the requirements of NSPS 40 CFR Part 60 Subpart AAa.

EPA – Comment #4

Fourth, Special Condition 4.C.3)b) requires Nucor to monitor total air flow into the baghouse; however, there is no discussion as to how air flow is to be measured. EPA recommends MoDNR consider including a discussion of how baghouse inlet air flow is measured.

MoDNR's response: MoDNR has added language to Special Condition 4.C.3)b) to require Nucor to continuously monitor the flowrate exiting the baghouse with flow monitoring device.

Nucor's response: Special Condition 4.C.3) – EPA states that MDNR should consider a discussion on how baghouse inlet air flow is measured. The baghouse will be a negative pressure system, meaning the fans and stack will be on the outlet side of the baghouse. Nucor's current plan is to install the flow monitor on the stack accounting for all airflow coming from the meltshop capture system. However, if the MDNR prefers inlet flow monitoring take place prior to the baghouse Nucor would be open to this, although we feel monitoring at the exit of the stack is just as representative.

EPA – Comment #5

Fifth, Special Condition 5. D. includes an activity for which Nucor must complete within "90 days from the date of start-up." Special Condition 14.B.6) requires Nucor to perform initial haul road testing no later than "180 days after initial start-up for commercial operations." Special Condition 15. B. requires Nucor to complete a physical barrier construction prior to "commencing operations of any unit contained in this permit." The terms "within 90 days from the date of start-up;" "no later than 180 days after initial start-up for commercial operations;" and "prior to commencing operations of any unit contained in this permit" are all likely too vague to be enforced from a practical matter. EPA encourages MoDNR to consider defining the terms of "start-up;" "start-up for commercial operations;" and "commencing operations."

MoDNR's response: MoDNR has added the following language to the Special Condition 5.D to in order to define initial startup.

> *Initial startup* for the purposes of this permit is defined as the period beginning with the first charge of material to the EAF and production of molten steel.

MoDNR has added the following language to the Special Condition 14.B.6) and 15.B to in order to define initial startup of commercial operations.

> *Initial startup of commercial operations* for the purposes of this permit is defined as the date that the plant first manufactures a product for the purpose of selling it to a customer.

Nucor's response: Special Conditions 5.D, 14.B.6), and 15.B – operational schedule definitions. Nucor agrees that these terms could be defined.

EPA – Comment #6

Sixth, Special Condition 7. G. requires Nucor to demonstrate compliance with the GHG emission limit in Special Condition 9. A. EPA believes the GHG emission limit is in Special Condition 6. A. and suggests MoDNR consider changing the reference.

MoDNR's response: This was a typographical error. MoDNR has corrected the permit to refer to Special Condition 6.A instead of Special Condition 9.A

Nucor's response: Special Condition 7.G – GHG compliance reference. Nucor agrees that the reference be changed to reflect Special Condition 6.A.

EPA – Comment #7

Seventh, Special Condition 14. B. 1) requires Nucor to submit a Standard Operating Procedure to the Air Pollution Control Program Compliance/ Enforcement Section within 60 days of the submittal of the initial test report in Special Condition 14. C. EPA's read of Special Condition 14. C. does not indicate a submittal of an initial test report and suggests MoDNR may want to revisit the reference citation.

MoDNR's response: This was a typographical error. Special Condition 14.A.1) was corrected to reference Special Condition 14.B instead of 14.C.

Nucor's response: Special Condition 14.A.1) – Standard Operating Procedure. Nucor recognizes in EPA's comments that Special Condition 14.B.1) is listed as the requirement for the Standard Operating Procedure. Nucor believes this is a typo, and that Special Condition 14.A.1 is the correct reference. In terms of the comment's suggestion for Special Condition 14.C, Nucor agrees the reference should be revisited and updated appropriately.

EPA – Comment #8

Finally, Special Condition 13. D. require Nucor to record pressure drop across silo filters at least once per day. Pressure drop is a measurement which is easily recorded on a continuous basis and EPA suggests MoDNR consider continuous pressure drop monitoring across silo filters.

MoDNR's response: It is MoDNR's opinion that daily pressure drop readings are appropriate for the silo filters due to the relatively low level of emissions from the silos and that continuous pressure drop readings is not needed.

Nucor's response: Special Condition 13.D. – EPA states that MDNR should consider continuous pressure drop monitoring across silo filters. The silo emissions are each less than 1 ton per year of particulate emissions. This requirement would be a significant cost to the facility with no real environmental benefit to reducing emissions. Visual emission observation will notify facility personnel immediately if there is an issue with the filter.

The following comments were submitted to the Air Pollution Control Program by **Nucor** via email on August 29, 2018.

Nucor - Comment #1
Special Condition 14(B)(1): In discussions with MDNR, a preliminary assessment resulted in a proposed silt loading limit of 0.5 grams per square meter (g/m^2) for the paved haul roads. The current permit shows a silt loading limit of 0.3 g/m^2. Nucor would like to propose that the silt loading limit for the paved haul roads be 0.5 g/m^2 instead of the 0.3 g/m^2. Using the haul road equation from AP-42 for paved haul roads (AP-42 Section 13.2.1 – see below) and using the accepted uncontrolled silt loading of 2.4 (from Table 13.2.1-2, ubiquitous baseline) times the ubiquitous winter baseline multiplier (x4), a control of approximately 76 percent achieved by reducing the silt loading from 2.4 to 0.5 g/m^2.

E=k*⟦(sL)⟧^0.91*⟦(W)⟧^1.02
Where:

E = particulate emission factor (lb/VMT for this calculation)
sL = silt loading grams per square meter (g/m^2) = 2.4 g/m^2
W = mean vehicle weight (tons)
k = constant (AP-42 Table 13.2-1.1) (for $PM_{2.5}$, k=0.00054)

Uncontrolled: E = 0.00054 *(2.4)0.91*(35)1.02 = 0.0450 lb/VMT

Controlled: E = 0.00054 *(0.5)0.91*(35)1.02 = 0.0108 lb/VMT

Reducing the silt loading from 2.4 g/m^2 to 0.5 g/m^2 achieves 76 percent control of $PM_{2.5}$ emissions. Therefore, based on calculations performed by MDNR, this 76 percent control should result in modeled compliance with the $PM_{2.5}$ NAAQS. Reducing silt loading any further should not be required, especially when given the fact that the maximum number of modeled vehicles on a 24-hour basis would rarely occur.

> **MoDNR's response:** The silt content of 0.3 g/m^2 has been demonstrated by multiple facilities at a variety of types of industry. Along with the fugitive dust plan that Nucor will develop, MoDNR believes that the silt content represents the best available control for paved haul roads.

Nucor Comment #2
Special Condition 16(H)(1): Nucor requests that the testing requirements language be separated for those pollutants which will use CERMS RATAs and those pollutants that will use stack tests.

> **MoDNR's response:** MoDNR has modified the language to Special Condition 16.H to accommodate Nucor's request.

Nucor Comment #3
Special Condition 16(J): Nucor requests that this condition state that if retesting is necessary that the prior approved testing protocol for the failed test be authorized to be used for the retest.

> **MoDNR's response:** MoDNR has added language to Special Condition 16.J to accommodate Nucor's request.