Prevention of Significant Air Quality Deterioration Review

Preliminary Determination

January 2024

Facility Name: Anovion Technologies LLC
City: Bainbridge
County: Decatur
AIRS Number: 04-13-087-00061
Application Number: 28941
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Review Conducted by:
State of Georgia - Department of Natural Resources
Environmental Protection Division - Air Protection Branch
Stationary Source Permitting Program

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SUMMARY

The Environmental Protection Division ("EPD") has reviewed the Prevention of Significant Deterioration ("PSD") Construction application submitted by Anovion Technologies LLC (hereafter "Anovion") for a permit to construct and operate a greenfield site that will be an anode materials facility capable of producing lithium-ion battery grade graphite powder from petroleum coke. The proposed project will use green petroleum coke ("pet coke") as a raw material, which will be milled and/or calcined before being packed into canisters for graphitization in an Acheson Furnace at temperatures up to 3,000^{o}C, and then screened and packaged for the final product. The facility anticipates manufacturing 40,000 metric tons (equivalent to 44,100 short tons or US tons "tons") of synthetic graphite product per year.

Summary of PSD/New Source Review Applicability

The proposed project will result in new sources of air pollutant emissions. The new facility will have emissions of filterable total suspended particulate matter ("filterable TSP"), particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers ("PM_{10}"), particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ("$PM_{2.5}$"), carbon monoxide ("CO"), nitrogen oxides ("NO_X"), sulfur dioxide ("SO_2"), volatile organic compounds ("VOC"), hazardous air pollutants ("HAP"), and Total Greenhouse Gases ("Total GHG").

A PSD New Source Review ("NSR") analysis was performed for the facility for all pollutants to determine if the proposed facility would be a major stationary source for any NSR pollutant and identify pollutants that would exceed the significant emission rate levels. The facility is expected to be a PSD major source because the potential-to-emit ("PTE") for CO is greater than the PSD major source threshold of 250 tons per year ("tpy"). Therefore, the project is subject to review under Georgia Rule for Air Quality Control ("Georgia Rule") 391-3-1-.02(7), which is the state regulatory citation equivalent to the Federal PSD regulation in 40 CFR 52.21. Pursuant to these regulations, new major stationary sources must demonstrate that they will not significantly deteriorate the air quality in the region. Additionally, the potential emissions of filterable TSP, PM_{10}, $PM_{2.5}$, NO_X, SO_2, and VOC were determined to be above the PSD significant level thresholds.

Anovion will be constructed in Decatur County, which is classified as "attainment" or "unclassifiable" for SO_2, $PM_{2.5}$, PM_{10}, NO_X, CO, and ozone (as VOC) in accordance with Section 107 of the Clean Air Act, as amended.

The EPD review of the data submitted by Anovion related to the proposed new facility indicates that the proposed facility conforms to all applicable federal new source performance standards ("NSPS"), national emission standards for hazardous air pollutants ("NESHAP"), and Georgia Rules for Air Quality Control. It is also the preliminary determination of the EPD that the proposed facility provides for the application of Best Available Control Technology ("BACT") for the control of filterable TSP, PM_{10}, $PM_{2.5}$, CO, NO_X, SO_2, and VOC as required by 40 CFR 52.21(j).

The Federal Land Manager ("FLM") responsible for PSD Class I area(s) within 300 km of the facility was contacted, provided preliminary annual emissions data, and given the opportunity for review of additional facility and emissions impact information. The U.S. Fish and Wildlife Service responded that significant impacts to air quality were not anticipated, and a Class I air quality analysis would not be necessary for this project.

EPD has determined through approved modeling techniques that the estimated emissions will not cause or contribute to a violation of any ambient air standard or allowable PSD increment in the area surrounding the facility or in Class I areas located within 300 km of the facility. It has further been determined that the proposal will not cause impairment of visibility or detrimental effects on soils or vegetation. Any air quality impacts produced by project-related growth should be inconsequential.

This Preliminary Determination concludes that an Air Quality Permit should be issued to Anovion Technologies LLC for the construction and initial operation of an anode materials facility capable of producing lithium-ion battery grade graphite powder from petroleum coke. This Preliminary Determination also acts as a narrative for the PSD State Implementation Plan (“SIP”) Permit.

1.0 INTRODUCTION – FACILITY INFORMATION AND EMISSIONS DATA

On July 18, 2023, Anovion Technologies LLC submitted a PSD Construction Permit application to construct and operate a greenfield site for an anode materials facility capable of producing lithium-ion battery grade graphite powder from petroleum coke. The facility will be located at 1600 Pondtown Road in Bainbridge, Decatur County.

Table 1-1: Title V Major Source Status

Pollutant	Is the Pollutant Emitted?	If emitted, what is the facility's Title V status for the Pollutant?		
		Major Source Status	Major Source Requesting SM Status	Non-Major Source Status
Filterable TSP	Yes			✓
PM_{10}	Yes			✓
$PM_{2.5}$	Yes			✓
SO_2	Yes	✓		
VOC	Yes			✓
NO_x	Yes			✓
CO	Yes	✓		
TRS	N/A			
H_2S	N/A			
Max Individual HAP (POM)	Yes			✓
Total HAPs	Yes			✓
Total GHGs	Yes			✓

Based on the proposed project description and data provided in the permit application, the facility estimated potential emissions of regulated pollutants from the greenfield facility are listed in Table 1-2 below:

Table 1-2: Emissions Increases from the Project

Pollutant	Potential Emissions Increase (tpy)	PSD Significant Emission Rate (tpy)	Subject to PSD Review
Filterable TSP	**58.43**	**25**	**Yes**
PM_{10}	**53.60**	**15**	**Yes**
$PM_{2.5}$	**14.16**	**10**	**Yes**
VOC	**55.55**	**40**	**Yes**
NO_X	**44.57**	**40**	**Yes**
CO	**2,930.21**	**100**	**Yes**
SO_2	**208.14**	**40**	**Yes**
TRS	---	10	No
Pb	---	0.6	No
Fluorides	---	3	No
H_2S	---	10	No
SAM	---	7	No
Total GHG	69,264	75,000	No
Max Individual HAP (POM)	5.82	N/A	N/A
Total HAP	7.19	N/A	N/A

According to the application, condensable PM emissions are not expected from the fugitive, process, and vent emissions from raw material handling, from coke milling, or from the cooling towers. Any possible condensable PM emissions from the combustion sources and graphitization furnaces have been included in the PM_{10} and $PM_{2.5}$ emission estimates. In the calculations as reflected in this Preliminary Determination, it was assumed that all baghouse and bin vent emissions are filterable TSP, with PM_{10} calculated as 100% of filterable TSP emissions and $PM_{2.5}$ calculated as 20% of filterable TSP emissions.

Based on the information presented in Tables 1-1 and 1-2 above, the construction of the greenfield Anovion facility, as specified per Georgia Air Quality Application No. 28941, is classified as a major PSD source by itself, with emissions of CO exceeding the PSD threshold emission limit of 250 tpy. Furthermore, emissions of filterable TSP, PM_{10}, $PM_{2.5}$, NO_X, SO_2, and VOC exceed their respective significant emission rate ("SER"). Therefore, the proposed Anovion facility will trigger a PSD review for filterable TSP, PM_{10}, $PM_{2.5}$, CO, NO_X, SO_2, and VOC.

A review of the calculated emissions as provided in Application No. 28941 for GHG shows that these emissions do not exceed the PSD SER and therefore do not need to be considered in this Preliminary Determination. Additionally, emissions of both maximum individual HAP (polycyclic organic matter or "POM") and total HAP emissions show that these emissions do not exceed the Title V major source threshold limits of 10 tpy (individual) and 25 tpy (total).

For Title V (40 CFR Part 70) purposes, the facility is classified as a major source due to CO and SO_2 emissions exceeding 100 tons per year.

Through its NSR procedures, EPD has evaluated Anovion Technologies LLC's proposal for compliance with State and Federal requirements. The findings of EPD have been assembled in this Preliminary Determination.

2.0 PROCESS DESCRIPTION

According to Application No. 28941, Anovion has proposed to construct and operate a greenfield site for an anode materials facility capable of producing lithium-ion battery grade graphite powder from petroleum coke. Approximately 150,172 tons per year of petroleum coke will be processed to produce 40,000 metric tons per year of final graphite powder product.

Raw Materials Handling
Both green and calcined pet coke are delivered to the facility via railcar or truck. Green coke is used for anode powder production, and calcined coke is used as insulating and conductive pack in the graphitization process. Green pet coke will arrive via railcar and will unload into an underground vault in an open shed. The openings of the unloading shed will be equipped with air knives and fog dust suppression to keep fugitive dust from escaping. Truck unloading stations are in a partial enclosure to reduce fugitives. Green coke is stored in an outside pile; fugitive emissions occur during addition/removal, and wind erosion. The material is conveyed from the unloading location to the top of the pile stacker by covered conveyors and enclosed transfer points. A Pile Stacker then distributes the pet coke into piles. As needed, pet coke is removed from the pile and conveyed to the process. Green coke from the bulk pile passes through a de-lumper to break up any large chunks on the way to the milling process. Design capacity for the unloading equipment is 100 metric tons per hour (110.23 tons per hour). Calcined coke is stored separately.

Lime is brought in by truck for use in the graphitization dry scrubber system. Fresh lime is stored in silos and conveyed to the scrubber when needed. Spent lime is conveyed back and stored in separate silos until it is trucked out for removal.

Fugitive emissions can be generated from raw material loading/unloading, material drops associated with hoppers, bucket elevators, crushers, and reject material transfers. Green pet coke is received in large pieces with little fine material; although, fugitives can be caused by wind erosion of the green pet coke storage pile, as well as disturbances of the pile with deliveries. Wind erosion emissions are assumed to be uncontrolled.

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from Raw Materials Handling can be categorized as fugitive or point source emissions. Most emissions are controlled by fabric filters/baghouses, except for the storage pile and truck unloading. Storage silo bin vents are equipped with static vents with compressed air cleaning. The material collected in the silo or bin vents is returned to the silo or bin; therefore, these are process equipment, not control equipment. Emissions from vents and baghouses are calculated based on the maximum fan capacity, exhaust grain loading of the filter, and process hours of operation.

Coke Milling
Green coke is conveyed to a milling system that includes a jet mill to further reduce the feed size for optimal performance, and a magnetic separator to remove ferrous contamination. Coke powder in the jet mill is milled to an average of 5 to 20 microns, pulled through a classifier wheel, and then into a baghouse to be trapped on the outside of bags. Periodic back-pulsing causes the fine powder to fall to the bottom of the baghouse. A screen downstream will remove any oversize material that might result from a jet mill malfunction. The oversized material is recycled back into the mill feed system. Milled material is then conveyed to calcining.

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from this area are controlled by fabric filters/baghouses. Emissions from baghouses are calculated based on the maximum fan capacity, exhaust grain loading of the filter, and process hours of operation.

Calcining and Blending

Milled coke powder is loaded into graphite canisters, which travel through electric roller hearth kilns where they are heated to 1200°C in a nitrogen inert atmosphere to prevent burning the product. This drives off volatile material and turns the green coke into calcined coke. Calcined coke powder is unloaded from the canisters and conveyed to blending. A small amount (<1 weight percent total) of proprietary additive powder is blended into the calcined coke powder. Coke and additive are metered into the blender, blended for a period of time, and then conveyed to graphitization canister loading.

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from this area are controlled by fabric filters/baghouses. Emissions from vents and baghouses are calculated based on the maximum fan capacity, exhaust grain loading of the filter, and process hours of operation. Kiln off-gases (primarily VOC) are routed to a thermal oxidizer for control. SO_2 emissions are uncontrolled but are minimized by not overheating the product. GHG emissions are also uncontrolled. A small quantity of products of combustion are emitted from the thermal oxidizer burners.

Graphitization

The facility will include two graphitization buildings; each building contains 14 furnaces which share a single DC electrical power supply. Blended coke powder is loaded and tamped into cylindrical graphite canisters for graphitization in an Acheson Furnace. The canisters are equipped with a lid. Loaded canisters are placed in the graphitization furnaces and surrounded by additional pet coke for a conductive core down the middle of the furnace. This conductive core is then surrounded by insulating pack material, which is less electrically conductive than the pack in the center conductive core. A fume hood is placed on top after loading the canisters into the furnace. A large DC current (up to 320,000 amps) is applied to the conductive core. This heats the furnace up to an average of 3000°C and the blended coke in the canisters is converted to graphite powder. The complete furnace operating cycle takes 56 hours on average to complete. It takes on average 54 hours for an individual furnace to be heated up from ambient temperature to 3,000°C and complete the graphitization process, and them it takes another approximately 2 hours to power down and disconnect the furnace from the power supply. For cost and logistical reasons, the two buildings are operated alternately – the second building will start heating up halfway through the first building's cycle. Assuming continuous operation and 168-hour work week, three furnace runs can be completed in each building per week, with a total of six furnace runs total per week from both buildings. The furnace runs are offset to even out power demand and minimize peak power usage for the plant.

The graphitization process results in filterable TSP, PM_{10}, $PM_{2.5}$, SO_2, CO, NO_X, HAP, and GHG emissions. The exhaust from the Acheson furnace is captured in the fume hoods and then sent through a Circulating Fluidized Bed scrubber system to remove SO_2 emissions, which result from the release of sulfur contained in the calcined product pet coke as well as in the purchased calcined coke used for packing and insulating. Additionally, these dry scrubbers will be removing filterable TSP, PM_{10}, and $PM_{2.5}$ emissions. VOC emissions are not expected from the furnace as all volatiles are driven off in the calcining process. GHG emissions were calculated assuming that the carbon content of the calcined packing coke is 100% (see 40 CFR Part 98, Subpart F).

Finishing (primary product)
The final powder is screened, has ferrous particles removed, and packaged into supersacks to be stored until they are loaded out onto railcars or trucks. Filterable TSP emissions that result from milling, hoppers, and product packaging are controlled with baghouses and/or vent filters.

Coating and Finishing (secondary product)
The primary product will be uncoated powdered graphite; however, a portion of the milled green coke could undergo granulation and post-graphitization coating in the production of a secondary product. In granulation, the milled green coke is coated with a small amount of pitch. The granulated product is kept separate from the non-granulated product while going through calcining and graphitization. The secondary coated product does not get the above-mentioned additive.

The granulated particulates are then coated a second time with a thin layer of pitch, then heated in carbonizing kilns to form a thin outer layer of carbon on the graphite product. The final powder is screened, has ferrous particles removed, and is packaged into supersacks to be stored until they are loaded out onto railcars or trucks.

For both products, filterable PM emissions that result from milling, hoppers, and product packaging are controlled with baghouses and/or vent filters. Filterable TSP, PM_{10}, $PM_{2.5}$, CO, NO_X, VOC, HAP, and GHG emissions are emitted from the two carbonizing kilns. VOC emissions from the applied pitch and VOC/HAP from the carbonizing kilns are controlled by thermal oxidizers. A small quantity of products of combustion are emitted from the thermal oxidizer burners.

Support Equipment
- Cooling towers are used to provide process cooling as well as HVAC cooling. Because of dissolved solids contained in the recirculating water, drift losses from the towers result in PM emissions. Two towers have a throughput of 1,321 gallons per minute, while the other four are at 4,843 gallons per minute.
- Two diesel-powered emergency generators will be installed for backup power, and two diesel-powered fire pumps will be installed to pump water in case of a fire. Both the emergency generators and fire pumps will emit products of fuel combustion. The emission limitations in 40 CFR 63 Subpart ZZZZ and 40 CFR 60 Subpart IIII were used to calculate the emissions. The facility will use ultra-low sulfur oil in all four units, and all four units will be limited to 500 hours per year or less each.
- The jet mills and nitrogen generation units consume large amounts of air and have dedicated air compressors.
- Cooling water is required for cooling the furnace rectiformer and components, as well as in the coating/granulation process.
- Chilled water is required for cooling the calcining kiln and magnetic separator. Dedicated chillers are provided for each process.
- Nitrogen of purity 99.95% is required for providing an inert atmosphere in the calcining and carbonizing kilns.
- Natural gas is required for the thermal oxidizer burners to destroy volatile components in the calcining and carbonizing kilns, which result in products of combustion. The total heat rating of the four burners is 4.7 million British thermal units ("MMBtu") per hour, utilizing less than 45 million standard cubic feet ("MMscf") per year of natural gas.

Anovion Technologies LLC permit application No. 28941 dated July 13, 2023 (with updates received September 20, September 25, September 26, and November 3, 2023; January 3, and 24, 2024), air dispersion modeling report received July 31, 2023 (completely updated November 21, 2023); and other supporting documentation can be found online at www.georgiaair.org/airpermit. The EPD Air Branch PSD Dispersion Modeling and Air Toxics Assessment Review is included in Appendix A of this Preliminary Determination.

3.0 REVIEW OF APPLICABLE RULES AND REGULATIONS

3.1 State Rules

Georgia Rule for Air Quality Control 391-3-1-.03(1) requires that any person prior to beginning the construction or modification of any facility which may result in an increase in air pollution shall obtain a permit for the construction or modification of such facility from the Director upon a determination by the Director that the facility can reasonably be expected to comply with all the provisions of the Act and the rules and regulations promulgated thereunder. Georgia Rule 391-3-1-.03(8)(b) continues that no permit to construct a new stationary source or modify an existing stationary source shall be issued unless such proposed source meets all the requirements for review and for obtaining a permit prescribed in Title I, Part C of the Federal Act [i.e., Prevention of Significant Deterioration of Air Quality (PSD)], and Section 391-3-1-.02(7) of the Georgia Rules (i.e., PSD).

Georgia Rule 391-3-1-.03(1) - Construction Permit requires that any person prior to beginning the construction or modification of any facility which may result in an increase in air pollution shall obtain a permit for the construction or modification of such facility from the Director upon a determination by the Director that the facility can reasonably be expected to comply with all the provisions of the Act and the rules and regulations promulgated there under.

Georgia Rule 391-3-1-.03(8)(b) continues that no permit to construct a new stationary source or modify an existing stationary source shall be issued unless such proposed source meets all the requirements for review and for obtaining a permit prescribed in Title I, Part C of the Federal Act [i.e., Prevention of Significant Deterioration of Air Quality], and Section 391-3-1-.02(7) of the Georgia Rules (i.e., PSD).

Georgia Rule 391-3-1-.02(2)(b) - Visible Emissions limits the opacity of visible emissions from any air contaminant source which is subject to some other emission limitation under section (2). The opacity of visible emissions from regulated sources may not exceed 40 percent under this general visible emission standard. This limitation applies to direct sources of emissions such as stationary structures, equipment, machinery, stacks, flues, pipes, exhausts, vents, tubes, chimneys, or similar structures with the capability of emitting particulates.

Georgia Rule 391-3-1-.02(2)(e) - Particulate Emission from Manufacturing Processes establishes an allowable rate of particulate emission for Manufacturing Processes. For process weight rates up to 30 tons per hour and for rates above 30 tons per hour the allowable emission rates are established by the following equations:

$E = 4.1\,P^{0.67}$ for process input weight rate up to 30 tons per hour
$E = 55\,P^{0.11} - 40$ for process input weight rate above 30 tons per hour

Where: E = the allowable emission rate in pounds per hour
P = process weight rate in tons per hour.

For most particulate matter emitting processes, BACT has been established as fabric filters/baghouses, which should allow the controlled sources to easily meet the requirements of Georgia Rule (e).

Georgia Rule 391-3-1-.02(2)(g) - Sulfur Dioxide establishes an allowable sulfur in fuel content limit of 2.5 weight percent for all fuel-burning sources below 100 MMBtu/hr input. Use of natural gas for external combustion and ultra-low sulfur diesel for internal combustion engines readily complies with this rule.

Georgia Rule 391-3-1-.02(2)(n) - Fugitive Dust requires the facility to take all reasonable precautions to prevent dust from becoming airborne for any operation, process, handling, transportation, or storage facility which may result in fugitive dust. This regulation also establishes allowable opacity and work practice standards to minimize fugitive dust.

3.2 Federal Rule – Prevention of Significant Deterioration

The regulations for PSD in 40 CFR 52.21 require that any new major source or modification of an existing major source be reviewed to determine the potential emissions of all pollutants subject to regulations under the Clean Air Act. The PSD review requirements apply to any new or modified source which belongs to one of 28 specific source categories having potential emissions of 100 tons per year or more of any regulated pollutant, or to all other sources having potential emissions of 250 tons per year or more of any regulated pollutant. They also apply to any modification of a major stationary source which results in a significant net emission increase of any regulated pollutant.

Georgia has adopted a regulatory program for PSD permits, which the United States Environmental Protection Agency (“EPA”) has approved as part of Georgia’s SIP. This regulatory program is codified in the Georgia Rules at 391-3-1-.02(7). This means that Georgia EPD issues PSD permits for new major sources pursuant to the requirements of Georgia’s regulations. It also means that Georgia EPD considers, but is not legally bound to accept, EPA comments or guidance. A commonly used source of EPA guidance on PSD permitting is EPA’s Draft October 1990 New Source Review Workshop Manual for Prevention of Significant Deterioration and Nonattainment Area Permitting (“NSR Workshop Manual”). The NSR Workshop Manual is a comprehensive guidance document on the entire PSD permitting process.

The PSD regulations require that any major stationary source or major modification subject to the regulations meet the following requirements:

- Application of BACT for each regulated pollutant that would be emitted in significant amounts;
- Analysis of the ambient air impact;
- Analysis of the impact on soils, vegetation, and visibility;
- Analysis of the impact on Class I areas; and
- Public notification of the proposed plant in a newspaper of general circulation

The following is a discussion of the applicable federal rules and regulations pertaining to the equipment that is the subject of this preliminary determination, which is then followed by the top-down BACT analysis.

3.3 Federal Rule - New Source Performance Standards

40 CFR 60 Subpart A (NSPS General Provisions)
The provisions of this regulation apply to the owner or operator of any stationary sources which contains an effected facility, the construction or modification of which is commenced after the date of publication in the part of any standard applicable to that facility.

40 CFR 60 Subpart IIII (NSPS for Internal Combustion Engines)
All diesel-fired emergency generators and fire pumps are subject to this rule. The units must use ultra-low sulfur (15 ppm) diesel. Compliance with 40 CFR 60 Subpart IIII is demonstrated by purchasing engines certified to the emissions standards in 40 CFR 60.4205(c) by the engine manufacturer and emission limitations of Table 4 of the regulation. These units are exempt from SIP permitting but are included in this Preliminary Determination to address BACT and include the intermittent emissions from these in the PSD and Toxic Impact Assessment ("TIA") model. PTE for these engines is based on 500 hours per year each in accordance with Georgia PTE guidance.

40 CFR 60 Subpart UUU (NSPS for Calciners and Dryers in Mineral Industries)
This regulation applies to each calciner and dryer at a mineral processing plant. A mineral processing plant is defined as any facility that processes or products any of the following minerals, their concentrates, or any mixture of which the majority (>50%) is any of the following or a combination of the following: alumina, ball clay, bentonite, diatomite, feldspar, fire clay, fuller's earth, gypsum, industrial sand, kaolin, lightweight aggregate, magnesium compounds, perlite, roofing granules, talc, titanium dioxide, and vermiculite. None of these materials are used at this facility; therefore, this regulation does not apply.

3.4 Federal Rule – National Emissions Standards for Hazardous Air Pollutants

The facility has asserted that projected HAP emissions from the entire process will not exceed 10 tpy of individual HAP or 25 tpy of total HAP; thus, the facility will be classified as a true minor source of HAP.

40 CFR 63 Subpart A (NESHAP General Provisions)
The provisions of this regulation apply to the owner or operator of any stationary sources which contains an effected facility, the construction or modification of which is commenced after the date of publication in the part of any standard applicable to that facility.

40 CFR 63 Subpart ZZZZ (Area Source NESHAP for Internal Combustion Engines)
New emergency engines over 500 bhp located at area sources of HAP are exempt from the emissions standards of 40 CFR 63 Subpart ZZZZ, and only have to comply with the initial notification requirements of 40 CFR 63.6645(f). Engines smaller than 500 bhp must comply with 40 CFR 60 Subpart IIII but are not subject to the initial notification requirements of 40 CFR 63 Subpart ZZZZ. Compliance with 40 CFR 63 Subpart ZZZZ is demonstrated by complying with all applicable requirements of 40 CFR 60 Subpart IIII per 40 CFR 63.6590(c).

3.5 State and Federal – Startup and Shutdown and Excess Emissions

Excess emission provisions for startup, shutdown, and malfunction are provided in Georgia Rule 391-3-1-.02(2)(a)7. Excess emissions from the equipment associated with the proposed project would most likely result from a malfunction of the associated control equipment. The facility cannot anticipate or predict malfunctions. However, the facility is required to minimize emissions during periods of startup, shutdown, and malfunction.

NSPS and NESHAP rules each contain their own provisions for periods of startup and shutdown.

3.6 Federal Rule – 40 CFR 64 – Compliance Assurance Monitoring

Under 40 CFR 64, the *Compliance Assurance Monitoring* Regulations (CAM), facilities are required to prepare and submit monitoring plans for certain emission units. The CAM Plans provide on-going and reasonable assurance of compliance with emission limits. Under the general applicability criteria, this regulation applies to units that use a control device to achieve compliance with an emission limit and whose pre-controlled emissions levels exceed the major source thresholds under the Title V permitting program. CAM is not applicable at this time. CAM applicability will be evaluated when the facility submits a Title V permit application for the Anovion facility within a year after the issuance of this PSD SIP permit.

Preliminarily, based on the information provided in this permit application, various particulate matter emission sources from the Material Handling and Delivery Area and the Jet Mills will likely need to be evaluated for PM emissions. The Graphitization Furnace will need to be evaluated for PM and SO_2 emissions, and the Calcining and Carbonizing Kilns will need to be evaluated for VOC emissions. Again, these evaluations do not need to be completed until the Title V permit application is submitted and therefore will not be considered in this PSD permitting review process.

4.0 CONTROL TECHNOLOGY REVIEW

The proposed project will result in emissions that are significant enough to trigger PSD review for the following pollutants: filterable TSP, PM_{10}, $PM_{2.5}$ CO, NO_X, VOC, SO_2.

Definition of BACT

The PSD regulation requires that BACT be applied to all regulated air pollutants emitted in significant amounts. Section 169 of the Clean Air Act defines BACT as "an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act, which would be emitted from any proposed major stationary source or major modification which the Administrator (in this case, EPD), on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques."

In no case can the application of BACT result in emissions of any pollutant which would exceed emissions allowed any applicable standards under 40 CFR Parts 60, 61, or 63. In addition, if EPD determines that there is no economically reasonable or technologically feasible way to measure the emissions, and hence to impose and enforceable emissions standard, it may require the source to use a design, equipment, work practice or operations standard or combination thereof, to reduce emissions of the pollutant to the maximum extent practicable.

The BACT limits contained in the permit as outlined below apply at all times, including startup and shutdown.

This review was conducted generally using the top-down analysis and five-step process recommended by EPA in their *Draft New Source Review Workshop Manual* dated October 1990. The five steps of a top-down BACT review procedure identified by EPA per BACT guidelines are listed below:

Step 1: Identify all available control technologies;
Step 2: Eliminate technically infeasible options;
Step 3: Rank the remaining control technologies by control effectiveness;
Step 4: Evaluate the most effective controls and documentation of results; and
Step 5: Selection of BACT

Opacity is not considered to be a PSD pollutant and therefore, opacity itself does not require a BACT evaluation and establishment of a BACT limit. However, BACT can include the use of visible emission limitations of work practice standards for regulated PSD pollutants. Opacity limits have been included in the draft permit as required by State and Federal regulations.

In some cases, such as trivial sources, EPD exercises its right as a SIP-approved permitting authority to proceed according to the governing regulation, and the plain language of said codified regulations (not draft guidance).

For each pollutant subject to BACT review from each of the emission units or groups or processes, a comprehensive review of potential control technologies was conducted utilizing the following sources:

- USEPA's RACT/BACT/LAER Clearinghouse ("RBLC");
- Vendor quotes and communications with control device equipment manufacturers;
- USEPA's Clean Air Technology Center ("CATC") website;
- Technical books and articles; and
- Federal and State Air Quality Permits.

EPD in particular utilized information contained in documents created by the South Carolina Department of Health and Environmental Control ("SCDHEC") regarding the facility Showa Denko Carbon, Inc. ("Showa") Permit No. 0900-0025-CZ and associated preliminary and final determinations to assist in understanding the proposed facility as well as to compare emissions limitations, air pollution control equipment, and work practice standards.

A search in the RBLC on "graphitization" gives no results. Additionally, a search on "graphitizing" yields only the Showa facility referenced above, with a process code of 99.999. A search on "graphite" yields one source with graphite furnaces (process code 19.600). Much of the particulate matter emissions information comes from an RBLC search of "coke." In all searches, EPD set the search window back to January 1, 2000, for facilities in the United States only.

4.1 SULFUR DIOXIDE – SO_2

The proposed project includes several process areas that are subject to PSD review and have sulfur dioxide (SO_2) emissions requiring a BACT evaluation. The emissions could be from process areas or combustion sources. There are no SO_2 emissions from the Carbonizing Kilns as all the sulfur is driven off in the Graphitization Furnaces and Calcining Kilns.

<u>Calcining Kilns</u>
Sulfur is contained in the green pet coke and some of that sulfur is emitted as SO_2 during heating in the calcining kilns. SO_2 emissions from natural gas fuel combustion from the thermal oxidizers were calculated from emission factors from AP-42, Section 1.4, based on burner sizes and 8,760 hours/year of operation, and are calculated at 0.012 tons per year total for all four units.

<u>Graphitization Furnaces</u>
Two scrubber systems will be installed to reduce SO_2 (as well as PM) emissions from the furnaces. The liberation of sulfur from the materials in the graphitization furnace is temperature dependent and begins in hour 28 of the 56-hour cycle when the furnace reaches an approximate temperature of 1,200°C. The hourly sulfur generation increases until its maximum in hour 40 at a temperature of approximately 2,200°C. All sulfur is generated by the end of hour 44; the temperature approaches 3,000°C in hour 50 and is held at that temperature until hour 54. It requires another two hours to power down and disconnect the power supply. All sulfur emissions are emitted during the 17-hour period between hours 28 through 44 while the temperature ranges from approximately 1,200°C to 2,400°C.

Emissions from scrubbers are calculated based on the maximum inlet gas flow rate (acf/min), exhaust concentration, and process hours of operation (8,760 hours/year).

Support Equipment
Two diesel-fired emergency generators and two diesel-fired fire pumps will be installed to pump water in case of power losses or fire. The fire pumps and emergency generators must meet the standards of 40 CFR 60 Subpart IIII and the emissions limitations were used as the basis for calculating the SO_2 emissions.

Table 4.1.1 Pre-Control Potential Sulfur Dioxide (SO_2) Emissions

Process Area/Equipment Description	Source ID Code	Estimated Maximum Annual Uncontrolled SO_2 Emissions (tpy)
Process Emissions from Calcining Kilns CK01 through CK06	TO01 TO02 TO03	31.35 31.35 31.35
Process Emissions from Graphitization Furnaces	GR01 GR02	3,399 3,399
Combustion Emissions from Emergency Generators and Fire Pumps	EG01 EG02 FP01 FP02	0.009 0.009 0.001 0.001

4.1.1 Sulfur Dioxide Emissions – Calcining/Carbonizing

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce SO_2 emissions from the use of thermal oxidizers that control VOC emissions from both calcining and carbonizing kilns. This analysis specifically looks at SO_2 emissions from the releasing of sulfur entrained in the raw green pet coke. SO_2 emissions were calculated at 0.012 tons per year from all four thermal oxidizer burners.

- Wet Scrubbers – Wet scrubbers cause the gas stream to be brought into contact with a scrubbing liquid, typically by spraying the liquid in a contacting tower. There are various types of scrubbers, dependent on removal efficiency and scrubbing reagent. Wet scrubbers typically employ sodium, calcium, or dual-alkali reagents using packed or spray towers. The required excess of reactant in the solution to achieve high acid gas dissolution rates is small. The reaction rate is mainly determined by the absorption of the gas by the liquid. Wet scrubber systems generate wastewater and sludge streams which require treatment and disposal, as well as consuming more energy. Wet scrubbers typically exhibit 80-98% control efficiency for SO_2 emissions.

- Dry Sorbent Injection (with upstream filter) - A fabric filter (or baghouse) is one of the most efficient means of separating particulates from a gas stream. The advantage of fabric filters is that efficiency is largely insensitive to the physical characteristics of the gas stream and changes in the dust loading. Baghouse installations are an industry standard for particulate controls and can also be used with alkali salts to remove SO_2. A reagent is injected into the flue gas stream to remove SO_2 by surface reactions. To reduce the sorbent requirements, these systems will recycle most of the baghouse collection into the feed system to promote better sorbent utilization. Furthermore, filter cake on the fabric due to deposited absorption reagent can improve the absorption of SO_2. Dry sorbent injection typically has a control efficiency of 50-80%.
- Good Operating Practices – The amount of sulfur generated into SO_2 is dependent on temperature and the time it is held at the elevated temperature. Good operational practices would involve not overheating the green pet coke at calcining to minimize SO_2 emissions. The combustion source must be operated within certain parameters to promote efficient and complete calcining of the green pet coke without liberating additional sulfur.

Step 2: Eliminate Technically Infeasible Options
Due to the exhaust gas temperature, a baghouse is not feasible without a process to cool the stream before entry. Therefore, Dry Sorbent Injection systems are eliminated from consideration.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Wet Scrubber
2. Good Operating Practices

Step 4: Evaluate Remaining Control Technologies
The outlet SO_2 concentration is calculated to be around 50 ppm, which is lower than equipment manufacturer's guarantees and makes a control device unnecessary. A cost analysis was performed and showed that, to remove 22 tons of SO_2 per year, it would annualize to more than $10,000 per ton. This value is not cost effective and wet scrubbers are eliminated from consideration.

Step 5: Selection of BACT
For sulfur dioxide emissions from Calcining Kilns (Thermal Oxidizer ID Codes TO01, TO02, and TO03), BACT has been selected as:

1. Good Operational Practices, to include avoiding higher than required operating temperatures;
2. 0.6% by weight sulfur content in the green pet coke on an annual weighted basis; and
3. 72.05 tons SO_2 during any consecutive twelve-month period.

EPD Review of BACT for SO_2 emissions from Calcining Kilns

A search of RBLC for process code 90.017 (Calciners & Dryers and Mineral Processing Facilities) for SO_2 controls shows three facilities – one with no controls, one with dry scrubbing, and one with a wet scrubber. Anovion has shown that a wet scrubber is economically infeasible for the amount of SO_2 emissions to be controlled, and that a dry scrubber would need the heated exhaust to be cooled prior to treatment. Therefore, EPD accepts the use of good operating practices as BACT and agrees that 0.6% sulfur content by weight satisfies BACT. Compliance will be determined through an initial stack test at representative production rates and to establish temperatures ranges for continuous monitoring. On-going testing will occur every 60 months. The sulfur content of green pet coke can range from 0.2% to 6%. The facility will be required to keep monthly records of the sulfur content in the green pet coke received.

4.1.2 Process Sulfur Dioxide Emissions – Graphitization Furnaces

According to the application, a total of 10.835 tons (9,829.5 kg as stated in the application) of sulfur is generated during the entire 56-hour synthetic graphite product production cycle, and all sulfur is generated between the temperatures of 1,200-2,400°C. This sulfur amount consists of 3% sulfur in the core pack (3% of 171.5 tons/cycle), 3% sulfur in the insulating pack (3% of 118.8 tons/cycle), 3% sulfur in the chimney coke (3% of 31.5 tons/cycle), 0.6% sulfur in the pet coke powder (0.6% of 165.5 tons/cycle), and 0.5% sulfur in the crucible (0.5% of 35.4 tons/cycle). Based on 314 annual cycles, this would equate to 6,797.7 tons uncontrolled SO_2 emissions per year, which averages out to 1,552 lb/hr over an entire 8,760-hour year.

The maximum hourly sulfur generation occurs in Hour 40 of the cycle and is calculated to be 0.95 tons/hr (861.4 kg/hr as stated in the application) at an approximate temperature of 2,200 °C. This value equates to 16,603 tons uncontrolled SO_2 emissions per year, which averages out to 3,791 lb/hr over an entire 8,760-hour year. This value is obviously higher as it is based on the highest hourly generation of sulfur emissions converted to SO_2 emissions. Liberation of sulfur ends in Hour 44 as the temperature increases to 3,000°C in Hour 50. The facility asserts that power consumption levels do not allow them to run both buildings at peak high temperatures at the same time; therefore, the buildings' cycles will be off-set at up to 28 hours to accommodate both this power limitation and to avoid any co-current peak SO_2 emissions from the furnaces.

Step 1: Identify all Available Control Technologies

The BACT Analysis identifies the following control technologies that could reduce SO_2 emissions from the graphitization process.

- Circulating Fluidized Bed Scrubber ("CFBS") – Circulating fluidized bed scrubbing is based on the fluidized bed principle. The exhaust gas stream enters the bottom of the up-flow vessel, flowing upward through a venturi section that accelerates the gas flow rate and causes turbulent flow. The turbulator wall surface of the vessel causes highly turbulent mixing of the exhaust gas, solids, and water for 4-6 seconds to achieve a high capture efficiency of the vapor phase acid gases contained in the exhaust. The gas and solids then leave the top of the scrubber and the baghouse removes the solid material. Hydrated lime and water mix with the turbulent flowing gas moving vertically through the vessel, which provides gas cooling, reactivation of recycled ash, and capture of pollutants. Water mist causes humidifying of the hydrated lime to increase the efficiency of the reaction between the lime and SO_2.

To increase the efficiency of the system and to reduce the amount of hydrated lime consumed, the collected sorbent captured from the baghouse is recirculated back into the base of the reactor. As needed, excess material is removed from the bottom of the baghouse, while fresh lime is added to the reactor. In addition to capturing the partially spent lime for recirculation, the baghouse will also serve to remove process dust that is entrained in the exhaust. The water plays the important role of cooling the exhaust gas to enhance the adsorption of the vapor phase pollutants onto the solid particles. The CFBS process achieves a very high solids-to-gas ratio, which improves the ability of vapor phase pollutants to find adsorption sites on the colliding solid particles. The effectiveness of the sorbent is largely a function of residence time. A CFBS can keep solids in the system from 20-30 minutes, which is a sufficient time period for the sorbent to react with the acid gases. Control systems maintain the dry flue gas at an optimum temperature and at an adequate removal efficiency by controlling the amount of water added and the amount of fresh sorbent added separately. The efficiency of this system can approach that of wet scrubbers, with 80-98% control.

- Wet Scrubbers – See Section 4.1.1 "Wet Scrubbers"
- Spray Dryer Absorber – Spray dry scrubbing is a process involving sorbent dissolution and SO_2 gas absorption into the alkaline slurry droplet with a series of reactions in the liquid phase within the spray dryer. In the spray drying scrubber process, a concentrated sorbent slurry is introduced at the top of the scrubber through specially designed nozzles and is finely atomized, producing a mist of droplets containing the sorbent, which reacts with SO_2 contained in the exhaust gas directed to the scrubber. In the scrubber, evaporation of water and drying of the droplets takes place as it flows downward, while at the same time, a dry waste product containing the reacted SO_2 is created. Part of the dry waste is collected at the bottom of the scrubber, while the solids suspended in the exhaust gas exiting the scrubber are removed by a particulate control device such as baghouse. Sorbents can include hydrated lime, burnt limestone, sodium carbonate, and Trona (Na_2CO_3 and $NaHCO_3$). Advantages of the use of a spray dry scrubber are reduced installation and operating costs, ease of product handling with no requirement for sludge handling equipment, and reduced water usage. With recent improvements in control of the gas humidity, liquid-to-gas ratio, stoichiometric molar ratio, flue gas concentration, and approach to saturation temperature, the efficiency of spray dryers in some applications approaches that of wet scrubbers, with 80-96% control.
- Dry Sorbent Injection (with upstream filter) – See Section 4.1.1 "Dry Sorbent Injection (with upstream filter)"
- Good Operating Practices – The source would be operated within parameters promoting efficient and economical operation. As these are electrical furnaces, no combustion emissions are anticipated.

Step 2: Eliminate Technically Infeasible Options
Each option discussed above is technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Circulating Fluidized Bed Scrubber System
2. Wet Scrubber
3. Spray Dry Scrubber
4. Sorbent Injection System (with upstream filter)
5. Good Operating Practices

Step 4: Evaluate Remaining Control Technologies
An RBLC search for SO_2 control on “electric furnace,” “electrical,” “Acheson,” “graphite,” “graphitizing,” and “graphitization” yielded no information of value. A rotary hearth furnace (process code 90.021) did show the use of a spray dryer scrubber and fabric filter, with a cost of $1,322 per ton of SO_2 removed.

Wet scrubbers, dry spray scrubbers, or sorbent injection systems in combination with wet/dry scrubber can achieve up to 98% control. There are various environmental and energy impacts for each option to be considered. A wet scrubber will result in a liquid/slurry waste stream, which would require both solid and wet waste disposal and wastewater treatment prior to discharge from the facility. Therefore, these options were removed from consideration.

Step 5: Selection of BACT
For process sulfur dioxide emissions from Graphitization Furnaces (Source ID Codes GR01 and GR02), BACT has been selected as:

1. Circulating Fluidized Bed Dry Scrubber Systems SCR1 and SCR2 – with a 98% removal of SO_2 emissions as measured by SO_2 continuous emission monitor systems (CEMS) on a three-hour rolling average;
2. 136.09 tons of SO_2 during any consecutive twelve-month period from both furnaces combined; and
3. 75.96 lb/hr as the sum of the hourly average of the rolling three-hour blocks from both scrubbers.

<u>EPD Review of BACT for process SO_2 emissions from Graphitization Furnaces</u>
EPD accepts the use of Circulating Fluidized Bed Dry Scrubber Systems SCR1 and SCR2 as BACT for process emissions of SO_2, and agrees that a minimum control of 98% satisfies BACT. Compliance will be determined through an initial stack test at representative production rates, continuous fluidized bed pressure drop across the system, fresh lime feed rate, evidence of proper lime recirculation rate monitoring for the scrubber systems (facility can set this parameter, but it can include the pressure drop alarms and any corrective action performed), and the use of a SO_2 CEMS to monitor emissions. Subsequent testing will occur every 12 months.

To avoid both furnaces emitting SO_2 from sulfur burn-off at the same time, the facility will not be allowed to start up the second furnace less than 20 hours after the start of the first in the staggering of cycles. The facility will need to record the date and time of the start of each cycle in each furnace building. Since SO_2 is generated between the production cycle hours of 26 and 44, no two cycles are allowed to overlap these hours. Anovion has demonstrated that continuous operation of one graphitization building at the peak hourly emission rate will not exceed the National Ambient Air Quality Standard (“NAAQS”).

Based on the emissions calculated above, a 98% reduction equates to 136.09 tons during any consecutive twelve-month period from both graphitization buildings, combined. For the maximum 40th hour of the synthetic graphite production cycle emission rate, the sum of the hourly average of the rolling three-hour blocks is established as 75.96 lb/hr for both scrubbers, combined.

If the SO_2 CEMS are down, the facility will use 75.96 lb/hr for each hour the CEMS are not recording data.

4.1.3 Combustion Sulfur Dioxide Emissions – Emergency Engines and Fire Pumps

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce SO_2 emissions from combustion in internal combustion engines. Stationary diesel-fired emergency compression ignition internal combustion engines are sold as package units with an engineering design tailored to meet the emission limitations of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ. The manufacturer provides an engine that complies with these regulations, and the purchaser is expected to operate and maintain the unit to guarantee compliance with the applicable emission limitations.

- Good Engine Design – Diesel emergency engines are certified to meet the required EPA emission standards based on the model year and size.
- Low Sulfur Content Fuel – The requirement for ultra-low sulfur diesel (15 ppm by weight maximum sulfur content) assists in minimizing SO_2 emissions from combustion. 40 CFR 60 Subpart IIII requires the use of such low-sulfur fuel.

Step 2: Eliminate Technically Infeasible Options
Both options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Good Engine Design
2. Use of Low-Sulfur Fuel

Step 4: Evaluate Remaining Control Technologies
Current BACT guidelines for acceptable SO_2 emissions from diesel-fired fire pumps and emergency generators meet the requirements of 40 CFR 60 Subpart IIII. Therefore, the use of a certified engine with good combustion practices can be considered BACT.

Step 5: Selection of BACT
For combustion sulfur dioxide emissions from Emergency Generators and Fire Pumps (Source ID Codes EG01, EG02, FP01, and FP02), BACT has been selected as:

1. Good engine design and certifying engines to be in compliance with 40 CFR 60 Subpart IIII;
2. Good operation, maintenance, and combustion practices; and
3. Use of a low-sulfur fuel (0.0015% sulfur content)

<u>EPD Review of BACT for combustion SO_2 emissions from Emergency Engines/Fire Pumps</u>
EPD agrees that certifying engines to 40 CFR 60 Subpart IIII, good operation and maintenance practices, and use of a low-sulfur fuel satisfies SO_2 BACT for emergency engines and fire pumps. The RBLC does not indicate that there are sources with add-on control devices for the control of SO_2 emissions from internal combustion engines.

Table 4.1.2: Summary of BACT for SO_2 Emissions

Process/Equipment Source ID Code	Control Method for SO_2 Emissions	Proposed SO_2 BACT Limit
Combustion Emissions from Calcining and Carbonizing Kilns CK01 through CK06, CAK1, and CAK2	Thermal Oxidizers TO01, TO02, TO03, and TO04; Good Operating Practices to avoid higher than required operating temperatures.	16.45 lb/hr (72.05 tpy); 0.6% by weight sulfur content in green pet coke.
Process Emissions from Graphitization Furnaces GR01 and GR02	Circulating Fluidized Bed Scrubber Systems SCR1 and SCR2	136.09 tons during any consecutive twelve-month period (total for both scrubbers); 75.96 lb/hr as the sum of the hourly average of both scrubbers' rolling 3-hour blocks.
Combustion Emissions from Emergency Generators and Fire Pumps EG01, EG02, FP01, and FP02	Use of EPA certified engine per requirements of NSPS IIII; Use of ultra-low sulfur diesel; Good Operation and Maintenance Practices.	40 CFR 60 Subpart IIII; 0.0015% sulfur content fuel Combustion emissions calculated at 0.02 tpy from all 4 units.

4.2 PARTICULATE MATTER – FILTERABLE PM, PM_{10}, AND $PM_{2.5}$

The proposed project includes several process areas that are subject to PSD review and have filterable TSP, which includes PM_{10} and $PM_{2.5}$, emissions requiring a BACT evaluation. The emissions could be fugitive or point sources and come from process areas or combustion sources.

According to the application, condensable PM emissions are not expected from the fugitives or process and vent emissions from raw material handling, from coke milling, or from the cooling towers. Any possible condensable PM emissions from the combustion sources and graphitization furnaces have been included in the PM_{10} and $PM_{2.5}$ emission estimates. In the calculations as reflected in this Preliminary Determination, it was assumed that all baghouse and bin vent emissions are filterable total suspended particulate matter (TSP) with PM_{10} calculated as 100% of filterable PM emissions and $PM_{2.5}$ calculated as 20% of filterable PM emissions.

<u>Raw Material Handling</u>
Fugitive particulate matter emissions are generated by the material unloading from trucks and railcars, and from both the green coke and packing coke storage piles.

Fugitive emissions can be generated from raw material loading/unloading, material drops associated with hoppers, bucket elevators, crushers, and reject material transfers. These emissions were calculated via methods in AP-42, Section 13.2.4. Additionally, fugitives can be caused by wind erosion of the green pet coke storage pile, as well as disturbances of the pile with deliveries. Wind erosion emissions are calculated using emission factors from AP-42, Section 13.2.5, with 52 pile disturbances per year, 25 meter per second (m/s) wind speed and are assumed to be uncontrolled.

Due to the size and consistency of the green pet coke, the presence of fine materials is unlikely. Furthermore, the pet coke is not particularly friable and is not easily broken into very small pieces during normal handling and storage operations.

Filterable TSP, PM_{10}, $PM_{2.5}$ emissions from this area can be categorized as fugitive or point source emissions. Most emissions are controlled by fabric filters, except for the storage pile and truck unloading. Storage silo bin vents are equipped with static vents with compressed air cleaning. The material collected on the silo or bin vents is returned to the silo or bin; therefore, these are process equipment, not control equipment. Emissions from vents and baghouses are calculated based on the maximum inlet gas flow rate (acf/min), exhaust grain loading of the filter (0.005 gr/dscf), and process hours of operation (8,760 hours/year).

Coke Milling

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from this area are controlled by fabric filters. Emissions from baghouses are calculated based on maximum inlet gas flow rate (acf/min), exhaust grain loading of the filter (0.005 gr/dscf), and process hours of operation (8,760 hours/year).

Calcining Kilns and Blending

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from this area are controlled by fabric filters. Emissions from baghouses are calculated based on the maximum inlet gas flow rate (acf/min), exhaust grain loading of the filter (0.005 gr/dscf), and process hours of operation (8,760 hours/year). Filterable PM emissions from natural gas fuel combustion from the four thermal oxidizers were calculated from emission factors from AP-42, Section 1.4, based on burner sizes and 8,760 hours/year of operation.

Graphitization Furnaces

While the main pollutant the scrubbers will be installed to reduce from the furnaces is SO_2, the scrubbers can also reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions to an exhaust concentration of 0.005 gr/dscf. Emissions from scrubbers are calculated based on the maximum inlet gas flow rate (acf/min), exhaust concentration, and process hours of operation (8,760 hours/year).

Coating and Finishing

Filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from baghouses are calculated based on maximum inlet gas flow rate (acf/min), exhaust grain loading of the filter (0.005 gr/dscf), and process hours of operation (8,760 hours/year).

Support Equipment

Two diesel-fired emergency generators and two diesel-fired fire pumps will be installed to pump water in case of power losses or fire. The fire pumps and emergency generators must meet the standards of 40 CFR 60 Subpart IIII and the emissions limitations were used as the basis for calculating total PM emissions due to combustion.

In the cooling towers, emissions occur when cooling water gets carried away by the air stream as drift droplets. The facility assumed a percentage drift loss of 0.005% and a total dissolved solids (“TDS”) concentration of 2,000 ppm, along with recirculation rates, to calculate hourly and annual emissions.

Table 4.2.1: Pre-Control Potential Filterable Particulate Matter (PM) Emissions

Process Area/Equipment Description	Source ID Code	EPD Estimated Maximum Annual Uncontrolled Filterable PM Emissions (tpy)
Fugitive Emissions from Truck/Rail Unloading	FUG1 FUG2	PM total = 2.19 PM total = 2.19
Fugitive Emissions from Green Pet Coke Storage Pile and Spent Lime Truck Loadout	STOR DRP1 DRP2 GATH SLLF	PM total = 3.51 PM total = 0.03 PM total = 0.03 PM total = 0.01 PM total = 0.31
Process Emissions from Material Delivery, Handling, Storage, and Transport	Baghouse IDs: DC01 DC31 DC02 DC39 DC30 DC40 DC33 – DC38 DC51 – DC54	For 16 emission points: Filterable TSP = 1,024 PM_{10} = 820 $PM_{2.5}$ = 205
Vent Emissions from Storage Silos	Baghouse IDs: DC03 – DC29 DC41 – DC49 DC55 – DC58	For 40 emission points: Filterable TSP = 666 PM_{10} = 532 $PM_{2.5}$ = 134
Process Emissions from Coke Milling	Baghouse IDs: DC32 DC50	For 2 emission points Filterable TSP = 222 PM_{10} = 178 $PM_{2.5}$ = 44
Combustion Emissions from Calcining and Carbonizing Kilns	CK01 – CK06 (3) CAK1 & CAK2 (1)	PM total = 0.13 (for 3) PM total = 0.03
Process Emissions from Graphitization Furnaces	GR01 & GR02	Filterable TSP = 5,608 PM_{10} = 4,486 $PM_{2.5}$ = 1,122
Combustion Emissions from Emergency Engines 500 hours/year	EG01 EG02 FP01 FP02	PM total = 0.24 PM total = 0.24 PM total = 0.033 PM total = 0.033
Fugitive Emissions from Cooling Towers	BB01 & BB02 BB1G & BB2G BB1C & BBGA	PM total = 0.58 (both) PM total = 2.15 (both) PM total = 2.15 (both)

4.2.1 Fugitive Particulate Matter Emissions – Truck/Rail Unloading

Step 1: Identify all Available Control Technologies
The following control technologies could reduce fugitive PM emissions from the unloading of pet coke from either truck or railcars. The RBLC does not identify any specific determinations for pet coke truck and rail unloading.

- Enclosure with Dust Collection - The use of enclosed structures to shelter material handling operations from wind effects has been shown to provide a reduction in airborne dust from operations such as pet coke unloading. Total enclosures could provide up to 99+% control efficiency.
- Wind Screens and/or Partial Enclosure - Walls and partial enclosures are most effective and practical at dedicated loading and unloading points. The reduction in particulate emissions varies, depending on the material and local weather conditions, but could be 50-75% efficient.
- Railcar Bottom Sealing Boot – The use of sealing boots for bottom unloading railcars reduces fugitive dust losses by preventing wind or other air movement in the unloading shed from picking up and blowing dust. It can also increase the capture effectiveness of any baghouse pulling on the receiving vault by reducing the height that the material drops and by reducing the open area of the vault. Estimated emissions reduction can be 50-75%.
- Water Sprays or Wet Suppression - Fine mists of water applied to dust generating sources, such as bulk material drop points, reduce dust emissions by impacting small particulates with water. The wetted particulate becomes heavier and quickly settles out of the air, reducing airborne dust. Alternatively, material may be thoroughly wetted prior to handling, which suppresses the generation of dust when the material is disturbed. Estimated emissions reduction is 50%.
- Air Knives and Fog Dust Suppression Systems – Air knives or fog dust suppression systems at the open ends of the unloading shed doorways act as barrier to the movement of dust. The efficiency of these devices can be difficult to calculate.
- Good Housekeeping Practices - Good housekeeping practices are used both inside and outside buildings where it can be difficult to feasibly implement other control technologies to reduce fugitive emissions. These practices could consist of activities such as the application of water or other chemicals to suppress dust from becoming airborne, posting speed limits for trucks and vehicles while on-site, and keeping roadways free of dust. Additional examples inside the buildings of the facility include periodically cleaning work areas and equipment, immediately cleaning material spills, and sweeping floors to remove dust. This control efficiency varies greatly and is difficult to quantify.

Step 2: Eliminate Technically Infeasible Options
All options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Enclosure with Dust Collection
2. Partial Enclosure
3. Railcar Bottom Sealing Boot
4. Air Knives or Fog Dust Suppression Systems at Building Openings
5. Water Sprays/Wet Suppression
6. Good Housekeeping Practices

Step 4: Evaluate Remaining Control Technologies
A total enclosure for the truck unloading would not be logistically sound due to issues with truck maneuvering and access. Total enclosures for railcars would require every railcar to be uncoupled before unloading and then recoupled back, which is logistically unfeasible. This option is removed from consideration for both the railcar and truck unloading areas. Watering the area makes the movement of raw materials more difficult, so that option is eliminated from consideration.

Step 5: Selection of BACT
For fugitive particulate matter emissions from Truck/Rail Unloading (Source ID Codes FUG1 and FUG2), BACT has been selected as:

1. Open-ended structure with Air Knives and Fog Dust Suppression System to prevent fugitive emissions during periods of active railcar unloading, and collecting fugitive unloading emissions to vent to baghouse DC31;
2. Partial Enclosure with plastic curtains closed across the openings during periods of active truck unloading; and
3. Good Housekeeping Practices to clean up material spills, minimize road dust, and maintain speed limits.

<u>EPD Review of BACT for fugitive PM emissions from Truck/Rail Unloading</u>
As none of the remaining options from Step 3 are classified as add-on control equipment, any combination of the above-listed would assist in reducing fugitive PM emissions to some degree. A search of the RBLC found that BACT requirements for fugitive PM emissions from coal/pet coke unloading operations (process code 90.011) have included enclosed railcar unloading stations kept with negative pressure, covered conveyors, and enclosed transfer points. As discussed above, the facility cannot accommodate enclosed railcar unloading stations. The facility did consider railcar unloading sealing boots, but provided data that show that air knives can comparably reduce fugitive emissions. The facility will have covered conveyors and enclosed transfer points. EPD agrees that the combination of these proposed BACT listed above will reasonably reduce fugitive PM emissions from the truck/rail unloading area.

4.2.2 Fugitive Particulate Matter Emissions – Green Pet Coke Storage Pile and Spent Lime Truck Loadout

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce fugitive PM emissions from the storage pile. Fugitives are generated from material drops associated with the Pile Stacker and from wind erosion of the pile. Fugitives can be created when the facility loads spent lime from the dry scrubber from storage silos into trucks for removal from the site. Covered conveyor emissions are included elsewhere.

- Total Enclosure - See 4.2.1 “Total Enclosure”
- Wind Screens and/or Partial Enclosure - See 4.2.1 “Wind Screens and/or Partial Enclosure”
- Water Sprays or Wet Suppression - See 4.2.1 “Water Sprays or Wet Suppression”
- Good Housekeeping Practices - See 4.2.1 “Good Housekeeping Practices”

Step 2: Eliminate Technically Infeasible Options
The height of the storage pile may reach 42 feet, which means the construction of a wall or screens would be impractical. Additionally, the wind blows from all directions throughout the year, so a wall or partial enclosure would not be effective during certain times of the year. Therefore, partial enclosures are not a viable option. Furthermore, due to the Pile Stacker needing continuous access to the storage pile, a domed total enclosure would also be impractical, as well as uneconomical, due to the size of the structure needed and the potential control of less than 2 tpy fugitive PM emissions estimated from wind erosion.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Water Sprays or Wet Suppression
2. Good Housekeeping Practices

Step 4: Evaluate Remaining Control Technologies
Either of the remaining options in Step 3 would assist in reducing fugitive PM emissions. A search of the RBLC did not turn up any BACT determinations for pet coke storage piles; however, there were entries for scrap steel, slag, and coal piles. Determinations included full or partial enclosures, wetting of the pile, and minimizing material handling.

Step 5: Selection of BACT
For fugitive particulate matter emissions from Green Pet Coke Storage Pile and Spent Lime Truck Loadout (Source ID Codes DRP1, DRP2, GATH, STOR, and SLLF), BACT has been selected as:

1. Water Spray (as needed if rain is not sufficient); and
2. Good Housekeeping Practices to include sweeping up the pile pad and cleaning up material spills.

<u>EPD Review of BACT for fugitive PM emissions from Green Pet Coke Storage Pile</u>
As none of the remaining options from Step 3 are classified as add-on control equipment, any combination of the above-listed would assist in reducing fugitive PM emissions to some degree. A search of the RBLC found that BACT requirements for fugitive PM emissions from fugitive dust sources (process code 90.190) have included baghouses, wet suppression, good operational practices, and minimal handling. Most of the sources in the RBLC are ash or finer products. As green pet coke tends to consist of larger pieces and requires effort to break up, EPD concurs that a baghouse/filter bag is not necessary. The proposed BACT includes wet suppression and good housekeeping practices. EPD agrees that the combination of these proposed work practices will reasonably reduce fugitive PM emissions from the green pet coke storage area and spent lime loadout.

4.2.3 Process Particulate Matter Emissions – Material Delivery, Handling, Storage, and Transport Operations

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from these processes. Conveyors are used to transfer raw materials from the material storage building or stockpile into a loading hopper that feeds an enclosed conveyor system. In addition to raw material unloading and storage, emissions are also generated from material drops associated with hoppers, bucket elevators, crushers, and reject material transfers.

- Fabric Filter/Baghouse - A baghouse involves the use of fabric bags where particulate-laden gas is drawn through the bags (or outside of the bags) and forms a layer of dust on the filter media. Local collection hoods and fabric filters are the industry standard for particulate controls and the most efficient means of removing varying sizes of particulate material. An additional advantage of using local collection hoods and baghouses is that air flows can be adjusted individually to accommodate changes in the dust loading. The best results are obtained when the fabric filter's velocity is controlled for the emission characteristics (air-to-cloth ratio) and providing additional capacity to handle the baghouse's cleaning cycle. The primary method of particle leakage is through pores in the filter that are not covered with the filter cake. The velocity of the exhaust through the pores is high, entraining both small and large particles. Once a filter cake forms, only a few pores remain and the filter must be cleaned or replaced. Baghouses are highly efficient in particulate matter removal, commonly designed with a 99.9% collection efficiency, or an exit concentration as low as 0.001 gr/dscf.
- Covered Conveyors and Enclosed Transfer Points – Covered conveyor systems prevent airflow from lifting dust from raw materials as they are moved on a conveyor belt. Similarly, enclosed transfer points work to isolate material drop points between conveyors from the surrounding conditions. Enclosed transfer points are typically designed with minimized material drop heights to reduce dust generated by materials being transferred. Covered conveyors are frequently used when conveyor systems are designed for dry materials. Covered conveyor systems and enclosed transfer points can effectively reduce particulate emissions by 95%.
- Wind Screens and/or Partial Enclosure - Screen walls and other structures to shelter material handling operations from wind effect has been shown to provide a reduction in airborne dust from such operations. Partial enclosures are most effective and practical at dedicated loading and unloading points. The reduction in particulate emissions varies, depending on the material and local weather conditions, but could be 50-75% efficient.
- Water Sprays or Wet Suppression - See 4.2.1 "Water Sprays or Wet Suppression"
- Good Housekeeping Practices - See 4.2.1 "Good Housekeeping Practices"

Step 2: Eliminate Technically Infeasible Options
The conveyor system requires that the material it is moving be kept dry to prevent clogging; therefore, water sprays and wet suppression of the raw materials is infeasible.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Fabric Filter/Baghouses
2. Local Collection Hoods
3. Covered Conveyors and Enclosed Transfer Points
4. Wind Screens and /or Partial Enclosures
5. Good Housekeeping Practices

Step 4: Evaluate Remaining Control Technologies

Wind screens and partial enclosures are effective at blocking wind which both entrains and carries dust and particulate away from the source. The green pet coke is delivered as large clumps and is not prone to entrainment.

Local collection hoods and fabric filters/baghouses are an industry standard for filterable TSP, PM_{10}, and $PM_{2.5}$ emission control in many applications and can be effectively applied to most dry dust sources. Fabric filters often are capable of 99% or greater removal efficiencies that are relatively consistent across the particle size range so that excellent control of all particle sizes can be obtained.

Covered conveyors and enclosed transfer points prevent strong air flows from lifting dust from raw materials as they are moved on a conveyor belt. Enclosed conveyors and transfer stations are frequently used when conveyor systems are designed for dry materials.

Good housekeeping practices can be applied to material handling operations. Paved roads and paved material handling areas would help suppress vehicular dust. Speed limits would prevent loose materials from becoming airborne during transportation.

Step 5: Selection of BACT

For filterable process particulate matter emissions from Material Delivery, Handling, Storage, and Transport Operations (Baghouse Source ID Codes DC01, DC02, DC30, DC31, DC33 through DC40, and DC51 through DC54), BACT has been selected as:

1. Fabric Filter/Baghouses – filterable TSP controlled to an exhaust concentration of 0.005 gr/dscf;
2. Use of Wind Screens and/or Partial Enclosures where appropriate;
3. Local Collection Hoods;
4. Covered Conveyors and Enclosed Transfer Points; and
5. Good Housekeeping Practices, to include minimizing road dust, maintaining speed limits, and cleaning up spills.

<u>EPD Review of BACT for filterable process PM emissions from Material Delivery, Handling, Storage, and Transport Operations</u>

EPD accepts fabric filter/baghouses as BACT for filterable TSP, PM_{10}, and $PM_{2.5}$ emissions, and agrees that a filterable TSP limit of 0.005 gr/dscf satisfies BACT. Compliance will be determined through an initial stack test of representative sources, documentation of filter efficiency guarantee, weekly pressure drop monitoring, weekly visible emissions checks, and requirements for having replacement parts for the dry particulate filtration systems. On-going testing will occur every 24 months on representative sources in order to establish appropriate monitoring parameters and demonstrate compliance with the emissions limitation. EPD agrees that the combination of these proposed work practices will further reduce filterable process particulate matter emissions from the material delivery and handling/transport area.

4.2.4 Vent Particulate Matter Emissions – Storage Silos

Step 1: Identify all Available Control Technologies

The BACT Analysis identifies the following control technologies that could reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from the material handling vents associated with materials handling, storage, and transfer. The activities include loading raw materials into a hopper, transferring materials on conveyors, loading materials into silos, transporting fresh lime to the scrubbers and spent lime from the scrubbers, and performing milling and sizing operations.

- Fabric Filter/Baghouse - See 4.2.3 “Fabric Filter/Baghouse”
- Fabric Filter/Silo Bin Vents – Silos are often equipped with vents that use back-pulsing of the filters with compressed air for cleaning. These filters do indeed control dust, but primarily the vent allows a pressure release during the filling process and prevents the loss of material during filling and conveying. There is no fan to draw the material through the media. Additionally, captured media is returned to the process and not discarded as waste. As with baghouses, bin vents are highly efficient in particulate matter removal, commonly designed with a 95-99+% collection efficiency, or to an outlet concentration of 0.001 gr/dscf.
- Covered Conveyors and Enclosed Transfer Points - See 4.2.3 “Covered Conveyors and Enclosed Transfer Points”
- Water Sprays or Wet Suppression - See 4.2.1 “Water Sprays or Wet Suppression”
- Good Housekeeping Practices - See 4.2.1 “Good Housekeeping Practices”

Step 2: Eliminate Technically Infeasible Options

The conveyor system requires that the material it is moving be kept dry to prevent clogging; therefore, water sprays or wet suppression of the raw materials transfer and conveying is infeasible.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Fabric Filter/Baghouses
2. Fabric Filter/Silo Bin Vents
3. Covered Conveyors and Enclosed Transfer Points
4. Good Housekeeping Practices

Step 4: Evaluate Remaining Control Technologies
Local collection hoods and fabric filters/baghouses are an industry standard for filterable TSP, PM_{10}, and $PM_{2.5}$ control in many applications and can be effectively applied to most dry dust sources. Fabric filters often are capable of 99% or greater removal efficiencies that are relatively consistent across the particle size range so that excellent control of all particle sizes can be obtained.

Silo bin vents are integral equipment to the silos and are used for product recovery, which does reduce what would otherwise be fugitive emissions. The bin vent filters separate the pulsed air from the material being stored, which allows proper filling of the silo, recovers the material, and avoids critical loss of product.

Enclosed conveyors and transfer stations prevent strong air flows from lifting dust from raw materials as they are moved on a conveyor belt. Covered conveyors and enclosed transfer points are frequently used when conveyor systems are designed for dry materials.

Good housekeeping practices can be applied to material handling operations by sweeping process and storage areas periodically to remove dust.

Step 5: Selection of BACT
For filterable particulate matter vent emissions from the Storage Silos (Baghouse Source ID Codes DC03 through DC29, DC41 through DC49, and DC55 through DC58), BACT has been selected as:

1. Fabric Filter/Silo Bin Vents – filterable TSP controlled to an exhaust concentration of 0.005 gr/dscf;
2. Covered Conveyors and Enclosed Transfer Points; and
3. Good Housekeeping Practices to include sweeping and cleaning up spills.

<u>EPD Review of BACT for vent PM emissions from Storage Silos</u>
EPD accepts fabric filters/silo bin vents as BACT for filterable TSP, PM_{10}, and $PM_{2.5}$ emissions, and agrees that a filterable TSP limit of 0.005 gr/dscf satisfies BACT. Compliance will be determined through maintenance checks and requirements for having replacement parts for the dry particulate filtration systems, as these are not classified as air pollution control equipment, but rather inherent process equipment. EPD agrees that the combination of these proposed work practices will further reduce filterable process particulate matter emissions from the storage silos.

4.2.5 Process Particulate Matter Emissions – Coke Milling

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from the conveying of crushed green pet coke from the stockpiles to the milling system to be milled to an average particle size of 5 to 20 microns.

- Fabric Filter/Baghouse - See 4.2.3 “Fabric Filter/Baghouse”

- Wet Scrubber or high efficiency Venturi Scrubber - Wet scrubbers use liquid spray to remove particles and acid gases from a waste gas stream. The primary function of wet scrubbers is to remove gaseous emissions, with a secondary function of particulate removal. Removal of pollutants is achieved through impaction, diffusion, interception, and/or absorption of the pollutant onto droplets of liquid. Wet scrubbers can be designed in many different configurations. High efficiency Venturi scrubbers utilize a downdraft of air to push the particulates into contact with the water droplets. Wet scrubbers offer an advantage over baghouses or other dry filters for the control of odors and the removal of condensable particulate. Although VOC control efficiency would not be claimed at this site, wet scrubbers are capable of reducing VOC emissions as well. The control efficiency for wet scrubber is typically 99.9%, while the control efficiency for Venturi scrubbers could achieve 99% with an outlet loading of 0.01 gr/dscf.
- Electrostatic Precipitator ("ESP") - An ESP involves use of the force created by an induced electrostatic charge to remove particulate matter from a gas stream. The charged particles are collected on plates and loosened from the plates during the cleaning process, dislodged by vibrating or rapping. The dust is collected in a hopper at the bottom of the ESP. ESPs are considered highly efficient in particulate matter collection because energy is applied directly to the particulate-laden gas stream; however, the documented efficiency is lower than baghouses, coming in around 97-99%. Dry ESPs are not designed to collect condensable particulate matter, which may clog the ESP, remain attached to the plates, and possibly short out the unit.
- Wet Electrostatic Precipitator ("WESP") - Wet ESPs are used in situations for which dry ESPs are not suitable, such as when the emissions are wet, sticky, or have a high resistivity. Liquid particles or aerosols present in the gas stream can be collected along with dry particles; however, consideration must be given to handling the resulting wastewater stream. The control efficiency is the same as a dry ESP.
- High Efficiency Cyclone - This type of particulate control technology is typically utilized to remove large particles - greater than 8-10 microns in aerodynamic diameter – through centrifugal and inertial forces induced by mechanically accelerating the particle-laden gas stream. Control efficiencies are lower than other options, with 80-99% for total PM, or 60-95% for PM_{10}.

Step 2: Eliminate Technically Infeasible Options

There were no BACT determinations found in the RBLC that include the use of an ESP or WESP to control particulate matter emissions from graphite manufacturing plants, so these types of controls can be considered technically infeasible.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Fabric filter/Baghouses
2. High Efficiency Cyclone
3. Wet Scrubber or high efficiency Venturi Scrubber

Step 4: Evaluate Remaining Control Technologies
Fabric filters/baghouses are an industry standard for filterable TSP, PM_{10}, and $PM_{2.5}$ emissions control in many applications and can be effectively applied to most dry dust sources. Fabric filters often are capable of 99% or greater removal efficiencies that are relatively consistent across the particle size range so that excellent control of all particle sizes can be obtained. An RBLC search for BACT emission limits for coal milling pulverizing, and grinding activities indicate that the typical concentration established as BACT range from 0.004 gr/dscf to 0.02 gr/dscf. The sources tend to be coal, which is used as a surrogate for pet coke in this instance. The most stringent PM emission limitations are achieved by using baghouses as the add-on control technology.

Although a wet scrubber is technically feasible, it would not be as cost effective as the fabric filter/baghouse. The use of a scrubber would result in the creation of a waste sludge for disposal and an increased amount of wastewater requiring treatment.

Cyclones are used primarily for pretreatment control devices and are not effective in removing small particles, achieving only 30% control for PM_{10}. Therefore, cyclones are not considered to be “best” available control technology. Cyclones are eliminated from further consideration.

Step 5: Selection of BACT
For filterable process particulate matter emissions from Coke Milling (Baghouse Source ID Codes DC32 and DC50), BACT has been selected as:

1. Fabric Filters/Baghouses – filterable TSP controlled to an exhaust concentration of 0.005 gr/dscf.

<u>EPD Review of BACT for process PM emissions from Coke Milling</u>
EPD accepts fabric filter/baghouses as BACT for filterable TSP, PM_{10}, and $PM_{2.5}$ emissions, and agrees that a filterable TSP limit of 0.005 gr/dscf satisfies BACT. Compliance will be determined through an initial stack test of these baghouses, documentation of filter efficiency guarantee, daily pressure drop monitoring, weekly visible emissions checks, and requirements for having replacement parts for the dry particulate filtration systems. On-going testing will occur every 24 months in order to establish appropriate monitoring parameters and demonstrate compliance with the emissions limitation.

4.2.6 Combustion Particulate Matter Emissions – Calcining/Carbonizing Kilns

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce filterable PM emissions from the use of thermal oxidizers that control VOC emissions from both calcining and carbonizing kilns. .

- Fabric Filter/Baghouse - See 4.2.3 “Fabric Filter/Baghouse”
- Wet Scrubber or high efficiency Venturi Scrubber - See 4.2.5 “Wet Scrubber or high efficiency Venturi Scrubber”
- Electrostatic Precipitator (ESP) - See 4.2.5 “Electrostatic Precipitator (ESP)”
- Wet Electrostatic Precipitator (WESP) - See 4.2.5 “Wet Electrostatic Precipitator (WESP)”
- High Efficiency Cyclone - See 4.2.5 “High Efficiency Cyclone”

- Good Combustion Practices – Good combustion practices can include annual burner tune-ups to assure complete combustion in the chambers, plus the use of an inherently clean burning fuel in the thermal oxidizers.

Step 2: Eliminate Technically Infeasible Options
There are no known add-on control devices for PM emissions from electrically heated coke calcining kilns. Additionally, the outlet total PM concentration is calculated to be lower than control equipment manufacturer's guarantees, which makes a control device unnecessary.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Good combustion practices

Step 4: Evaluate Remaining Control Technologies
Annual burner tune-ups help to ensure complete combustion in the oxidizer chamber. Natural gas is considered to be a clean burning fuel.

Step 5: Selection of BACT
For filterable particulate matter combustion emissions from Calcining and Carbonizing (Thermal Oxidizer ID Codes TO01, TO02, TO03, and TO04), BACT has been selected as:

1. Good Combustion Practices, to include annual burner tune-ups and the use of natural gas.

<u>EPD Review of BACT for combustion PM emissions from Calcining/Carbonizing</u>
EPD accepts good combustion practices as BACT for filterable PM combustion emissions, to include annual tune-ups for the burners (as outlined by the manufacturer) and the use of natural gas. Natural gas is an inherently clean-burning fuel which minimizes filterable PM emissions. Additionally, the small sizes of the burners indicate that minimal natural gas will be used for these units, calculated at less than 45 MMscf per year.

4.2.7 Process Particulate Matter Emissions – Graphitization Furnaces

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from the graphitization process.

- Dry Filtration – Dry filtration incorporates baghouses, but also includes other technologies that remove dry particles from gas streams. Filters in these systems may be reuseable or disposable. Reusable filters can be cleaned by mechanical shaking, reversing the air flow, or pulsing the air flow, while disposable filters must be replaced when the PM loading is such that the pressure drop exceeds a specified level. Design efficiencies range from 0.005 gr/dscf to 0.01 gr/dscf. These systems are suited to controlling emissions from sources with low exhaust flow rates and intermittent exhaust streams.
- Wet Scrubber or high efficiency Venturi Scrubber - See 4.2.5 "Wet Scrubber or high efficiency Venturi Scrubber"
- Electrostatic Precipitator (ESP) - See 4.2.5 "Electrostatic Precipitator (ESP)"
- Wet Electrostatic Precipitator (WESP) - See 4.2.5 "Wet Electrostatic Precipitator (WESP)"
- High Efficiency Cyclone - See 4.2.5 "High Efficiency Cyclone"

- Circulating Fluidized Bed Scrubber – See 4.1.2 “Circulating Fluidized Bed Scrubber”

Step 2: Eliminate Technically Infeasible Options
There were no BACT determinations found in the RBLC that include the use of an ESP or WESP to control particulate matter emissions from graphite manufacturing plants, so these types of controls can be considered technically infeasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Fabric Filter/Baghouses
2. Wet Scrubber or High Efficiency Venturi Scrubber
3. High Efficiency Cyclone
4. Circulating Fluidized Bed Scrubber

Step 4: Evaluate Remaining Control Technologies
Fabric filters/baghouses are an industry standard for filterable TSP, PM_{10}, and $PM_{2.5}$ control in many applications and can be effectively applied to most dry dust sources. Fabric filters often are capable of 99% or greater removal efficiencies that are relatively consistent across the particle size range so that excellent control of all particle sizes can be obtained.

Cyclones are used primarily for pretreatment control devices and are not effective in removing small particles, achieving only 30% control for PM_{10}. Therefore, cyclones are not considered to be “best” available control technology. Cyclones are eliminated from further consideration.

A wet scrubber will result in a liquid/slurry waste stream, which would require both solid and wet waste disposal and wastewater treatment prior to discharge from the facility. Therefore, wet scrubbers were removed from consideration.

The facility will be installing two Circulating Fluidized Bed Scrubber systems for the control of SO_2 emissions from these graphitization furnaces. As scrubbers are also a baseline listed control technology for the control of particulate matter emissions, this will be the most cost-effective option for PM control. The facility asserts that the scrubbers can control the same concentration as fabric filter/baghouses; therefore, no further filterable TSP, PM_{10}, and $PM_{2.5}$ emissions control is necessary.

Step 5: Selection of BACT
For filterable process particulate matter emissions from Graphitization Furnaces (Source ID Codes GR01 and GR02), BACT has been selected as:

1. Circulating Fluidized Bed Scrubber Systems SCR1 and SCR2 – controlled to an exhaust concentration of 0.005 gr/dscf for filterable TSP.

EPD Review of BACT for process PM emissions from Graphitization Furnaces

EPD accepts the use of Circulating Fluidized Bed Scrubber Systems SCR1 and SCR2 as BACT for filterable TSP, PM_{10}, and $PM_{2.5}$ emissions, and agrees that an exhaust loading of 0.005 gr/dscf filterable TSP satisfies BACT. Compliance will be determined through an initial stack test at representative production rates, continuous fluidized bed pressure loss across the system, fresh lime feed rate, and evidence of proper lime recirculating rate monitoring for the scrubber systems. Subsequent testing will occur every 12 months. EPD is in agreement that the scrubber systems satisfy requirements for both filterable PM emissions control, as well as SO_2 emissions control.

4.2.8 Combustion Particulate Matter Emissions – Emergency Engines and Fire Pumps

Step 1: Identify all Available Control Technologies

Ash and metallic additives in fuel contribute to the particulate content of the exhaust from internal combustion engines. The BACT Analysis identifies the following control technologies that could reduce filterable TSP, PM_{10}, and $PM_{2.5}$ emissions from combustion in IC engines.

- Good Engine Design – Diesel emergency engines are certified to meet the required EPA emission standards based on the model year and size.
- Good Combustion Practices – Good combustion practices are used to reduce PM emissions by optimizing conditions in the combustion zone of a fuel-burning source. These practices can include introducing the proper ratio of combustion air to the fuel, maintaining a minimum temperature in the firebox, and maintaining a minimum residence time of fuel and air in the combustion zone.

Step 2: Eliminate Technically Infeasible Options

Both options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Good Engine Design
2. Good Combustion Practices

Step 4: Evaluate Remaining Control Technologies

Current BACT guidelines for acceptable PM emissions from diesel-fired fire pumps and emergency generators meet the requirements of 40 CFR 60 Subpart IIII. Therefore, the use of a certified engine with good combustion practices can be considered BACT.

Step 5: Selection of BACT

For combustion particulate matter emissions from Emergency Generators and Fire Pumps (Source ID Codes EG01, EG02, FP01, and FP02), BACT has been selected as:

1. Good engine design and certifying engines to be in compliance with 40 CFR 60 Subpart IIII; and
2. Good operation, maintenance, and combustion practices

EPD Review of BACT for combustion PM emissions from Emergency Engines/Fire Pumps

EPD agrees that certifying engines to 40 CFR 60 Subpart IIII and good operation and maintenance practices satisfies filterable PM BACT for combustion emissions from emergency engines and fire pumps.

4.2.9 Fugitive Particulate Matter Emissions – Cooling Towers

Step 1: Identify all Available Control Technologies
Drift is the amount of mist produced by the tower. The BACT Analysis identifies the following control technologies that could reduce fugitive PM emissions from cooling towers.

- High Efficiency Mist Eliminators – Mist eliminators are the most used control technique for PM emissions from cooling towers.
- Good Operational Practices

Step 2: Eliminate Technically Infeasible Options
Both options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. High Efficiency Mist Eliminators
2. Good Operational Practices

Step 4: Evaluate Remaining Control Technologies
Mist eliminators are typically incorporated into cooling tower design to prevent water droplets from leaving the tower, thus reducing PM emissions. The only alternative would be to reduce the solids content of the water, either by water treatment or by reducing the cycle of concentration, which would increase the blow down discharge and make-up water requirements of the towers.

Step 5: Selection of BACT
For fugitive particulate matter emissions from Cooling Towers (Source ID Codes BB01, BB02, BB1G, BB2G, BB1C, and BBGA), BACT has been selected as:

1. Mist Eliminators with a drift rate of 0.005% of the water circulation rate.

<u>EPD Review of BACT for fugitive PM emissions from Cooling towers</u>
EPD agrees that a cooling tower design with a drift rate of 0.005% is acceptable for BACT for this facility. Total dissolved solids are calculated at 2,000 ppmw.

Table 4.2.2: Summary of BACT for filterable PM Emissions

Process/Equipment Source ID Code	Control Method for filterable PM	Proposed filterable PM BACT Limit
Fugitive – Rail/truck Unloading and Green Pet Coke Storage Pile: FUG1, FUG2, DRP1, DRP2, GATH, STOR, and SLLF	Open shed with air knives and fog dust suppression system during periods of active unloading emissions vented to Baghouse DC31; Partial enclosure for truck unloading, with plastic curtains across the opening during periods of active unloading; Water suppression of the storage pile (as needed); Good Housekeeping Practices to include clean-up of any spill, minimizing road dust, maintaining speed limits, and sweeping of the pile pad.	None Total fugitive emissions estimated at 8 tpy; the listed BACT work practice methods should reduce this emission rate.
Process Emissions from Material Delivery, Handling, Storage, and Transport Operations	Fabric filters/ baghouses DC01, DC02, DC30, DC31, DC39, DC40, DC33 through DC38, DC51 through DC54; Covered conveyors and enclosed transfer points; Good Housekeeping Practices to include clean-up of any spills or sweeping of the pile pad and speed limits/maintaining roads.	0.005 gr/dscf each unit Process emissions calculated at 10.24 tpy from all 16 emission points after BACT controls. Listed work practice methods should further reduce emissions.
Vent Emissions from Storage Silos	Fabric filters/bin vent filters DC03-DC29, DC41-DC49, and DC55-DC58; Covered conveyors and enclosed transfer points (as appropriate); Good Housekeeping Practices to include sweeping and clean-up of spills.	0.005 gr/dscf each unit Vent emissions calculated at 7.2 tpy from all 40 emission points after BACT controls. Listed work practice methods should further reduce emissions.

Process/Equipment Source ID Code	**Control Method for filterable PM**	**Proposed filterable PM BACT Limit**
Process Emissions from Coke Milling	Fabric filters/Baghouses DC32 and DC50	0.005 gr/dscf each unit Process emissions calculated at 2.21 tpy from both emission points after BACT controls.
Combustion Emissions from Calcining Kilns CK01 through CK06 - Thermal Oxidizers TO01, TO02, and TO03	Good Combustion Practices; Use of natural gas; Annual burner tune-ups.	0.01 lb/hr each unit Combustion PM emissions calculated at 0.12 tpy from all three thermal oxidizers
Combustion Emissions from Carbonizing Kilns CAK1 and CAK2 - Thermal Oxidizer TO04	Good Combustion Practices; Use of natural gas; Annual burner tune-ups.	0.01 lb/hr Combustion PM emissions calculated at 0.03 tpy.
Process Emissions from Graphitization Furnaces GR01 and GR02	Scrubbers SCR1 and SCR2	0.005 gr/dscf each unit Process emissions calculated at 30.15 tpy after BACT controls.
Combustion Emissions from Emergency Generators and Fire Pumps EG01, EG02, FP01, and FP02	Use of EPA certified engines per requirements of NSPS IIII; Good Operation, Combustion, and Maintenance Practices.	40 CFR 60 Subpart IIII Combustion emissions calculated at 0.55 tpy from all four units.
Fugitive Emissions from Cooling Towers BB01, BB02, BB1G, BB2G, BB1C, and BBGA	Mist Eliminators	0.005% drift loss Fugitive emissions calculated at 4.54 tpy (based on 2,000 ppmw TDS) from all six towers.

4.3 CARBON MONOXIDE - CO

The proposed project includes several process areas that are subject to PSD review and have carbon monoxide (CO) emissions requiring a BACT evaluation. The emissions could be from process areas or combustion sources.

Calcining/Carbonizing Kilns
CO emissions are generated as a result of incomplete combustion of the volatile constituents contained in the green pet coke and pitch incinerated in the kilns' thermal oxidizers. As material exits the jet mills, it is first heated up in the calcining kilns and naturally occurring volatiles are driven off. Later, pitch is applied to roughly 25% of the product as a secondary product, and about 50% of the volatiles from the pitch are also driven off. Additionally, CO emissions are generated in products of combustion for the natural gas-fired thermal oxidizers.

Graphitization Furnaces
CO emissions are generated from the contents of the furnace when the carbon in the coke is converted to graphite powder.

Emergency Generators and Fire Pumps
Two diesel-fired emergency generators and two diesel-fired fire pumps will be installed to pump water in case of power losses or fire. The fire pumps and emergency generators must meet the standards of 40 CFR 60 Subpart IIII and the emissions limitations were used as the basis for calculating the CO emissions.

Table 4.3.1: Pre-Control Potential Carbon Monoxide (CO) Emissions

Process Area/Equipment Description	Source ID Code	Estimated Maximum Annual CO Emissions without Add-on Control Devices (tpy)
Emissions from Calcining and Carbonizing Kilns (both primary and secondary products) CK01 through CK06, CAK1, and CAK2	TO01 TO02 TO03 TO04	20 20 20 2.7
Process Emissions from Graphitization Furnaces	GR01 GR02	1,455 1,455
Combustion Emissions from Emergency Generators and Fire Pumps	EG01 EG02 FP01 FP02	4.2 4.2 0.6 0.6

4.3.1 Carbon Monoxide Emissions – Calcining/Carbonizing Kilns

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce CO emissions from the pitch and green pet coke that is burned in both calcining and carbonizing kilns. Estimated CO emissions from the calcining and carbonizing kiln are minimal. This analysis looks at CO combustion emissions from the natural gas used to fire the four thermal oxidizers, as well as CO released from the combustion of VOC released from the calcining of the green pet coke, and the applied pitch to the secondary product before reentering the calcining kilns and a second coat of pitch applied before entering the carbonizing kilns.

The additional CO generated when VOC is released from the green pet coke and added pitch was calculated by a 75/25 split between the primary and secondary products, 8% VOC content in the green pet coke, 5% weight of pitch prior to calcining, and a kerosene-derived heating value of 19,862 MMBtu/lb heating value for the VOC released from the green pet coke. CO emissions from calcining both primary and secondary products, and from the pitch added to the secondary product, come to about 2.8 tons per year from each thermal oxidizer.

- Thermal Oxidization/Incineration – Thermal oxidizer/incineration is the process of oxidizing combustible materials by exposing the material to a temperature above its ignition point in the presence of oxygen for period of time needed to complete the combustion to carbon dioxide (CO_2) and water. CO destruction efficiency depends on many factors, including temperature, residence time, and inlet CO concentration. Typical thermal incinerator efficiencies range from 98-99.99% or higher.
- Regenerative Thermal Oxidation ("RTOs") – RTOs have the added benefit over thermal oxidizer systems of utilizing waste heat as supplemental fuel. Typical RTO efficiencies are lower than a straight incinerator and range from 95-99%. The lower efficiencies are associated with lower concentration flows. Waste streams with consistent high flow and low concentration are best suited to an RTO's economy of scale. Particulate matter emissions can clog the incinerator's packed bed and would have to be removed by an internal filter or other pretreatment. Test data for facilities using an RTO for CO control showed 80-90%, while vendor data has estimated a control efficiency of 97%.
- Regenerative Catalytic Oxidation ("RCOs") – RCOs operate in a similar manner as RTOs, except it uses a catalyst rather than ceramic material in the packed bed. The catalyst allows for destruction at a lower oxidization temperature. The catalyst is a precious metal and oxidization occurs around 800°F, which reduces the amount of fuel needed for the system and the size of the incinerator. Particulate matter emissions can clog the incinerator's packed bed and would have to be removed by an internal filter or other pretreatment.

Step 2: Eliminate Technically Infeasible Options
All options listed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Thermal Oxidization/Incineration
2. Regenerative Thermal Oxidization (RTO)
3. Regenerative Catalytic Oxidization (RCO)

Step 4: Evaluate Remaining Control Technologies
The high exhaust temperatures from the kilns and the lower gas flow rate render a regenerative unit unnecessary and the Regenerative Thermal Oxidizer (RTO) is therefore eliminated from consideration.

Due to the need for additional filtration to separate out the particulate emissions prior to the unit and the higher cost of the precious metal catalyst, Regenerative Catalytic Oxidization (RCO) is also removed from consideration.

The top control is oxidization as provided by direct-fired Thermal Oxidizers.

Step 5: Selection of BACT
For carbon monoxide emissions from Calcining and Carbonizing (Source ID Codes CK01 through CK06, CAK1, and CAK2), BACT has been selected as:

1. Direct-fired Thermal Oxidizers (TO01, TO02, TO03, and TO04), fired by natural gas;
2. 9.71 tons of CO during any consecutive twelve-month period for Thermal Oxidizer Source ID Codes TO01, TO02, and TO03; and
3. 0.82 tons of CO during any consecutive twelve-month period for Thermal Oxidizer Source ID Code TO04.

EPD Review of BACT for CO emissions from Calcining/Carbonizing
EPD accepts the use of natural gas-fired direct-fired Thermal Oxidizers as BACT for CO emissions. Natural gas is an inherently clean-burning fuel which minimizes CO emissions. Additionally, the small sizes of the burners indicate that minimal natural gas will be used for these units, calculated at less than 45 MMscf per year. Thermal oxidizers are the best option for capturing volatile components in the burn-off of the pitch applications as well. The facility will conduct annual tune-ups of all four thermal oxidizers as an on-going demonstration of compliance with the emission limitations. For the three calcining thermal oxidizers, compliance testing for VOC, NO_X, and CO emissions will establish an appropriate combustion temperature minimum/range, with subsequent testing occurring every 60 months.

4.3.2 Process Carbon Monoxide Emissions – Graphitization Furnaces

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce CO emissions from the graphitization process. CO is generated from the furnace contents as the carbon is driven off from the pet coke during the high temperature exposure.

- Thermal Oxidization/Incineration – See 4.3.1 “Thermal Oxidization/Incineration”
- Regenerative Thermal Oxidizer (RTOs) – See 4.3.1 “Regenerative Thermal Oxidation (RTOs)”
- Thermal Recuperative Oxidation (TRO) – These systems incorporate a heat exchanger with a combustion chamber and can handle a large range of process flow rate and concentration. A heat exchanger is used to preheat the CO-laden air prior to entering the combustion chamber to reduce operating costs.
- Regenerative Catalytic Oxidation (RCOs) – See 4.3.1 “Regenerative Catalytic Oxidation (RCOs)”
- Flares – Flares are a combustion control process where the CO gas stream is piped to a remote elevated location and burned in an open flame. Destruction efficiency depends on flame temperature, sufficient residence times, and fuel mixing.
- Good Operating Practices – The use of electricity to heat the furnaces versus fossil fuels is much cleaner and has fewer associated emissions.

Step 2: Eliminate Technically Infeasible Options
The high sulfur loading from the green pet coke could poison the catalyst in the Regenerative Catalytic Oxidizers (RCOs) and is deemed technically infeasible for the graphitization furnaces.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Good Operating Practices with utilization of electricity to heat the furnaces.
2. Regenerative Thermal Oxidizer (RTOs)
3. Incineration/Thermal Oxidizers
4. Flares

Step 4: Evaluate Remaining Control Technologies
Flares are typically recommended for use as safety devices and not as an add-on air pollution control device; therefore, they are eliminated from consideration.

Incinerator/Thermal Oxidizers are not as economical as a regenerative unit on an annualized basis since they do not recover waste heat energy from the waste gases. The waste gases can be used to pre-heat incoming air, which reduces the amount of supplement fuel required and increases the operating costs. Thermal oxidizers are eliminated from further consideration.

Regenerative Thermal Oxidizers (RTOs) have high initial costs and expensive installations. The facility did obtain a quote for two RTO systems with an estimated 98% CO destruction/removal efficiency. The quoted cost of $7,357,000 for both systems showed an approximate cost of $2,078 per ton of CO removed. However, any incineration unit would increase NO_X emissions by more than the current calculated facility-wide NO_X emissions rate (an increase of approximately 63 tons per year compared to the facility-wide calculated emissions at 44.6 tpy). As there is a linear relationship between reductions in ozone and reductions in NO_X formation, the control of CO emissions is not a net-positive environmental benefit.

Step 5: Selection of BACT
For process carbon monoxide emissions from Graphitization Furnaces (Source ID Codes: GR01 and GR02), combined BACT has been selected as:

1. Good Operating Practices to include the use of electricity to heat the furnaces; and
2. 2,910.1 tons of CO during any consecutive twelve-month period.

<u>EPD Review of BACT for process CO emissions from Graphitization Furnaces</u>
EPD accepts the use of electricity to power the furnaces as BACT for CO, and agrees that an uncontrolled limit of 2,910.1 tons per year satisfies BACT. Showa does not have an add-on control device, and a search of the RBLC shows no other applicable equipment for graphitization furnaces. (*Aside – the RBLC does state that the Showa facility added a wet scrubber as controls for CO from its graphitization furnaces, but the permit and preliminary determination do not reflect that; therefore, it is assumed this is an RBLC entry mistake.)*

As calculations in the application for CO emissions from these graphitization furnaces are based solely on an emissions factor that is documented only as "process knowledge," compliance will be determined through an initial stack test at representative production rates. Anovion can either establish its own site-specific emission factor or verify the accuracy of the 0.066 ton CO/ton graphite product produced emission factor, with repeated testing every 60 months (5 years).

4.3.3 Combustion Carbon Monoxide Emissions – Emergency Engines and Fire Pumps

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce CO emissions from combustion in internal combustion engines. Stationary diesel-fired emergency compression ignition internal combustion engines are sold as package units with an engineering design tailored to meet the emission limitations of 40 CFR 60 Subpart IIII and 63 Subpart ZZZZ. The manufacturer provides an engine that complies with these regulations, and the purchaser is expected to operate and maintain the unit to guarantee compliance with the applicable emission limitations.

- Good Engine Design – Diesel emergency engines are certified to meet the required EPA emission standards based on the model year and size.
- Good Combustion Practices – Good combustion practices are used to reduce PM emissions by optimizing conditions in the combustion zone of a fuel-burning source. These practices can include introducing the proper ratio of combustion air to the fuel, maintaining a minimum temperature in the firebox, and maintaining a minimum residence time of fuel and air in the combustion zone.

Step 2: Eliminate Technically Infeasible Options
Both options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Good Engine Design
2. Good Combustion Practices

Step 4: Evaluate Remaining Control Technologies
Current BACT guidelines for acceptable CO emissions from diesel-fired fire pumps and emergency generators meet the requirements of 40 CFR 60 Subpart IIII. Therefore, the use of a certified engine with good combustion practices can be considered BACT.

Step 5: Selection of BACT
For combustion carbon monoxide emissions from Emergency Generators and Fire Pumps (Source ID Codes EG01, EG02, FP01, and FP02), BACT has been selected as:

1. Good Engine Design and certifying engines to be in compliance with 40 CFR 60 Subpart IIII; and
2. Good Operation, Maintenance, and Combustion Practices.

<u>EPD Review of BACT for combustion CO emissions from Emergency Engines/Fire Pumps</u>
EPD agrees that certifying engines to 40 CFR 60 Subpart IIII and good operation and maintenance practices satisfies CO BACT for emergency engines and fire pumps. The RBLC does not indicate that there are sources with add-on control devices for the control of CO emissions from internal combustion engines.

Table 4.3.2: Summary of BACT for CO Emissions

Process/Equipment Source ID Code	Control Method for CO	Proposed CO BACT Limit
Combustion Emissions from Calcining Kilns CK01 through CK06	Thermal Oxidizers TO01 through TO03; Good Combustion Operation in the kiln oxidizers; Annual burner tune-ups.	9.71 tpy during any consecutive twelve-month period
Combustion Emissions from Carbonizing Kilns CAK1 and CAK2	Thermal Oxidizer TO04; Good Combustion Operation in the kiln oxidizer; Annual burner tune-ups.	0.82 tpy during any consecutive twelve-month period
Process Emissions from Graphitization Furnaces GR01 and GR02	Good Operating Practices, to include the use of electricity to heat the graphitization furnaces.	2,910.1 tpy during any consecutive twelve-month period
Combustion Emissions from Emergency Generators and Fire Pumps EG01, EG02, FP01, and FP02	Use of EPA certified engine per requirements of NSPS IIII; Good Operation and Maintenance Practices.	40 CFR 60 Subpart IIII Combustion emissions calculated at 9.6 tpy from all four units.

4.4 NITROGEN OXIDES – NO_X

The proposed project includes several process areas that are subject to PSD review and have nitrogen oxides (NO_X) emissions from process areas or combustion sources that require a BACT evaluation.

Calcining and Carbonizing Kilns
NO_X emissions from natural gas fuel combustion from the four thermal oxidizers were calculated from emission factors from AP-42, Section 1.4, based on burner sizes and 8,760 hours/year of operation. NO_X generated by the oxidizer's combustion of the volatile content in the pitch and the raw green pet coke were also calculated, as well as from the inert atmosphere.

Graphitization Furnaces
Nitrogen content in the raw materials contributes to NO_X emissions.

Support Equipment
Two diesel-fired emergency generators and two diesel-fired fire pumps will be installed to pump water in case of power losses or fire. The fire pumps and emergency generators must meet the standards of 40 CFR 60 Subpart IIII and the emissions limitations were used as the basis for calculating the NO_X emissions.

Table 4.4.1: Pre-Control Potential Nitrogen Oxides (NO_X) Emissions

Process Area/Equipment Description	Source ID Code	Estimated Maximum Annual Uncontrolled NO_X Emissions (tpy)
Combustion Emissions from Calcining Kilns CK01 through CK06	TO01 TO02 TO03	0.558 0.558 0.558
Combustion Emissions from Carbonizing Kilns CAK1and CAK2	TO04	0.336
Graphitization Furnaces	GR01 GR02	7.72 7.72
Combustion Emissions from Emergency Generators and Fire Pumps	EG01 EG02 FP01 FP02	7.72 7.72 1.05 1.05

4.4.1 Nitrogen Oxides Emissions – Calcining/Carbonizing Kilns

Step 1: Identify all Available Control Technologies

The BACT Analysis identifies the following control technologies that could reduce NO_X emissions from the use of thermal oxidizers that control VOC emissions from the pitch and green pet coke that is burned in both calcining and carbonizing kilns. This analysis looks at NO_X combustion emissions from the natural gas used to fire the four thermal oxidizers and NO_X released from the combustion of VOC released from the calcining of the green pet coke, as well as the applied pitch to the secondary product before reentering the calcining kilns and a second coat of pitch applied before entering the carbonizing kilns.

The NO_X emissions generated when VOC is released from the green pet coke and added pitch was calculated by a 75/25 split between the primary and secondary products, 8% VOC content in the green pet coke, 5% weight of pitch prior to calcining, and a kerosene-derived heating value of 19,862 MMBtu/lb heating value for the VOC released from the green pet coke. NO_X emissions from calcining both primary and secondary products, and from the pitch added to the secondary product, come to about 3.4 tons per year from each thermal oxidizer, as well as about 1.6 tons per year total for the NO_X products of combustion from the natural gas usage.

- Selective Catalytic Reduction ("SCR") – A reagent, typically ammonia or urea, is injected downstream of the combustion source. The reagent reacts with the NO_X in the gas stream, and then this reaction passes over a catalyst bed. This NO_X reduction chemical reaction results in the formation of nitrogen and water. The operating temperature range for these systems depends on catalyst type and gas stream composition and can vary from 480^{o}F to 800^{o}F. The unreacted ammonia (ammonia slip) can be emitted from the system at 5-10 ppm. These systems can control NO_X emissions with 70-95% efficiency.
- Selective Non-Catalytic Reduction ("SNCR") – This system is similar to SCR but does not contain a catalyst. The reagent is injected after the combustion source, usually in the source's radiant and convective regions. The combustion unit then acts as a reactor chamber for the nitrogen oxides and reagents. This reaction takes place in a higher operating range, more like 1600^{o}F to 2100^{o}F. These systems have a lower NO_X control efficiency of 30-65%.

- Low NO_X Burners – These burners reduce the amount of NO_X formation from combustion sources by limiting excess air and reducing peak flame temperature. The control efficiency varies and is difficult to generally quantify.
- Flue Gas Recirculation with Low NO_X Burners – These systems recirculate up to 20% of the source flue gas into the source combustion chamber to reduce peak temperature and lower the percentage of oxygen in the combustion air/flue gas mixture. This results in a decrease of thermal NO_X emissions due to a lower flame temperature.
- Good Combustion Practices – The combustion source would be operated within certain parameters promoting efficient and complete fuel combustion. These include good air/fuel mixing, sufficient residence time, proper fuel gas supply system design and operation to minimize the effect of contaminants and fluctuation in process and flow on the fuel gas quality delivered to the combustion units; and good burner maintenance and operation.

Step 2: Eliminate Technically Infeasible Options
The outlet NO_X concentration is calculated to be around 25 ppm. This low outlet concentration makes any add-on control device unnecessary. Therefore, both SCR and SNCR are eliminated from consideration. The use of Flue Gas Recirculation and Low NO_X Burners is not possible due to the flame type used in these direct-fired thermal oxidizers.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Good Combustion Practices

Step 4: Evaluate Remaining Control Technologies
The only control technology remaining is good combustion practices.

Step 5: Selection of BACT
For nitrogen oxides emissions from Calcining and Carbonizing Kilns (Source ID Codes CK01 through CK06, CAK1, and CAK2), BACT has been selected as:

1. Good Combustion Practices, to include good air/fuel mixing, sufficient residence time, proper fuel gas supply system design and operation to minimize the effect of contaminants and fluctuation in process and flow on the fuel gas quality delivered to the combustion units; and good burner maintenance and operation;
2. 11.56 tons of NO_X during any consecutive twelve-month period for Thermal Oxidizer Source ID Codes TO01, TO02, and TO03; and
3. 0.93 tons of NO_X during any consecutive twelve-month period for Thermal Oxidizer Source ID Code TO04.

<u>EPD Review of BACT for NO_X emissions from Calcining/Carbonizing</u>
EPD accepts the use of natural gas-fired direct-fired Thermal Oxidizers as BACT for NO_X emissions. Natural gas is an inherently clean-burning fuel which minimizes products of combustion NO_X emissions. Additionally, the small sizes of the burners indicate that minimal natural gas will be used for these units, calculated at less than 45 MMscf per year. Thermal oxidizers are the best option for capturing volatile components in the burn-off of the pitch applications as well. The facility will conduct annual tune-ups of all four thermal oxidizers as on-going demonstration of compliance with the emission limitations. For the three calcining thermal oxidizers, compliance testing for VOC, NO_X, and CO emissions will establish an appropriate combustion temperature minimum/range, with subsequent testing occurring every 60 months.

4.4.2 Process Nitrogen Oxides Emissions – Graphitization Furnaces

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce NO_X emissions from the graphitization process. NO_X is generated from the raw material contents.

- Selective Catalytic Reduction (SCR) – See Section 4.4.1 "Selective Catalytic Reduction (SCR)"
- Selective Non-Catalytic Reduction (SNCR) – See Section 4.4.1 "Selective Noncatalytic Reduction (SNCR)"
- Good Operating Practices - The source would be operated within parameters promoting efficient and economical operation. As these are electrical furnaces, no combustion emissions are anticipated.

Step 2: Eliminate Technically Infeasible Options
The outlet NO_X concentration is calculated to be around 5 ppm, which is lower than equipment manufacturer's guarantees and makes an add-on control device unnecessary. Therefore, both SCR and SNCR are eliminated from consideration.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Good Operating practices

Step 4: Evaluate Remaining Control Technologies
The only control technology remaining is Good Operating Practices.

Step 5: Selection of BACT
For nitrogen oxides emissions from Graphitization Furnaces (Source ID Codes GR01 and GR02), BACT has been selected as:

1. Good Operating Practices to include the use of electricity to heat the furnaces; and
2. 15.43 tons NO_X during any consecutive twelve-month period.

EPD Review of BACT for NO_X emissions from Graphitization Furnaces
EPD accepts the use of electricity to power the furnaces as BACT for NO_X, and agrees that an uncontrolled limit of 15.43 tons per year satisfies BACT. A search of the RBLC shows no other applicable add-on equipment for NO_X control from graphitization furnaces.

As calculations for NO_X emissions from these graphitization furnaces are based solely on an emission factor that is documented only as "process knowledge," compliance will be determined through an initial stack test at representative production rates. Anovion can either establish its own site-specific emission factor or verify the accuracy of the 0.00035 ton NO_X per ton graphite produced emission factor used in Application No. 28941. Due to the expected low emissions value, no subsequent testing is required at this time.

4.4.3 Combustion Nitrogen Oxides Emissions – Emergency Engines and Fire Pumps

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce NO_X emissions from combustion in internal combustion engines. Stationary diesel-fired emergency compression ignition internal combustion engines are sold as package units with an engineering design tailored to meet the emission limitations of 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ. The manufacturer provides an engine that complies with these regulations, and the purchaser is expected to operate and maintain the unit to guarantee compliance with the applicable emission limitations.

- Good Engine Design – Diesel emergency engines are certified to meet the required EPA emission standards based on the model year and size.
- Good Combustion Practices – Good combustion practices are used to reduce NO_X emissions by optimizing conditions in the combustion zone of a fuel-burning source. These practices can include introducing the proper ratio of combustion air to the fuel, maintaining a minimum temperature in the firebox, and maintaining a minimum residence time of fuel and air in the combustion zone.

Step 2: Eliminate Technically Infeasible Options
Both options discussed above are technically feasible.

Step 3: Rank Remaining Technically Feasible Control Technologies
1. Good Engine Design
2. Good Combustion Practices

Step 4: Evaluate Remaining Control Technologies
Current BACT guidelines for acceptable NO_X emissions from diesel-fired fire pumps and emergency generators meet the requirements of 40 CFR 60 Subpart IIII. Therefore, the use of a certified engine with good combustion practices can be considered BACT.

Step 5: Selection of BACT
For combustion carbon monoxide emissions from Emergency Generators and Fire Pumps (Source ID Codes EG01, EG02, FP01, and FP02), BACT has been selected as:

1. Good Engine Design and certifying engines to be in compliance with 40 CFR 60 Subpart IIII; and
2. Good Operation, Maintenance, and Combustion Practices.

<u>EPD Review of BACT for combustion NO_X emissions from Emergency Engines/Fire Pumps</u>
EPD agrees that certifying engines to 40 CFR 60 Subpart IIII and good operation and maintenance practices satisfies NO_X BACT for emergency engines and fire pumps. The RBLC does not indicate that there are sources with add-on control devices for the control of NO_X emissions from internal combustion engines.

Table 4.4.2: Summary of BACT for NO_X Emissions

Process/Equipment Source ID Code	Control Method	Proposed BACT Limit
Combustion Emissions Calcining Kilns CK01 through CK06 (TO01, TO02, and TO03)	Good Combustion Practices	11.56 tpy (for all 6 kilns) during any consecutive twelve-month period
Combustion Emissions from Carbonizing Kilns CAK1 and CAK2 (TO04)	Good Combustion Practices	0.93 tpy (for both kilns) during any consecutive twelve-month period
Process Emissions from Graphitization Furnaces: GR01 and GR02	Good Operating Practices	15.43 tpy during any consecutive twelve-month period
Combustion Emissions from Emergency Generators and Fire Pumps: EG01, EG02, FP01, and FP02	Good Operation and Maintenance Practices; Use of EPA certified engine per requirements of NSPS IIII.	40 CFR 60 Subpart IIII; Combustion emissions calculated at 17.54 tpy from all 4 units

4.5 VOLATILE ORGANIC COMPOUNDS – VOC

Calcining/Carbonizing Kilns

Green pet coke is calcined in electrically heated kilns at 1200^{o}C in an inert nitrogen atmosphere to drive off both water content and volatile constituents contained in the green pet coke and pitch These VOC compounds will be incinerated in the kilns' thermal oxidizers. As material exits the jet mills, it is first heated up in the calcining kilns and all naturally occurring volatiles are driven off. Later, pitch is applied to roughly 25% of the product as a secondary product, and about 50% of the volatiles from the pitch are also driven off. Additionally, VOC emissions are also generated in products of combustion for the natural gas-fired thermal oxidizers.

For the secondary product, after graphitization, petroleum pitch is applied a second time and this product enters the carbonizing kilns, which contributes additional VOC emissions.

Emergency Generators and Fire Pumps

Two diesel-fired emergency generators and two diesel-fired fire pumps will be installed to pump water in case of power losses or fire. The fire pumps and emergency generators must meet the standards of 40 CFR 60 Subpart IIII and the emissions limitations were used as the basis for calculating the VOC emissions.

Table 4.5.1: Pre-Control Potential Volatile Organic Compounds (VOC) Emissions

Process Area/Equipment Description	Source ID No	Estimated Maximum Annual VOC Emissions without Add-on Control Devices (tpy)
Calcining Kilns	CK01 CK02 CK03 CK04 CK05 CK06	600 600 600 600 600 600
Carbonizing Kilns	CAK1 CAK2	171.5 171.5
Emergency Generators and Fire Pumps	EG01 EG02 FP01 FP02	0.27 0.27 0.05 0.05

4.5.1 Volatile Organic Compound Emissions – Calcining/Carbonizing Kilns

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce VOC emissions from the pitch and green pet coke that is burned in both calcining and carbonizing kilns. Green pet coke for powdered product is milled before heating in the calcining kilns. Calcining of the green pet coke is conducted in electrically heated kilns at 1,200ºC in an inert nitrogen atmosphere which drives off the volatile components including water VOCs.

After graphitization, as part of production of the secondary product, petroleum-based pitch is applied a second time and the product is heated in the carbonizing kilns. Note that all moisture (water), VOC, and sulfur were driven out of the material during calcining and graphitization processes. However, additional VOC is generated from the heating of the second application of pitch in the carbonizing kilns.

The additional VOC released from the green pet coke and added pitch was calculated by a 75/25 split between the primary and secondary products, 8% VOC content in the green pet coke, 5% weight of pitch prior to calcining, and a kerosene-derived heating value of 19,862 MMBtu/lb heating value for the VOC released from the green pet coke. VOC emissions from calcining both primary and secondary products, and from the pitch added to the secondary product, come to about 3.5 tons per year from each thermal oxidizer.

- Thermal Oxidization/Incineration – Thermal oxidizer/incineration is the process of oxidizing combustible materials by exposing the material to a temperature above its ignition point in the presence of oxygen for period of time needed to complete the combustion to carbon dioxide (CO_2) and water. Thermal oxidizers can be used to reduce emissions from most VOC sources. Fuel consumption can be high, so thermal units are best suited for lower flow applications with moderate-to-high VOC loadings, with gas flow rates in the range of 500-50,000 standard cubic feet per minute (“scfm”).

VOC destruction efficiency depends on many factors, including chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing. Thermal incinerator efficiencies typically range from 98-99.99% or higher, depending on system requirements and characteristics of the gas stream. Design conditions needed to meet 98% or higher control, or 20 parts per million volume ("ppmv"), are 1,600^{o}F combustion temperature, 0.75 second residence time, and proper mixing.

Thermal oxidizers can be used over a wide range of organic vapor concentrations. Economically, oxidizers perform best at inlet VOC concentrations of 1,500-3,000 ppmv, but the lower explosive limit ("LEL") of the compound being controlled must be taken into consideration. Costs to operate can be high due to supplemental fuel costs. Oxidizers are more expensive on an annualized basis as recuperative or regenerative oxidizers since they do not recover waste heat energy from the exhaust gases.

Direct-fired thermal oxidizers work by taking in the process emissions and introducing them to a firing chamber through or near a burner operating at 1,800-2,200^{o}F. Airflow rates in the firing chamber range from 500-50,000 scfm. The emissions are contained in the chamber until the required destruction efficiency is reached. From a production and installation standpoint, these systems are among the least capital intensive; however operating costs can be higher since there is no form of heat recovery. The best environment for these units is to take in a high volume of VOC, enabling the unit to use those emissions as fuel source for complete combustion at the targeted operating temperature. Target applications include treatment of gas streams with a British thermal units per standard cubic foot ("btu/scf") value of 500 or greater.

- Recuperative Thermal Oxidation – These systems incorporate a heat exchanger with a combustion chamber and can handle a wide range of process flow rates and VOC concentrations. The heat exchanger is used to preheat the VOC-laden air prior to entering the combustion chamber to reduce operating costs.
- Regenerative Thermal Oxidizer (RTOs) – RTOs have the added benefit over thermal oxidizer systems of utilizing waste heat as supplemental fuel. VOC destruction efficiency depends on chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing. Typical RTO efficiencies are lower than a straight incinerator and range from 95-99%. The lower efficiencies are associated with lower concentration flows. Waste streams with consistent high flow (greater than 5,000 scfm) and lower VOC concentrations (less than 1,000 ppmv) are best suited to an RTO's economy of scale. Particulate matter emissions can clog the incinerator's packed bed and would have to be removed by an internal filter or other pretreatment.

  RTOs have been used effectively at inlet loadings as low as 100 ppmv. RTOs disadvantages include high initial costs with difficult and expensive installations; larger size and weight; and higher maintenance demand for moving parts. Consistent high flow, low concentration waste streams are most economically treated by an RTO.
- Regenerative Catalytic Oxidation (RCOs) – RCOs operate in a similar manner as RTOs, except it uses a catalyst rather than ceramic material in the packed bed. The catalyst allows for destruction at a lower oxidization temperature. The catalyst is a precious metal and oxidization occurs around 800^{o}F, which reduces the amount of fuel needed for the system and the size of the incinerator. Particulate matter emissions can clog the incinerator's packed bed and would have to be removed by an internal filter or other pretreatment.

Typical RCO design efficiencies range from 90-99%, depending on system requirements and characteristics of the waste stream. Lower efficiencies are associated with lower concentration flows. Like RTOs, PM would need to be removed by some pretreatment because it blocks active sites in the catalyst bed.

RCOs have been used effectively at inlet loadings as low as 100 ppmv. RCOs disadvantages include high initial costs with difficult and expensive installations; larger size and weight; and higher maintenance demand for moving parts. Consistent high flow, low concentration waste streams are most economically treated by an RCO.

- Flares - Flaring is a VOC combustion control process in which the VOC gas stream is piped to a remote location and burned in an open flame using a specifically designed burner tip, auxiliary fuel, and air to promote mixing for nearly complete VOC destruction. Gas flow rate can range from minimal flow to over 1,00,000 scfm. VOC destruction efficiency depends on flame temperature, sufficient residence time in the combustion zone, and turbulent mixing. A properly operated flare can achieve a destruction efficiency of 98+% with waste streams exceeding 300 BTU/SCF.

  Disadvantages of flares include possible undesirable noise/smoke/heat radiation/ light, as well as production of other pollutants; cannot treat streams with halogenated compounds; and heat cannot be recaptured. Flaring is best for streams without a consistent gas flow. Flares are typically used as a safety device and not as pollution control devices.
- Boilers – Emission streams are controlled in boilers and used as supplemental fuel when the streams have a fuel value greater than 150 btu/scf. There are limitations to the use of oilers as control devices since the boilers are essential to the operation of the facility. Only waste streams that will not affect boiler performance or reliability can be controlled.
- Adsorption/Carbon Filtration – Adsorption is a surface phenomenon where the attraction between an adsorbent (i.e., active carbon) and the adsorbate (i.e., VOC compounds) binds the pollutant to the carbon surface. The carbon and the VOC are chemically inactive after adsorption. The VOC may be desorbed from the carbon and reclaim or destroyed. Adsorbers can reduce inlet VOC concentrations from 400-2,000 ppm to less than 50 ppm. However, these systems are not as effective at lower concentrations, and if the concentrations are higher, a different control strategy would be more effective. The adsorption capacity is affected by the concentration of VOC, air flow rate, weight of adsorbent in the bed, type of adsorbent, and the working capacity of the adsorbent. A well-designed adsorber system can achieve 95-98% control efficiency at inlet VOC concentrations between 500 and 2,000 ppm.
- Absorption (Wet Scrubbing) – This technology is typically used when controlling inorganic gases. Typical gas flow rates for packed-bed wet scrubbers are 500-75,000 scfm, while for spray tower wet scrubbers the flow rate is 1,500-100,000 scfm. Removal efficiencies for gas absorbers vary for each pollutant/solvent system and with the type of absorber used. Most absorbers have removal efficiencies greater than 90%. Packed tower absorbers can range from 70-99+%, while spray tower absorbers have a wider range of 50-95%. Lower control efficiencies represent flows containing relatively insoluble compounds at low concentrations, while the higher efficiencies are for gas flows that contain readily soluble compounds in high concentrations.

Typical gas stream concentrations range from 250-10,000 ppmv. Effluent from the column may be recycled into the system and used again. The recycle stream may go to a treatment system to remove the pollutants or reaction product. Make-up solvent may then be added before the liquid stream reenters the column. Packed-bed wet scrubbers are limited to PM concentrations less than 0.20 gr/dscf to avoid clogging. Spray tower wet scrubbers are not as prone to fouling, but very high liquid-to-gas ratios may be needed to capture fine PM.
Packed-bed and spray tower disadvantages include water or liquid disposal issues. PM may cause pugging of the bed or plates and thus incur higher maintenance costs. Some materials are sensitive to temperature.

- Condensation – A refrigerated condenser is a control device that is used to condense a gaseous VOC emission stream to a liquid. Condensed organic vapors can then be recovered, refined, and reused, preventing their release into ambient air. Condensers are less effective on dilute streams and are typically used for controlling streams with VOC concentrations greater than 5,000 ppmv with flow rates of less than 2,000 scfm. Mechanical refrigeration with the condenser chilled by a brine heat exchanger can see control efficiencies of 50-90%. Using refrigerants in these systems can increase efficiency to 90+%. Cryogenic refrigeration can raise the upper limit of a condenser to 99% by having a cold side temperature as low as -352^{o}F. As efficiencies in refrigerated condensers are dependent on the lowest vapor pressure attained by the organic compounds, the lowest achievable temperature drives the efficiency of the system. However, refrigerated condensers can be very expensive.
- Biofilters and Trickling Bed Reactors – Biofilters use microorganisms to remove air pollutants as an air stream passes through a packed bed. The pollutant transfers into a thin biofilm on the surface of the packing material where microorganisms such as bacteria and fungi are located. These microorganisms then degrade the pollutant. Trickling filters and bioscrubbers use biofilm and inert media, such as glass and ceramics, and the bacterial action in their recirculation waters. Typical efficiencies in these systems are 50-90%.
- Good Work practices – Good work practices can minimize VOC emissions, such as storing VOC-containing materials in closed containers when not in use; transporting VOC materials in closed containers; minimizing spills of VOC-containing materials; and implementing current practices on the use of VOC-containing material.

Step 2: Eliminate Technically Infeasible Options
Recuperative thermal oxidizers have not been used in the graphite industry due to waste stream loading of less than 1,500 ppm and that these units are not suited for streams with variable flow. This system is therefore technically infeasible.

Regenerative catalytic oxidizers have not been used in the graphite industry because a suitable catalyst has not been identified. This system is not technically feasible.

Flares are eliminated from consideration because the heating value of waste stream is too low and the fact that flares are not recommended as add-on air pollution control devices.

Since the facility is designed to use electrically heated kilns and furnaces, installing a boiler just for the purpose of destroying VOC emissions makes this technology infeasible.

Wet scrubbers are used more commonly to control inorganic gases and are not always recommended for VOC control; therefore, this option is eliminated.

Carbon adsorbers are susceptible to fouling by particulate matter emissions in the process, which increases the need to replace the carbon beds. The recovered solvent is not reusable. Two waste streams would need to be disposed of; therefore, this option is eliminated.

Condensation is not practical given the low concentration of VOC in the gas stream and the high temperature that would need to be cooled. The power needed to cool the large volume of air would be cost prohibitive.

Biofiltration and trickling bed reactors have not been used in the graphite industry, and the emissions and waste streams in this process are not compatible. This option is also eliminated from consideration.

Step 3: Rank Remaining Technically Feasible Control Technologies

1. Thermal Oxidizer
2. Regenerative Thermal Oxidizer
3. Good Work Practices

Step 4: Evaluate Remaining Control Technologies

In many cases, regenerative thermal oxidizers (RTOs) provide the most efficient VOC control with the lowest operating costs. In this situation, though, due to the high exhaust temperature from the kilns and the low outlet flow rate, the need for a regenerative unit is not necessary.

The low natural gas input rate, lower cost, and lower system complexity favors the use of a direct-fired thermal oxidizer.

Step 5: Selection of BACT

For volatile organic compound emissions from Calcining and Carbonizing Kilns (Source ID Codes CK01 through CK06, CAK1, and CAK2), BACT has been selected as:

1. Direct-fired Thermal Oxidizers (TO01, TO02, TO03, and TO04), fired by natural gas;
2. 51.49 tons of VOC during any consecutive twelve-month month period for Thermal Oxidizer Source ID Codes TO01, TO02, and TO03; and
3. 3.45 tons of VOC during any consecutive twelve-month period for Thermal Oxidizer Source ID Code TO04.

<u>EPD Review of BACT for VOC emissions from Calcining/Carbonizing</u>

EPD accepts the use of direct-fired Thermal Oxidizers as BACT for VOC emissions from the calcining and carbonizing processes. Natural gas is an inherently clean-burning fuel which minimizes VOC emissions. Additionally, the small sizes of the burners indicate that minimal natural gas will be used for these units, calculated at less than 45 MMscf per year. Thermal oxidizers are the best option for capturing volatile components in the burn-off of the pitch applications as well. Thermal oxidizers are designed to destroy 99% of volatile compounds from the process. The facility will conduct annual tune-ups of all four thermal oxidizers as on-going demonstration of compliance with the emission limitations. For the three calcining thermal oxidizers, compliance testing for VOC, NO_X, and CO emissions will establish an appropriate combustion temperature minimum/range, with subsequent testing occurring every 60 months.

4.5.2 Combustion Volatile Organic Compound Emissions – Emergency Engines and Fire Pumps

Step 1: Identify all Available Control Technologies
The BACT Analysis identifies the following control technologies that could reduce VOC emissions from combustion in internal combustion engines. Stationary diesel-fired emergency compression ignition internal combustion engines are sold as package units with an engineering design tailored to meet the emission limitations of 40 CFR 60 Subpart IIII and 63 Subpart ZZZZ. The manufacturer provides an engine that complies with these regulations, and the purchaser is expected to operate and maintain the unit to guarantee compliance with the applicable emission limitations.

VOCs are emitted into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported into the quench later during combustion, where temperatures are too low to support combustion. Additionally, poor air and fuel ratios, incomplete mixing, large fuel droplets, and low cylinder temperature can cause partially burned hydrocarbons.

- Good Engine Design – Diesel emergency engines are certified to meet the required EPA emission standards based on the model year and size.
- Good Combustion Practices – Good combustion practices are used to reduce VOC emissions by optimizing conditions in the combustion zone of a fuel-burning source. These practices can include introducing the proper ratio of combustion air to the fuel, maintaining a minimum temperature in the firebox, and maintaining a minimum residence time of fuel and air in the combustion zone.

Step 2: Eliminate Technically Infeasible Options
Both options discussed above are technically feasible.
Step 3: Rank Remaining Technically Feasible Control Technologies
1. Good Engine Design
2. Good Combustion Practices

Step 4: Evaluate Remaining Control Technologies
Current BACT guidelines for acceptable VOC emissions from diesel-fired fire pumps and emergency generators meet the requirements of 40 CFR 60 Subpart IIII. Therefore, the use of a certified engine with good combustion practices can be considered BACT.

Step 5: Selection of BACT
For combustion volatile organic compound emissions from Emergency Generators and Fire Pumps (Source ID Codes EG01, EG02, FP01, and FP02), BACT has been selected as:

1. Good Engine Design and certifying engines to be in compliance with 40 CFR 60 Subpart IIII; and
2. Good Operation, Maintenance, and Combustion Practices.

EPD Review of BACT for combustion VOC emissions from Emergency Engines/Fire Pumps

EPD agrees that certifying engines to 40 CFR 60 Subpart IIII and good operation and maintenance practices satisfies VOC BACT for emergency engines and fire pumps. The RBLC does not indicate that there are sources with add-on control devices for the control of VOC emissions from internal combustion engines.

Table 4.5.2: Summary of BACT for VOC Emissions

Process/Equipment Source ID Code	Control Method	Proposed BACT Limit
Combustion Emissions from Calcining Kilns: CK01 through CK06 (TO01, TO02, and TO03)	Thermal Oxidizers TO01 through TO03; Good combustion operation in the kiln oxidizers; Annual burner tune-ups.	51.49 tpy (for all 6 kilns) during any consecutive twelve-month period
Combustion Emissions from Carbonizing Kilns: CAK1 and CAK2 (TO04)	Thermal Oxidizer TO04; Good combustion operation in the kiln oxidizer; Annual burner tune-ups.	3.45 tpy (for both kilns) during any consecutive twelve-month period
Combustion Emissions from Emergency Generators and Fire Pumps: EG01, EG02, FP01, and FP02	Good operation and maintenance practices; Use of EPA certified engine per requirements of NSPS IIII.	40 CFR 60 Subpart IIII for NMHC + NO_X Combustion emissions calculated at 0.64 tpy from all 4 units

5.0 TESTING AND MONITORING REQUIREMENTS

In order to demonstrate initial and ongoing compliance with BACT limits as well as federal and state emissions standards, the draft permit contains requirements for emissions testing of equipment, and ongoing monitoring of pollution control equipment parameters. These requirements will be discussed below according to the associated compliance requirement.

Plantwide Production Cap

Compliance with the plantwide production limit and number of synthetic graphite production cycles per year established in Section 2.0 of the permit is demonstrated via record keeping; no testing or monitoring is directly used to show compliance. Monthly records of the amount of synthetic graphite product produced and number of product production cycles are required.

Particulate Matter BACT Limits

Dry particulate filters are used to meet most of the BACT filterable PM limits. The dry particulate filters are disposable; the facility must keep an adequate supply of replacement filters on-hand at all times. For sources controlled by baghouses, the facility will be required to conduct an initial test of Baghouses DC01, DC30, DC33, DC37, and DC54, plus Jet Mill baghouses DC32 and DC50. During the tests, the facility will establish pressure drop parameter values to assure compliance with the emission limitation. The facility will maintain records documenting filter efficiency, daily pressure drop monitoring, and weekly visible emissions checks to ensure proper maintenance are required for compliance assurance. Subsequent baghouse testing will occur every 24 months, with testing of Jet Mill baghouses DC32 and DC50, as well as three representative baghouses from DC01, DC02, DC30, DC31, DC37 through DC40, and DC54.

For the sources with bin vents, compliance will be determined through maintenance checks and requirements for having replacement parts for the dry particulate filtration systems, as these are not classified as air pollution control equipment, but rather inherent process equipment.

For the graphitization furnace scrubber systems, compliance will be determined through an initial stack testing for both filterable PM and SO_2 simultaneously. These tests shall occur during the synthetic graphite production cycle at maximum SO_2 generation production rates – roughly, hours 38 through 42 according to the application. The facility will document capture efficiency guarantee (98%) and establish parameter monitoring for continuous gas phase pressure loss across the system, fresh reagent feed rate, and either recycled reagent feed rate or total reagent feed rate monitoring for the scrubber systems. Subsequent testing will occur every 12 months in order to establish appropriate monitoring parameters and demonstrate on-going compliance with the emissions limitation.

Carbon Monoxide BACT Limits

Most of the facility's CO emissions are emitted from the graphitization furnaces. Since Anovion used an undocumented emission factor of 0.066 tons CO per ton graphite produced to calculate emissions in Application No. 28941, the facility will be required to conduct an initial performance test to either verify that emission factor or establish a site-specific factor. Subsequent testing will occur every 60 months to verify or reestablish the emission factor.

Estimated CO emissions from the calcining and carbonizing kiln are minimal. As the facility will be operating thermal oxidizers to control CO, NO_X, and VOC emissions from these kilns, a minimum combustion temperature will be established as part of CO, NO_X, and VOC testing. The facility will conduct annual tune-ups of all four thermal oxidizers as an on-going demonstration of compliance with the emission limitations.

<u>Sulfur Dioxide BACT Limits</u>

The facility will verify that the green pet coke received by the facility will not exceed 0.6% sulfur content by weight on a monthly average. The facility will need to keep monthly records of the sulfur content in the green pet coke received, either by internal testing or supplier certification records or some other protocol. Additionally, the facility will be required to test SO_2 emissions from thermal oxidizers TO01, TO02, and TO03 to verify compliance with 16.45 lb/hr SO_2 emissions as determined in Application No. 28941. Subsequent retesting will occur every 60 months.

The facility is utilizing Circulating Fluidized Bed Scrubber systems to control SO_2 emissions from the graphitization furnaces, as well as PM emissions. These tests shall occur during the synthetic graphite production cycle at maximum SO_2 generation production rates – roughly, hours 38 through 42 according to the application. The facility will document capture efficiency guarantee (98%) and establish parameter monitoring for continuous fluidized bed pressure loss across the system, fresh lime feed rate, and evidence of proper lime recirculation rate monitoring for the scrubber systems, which could include the pressure drop alarms and any corrective action taken in response. The facility will also utilize SO_2 CEMS to monitor emissions from the furnaces. Should the SO_2 CEMS be off-line, the facility is required to use 75.96 lb/hr as the emissions rate for the time while the CEMS is down. Subsequent retesting will occur every 12 months.

The facility will not be allowed to start up the second furnace less than 20 hours after the start of the first in order to stagger the synthetic graphite production cycles. The facility will need to record the date and time of the start of each cycle in each furnace building. Since all SO_2 is generated from the furnaces between the cycle hours of 26 and 44, no two cycles shall overlap these hours. Anovion has demonstrated that continuous operation of one graphitization building at the peak hourly emission rate will not exceed the NAAQS.

<u>Nitrogen Oxides BACT Limits</u>

NO_X emissions estimated to be emitted from the calcining and carbonizing kiln are minimal. As the facility will be operating thermal oxidizers to control CO, NO_X, and VOC emissions from these units, a minimum combustion temperature will be established as part of VOC testing. The facility will conduct annual tune-ups of all four thermal oxidizers as an on-going demonstration of compliance with the emission limitations.

Since Anovion used an undocumented emission factor of 0.00035 tons NO_X per ton graphite produced to calculate emissions in Application No. 28941, the facility will be required to conduct an initial performance test to either verify that emission factor or establish a site-specific factor. Subsequent testing will occur every 60 months to verify or reestablish the emission factor.

Volatile Organic Compounds BACT Limits

Thermal oxidizers are the best option for capturing volatile components in the burn-off of the pitch applications in the calcining and carbonizing kilns. As the facility will be operating thermal oxidizers to control CO, NO_X, and VOC emissions from the calcining and carbonizing kilns, a minimum combustion temperature will be established as part of VOC testing in thermal oxidizers TO01, TO02, and TO03. The facility will conduct annual tune-ups of all four thermal oxidizers as an on-going demonstration of compliance with the emission limitations. Subsequent testing will occur every 60 months in order to reestablish appropriate monitoring parameters and demonstrate compliance with the emissions limitations.

40 CFR 60 Subpart IIII

A non-resettable hour meter to track operating hours is the only monitoring required by the engine NSPS. While engine testing is an option to demonstrate compliance with the applicable emission limits, engine manufacturers EPA certifications will be the method of choice. The proposed diesel engines will be required by the NSPS to document the use of ultra-low sulfur fuel and follow requirements in the NSPS. These engines are otherwise exempt from permitting in normal SIP permits; they were included in the permit because they are subject to the BACT limits.

Georgia Rules (b), (g), (e), and (n)

No testing or monitoring is necessary because the likelihood of violation of any of these standards is minimal.

CAM Applicability:

Because the permit will not be a Title V permit, CAM is not applicable and is not being triggered by the proposed greenfield facility. Therefore, no CAM provisions are being incorporated into the facility's permit.

6.0 AMBIENT AIR QUALITY REVIEW

An air quality analysis is required to determine the ambient impacts associated with the construction and operation of the proposed modifications. The main purpose of the air quality analysis is to demonstrate that emissions emitted from the proposed modifications, in conjunction with other applicable emissions from existing sources (including secondary emissions from growth associated with the new project), will not cause or contribute to a violation of any applicable NAAQS in a Class II area or PSD Increment in a Class I or Class II area. NAAQS exist for NO_2, CO, $PM_{2.5}$, PM_{10}, SO_2, Ozone (O_3), and lead. PSD increments exist for SO_2, NO_2, $PM_{2.5}$, and PM_{10}.

The proposed project at the Anovion triggers PSD review for VOC (i.e., ozone), NO_X, PM, PM_{10}, $PM_{2.5}$, CO, and SO_2. An air quality analysis was conducted to demonstrate the facility's compliance with the NAAQS and PSD Increment standards for NO_X, PM_{10}, $PM_{2.5}$, CO, and SO_2. An additional analysis was conducted to demonstrate compliance with the Georgia air toxics program. This section of the application discusses the air quality analysis requirements, methodologies, and results. Supporting documentation may be found in the Air Quality Dispersion Report of the application and in the additional information packages.

The facility utilized AERMOD and 5-year meteorological data to model proposed emissions of each pollutant subject to PSD review.

Modeling Requirements

The air quality modeling analysis was conducted in accordance with Appendix W of Title 40 of the Code of Federal Regulations (CFR) §51, *Guideline on Air Quality Models*, and Georgia EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions (Revised)*.

The proposed project will cause net emission increases of VOC, NO_X, PM, PM_{10}, $PM_{2.5}$, CO, and SO_2 that are greater than the applicable PSD Significant Emission Rates. Therefore, air dispersion modeling analyses are required to demonstrate compliance with the NAAQS and PSD Increment. VOC has no PSD increment or NAAQS and therefore are not modeled. However, VOC and SO_2 emissions are considered in the secondary formation analysis for ozone and $PM_{2.5}$, respectively.

Significance Analysis: Ambient Monitoring Requirements and Source Inventories

Initially, a Significance Analysis is conducted to determine if the NO_X, PM_{10}, $PM_{2.5}$, CO, and SO_2 emissions increases at Anovion would significantly impact the area surrounding the facility. Maximum ground-level concentrations are compared to the pollutant-specific U.S. EPA-established Significant Impact Level ("SIL").

If a significant impact (i.e., an ambient impact above the SIL) does not result, no further modeling analyses would be conducted for that pollutant for NAAQS or PSD Increment. If a significant impact does result, further refined modeling would be completed to demonstrate that the proposed project would not cause or contribute to a violation of the NAAQS or consume more than the available Class II Increment.

NAAQS Analysis

The primary NAAQS are the maximum concentration ceilings, measured in terms of total concentration of pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health." Secondary NAAQS define the levels that "protect the public welfare from any known or anticipated adverse effects of a pollutant."

If the maximum pollutant impact calculated in the Significance Analysis exceeds the SIL at an off-property receptor, a NAAQS analysis is required. The NAAQS analysis would include the potential emissions from all emission units at Anovion, except for units that are generally exempt from permitting requirements or are normally operated only in emergency situations. The emissions modeled for this analysis would reflect the results of the BACT analysis for the modified emission unit. Facility emissions would then be combined with the allowable emissions of sources included in the regional source inventory. The resulting impacts, added to appropriate background concentrations, would be assessed against the applicable NAAQS to demonstrate compliance. For an annual average NAAQS analysis, the highest modeled concentration among five consecutive years of meteorological data would be assessed, while the highest second-high impact would be assessed for the short-term averaging periods.

PSD Increment Analysis

The PSD Increments were established to "prevent deterioration" of air quality in certain areas of the country where air quality was better than the NAAQS. To achieve this goal, U.S. EPA established PSD Increments for certain pollutants. The sum of the PSD Increment concentration and a baseline concentration defines a "reduced" ambient standard, either lower than or equal to the NAAQS that must be met in an attainment area. Significant deterioration is said to have occurred if the change in emissions occurring since the baseline date results in an off-property impact greater than the PSD Increment (i.e., the increased emissions "consume" more that the available PSD Increment).

U.S. EPA has established PSD Increments for NO_X, SO_2, $PM_{2.5}$ and PM_{10}; no increments have been established for CO. The PSD Increments are further broken into Class I, II, and III Increments. Anovion is located in a Class II area.

To demonstrate compliance with the PSD Increments, the increment-affecting emissions (i.e., all emissions increases or decreases after the appropriate baseline date) from the facility and those sources in the regional inventory would be modeled to demonstrate compliance with the PSD Class II increment for any pollutant greater than the SIL in the Significance Analysis. For an annual average analysis, the highest incremental impact will be used. For a short-term average analysis, the highest second-high impact will be used.

Modeling Methodology

Details on the dispersion model, including meteorological data, source data, and receptors can be found in EPD's PSD Dispersion Modeling and Air Toxics Assessment Review in Appendix A of this Preliminary Determination and in the Air Dispersion Modeling Report of the permit application.

Modeling Results

Table 6-1 shows that the proposed project will cause ambient impacts above the SILs for all NO_2, CO (not the 1-hour standard), PM_{10}, $PM_{2.5}$, and SO_2 for the various averaging periods, requiring NAAQS and Increment analyses be performed for these pollutants.

Table 6-1: Class II Significance Impact Levels Modeling

Pollutant	Averaging Period	Max Modeled Conc. (µg/m^3)	Secondary Impact (µg/m^3)*	Total (µg/m^3)	SIL (µg/m^3)	SIA (km)	Receptor UTM Zone: 16	
							Easting (meter)	Northing (meter)
CO	1-hour	1,162.19828	N/A	1,162.19828	2,000	N/A	730,447.81	3,426,198.25
	8-hour	517.53563	N/A	**517.53563**	500	639.2798	731,747.81	3,425,498.25
NO_2	1-hour	33.79659	N/A	**33.79659**	7.5	3,779.113	730,716.78	3,425,884.94
	Annual	1.53675	N/A	**1.53675**	1	965.797	731,560.56	3,425,691.19
PM_{10}	24-hour	28.42024	N/A	**28.42024**	5	2,293.851	730,719.87	3,425,736.66
	Annual	5.87925	N/A	**5.87925**	1	1,472.82	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	9.13464	0.2970	**9.431640**	1.2	4,061.961	730,719.87	3,425,736.66
	Annual	1.78231	0.0251	**1.807410**	0.2	1,909.595	730,719.87	3,425,736.66
SO_2***	1-hour	185.50343	N/A	**185.50343**	7.9	31,048.3	730,712.65	3,426,082.65
	3-hour	143.5134	N/A	**143.5134**	25	5,876.36	730,712.65	3,426,082.65
	24-hour	60.19315	N/A	**60.19315**	5	5,548.608	731,562.65	3,425,643.96
	Annual	8.85868	N/A	**8.85868**	1	4,989.614	731,564.74	3,425,596.73

* Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

A Full Impact Analysis was conducted for the pollutants and averaging times listed in red in the table above.

<u>Significant Impact Area</u>

For any off-site pollutant impact calculated in the Significance Analysis that exceeds the SIL, a Significant Impact Area (SIA) must be determined. The SIA encompasses a circle centered on the facility being modeled with a radius extending out to the lesser of either: 1) the farthest location where the emissions increase of a pollutant from the proposed project causes a significant ambient impact, or 2) a distance of 50 kilometers. All sources of the pollutants in question within the SIA plus an additional 50 kilometers are assumed to potentially contribute to ground-level concentrations and must be evaluated for possible inclusion in the NAAQS and Increment Analysis.

Based on the results of the Significance Analysis, the distance between the facility and the furthest receptor from the facility that showed a modeled concentration exceeding the corresponding SIL was determined to be 30.9 kilometers for 1-hour maximum SO_2 emissions.

NAAQS and Increment Modeling

The next step in completing the NAAQS and Increment analyses was the development of a regional source inventory. Nearby sources that have the potential to contribute significantly within the facility's SIA are ideally included in this regional inventory.

The distance from the facility of each source listed in the regional inventories was calculated, and all sources located less than 50 kilometers from the mill were included from the analysis. Sources were pulled from the Georgia EPD source inventory tool at the Florida Department of Environmental Protection. Additionally, pursuant to the "20D Rule," facilities outside the SIA were also excluded from the inventory if the entire facility's emissions (expressed in tons per year) were less than 20 times the distance (expressed in kilometers) from the facility to the edge of the SIA. In applying the 20D Rule, facilities in close proximity to each other (within approximately 5 kilometers of each other) were considered as one source. Then, any Increment consumers from the provided inventory were added to the permit application forms or other readily available permitting information.

The regional source inventory used in the analysis is included in the permit application and the attached modeling report.

NAAQS Analysis

In the NAAQS analysis, impacts within the facility's SIA due to the potential emissions from all sources at the facility and those sources included in the regional inventory were calculated. Since the modeled ambient air concentrations only reflect impacts from industrial sources, a "background" concentration was added to the modeled concentrations prior to assessing compliance with the NAAQS.

The results of the NAAQS analysis are shown in Table 6-2. For the short-term averaging periods, the impacts are the highest second-high impacts. For the annual averaging period, the impacts are the highest impact. When the total impact at all significant receptors within the SIA are below the corresponding NAAQS, compliance is demonstrated.

Table 6-2: NAAQS Modeling Results

Pollutant	Averaging Period	Max Modeled Conc. (µg/m³)*	Back ground (µg/m³)	Secondary Impact (µg/m³)**	Total (µg/m³)	NAAQS (µg/m³)	Receptor UTM Zone: 16	
							Easting (meter)	Northing (meter)
CO	1-hour	1,128.77811	1,068	N/A	2,196.77811	40,000	731,747.81	3,425,498.25
	8-hour	461.6142	839	N/A	1,300.61420	10,000	731,573.12	3,425,407.82
NO_2	1-hour	114.58928	30.3	N/A	144.88928	188	734,047.81	3,422,798.25
	Annual	1.68783	4.5	N/A	6.18783	100	731,560.56	3,425,691.19
PM_{10}	24-hour	22.9132	37.2	N/A	60.11320	150	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	5.63302	24.4	0.2970	30.33002	35	730,719.87	3,425,736.66
	Annual	1.6478	8.9	0.0251	10.5729	12	730,719.87	3,425,736.66
SO_2	1-hour	303.59292	4.7	N/A	**308.29292**	196	730,712.65	3,426,082.65
	3-hour	305.38934	4.2	N/A	309.58934	365	734,647.81	3,422,298.25

* Maximum modeled concentrations for all pollutants except SO_2 reflect the "ALL" source group. SO_2 maximum modeled concentrations include only one graphitization furnace (TR2).

** Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

As indicated in Table 6-2 above, the total modeled impact for the 24-hour averaging period for SO_2 1-hour averaging period exceeds the corresponding NAAQS. All of the other total modeled impacts at all significant receptors within the SIA are below the corresponding NAAQS.

Table 6-3: 1-hour SO_2 NAAQS Contribution Analysis

Total Conc. (μg/m³)*	Anovion Contribution (μg/m³)	Receptor UTM (Zone: 16)		Rank	Remark
		Easting (meter)	Northing (meter)		
308.29292	0.0031	734,397.81	3,422,548.25	4th	Highest 1-hour SO_2 concentration among all receptors exceeding the 1-hour SO_2 NAAQS level
210.92064	2.46754	734647.81	3,422,048.00	7th	Maximum 1-hour SO_2 contribution by Anovion among all receptors and ranks exceeding the 1-hour SO_2 NAAQS level

* Five receptors exceeded the 1-hour SO_2 NAAQS level (196 μg/m³). The applicant excluded one receptor as the receptor was within the fenceline of a separate offsite facility (Walton Bainbridge Power Facility). The culpability analysis includes the remaining four receptors and the 1-hour SO_2 background concentration of 4.7 μg/m³. During its review, the DMU considered both operating scenarios (TR1 only and TR2 only) individually. The highest modeled concentration occurs when only TR2 is operating. The highest Anovion contribution occurs when only TR1 is operating. The exceedance(s) at each of NAAQS violation receptors occurred from 4th rank up to 24th, but no exceedances afterwards. This refined modeling demonstrates that Anovion will not cause or contribute a significant impact (i.e., ≥ 7.9 μg/m³) to the SO_2 NAAQS exceedances at the 1-hour averaging period.

Increment Analysis

The modeled impacts from the NAAQS run were evaluated to determine whether compliance with the Increment was demonstrated. The results are presented in Table 6-4.

Table 6-4: PSD Increment Modeling Results

Pollutant	Averaging Period	Max Modeled Conc. (μg/m³)*	Secondary Impact (μg/m³)**	Total (μg/m³)	Class II PSD Increment (μg/m³)	Receptor UTM Zone: 16	
						Easting (meter)	Northing (meter)
NO_2	Annual	1.68194	N/A	1.68194	25	731,560.56	3,425,691.19
PM_{10}	24-hour	24.07244	N/A	24.07244	30	730,717.81	3,425,835.51
	Annual	5.87925	N/A	5.87925	17	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	7.18391	0.2970	7.48091	9	730,719.87	3,425,736.66
	Annual	1.78231	0.0251	1.80741	4	730,719.87	3,425,736.66
SO_2	3-hour	123.52901	N/A	123.52901	512	730,711.62	3,426,132.08
	24-hour	51.12178	N/A	51.12178	91	731,562.65	3,425,643.96
	Annual	8.96087	N/A	8.85868	20	731,564.74	3,425,596.73

* Maximum modeled concentrations for all pollutants except SO_2 reflect the "ALL" source group. SO_2 maximum modeled concentrations include only one graphitization furnace (TR2).
** Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

Table 6-4 demonstrates that the impacts are below the corresponding increments for all pollutants, including maximum 1-hour SO_2 emissions, even with the conservative modeling assumption that all NAAQS sources were Increment sources.

Class I Area Analysis

Federal Class I areas are regions of special national or regional value from a natural, scenic, recreational, or historic perspective. Class I areas are afforded the highest degree of protection among the types of areas classified under the PSD regulations. U.S. EPA has established policies and procedures that generally restrict consideration of impacts of a PSD source on Class I Increments to facilities that are located near a federal Class I area. Historically, a distance of 100 km has been used to define "near", but more recently, a distance of 300 kilometers has been used for all facilities.

The three Class I areas within approximately 300 kilometers of Anovion are Bradwell Bay Wilderness located ~ 80 km south of the facility; Saint Marks National Wildlife Refuge located ~95 km south of the facility; and Okefenokee Wilderness located ~195 km east of the facility. The U.S. Fish and Wildlife Service (FWS) is the designated Federal Land Manager (FLM) responsible for oversight of all three of these Class I areas.

To simplify the assessment, U.S. EPA modeling guidance provides for a screening process that uses an arc of receptors located at 50km from Anovion in the direction of each of the Class I areas. This technique was used and the results are in Table 6-5.

Table 6-5: Class I Significant Impact Levels Modeling (Screening analysis with AERMOD)

Pollutant	Averaging Period	Max Modeled Conc. (μg/m^3)	Secondary Impact (μg/m^3)*	Total (μg/m^3)	SIL (μg/m^3)	Receptor UTM Zone: 16	
						Easting (meter)	Northing (meter)
NO_2	Annual	0.00735	N/A	0.00735	0.1	778,148.73	3,408,136.50
PM_{10}	24-hour	0.15777	N/A	0.15777	0.3	770,021.40	3,456,703.53
	Annual	0.00859	N/A	0.00859	0.2	773,566.50	3,398,741.55
$PM_{2.5}$	24-hour	0.06471	0.141	0.20571	0.27	694,596.41	3,459,337.43
	Annual	0.00232	0.003	0.00532	0.05	773,566.50	3,398,741.55
SO_2	3-hour	3.32681	N/A	**3.32681**	1	774,022.47	3,450,989.41
	24-hour	0.63556	N/A	**0.63556**	0.2	774,022.47	3,399,485.61
	Annual	0.03744	N/A	0.03744	0.1	683,348.86	3,439,856.10

* Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

Table 6-6: Class I Significant Impact Levels Modeling (Screening analysis with CALPUFF)

Pollutant	Averaging Period	Class I Area	Max Modeled Conc. (μg/m^3)	SIL (μg/m^3)
SO_2	3-hour	Bradwell Bay	0.423600	1
	24-hour		0.155190	0.2
SO_2	3-hour	Saint Marks	0.389530	1
	24-hour		0.142310	0.2
SO_2	3-hour	Okefenokee	0.122610	1
	24-hour		0.046921	0.2

Class I Visibility Analysis

A screening technique is used to assess the potential for project impacts at Class I areas. The metric is a Q/D method, whereas Q is the sum of maximum daily emissions (expressed in tons per year) of visibility impairing pollutants (NOx, PM_{10} and SO_2). D is the distance to the nearest Class I area in kilometers. The corresponding Federal Land Manager, Fish and Wildlife Service, reviewed and approved the analysis on July 24, 2023.

The AQRV Q/D screening level is 10. Based on the predicted permitted emissions from the project the maximum Q/D (for Bradwell Bay, the closest Class I Area) is 7.67. Therefore, no significant visibility impact is expected. No further analysis was performed.

Ozone Analysis

It is estimated that the facility's own contribution is 0.2 ppb, which is less than the ozone SIL of 1ppb. Therefore, cumulative assessment was conducted. The cumulative analysis for ozone shows that the impact on ambient ground level ozone concentrations from the facility will not cause an ozone NAAQs violation.

7.0 ADDITIONAL IMPACT ANALYSES

PSD requires an analysis of impairment to visibility, soils, and vegetation that will occur as a result of a modification to the facility and an analysis of the air quality impact projected for the area as a result of the general commercial, residential, and other growth associated with the proposed project.

Soils and Vegetation

To address the potential soil and vegetation impacts, Anovion adopted the NAAQS analysis presented above because EPA set the secondary NAAQS standards for such analysis to protect public welfare, including protection against damage to crops and vegetation. The Soils and Vegetation analyses have been reviewed and based on the results of the contribution of Anovion on the NAAQS secondary standards, there are no adverse effects on Soils and Vegetation due to increased ozone levels attributed to this project.

Growth

The purpose of the growth analysis is to estimate the impact of growth in the area associated with the project. Construction at the facility is expected to require a large temporary workforce, but there will not be a significant shift in population long-term.

The local air quality monitoring data for the region shows that the ambient air around the project site can readily accommodate any additional direct or indirect growth which may occur from the proposed plant without project-associated growth causing or contributing to violations of the NAAQS or PSD increment. Therefore, EPD agrees with the applicant that any growth attributable to this proposed project is not expected to cause quantifiable air quality impacts.

Visibility

To demonstrate that visibility impairment will not result from Anovion, the VISCREEN model was used to assess potential impacts on ambient visibility at so-called “sensitive visible plume receptors” within 50km of the site. The Decatur County Industrial Airpark is subject to Class II area visibility analysis.

The results of the Level II VISCREEN analysis show that the screening criteria are not exceeded at any of the sensitive receptors when evaluated using the Level II input parameters. Therefore, the proposed facility is not anticipated to cause adverse impacts on visibility at the sensitive receptors in the surrounding area.

Georgia Toxic Air Pollutant Modeling Analysis

Georgia EPD regulates the emissions of toxic air pollutant ("TAP") emissions through a program covered by the provisions of *Georgia Rules for Air Quality Control*, 391-3-1-.02(2)(a)3.(ii). A TAP is defined as any substance that may have an adverse effect on public health, excluding any specific substance that is covered by a State or Federal ambient air quality standard. Procedures governing the Georgia EPD's review of TAP emissions as part of air permit reviews are contained in the agency's "*Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions (Revised)*."

For projects with quantifiable increases in TAP emissions, an air dispersion modeling analysis is generally performed to demonstrate that off-property impacts are less than the established Acceptable Ambient Concentration ("AAC") values. The TAP evaluated are restricted to those that may increase due to the proposed project. Thus, the TAP analysis would generally be an assessment of off-property impacts due to facility-wide emissions of any TAP emitted by a facility.

The applicant calculated the facility-wide emissions of compounds identified as TAP in the Georgia Air Toxics Guidelines, using estimated short- and long-term emission rates. For natural gas combustion sources, the emissions are conservatively estimated at 8,760 hr/yr. The facility wide total TAP emissions (lb/yr) for each compound were compared to rate in the maximum emission rate ("MER") list in Appendix A of the guidelines as a screening tool. To address TAP that may originate from volume sources, the applicant included back in the TAPs model any compound that is emitted from volume sources in rates greater than 20% of the MER. (The guidelines specify that MER can be used when emissions are mainly from point sources.)

All TAP compounds that are emitted from this location were assessed and compared to their MER; none exceeded their MER. No further analysis of these TAP was necessary.

8.0 EXPLANATION OF DRAFT PERMIT CONDITIONS

The permit requirements for this proposed facility are included in draft Permit No. 3624-087-0061-P-01-0.

Section 1.0: Facility Description

Greenfield site for anode materials facility capable of producing 40,000 metric tons of lithium-ion battery grade graphite powder from petroleum coke each year.

Section 2.0: Requirements Pertaining to the Entire Facility

Condition 2.1.1 limits the facility to a production rate of 40,000 metric tons (44,100 tons) of synthetic graphite product during any consecutive twelve-month period to ensure compliance with the modeling for the long-term standards.

Condition 2.1.2 limits the facility to 314 synthetic graphite product production cycles from both graphitization furnaces combined during any consecutive twelve-month month period as this number was the basis for many emissions calculations.

Section 3.0: Requirements for Emission Units

Condition 3.2.1 requires the facility to operate the thermal oxidizers and scrubber systems at all times the associated process equipment is in operation.

Condition 3.2.2 lists all equipment whose emissions vent to a baghouse/fabric filter/bin vent filter and their associated BACT filterable TSP emission limitation as outlined in Application No. 28941 of 0.005 gr/dscf. This condition also defines that the emissions limits are associated with total suspended particulates (filterable TSP) and the breakdown of the PM_{10} and $PM_{2.5}$ content of this total TSP limit. The facility is required to operate the associated baghouse/fabric filter/bin vent filter at all times the associated process equipment is in operation.

Conditions 3.2.3, 3.2.4, 3.2.5, 3.2.6, and 3.2.7 outline various work practices for fugitive and process filterable TSP emissions that are considered BACT for this facility. These include enclosing unloading areas, good housekeeping, water spraying, covered conveyors and transfer stations, sweeping, cleaning spills, and maintaining the roads, as well as operating the associated fabric filters or bin vents as outlined.

Condition 3.2.8 requires the facility to design the cooling towers at the facility to have a drift rate of no greater than 0.005%, which is industry standard.

Condition 3.2.9 contains a BACT limit that requires that the filterable TSP emissions from the graphitization furnace scrubber systems be less than 0.005 gr/dscf.

Condition 3.2.10 contains a BACT limit that limits the CO emissions from the graphitization furnaces to less than 2,910.1 tons during any consecutive twelve-month period.

Condition 3.2.11 contains BACT limits for SO_2 emissions from the graphitization process. The annual limit of 136.09 tons from both furnaces combined during any consecutive twelve-month period is based on an annualized average rate, while the 75.96 lb/hr is based on the peak hourly generation of SO_2 emissions from the captured sulfur, also from both furnaces combined. If the required CEMS is down, the facility will be required to use 75.96 lb/hour as the emission rate during the period of CEMS outage.

Condition 3.2.12 contains a BACT limit for the sulfur content in the received green pet coke to 0.6% weight, on a monthly average. Since this value is used in many of the SO_2 calculations, it is important that this value be known.

Condition 3.2.13 defines the times between synthetic graphite product production cycles for the graphitization furnaces to avoid the sulfur generation periods from overlapping. Hours 26 through 44 cannot overlap based on peak sulfur generation from the furnaces.

Condition 3.2.14 contains a BACT limit for NO_X from the graphitization furnaces of 15.43 tons during any consecutive twelve-month period.

Condition 3.2.15 requires the facility to conduct good combustion practices, operating, and maintenance practices for the thermal oxidizer burners in order to minimize all emissions.

Condition 3.2.16 restricts the facility to firing natural gas only in the thermal oxidizer burners.

Condition 3.2.17 contains BACT limits for filterable TSP, CO, SO_2, NO_X, and VOC emissions from the calcining thermal oxidizers.

Condition 3.2.18 contains BACT limits for filterable TSP, CO, NO_X, and VOC emissions from the carbonizing thermal oxidizers.

Condition 3.2.19 requires the facility to conduct good combustion practices, operating, and maintenance practices for the emergency generators and fire pumps to minimize all combustion-related emissions.

Condition 3.2.20 restricts the facility to firing ultra-low sulfur diesel only in the emergency generators and fire pumps.

Condition 3.3.1 outlines the 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ requirements for the emergency generators and fire pumps.

Condition 3.4.1 states the Georgia Rule (b) requirements for opacity.

Condition 3.4.2 lists the Georgia Rule (e) limitations for particulate emissions. Due to the extensive baghouses/bin vent filters, the likelihood of exceeding this rule is minimal.

Condition 3.4.3 outline Georgia Rule (n) fugitive requirements, especially for roads.

Condition 3.5.1 requires the facility to maintain a supply of filter bags for all baghouses on site.

Section 4.0: Requirements for Testing

Conditions 4.1.1 and 4.1.2 are template testing requirements that are included in all permits.

Condition 4.1.3 lists the test methods that are applicable to the facility.

Conditions 4.1.4 and 4.1.5 are also template conditions for testing that are included in all permits.

Condition 4.2.1 outlines the testing requirements for the graphitization furnaces.

- For PM and SO_2 emissions, the tests must be conducted simultaneously to establish operating parameters for fluidized bed pressure loss across the system, fresh reagent feed rate, evidence of proper lime recirculation rate monitoring for the scrubber system that demonstrate compliance with the PM concentration of 0.005 gr/dscf and the SO_2 limit of 136.09 tons per year. These tests shall occur during the synthetic graphite production cycle at maximum SO_2 generation production rates – roughly, Hours 38 through 42 according to the application. Repeat testing will occur every 12 months to verify parameter values.
- For CO emissions, the test will verify the accuracy of the emission factor that was used in Application No. 28941 of 0.066 tons CO per ton graphite produced. The facility may also establish their own site-specific emission factor or simply verify this one. Subsequent testing will occur every 60 months (5 years) to assure compliance with the 2,910.1 tons CO per year emission limitation.
- For NO_X emissions, the test will verify the accuracy of the emission factor that was used in Application No. 28941 of 0.00035 tons NO_X per ton graphite produced. The facility may also establish their own site-specific emission factor or simply verify this one. Subsequent testing will occur every 60 months (5 years) to assure compliance with the 15.43 tons NO_X per year emission limitation.

Condition 4.2.2 outlines the testing requirements for the calcining kilns.

- For VOC emissions, the test must be conducted to establish minimum combustion temperature that assures compliance with the VOC, NO_X, and CO limits of 51.49 tons per year, 11.56 tons per year, and 9.71 tons per year, respectively. Repeat testing will occur every 60 months to verify parameter values.
- For SO_2 emissions, the tests will verify the accuracy of 16.45 lb/hr as stated in Application No. 28941. Repeat testing will occur every 24 months to verify accuracy.

Condition 4.2.3 requires the facility to test filterable PM emissions to establish operating parameters for pressure drop across the Jet Mill baghouses (Source ID Codes DC32 and DC50) that demonstrate compliance with the PM concentration of 0.005 gr/dscf. Repeat testing will occur every 24 months.

Condition 4.2.4 requires the facility to test PM emissions to establish pressure drop values for baghouse source ID codes DC01, DC02, DC30, DC31, DC37 through DC40, and DC54 to demonstrate compliance with the PM concentration of 0.005 gr/dscf. The initial test will be on baghouses DC01, DC30, DC37, and DC54. Repeat testing will occur every 24 months on any three baghouses out of the 9 listed.

Condition 4.2.5 outlines the testing frequency for the testing listed above.

Section 5.0: Requirements for Monitoring

Condition 5.1.1 is a general monitoring requirement.

Condition 5.2.1.a requires the facility to install and maintain a continuous emissions monitoring system (CEMS) for SO_2 and O_2 emissions on the scrubbers for the graphitization furnaces.

Condition 5.2.2.a requires the facility to maintain a continuous monitoring system for combustion temperature on the four thermal oxidizers.

Condition 5.2.2.b requires the facility to maintain continuous monitoring systems for fresh lime feed rate on the graphitization furnace scrubbers.

Condition 5.2.2.c requires the facility to maintain continuous monitoring systems for fluidized bed pressure drop across the systems on the graphitization furnace scrubbers.

Condition 5.2.2.d requires the facility to install a continuous non-resettable device to monitor and record the hours of emergency and non-emergency operation of the emergency generators and fire pumps.

Condition 5.2.3.a requires the facility to monitor pressure drop across baghouses DC01, DC02, DC30, DC31, DC32, Dc37 through DC40, DC50, and DC54 once per 24-hour operational period.

Condition 5.2.3.b requires the facility to monitor evidence of proper lime recirculation rate in the graphitization scrubber systems, including any pressure drop alarms and any resulting corrective action.

Condition 5.2.4 requires various other monitoring, such as production of synthetic graphite product each month in metric tons, number of combined synthetic graphite production cycles completed each month with documentation of start date and time and verification that hours 26 through 44 of each cycle does not overlap, hours of operation of the emergency generators and fire pumps each month, and records of the sulfur content of the delivered green pet coke either by supplier certifications or in-house testing averaged over the month.

Condition 5.2.5 requires the facility to conduct weekly visible emissions check for stacks that vent flue gases from baghouses DC01, DC02, DC30 through DC40, and DC50 through DC54; calcining kilns CK01 through CK06, carbonizing kilns CAK1 and CAK2, and graphitization furnaces GR01 and GR02.

Condition 5.2.6 requires the facility to create a preventative maintenance plan for all baghouses and bin vents on site. The pressure drop requirement was removed from this condition and left with only weekly checks of the baghouses for performance checks.

Condition 5.2.7 requires the facility to conduct annual tune-ups of the four thermal oxidizer burners in order to ensure proper operation of the units.

Section 6.0: Other Recordkeeping and Reporting Requirements

Conditions 6.1.1 and 6.1.2 are general permit conditions for recordkeeping.

Condition 6.1.3 requires the facility to submit a semiannual report.

Condition 6.1.4 outlines the excess emissions (none in this Permit), exceedances, excursions, and other items that need to be included in the semiannual report required by Condition 6.1.3.

- Condition 6.1.4.b.i requires the facility to report any consecutive twelve-month rolling total of synthetic graphite product production that exceeds 40,000 metric tons.
- Condition 6.1.4.b.ii requires the facility to report any consecutive twelve-month rolling total of synthetic graphite product production cycles that exceeds 314.
- Condition 6.1.4.b.iii requires the facility to report any instance where furnace cycle hours 26 through 44 overlap in the two furnace buildings.
- Condition 6.1.4.b.iv requires the facility to report any consecutive twelve-month rolling total of SO_2 emissions from both graphitization furnaces combined that exceed 136.09 tons.
- Condition 6.1.4.b.v requires the facility to report any hour where total SO_2 emissions from both graphitization furnaces combined exceed 75.96 lb/hr as an hourly average of the rolling 3-hour average.
- Condition 6.1.4.b.vi requires the facility to report any consecutive twelve-month rolling total of CO emissions from both graphitization furnaces combined that exceed 2,910.1 tons.
- Condition 6.1.4.b.vii requires the facility to report any consecutive twelve-month rolling total of NO_X emissions from both graphitization furnaces combined that exceed 15.43 tons.
- Condition 6.1.4.b.viii requires the facility to report any consecutive twelve-month rolling total of VOC emissions from all calcining kilns combined that exceed 51.49 tons.
- Condition 6.1.4.b.ix requires the facility to report any consecutive twelve-month rolling total of CO emissions from all calcining kilns combined that exceed 9.71 tons.
- Condition 6.1.4.b.x requires the facility to report any consecutive twelve-month rolling total of NO_X emissions from all calcining kilns combined that exceed 11.56 tons.
- Condition 6.1.4.b.xi requires the facility to report any hour where total SO_2 emissions from all calcining kilns combined exceed 16.45 lb/hr.
- Condition 6.1.4.b.xii requires the facility to report any weekly determinations of visible emissions by Condition 5.2.5 for Dust Collectors DC01, DC02, DC30 through DC40, and DC50 through DC54; Calcining Kilns CK01 through CK06, Carbonizing Kilns CAK1 and CAK2, and Graphitization Furnaces GR01 and GR02 that require action to be taken to correct.
- Condition 6.1.4.b.xiii requires the facility to report any instance of maintenance as determined by the preventative maintenance program in Condition 5.2.6 for dust collectors DC01 through DC58.
- Condition 6.1.4.b.xiv requires the facility to report any consecutive twelve-month rolling total hours of operation of the emergency generators and fire pumps that exceed 500 hours per year or 100 hours of non-emergency operation.
- Condition 6.1.4.b.xv requires the facility to report any instance when the calcining or carbonizing kilns are operated without the associated thermal oxidizers.
- Condition 6.1.4.b.xvi requires the facility to report any instance when the graphitization furnaces are operated without the scrubbers.

- Condition 6.1.4.b.xvii requires the facility to report any instance when any applicable stack is operated without its associated baghouse/bin vent/fabric filter as outlined by Table 3.2.
- Condition 6.1.4.x.v.iii requires the facility to report all periods of operation during which the SO2 CEMS on the graphitization furnace scrubbers are not in operation.
- Condition 6.1.4.c.i requires the facility to report any 3-hour period when the combustion temperatures of the thermal oxidizers fall below the minimum as determined by the most recent testing.
- Condition 6.1.4.c.ii requires the facility to report any 3-hour period when the fresh lime feed rate of the graphitization scrubbers falls outside the acceptable range/value as determined by the most recent testing.
- Condition 6.1.4.c.iii requires the facility to report any 3-hour period when the fluidized bed pressure drop across the graphitization scrubbers falls outside the acceptable range/value as determined by the most recent testing.
- Condition 6.1.4.c.iv requires the facility to report any instance of the process operation where the lime recirculation rate of the graphitization scrubbers is shown to be improper as determined by the most recent testing.
- Condition 6.1.4.c.v requires the facility to report any instance of fluidized bed pressure drop alarms on the graphitization scrubbers and any corrective action taken.
- Condition 6.1.4.c.vi requires the facility to report any instance of pressure drop across the Jet Mill baghouses DC32 and DC50 that falls outside the acceptable range/value as determined by the most recent testing.
- Condition 6.1.4.c.vii requires the facility to report any instance of pressure drop across the nine baghouses DC01, DC02, DC30, DC31, DC37 through DC40, and DC54 that falls outside the acceptable range/value as determined by the most recent testing.
- Condition 6.1.4.d.i requires the facility to report all hours of operation of the emergency generators and fire pumps, both emergency and non-emergency, for the reporting period.
- Condition 6.1.4.d.ii requires the facility to report all monthly twelve-month rolling totals of synthetic graphite product produced during the reporting period.
- Condition 6.1.4.d.iii requires the facility to report all monthly twelve-month rolling totals of synthetic graphite product production cycles during the reporting period. This report should specifically note that the two buildings' cycles do not overlap between the hours of 26 and 44.
- Condition 6.1.4.d.iv requires the facility to report any findings on the thermal oxidizer tune ups that require maintenance as required by Condition 5.2.7.
- Condition 6.1.4.d.v requires the facility to submit all BACT work practice worksheets from the reporting period.
- Condition 6.1.4.d.v requires the facility to report each month's twelve-month rolling total for SO_2, CO, NO_X, and VOC emissions from the graphitization furnaces and calcining kilns.

Condition 6.2.1 requires the facility to submit for Division approval a protocol that lists all facility activities that will meet the requirements of the Work Practice BACT Standards. Once approved, the facility is required to maintain records of dates, times, and activities performed that support the work practices.

Condition 6.2.2 requires the facility to use monthly synthetic graphite product production records (Condition 5.2.4.a) to determine the twelve-month rolling total production for each calendar month.

Condition 6.2.3 requires the facility to use the monthly synthetic graphite product production cycle records (Condition 5.2.4.b) to determine the twelve-month rolling total cycles for each calendar month.

Condition 6.2.4 requires the facility to use the SO_2 CEMS data to calculate monthly SO_2 emissions from the graphitization furnaces. For every hour the CEMS is down, the facility must use 75.96 lb/hr as the emission rate. Condition 6.2.5 requires the facility to use the monthly SO_2 emissions information to determine twelve-month rolling totals of SO_2 emissions of the furnaces combined to ensure compliance with 136.09 tons.

Condition 6.2.6 requires the facility to use the SO_2 CEMS to determine the average hourly rolling 3-hour average from both furnace scrubbers combined to determine compliance with 75.96 lb/hr.

Condition 6.2.7 requires the facility to use CO emission factors (until initial testing, use the one provided in Application No 28941) to calculate monthly CO emissions from the graphitization furnaces. Condition 6.2.8 requires the facility to use the monthly CO emissions information to determine twelve-month rolling totals of CO emissions of both furnaces to ensure compliance with 2,910.1 tons.

Condition 6.2.9 requires the facility to use NO_X emission factors (until initial testing, use the one provided in Application No 28941) to calculate monthly NO_X emissions from the graphitization furnaces. Condition 6.2.10 requires the facility to use the monthly NO_X emissions information to determine twelve-month rolling totals of NO_X emissions from both furnaces to ensure compliance with 15.43 tons.

Condition 6.2.11 requires the facility to submit for Division approval a protocol that shows how the facility will demonstrate compliance with the emission limitations for NO_X, CO, and VOC emissions from the calcining kilns. Since the combustion temperature of the thermal oxidizers also affect NO_X and CO emissions, the facility must determine the optimal way to minimize all emissions while tracking the VOC emissions.

Condition 6.2.12 requires the facility to use the protocol to determine monthly VOC emissions from the calcining kilns. Condition 6.2.13 requires the facility to use the monthly emission information to determine the twelve-month rolling totals of VOC from all three kilns to ensure compliance with 15.43 tons.

Condition 6.2.14 requires the facility to use the protocol to determine monthly CO emissions from the calcining kilns. Condition 6.2.15 requires the facility to use the monthly emission information to determine the twelve-month rolling totals of CO from all three kilns to ensure compliance with 9.71 tons.

Condition 6.2.16 requires the facility to use the protocol to determine monthly NO_X emissions from the calcining kilns. Condition 6.2.17 requires the facility to use the monthly emission information to determine the twelve-month rolling totals of NO_X from all three kilns to ensure compliance with 11.56 tons.

Condition 6.2.18 requires the facility to submit for Division approval a protocol that shows how the facility will demonstrate compliance with the 16.45 lb/hr SO_2 emissions from the calcining kilns combined.

Condition 6.2.19 requires the facility to submit for Division approval a protocol for determining the monthly average green petroleum coke sulfur content to demonstrate compliance with the sulfur limit of 0.6% in Condition 3.2.12.

Conditions 6.2.20 through 6.2.25 outline several requirements for the emergency generators and fire pumps under 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

Section 7.0: Other Specific Requirements

This section includes general PSD construction timeframe conditions, Georgia general requirements for reporting of initial construction, and Title V application submittal.

Section 8.0: General Provisions

The general provisions found in Georgia SIP permits are included here.

Equipment Table 3.1

Emission Units		**Applicable Requirements/Standards**	**Air Pollution Control Devices**	
ID No.	**Description**		**ID No.**	**Description**
EG01 EG02	Ultra-low sulfur diesel fired Emergency Generators 1 and 2 – 2,933 hp (22.49 MMBtu/hr)	40 CFR 52.21 40 CFR 60 Subpart A 40 CFR 60 Subpart IIII 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None
FP01 FP02	Ultra-low sulfur diesel fired Fire Pumps 1 and 2 – 400 hp (3.31 MMBtu/hr)	40 CFR 52.21 40 CFR 60 Subpart A 40 CFR 60 Subpart IIII 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None
BB01 BB02 BB1G BB2G BB1C BBGA	Building 1 Cooling Tower Building 2 Cooling Tower Building 1 Graphitization Cooling Tower Building 2 Graphitization Cooling Tower Building 1 Coatings Cooling Tower Building 1 Granulation Cooling Tower	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
STOR	Fugitives – Outdoor Pet Coke Storage	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
DRP1	Fugitives – Drop emissions from feed conveyor to pile stacker	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
DRP2	Fugitives – Drop emissions from pile stacker to pile	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
GATH	Fugitives - Gathering conveyor to indoor storage	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
FUG1	Fugitives - Coke Unloading Fugitives	40 CFR 52.21 391-3-1-.02(2)(n)	None	None

Emission Units		Applicable Requirements/Standards	Air Pollution Control Devices	
ID No.	Description		ID No.	Description
FUG2	Fugitives – Truck and Rail Unloading Fugitives	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
SLLF	Fugitives - Spent Lime Loadout	40 CFR 52.21 391-3-1-.02(2)(n)	None	None
CK01 CK02	Calcining Kiln 1 Calcining Kiln 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	TO01	Thermal Oxidizer
CK03 CK04	Calcining Kiln 3 Calcining Kiln 4	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	TO02	Thermal Oxidizer
CK05 CK06	Calcining Kiln 5 Calcining Kiln 6	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	TO03	Thermal Oxidizer
CAK1 CAK2	Carbonizing Kiln 1 Carbonizing Kiln 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	TO04	Thermal Oxidizer
GR01	Graphitization Furnace Building 1	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	SCR1	Circulating Fluidized Bed Scrubber System
GR02	Graphitization Furnace Building 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	SCR2	Circulating Fluidized Bed Scrubber System

Emission Units		Applicable Requirements/Standards	Air Pollution Control Devices	
ID No.	Description		ID No.	Description
BE01	B1 Bucket Elevator 1	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC01	Baghouse
CL01	B1 Coke Cooler 1			
CS01	B1 Jaw Crusher 1			
CV01	B1 0-8mm Chain Conveyor to Recycle Bin 1			
CV02	B1 Vibrating Conveyor 1			
CV03	B1 Chain Conveyor (oversize) 1			
FE01	B1 Feeder from Bin 1			
PM01	B1 Feed Bin to Bagging 1			
PM02	B1 Feed Bin to Bagging 2			
PM03	B1 Feed Bin to Bagging 3			
SC01	B1 Pack Screener 1			
SL01	B1 Pack Receiver 1			
SL02	B1 0-2 mm Bin for Bagging 1			
SL03	B1 2-8 mm Bin for Bagging 1			
SL04	B1 8-25 mm Bin for Bagging 1			
SL05	B1 Oversize Recycle Coke Chimney 1			
SL06	B1 Recycle Coke Bin 1			
CV04	B1 New Coke Transfer by Conveyor to Bins for Makeup 1			
LD01	B1 New Conductive/Insulating Pet Coke Transfer to Hopper 1			
LD02	B1 New Conductive/Insulating Pet Coke Transfer to Hopper 2			
SL07	B1 Make-up Coke Bin 1			
SL00	B1 Anode Graphite Receiver Bin for Canister Unloading 1			
SL08	B1 Calcined Coke Receiver Bin for Canister Unloading 1			
SL09	B1 Calcined Coke Receiver Bin for Canister Unloading 2			
SL10	B1 Calcined Coke Receiver Bin for Canister Unloading 3			
SL11	B1 Anode Graphite Receiver Bin for Canister Unloading 2			
SL12	B1 Coated Anode Graphite Receiver Bin for Canister Unloading			
PM04	B1 Fines Bagging Station 1			
SL13	B1 Pack Fines from Craine 1			
SL14	B1 DC Dust and Pack Fines Receiver Bin 1			
PM05	B1 Fines Bagging Station 2			
SL15	B1 Pack Fines from Crane 2			
SL16	B1 DC Dust and Pack Fines Receiver Bin 2			
BE02	B1 Bucket Elevator 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC02	Baghouse
CL02	B1 Coke Cooler 2			
CS02	B1 Jaw Crusher 2			
CV06	B1 Vibrating Conveyor 2			
FE02	B1 Feeder from Bin 2			
PM06	B1 Feed Bin to Bagging 4			
PM07	B1 Feed Bin to Bagging 5			
PM08	B1 Feed Bin to Bagging 6			
SC02	B1 Pack Screener 2			
SL17	B1 Pack Receiver Bin 2			
SL18	B1 0-2 mm Bin for Bagging 2			
SL19	B1 2-8 mm Bin for Bagging 2			
SL20	B1 8-25 mm Bin for Bagging 2			
SL21	B1 Recycle Coke Chimney Bin			
SL22	B1 Recycle Coke Bin 2			
LD03	B1 New Coke Transfer to Bins 1			
LD04	B1 New Coke Transfer to Bins 2			
SL23	B1 Makeup Coke Bins			

Emission Units		Applicable Requirements/Standards	Air Pollution Control Devices	
ID No.	Description		ID No.	Description
514A 514B 514C 514D 514E 514F 514G 514H 514I 514J 517A 517B 517C 517D 517E 517F 517G 517H 590A 590B 590C 590D 591A 591B 591C 591D 591E	Silo 514A Silo 514B Silo 514C Silo 514D Silo 514E Silo 514F Silo 514G Silo 514H Silo 514I Silo 514J Silo 517A Silo 517B Silo 517C Silo 517D Silo 517E Silo 517F Silo 517G Silo 517H Silo 590A Silo 590B Silo 590C Silo 590D Silo 591A Silo 591B Silo 591C Silo 591D Silo 591E	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC03 DC04 DC05 DC06 DC07 DC08 DC09 DC10 DC11 DC12 DC13 DC14 DC15 DC16 DC17 DC18 DC19 DC20 DC21 DC22 DC23 DC24 DC25 DC26 DC27 DC28 DC29	Bin Vents/Baghouses
TR01 RL01 RL02 HO01 CR01 BE03 BC01 BC02	B1 Truck Unload Bucket Conveyor B1 Rail Unload Bucket Conveyor B1 Rail Unload Bucket Elevator 1 B1 Hopper to Lump Breaker B1 Lump Breaker B1 Bucket Elevator after Lump Breaker Belt Conveyor from BE120 Belt Conveyor to BE2100	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC30	Baghouse
HO02 RL03 HO03 UL01 RL04	Transfer Bin Rail Unload Bucket Elevator 2 Hopper to Silos A-G Rail and Truck Unloading Prior to Silos Rail Car Loading with Used Coke	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC31	Baghouse
SR01 SR02	B1 Jet Mill Screen 1 B1 Jet Mill Screen 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC32	Baghouse
HO04	Hopper to Silo Distribution	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC33	Baghouse
CV07	Shuttle Conveyor to Silo	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC34	Baghouse
CV08	Bucket Conveyor from Silos 161-165	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC35	Baghouse
CV09	Bucket Elevator from BC180	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC36	Baghouse
CB01 BL01	Crucible Loading/Unloading for Calcining Blender Feed	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC37	Baghouse
TK01 KDC1 TB01	Transfer to Kilns Kiln Dust Collector Transfer to Blending	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC38	Baghouse

Emission Units		Applicable Requirements/Standards	Air Pollution Control Devices	
ID No.	Description		ID No.	Description
BE04 CL03 CS03 CV10 CV11 CV12 FE03 PM09 PM10 PM11 SC03 SL24 SL25 SL26 SL27 SL28 SL29 SL30 LD05 LD06 SL31 SL32 SL33 SL34 SL35 PM12 SL36 SL37 PM13 SL38 SL39	B2 Bucket Elevator 1 B2 Coke Cooler 1 B2 Jaw Crusher 1 B2 0-8 mm Chain Conveyor to Recycle Bin 1 B2 Vibrating Conveyor 1 B2 Chain Conveyor (oversize) 1 B2 Feeder from Bin 1 B2 Feed Bin to Bagging 1 B2 Feed Bin to Bagging 2 B2 Feed Bin to Bagging 3 B2 Pack Screener 1 B2 Pack Receiver Bin 1 B2 0-2 mm Bin for Bagging 1 B2 2-8 mm Bin for Bagging 1 B2 8-25 mm Bin for Bagging 1 B2 Oversize Recycle Chimney B2 Recycle Coke Bin 1 B2 New Coke Transfer by Conveyor to Bins for Makeup 1 B2 New Conductive/Insulation Pet Coke Transfer to Hopper 1 B2 New Pet Cok New Conductive/Insulation Pet Coke Transfer to Hopper 2 B2 Make-up Coke Bin 1 B2 Calcined Coke Receiver Bin for Canister Loading 1 B2 Anode Graphite Receiver Bin for Canister Unloading 1 B2 Calcined Coke Receiver Bin for Canister Loading 2 B2 Anode Graphite Receiver Bin for Canister Unloading 2 B2 Fines Bagging 1 B2 Fines Packing from Crane 1 B2 DC Dust and Pack Fines Receiver Bin 1 B2 Fines Bagging Station 2 B2 Pack Fines from Craine 2 B2 DC Dust and Pack Fines Receiver Bin 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC39	Baghouse
BE05 CL03 CS04 CV13 FE04 PM14 PM15 PM16 SC04 SL40 SL41 SL42 SL43 SL44 SL45 LD07 LD08 SL46	B2 Bucket Elevator 2 B2 Coke Cooler 2 B2 Jaw Crusher 2 B2 Vibrating Conveyor 2 B2 Feeder from Bin 2 B2 Feed Bin to Bagging 4 B2 Feed Bin to Bagging 5 B2 Feed Bin to Bagging 6 B2 Pack Screener 2 B2 Pack Receiver 2 B2 0-2 mm Bin for Bagging 2 B2 2-8 mm Bin for Bagging 2 B2 8-25 mm Bin for Bagging 2 B2 Recycle Chimney Coke Bin B2 Recycle Coke Bin 2 B2 New Coke Transfer to Bins 1 B2 New Coke Transfer to Bins 2 B2 Make-up Coke Bin 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC40	Baghouse

Emission Units		Applicable Requirements/Standards	Air Pollution Control Devices	
ID No.	Description		ID No.	Description
590F 590G 590H 590I 591F 591G 591H 591I 591J	Silo 590F Silo 590G Silo 590H Silo 590I Silo 591F Silo 591G Silo 591H Silo 591I Silo 591J	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC41 DC42 DC43 DC44 DC45 DC46 DC47 DC48 DC49	Bin Vents/Baghouses
SR03 SR04	B2 Jet Mill Screen 1 B2 Jet Mill Screen 2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC50	Baghouse
CV14	Shuttle Conveyor to Silo	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC51	Baghouse
CV15	Bucket Conveyor from Silos 166-170	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC52	Baghouse
BE06	Bucket Elevator from BC181	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC53	Baghouse
CB02 BL02	B2 Crucible Load/Unload for Calcining B2 Blender Feed	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC54	Baghouse
FLS1	Fresh Lime Silo #1	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC55	Bin Vent
FLS2	Fresh Lime Silo #2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC56	Bin Vent
SLS1	Spent Line Silo #1	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC57	Bin Vent
SLS2	Spent Lime Silo #2	40 CFR 52.21 391-3-1-.02(2)(b) 391-3-1-.02(2)(e)	DC58	Bin Vent

* Generally applicable requirements contained in this permit may also apply to emission units listed above. The lists of applicable requirements/standards are intended as a compliance tool and may not be definitive.

B1 - Building 1
B2 - Building 2

APPENDIX A

EPD'S PSD Dispersion Modeling and Air Toxics Assessment Review

DMU Modeling Review Report – PSD

General Information

Application #	28941
AIRS #	087-00061
Applicant	Anovion Technologies, LLC
Application Receipt Date	07/18/2023
Modeling Review Request Date	08/22/2023
Assigned SSPP PM1	Heather Brown
Assigned Permit Engineer	Wendy Troemel
Date of Review Report Submission	11/21/2023
Assigned DMU Modeler	Sarah Ray
Approved by DMU PM1	11/21/2023
List of Reviewed Pollutants	PM_{10}, $PM_{2.5}$, CO, SO_2, and NO_2

Review Summary

Are the modeled concentrations of all pollutants below SIL for Class I and Class II areas?	☐ Yes	☒ No
If "No" for the question above, list all pollutants whose modeled impacts were greater than or equal to the applicable SIL.	Class II 1-hour NO_2 Class II annual NO_2 Class II 24-hour PM_{10} Class II 24-hour $PM_{2.5}$ Class II 1-hour SO_2 Class II 3-hour SO_2 Class II 24-hour SO_2 Class II annual SO_2 Class II 8-hour CO Class I 3-hour SO_2 Class I 24-hour SO_2	
If cumulative modeling (i.e., Increment and NAAQS) is performed, are all pollutant below their applicable PSD Increment thresholds and NAAQS?	☐ Yes	☒ No
If "No" for the question above, list all pollutants whose modeled impacts were greater than applicable PSD Increment threshold and/or NAAQS.	Class II 1-hour SO_2 NAAQS **Note: Facility contributions are below the corresponding SILs.**	
Did the AQRV analysis show compliance?	☒ Yes	☐ No

Modeling Results

Table 1. Class II Significant Impact Levels Modeling

Pollutant	Averaging Period	Max Modeled Conc. (µg/m^3)	Secondary Impact (µg/m^3)*	Total (µg/m^3)	SIL (µg/m^3)	SIA (km)	Receptor UTM Zone: 16	
							Easting (meter)	Northing (meter)
CO	1-hour	1,162.19828	N/A	1,162.19828	2,000	N/A	730,447.81	3,426,198.25
	8-hour	517.53563	N/A	**517.53563**	500	639.2798	731,747.81	3,425,498.25
NO_2	1-hour	33.79659	N/A	**33.79659**	7.5	3,779.113	730,716.78	3,425,884.94
	Annual	1.53675	N/A	**1.53675**	1	965.797	731,560.56	3,425,691.19
PM_{10}	24-hour	28.42024	N/A	**28.42024**	5	2,293.851	730,719.87	3,425,736.66
	Annual	5.87925	N/A	**5.87925**	1	1,472.82	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	9.13464	0.2970	**9.431640**	1.2	4,061.961	730,719.87	3,425,736.66
	Annual	1.78231	0.0251	**1.807410**	0.2	1,909.595	730,719.87	3,425,736.66
SO_2***	1-hour	185.50343	N/A	**185.50343**	7.9	31,048.3	730,712.65	3,426,082.65
	3-hour	143.5134	N/A	**143.5134**	25	5,876.36	730,712.65	3,426,082.65
	24-hour	60.19315	N/A	**60.19315**	5	5,548.608	731,562.65	3,425,643.96
	Annual	8.85868	N/A	**8.85868**	1	4,989.614	731,564.74	3,425,596.73

* Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

Table 2. Class I Significant Impact Levels Modeling (Screening analysis with AERMOD)

Pollutant	Averaging Period	Max Modeled Conc. (µg/m^3)	Secondary Impact (µg/m^3)*	Total (µg/m^3)	SIL (µg/m^3)	Receptor UTM Zone: 16	
						Easting (meter)	Northing (meter)
NO_2	Annual	0.00735	N/A	0.00735	0.1	778,148.73	3,408,136.50
PM_{10}	24-hour	0.15777	N/A	0.15777	0.3	770,021.40	3,456,703.53
	Annual	0.00859	N/A	0.00859	0.2	773,566.50	3,398,741.55
$PM_{2.5}$	24-hour	0.06471	0.141	0.20571	0.27	694,596.41	3,459,337.43
	Annual	0.00232	0.003	0.00532	0.05	773,566.50	3,398,741.55
SO_2	3-hour	3.32681	N/A	**3.32681**	1	774,022.47	3,450,989.41
	24-hour	0.63556	N/A	**0.63556**	0.2	774,022.47	3,399,485.61
	Annual	0.03744	N/A	0.03744	0.1	683,348.86	3,439,856.10

* Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

Table 3. Class I Significant Impact Levels Modeling (Screening analysis with CALPUFF)

Pollutant	Averaging Period	Class I Area	Max Modeled Conc. (µg/m^3)	SIL (µg/m^3)
SO_2	3-hour	Bradwell Bay	0.423600	1
	24-hour		0.155190	0.2
SO_2	3-hour	Saint Marks	0.389530	1
	24-hour		0.142310	0.2
SO_2	3-hour	Okefenokee	0.122610	1
	24-hour		0.046921	0.2

Table 4. NAAQS Modeling

Pollutant	Averaging Period	Max Modeled Conc. (μg/m³)*	Background (μg/m³)	Secondary Impact (μg/m³)**	Total (μg/m³)	NAAQS (μg/m³)	Receptor UTM Zone: 16	
							Easting (meter)	Northing (meter)
CO	1-hour	1,128.77811	1,068	N/A	2,196.77811	40,000	731,747.81	3,425,498.25
	8-hour	461.6142	839	N/A	1,300.61420	10,000	731,573.12	3,425,407.82
NO_2	1-hour	114.58928	30.3	N/A	144.88928	188	734,047.81	3,422,798.25
	Annual	1.68783	4.5	N/A	6.18783	100	731,560.56	3,425,691.19
PM_{10}	24-hour	22.9132	37.2	N/A	60.11320	150	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	5.63302	24.4	0.2970	30.33002	35	730,719.87	3,425,736.66
	Annual	1.6478	8.9	0.0251	10.5729	12	730,719.87	3,425,736.66
SO_2	1-hour	303.59292	4.7	N/A	**308.29292**	196	730,712.65	3,426,082.65
	3-hour	305.38934	4.2	N/A	309.58934	1,300	734,647.81	3,422,298.25

* Maximum modeled concentrations for all pollutants except SO_2 reflect the "ALL" source group. SO_2 maximum modeled concentrations include only one graphitization furnace (TR2).

** Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

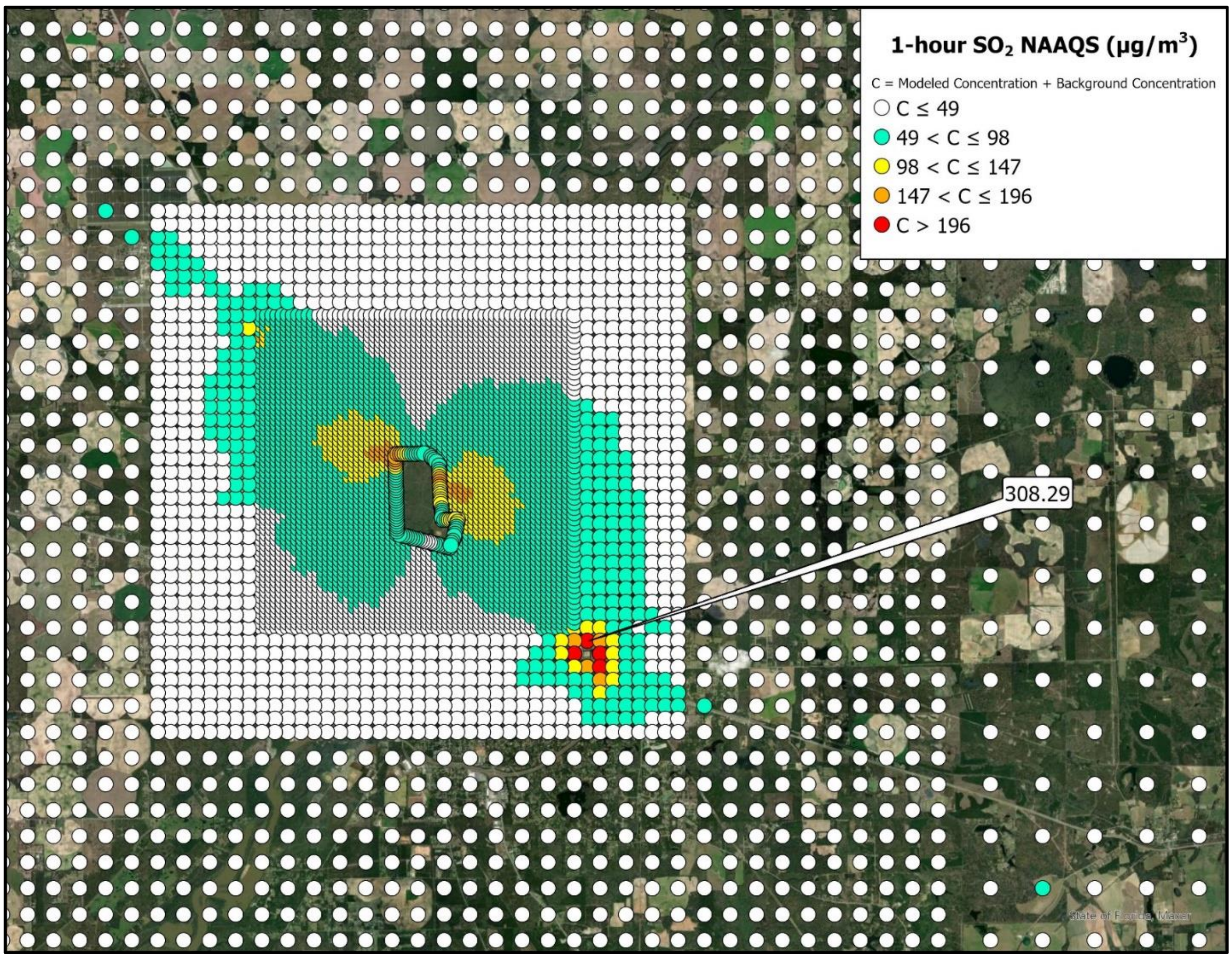

Figure 1. Spatial distribution of modeled SO_2 concentrations at 1-hour SO_2 NAAQS modeling receptors.

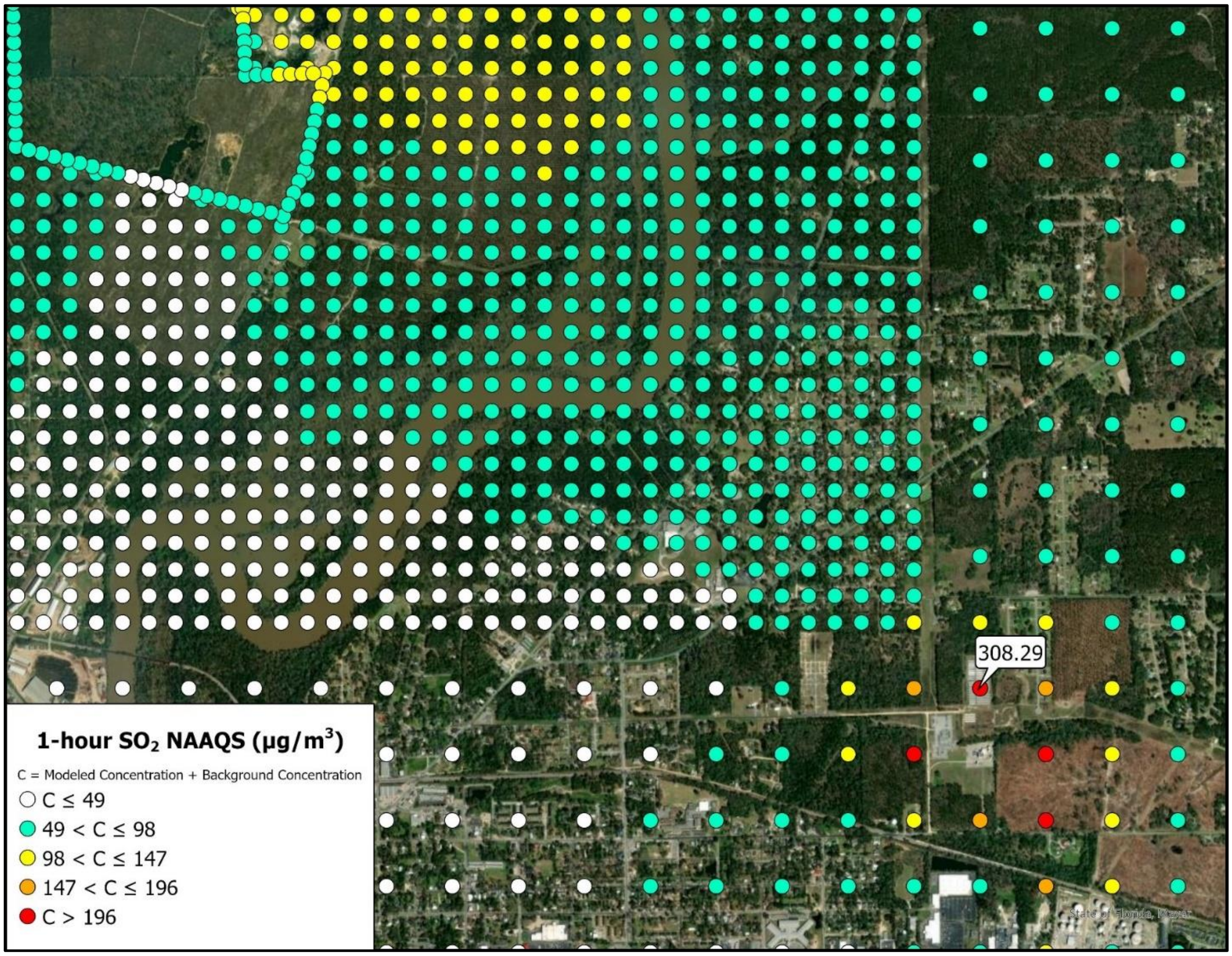

Figure 2. Zoomed-in map of spatial distribution of modeled SO_2 concentrations at 1-hour SO_2 NAAQS modeling receptors around the facility. For the red dot site of 308.29 $\mu g/m^3$, the Anovion contribution is below 7.9 $\mu g/m^3$.

Table 5. 1-hour SO_2 NAAQS Contribution Analysis

Total Conc. (μg/m^3)*	Anovion Contribution (μg/m^3)	Receptor UTM (Zone: 16)		Rank	Remark
		Easting (meter)	Northing (meter)		
308.29292	0.0031	734,397.81	3,422,548.25	4th	Highest 1-hour SO_2 concentration among all receptors exceeding the 1-hour SO_2 NAAQS level
210.92064	2.46754	734647.81	3,422,048.00	7th	Maximum 1-hour SO_2 contribution by Anovion among all receptors and ranks exceeding the 1-hour SO_2 NAAQS level

* Five receptors exceeded the 1-hour SO_2 NAAQS level (196 μg/m^3). The applicant excluded one receptor as the receptor was within the fenceline of a separate offsite facility (Walton Bainbridge Power Facility). The culpability analysis includes the remaining four receptors and the 1-hour SO_2 background concentration of 4.7 μg/m^3. During its review, the DMU considered both operating scenarios (TR1 only and TR2 only) individually. The highest modeled concentration occurs when only TR2 is operating. The highest Anovion contribution occurs when only TR1 is operating. The exceedance(s) at each of NAAQS violation receptors occurred from 4th rank up to 24th, but no exceedances afterwards. This refined modeling demonstrates that Anovion will not cause or contribute a significant impact (i.e., ≥ 7.9 μg/m^3) to the SO_2 NAAQS exceedances at the 1-hour averaging period.

Table 6. PSD Increment Modeling

Pollutant	Averaging Period	Max Modeled Conc. (μg/m^3)*	Secondary Impact (μg/m^3)**	Total (μg/m^3)	Class II PSD Increment (μg/m^3)	Receptor UTM Zone: 16	
						Easting (meter)	Northing (meter)
NO_2	Annual	1.68194	N/A	1.68194	25	731,560.56	3,425,691.19
PM_{10}	24-hour	24.07244	N/A	24.07244	30	730,717.81	3,425,835.51
	Annual	5.87925	N/A	5.87925	17	730,719.87	3,425,736.66
$PM_{2.5}$	24-hour	7.18391	0.2970	7.48091	9	730,719.87	3,425,736.66
	Annual	1.78231	0.0251	1.80741	4	730,719.87	3,425,736.66
SO_2	3-hour	123.52901	N/A	123.52901	512	730,711.62	3,426,132.08
	24-hour	51.12178	N/A	51.12178	91	731,562.65	3,425,643.96
	Annual	8.96087	N/A	8.85868	20	731,564.74	3,425,596.73

* Maximum modeled concentrations for all pollutants except SO_2 reflect the "ALL" source group. SO_2 maximum modeled concentrations include only one graphitization furnace (TR2).
** Secondary $PM_{2.5}$ impacts were estimated with the MERP approach using the NO_X and SO_2 emissions at the proposed facility.

Table 7. Additional Analysis

Analysis	Results
Ozone Impact	The significant impact of ozone is 0.20 ppb, which is less than the ozone SIL (1 ppb). The DMU calculated this value using MERPs from the Bay County, Florida hypothetical source. Therefore, the applicant did not need to conduct a cumulative ozone analysis.
Significant Monitoring Concentration	No preconstruction monitoring is required for annual NO_2 or 8-hour CO as maximum modeled concentrations do not exceed significant monitoring concentrations. Maximum modeled 24-hour PM_{10} and 24-hour SO_2 concentrations exceed significant monitoring concentrations. Available monitoring networks will be utilized for preconstruction monitoring.
AQRV	No adverse comments were received from the applicable FLMs. During its review, the DMU confirmed that Q/D values for all Class I areas within 300 km were less than 10. This analysis demonstrates that the expected project impact on Class I AQRVs will be negligible.
Others	A Class II visibility analysis showed no issues based on the impact evaluation. Soils and vegetation analysis showed no detrimental effects. Economic growth analysis showed no detrimental effects.