GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

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# NARRATIVE

TO: Heather Brown

FROM: Wendy Troemel

DATE: August 8, 2023

| | |
|---|---|
| Facility Name: | **LG Energy Solution, Ltd.** |
| AIRS No.: | 029-00021 |
| Location: | Ellabell, GA (Bryan County) |
| Application #: | 28892 |
| Date of Application: | May 31, 2023, updated July 29, 2023 |

## Application/Background Information

LG Energy Solution, Ltd (LGES) has submitted an application to construct and operate a new lithium-ion battery cell manufacturing facility. The new facility will be constructed at 9728 Hwy 280E, Ellabell, Georgia (Bryan County). Construction is anticipated to begin in November 2023.

Application No. 28892 (processed as an Expedited Permit) was received on May 31, 2023, with updated emissions calculations received on August 2, 2023. A public advisory was issued on June 7, 2023, and expired on July 7, 2023. No comments were received. The greenfield facility was assigned AIRS No. 029-00021. The facility will be permitted to operate 8,760 hours/year. Bryan County is classified as attainment for all applicable pollutants.

## Site Determination

The LGES facility will be constructed on the Bryan County Mega Site, just south of the Hyundai Group Metaplant America, LLC, facility (Hyundai) permitted under Georgia Air Permit No. 3711-029-0015-P-01-0, issued December 22, 2022. The Hyundai facility includes the auto assembly plant (stamping, body, paint, and assembly shops), Mobis (supplies parts, battery packs, and sub-assemblies), Transys (seats), Glovis (final preparations prior to shipping out), and Hyundai Steel (metal stamping). LGES will provide battery cells to the Hyundai plant.

In order to determine if two facilities are part of the same "major source" under Title V or "stationary source" for NSR-PSD, all three of the following must apply:

1. Both belong to the same industrial grouping;
2. Both located on one or more contiguous or adjacent properties; and
3. Both under control of the same person (or persons).

1. Based on the classifications and classification scheme in the 1972 Standard Industrial Classification ("SIC") Manual, the Hyundai facility is in SIC Industry Code 3711, "Motor Vehicles and Passenger Car Bodies," within SIC Major Group 37, "Transportation Equipment." LGES is in SIC Industry Code 3691, "Storage Batteries," within SIC Major Group 36, "Electrical and Electronic Machinery, Equipment, and Supplies."

2. The facility will be located on the Bryan County Mega Site along with the Hyundai facility, so the facilities are contiguous and/or adjacent.

3. For the third item, based on the April 30, 2018, in a letter from William Wehrum (Asst. Administrator of EPA for Air and Radiation) to Patrick McDonnell (Pennsylvania DEP), it states:

   "For Title V and NSR permitting purposes, 'control' assessment should be focused on the power or authority of one entity to dictate decisions of the other that could affect the applicability of, or the compliance with, relevant air pollution regulatory requirements."

   Furthermore, dependency relationships should not be presumed to result in common control.

   Hyundai and the listed-above affiliate entities were permitted together under a separate PSD permit, issued December 22, 2022. The proposed manufacturing facility for electric vehicle batteries is considered a 50/50 equity interest joint venture between Hyundai Motor Co., KIA Corporation, and Hyundai Mobis Co. Ltd (collectively referred to as HMG), and LGES. The corporate legal entity for this joint venture is still being formed; however, LGES took the lead to sign and submit this application. Once the legal entity is finalized, a name change for this facility will be submitted. As further explained in Attachment E of Application No. 28892, LGES will have control over both the day-to-day activities and the strategic operational decisions in this facility, as the board of directors for this unnamed joint venture gave LGES control of management through the appointment of LGES's choice for CEO. Among other items, this will allow LGES to have executive control over air pollution control and compliance decisions for the battery plant and will operate the battery plant so that it will not be under the control of the same person(s) as the Hyundai facility. There will be no shared manufacturing or air pollution control equipment.

   To address an EPA comment on the Hyundai draft PSD permit voicing concerns that Hyundai would be the "sole consumer of the LGES batteries," it is asserted that the joint venture is not restricted to producing and selling its batteries only to Hyundai. There will be no dependence on each other for their respective operations. This joint venture will sell batteries to Hyundai in a buyer-seller relationship, based on contract-negotiated prices. Between the two companies, there will be no common employees, including plant managers, security personnel, corporate executive officers, or board members. They will not share common payroll activities, employee benefits, health plans, retirement funds, insurance coverage, or other administrative functions.

   It is worth noting that, while the two facilities are represented to be separate, the Hyundai PSD application included estimates of battery plant emissions for PSD modeling purposes conservatively as secondary emissions.

**Process Description**

There are three steps of lithium-ion battery manufacturing: electrode manufacturing, battery cell assembly, and battery formation. The facility will operate five natural gas-fired hot oil heaters (OH01 through OH05) equipped with low $NO_X$ burners. These hot oil heaters will provide process heat and indirect heating for the cathode and anode dryers and are rated at 23.8 MMBtu/hr. Three natural gas-fired steam boilers (B01 through B03) will provide process heat for the Solvent Recovery Plant. These boilers are rated at 6.7 MMBtu/hr. Three natural gas-fired hot water boilers (B04 through B06) will also provide comfort heat and process heat. These boilers rated at 6.0 MMBtu/hr. A number of natural gas-fired HVAC comfort heaters and dock heaters (HVAC and DH) vary in size, but total 148 MMBtu/hr. The facility also includes two ultra-low sulfur (ULSD) diesel fire pumps, seven ULSD emergency generators, various laboratories and quality evaluation centers, N-Methyl-2-Pyrrolidone (NMP) and electrolyte storage tanks (VOC emissions routed to AC04 through AC07), and cooling towers.

- Electrode manufacturing - Solid raw materials for the anodes and cathodes are measured and mixed with either NMP for cathodes or water for anodes. The electrode slurries are coated onto metal foil substrates, then the coated electrode foil is dried in dryers that are indirectly heated by hot oil heaters. PM emissions from measuring and mixing are controlled using dust collectors (DC01 through DC06). VOC emissions from the electrode mixing and processing and general area cleaning are sent to activated carbon towers (AC01 through AC03). VOC emissions from cathode drying are collected by the wet scrubbers for the Solvent Recovery Plant (WS01 through WS06), then sent to distillation columns to recover and regenerate the NMP for reuse within the facility. These wet scrubbers are inherent process equipment.

- Assembly process - Cathodes and anodes are notched, where uncoated foil is trimmed to leave a tab for welding. After notching, the electrodes are stacked with a separator sheet, packaged in aluminum pouches, and the tabs are welded together. These packs are then filled with electrolyte and sealed. The packaged cells are tested in the packaging QA/QC area, where cells might be opened for inspection. PM emissions from tab marking, welding, and packaging are controlled by fume collectors (FC01 through FC03, FC03-1, and FC04 through FC12). Scrap from trimming is collected and exhaust air is recycled back into the building. VOC emissions from the electrolyte filling/sealing process and any emissions from the packaging QA/QC area are controlled by activated carbon towers (AC04 through AC07 and AC13 and AC14).

- Formation area - Electrolyte cells are activated (electrical charge applied) and accumulated VOC gases are routed to activated carbon towers (AC08 through AC12) for control. Cells that do not meet quality standards are removed from the line and submerged in salt water to discharge the electronic potential. The emissions are controlled by activated carbon towers (AC15 and AC16).

The facility will also utilize 36 dust collectors as both air pollution control equipment (APCE) and a method for cleaning process air to be recycled back into the building. Those dust collectors that clean air do not discharge to atmosphere and therefore will not be monitored as APCE. These units are not listed below in the table.

## Equipment Table

| ID | Equipment | APCE ID No. | Stack # | Main Pollutant |
|---|---|---|---|---|
| **ELECTRODE MANUFACTURING** | | | | |
| AM | Electrode Mixing - Anode | AC03<br>DC04-DC06 | ST11<br>ST08-ST10 | PM |
| CM | Electrode Mixing - Cathode | AC01-AC02<br>DC01-DC03 | ST06 & ST07<br>ST03-ST05 | PM, Inorganic HAP |
| SRP | Electrode Coating/Dryers<br>Solvent Recovery Plant | WS01-WS06 | ST12-ST17 | VOC |
| **ASSEMBLY PROCESSES** | | | | |
| NNC | Notching and Cutting | --- | Inside | PM |
| NNC | Tab Marking - Anode | FC01-FC03<br>FC03-1 | ST57-ST59<br>ST59-1 | PM |
| AP | Packaging (Cutting/tab welding) | FC04-FC12 | ST60-ST68 | PM |
| EF | Electrolyte Fill | AC04-AC07 | ST69-ST72 | VOC/HAP |
| QA | Packaging QA/QC Room | AC13-AC14 | ST78-ST79 | VOC/HAP |
| **CELL FORMATION** | | | | |
| DG | Degas (cell charging and degassing) | AC08-AC12 | ST73-ST77 | VOC/HAP |
| **DISCHARGE, QUALITY EVALUATION, UTILITIES, TANKS** | | | | |
| SB | Safety Building (safety test process and cell discharge) | AC15-AC16 | ST80-ST81 | VOC/HAP |
| GEN1-GEN7 | Emergency generators 1-7, diesel, varying sizes from 235 hp -1,005 hp, ULSD | --- | ST109-ST115 | $NO_X$, CO, VOC |
| FP01-FP02 | 190 hp and 282 hp diesel Fire Pumps, ULSD | --- | ST107-ST108 | $NO_X$, CO, VOC |
| B01– B03 | SRP Boilers 1-3, 6.7 MMBtu/hr each, natural gas fired units (Solvent Recovery Plant) | --- | ST18, ST19, & ST20 | $NO_X$, CO, PM, VOC |
| B04-B06 | Utility Hot Water Heaters 1-3, 6.0 MMBtu/hr each, natural gas fired units | --- | ST82, ST83, & ST86 | $NO_X$, CO, PM, VOC |
| OH01-OH05 | Hot Oil Heaters 1-5, 23.8 MMBtu/hr each, natural gas fired units, low-NOx burners | --- | ST01 & ST02 | $NO_X$, CO, PM, VOC |
| DH | Dock Heaters for comfort ~20, 0.4 MMBtu/hr, 8 MMBtu/hr total | --- | --- | $NO_X$, CO, PM, VOC |
| HVAC | HVAC system, including ~100 natural gas heaters ranging from 0.1-4 MMBtu/hr, 140 MMBtu/hr total | --- | --- | $NO_X$, CO, PM, VOC |
| CT | Cooling Towers | --- | --- | PM |
| TK1-TK3 | Tanks 1-3 (NMP Tanks) 26,390 gallons each | --- | --- | VOC |
| TK4 | Tank 4 (waste NMP) 7,920 gallons | --- | --- | VOC |
| TK5-TK12 | Tanks 5-12 (Electrolyte Storage Tanks) 13,100 gallons each | AC04-AC07 | ST69-ST72 | VOC |

DC - Dust Collector
WS – Wet Scrubber
AC – Activated Carbon Tower
FC – Fume Collectors
ULSD – Ultra-low Sulfur Diesel (15 ppm sulfur content)

**Emissions Summary**

The facility provided potential and estimated emissions. The facility requested limits to avoid classification as a major source of HAP (10/25 tpy), as well as 100 tpy limits for VOC, $NO_X$, CO, and PM to be a Title V Synthetic Minor source. These limits are declared as their potential emissions for those pollutants.

Boilers/Hot Oil Heaters/Hot Water Heaters

Emission factors from AP-42, Section 1.4, Tables 1.4-1 and 1.4-2 were used to calculate emissions from the boilers and hot oil heaters, except for $NO_X$, which utilized emission factors from manufacturer's specifications. The total heat input capacity of all units as proposed is 305.1 MMBtu/hr. All units will only fire natural gas and the bigger units will have low-$NO_X$ burners. These units emit most of the $NO_X$ and CO emissions from the facility, as well as nearly 10 tpy PM, 7.2 tpy of VOC, and 3 tpy HAPs from natural gas combustion.

Fire Pumps/Emergency Generators

The Division used emission factors from AP-42 Section 3.3 and 3.4, Tables 3.3-1 and 3.4.1 to calculate emissions from the fire pumps and emergency generators. The facility utilized emission factors based on manufacturer's specifications for both fire pumps for PM, CO, $NO_X$, and VOC calculations, which shows emission reductions of anywhere from 70-93% for these pollutants over the AP-42 emission factors. However, the total emissions from the fire pumps are still minor. The total hp provided by these units total 3221 hp-hr. All units will operate 500 hours per year or less and will fire ultra-low sulfur diesel (ULSD - 15 ppm sulfur). Aside from the remainder of the facility-wide $NO_X$ and CO emissions, these units also emit 1 tpy PM, 1.5 tpy of VOC, and minimal HAPs from ULSD combustion.

VOC Emissions/Carbon Tower Absorbers/Scrubbers

Storage tank working and breathing losses, as well as fugitives from loading/unloading are estimated at 0.06 tpy VOC. The facility used EPA's TANKS 4.0.9d to estimate these emissions. The facility will also have printing and cleaning related VOC emissions, assumed with no controls. These are estimated at 0.3 tpy.

The WS01 through WS06 scrubbers are classified as absorbers in the NMP recovery system and are used as material recovery devices for NMP; they are considered inherent process equipment and are not considered to be APCE. The facility is claiming a 1 ppm emission rate of NMP from these scrubbers. A molecular weight of 99.13 g/mole was used in these calculations.

The facility has asserted that the exit concentration of VOC emissions from all activated carbon towers are conservatively estimated at 2 ppm, except for the degassing area, which is estimated at 42 ppm. The Division calculated the molecular weight of the electrolyte as 116 g/mol (the average of the individual compounds as listed in the Material Safety Data Sheet (MSDS)) for use as emissions from units AC04-AC07 and AC13-AC16. NMP is the primary emission source from AC01-AC03, so 99.13 g/mole was used for these units. The molecular weight of ethylene, 28.1 g/mole, was used from the degas units AC08-AC12. Air flows as stated in the SIP application were used in calculations as well.

The facility will be capped at 100 tpy of total VOC emissions and will be required to create a protocol for calculating emissions and track monthly and rolling 12-month total VOC emissions to assure compliance with this avoidance limit.

CO Emissions

All CO emissions are generated by boilers, hot oil/water heaters, fire pumps, and emergency generators. By installing low $NO_X$ burners and firing natural gas only, emissions are minimized. However, in order to stay below the 100 tpy emission limitation, the facility will have to track usage hours and restrict fuel usage as needed. CO emissions were calculated using AP-42 Table 1.4-1 for natural gas combustion units and AP-42 Tables 3.3-1 and 3.4-1 for diesel fired units.

The facility will be capped at 100 tpy of total CO emissions and will be required to create a protocol for calculating emissions and track monthly and rolling 12-month total CO emissions to assure compliance with this avoidance limit.

$NO_X$ Emissions

Without the vendor provided specifications on the natural gas burners on the heaters and boilers, the facility's $NO_X$ emissions based on the AP-42 factor of 100 lb/MMscf for all natural gas combustion units would be 154 tpy $NO_X$. To stay below the 100 tpy emission limitation, the facility will have to track usage hours and restrict fuel usage as needed.

The facility utilized information from the manufacturer's specification sheet for the $NO_X$ emissions factor for units GEN5 & GEN6, as well as the afore-mentioned lower emission factors for the heaters and boilers.

The facility will be capped at 100 tpy of total $NO_X$ emissions and will be required to create a protocol for calculating emissions and track monthly and rolling 12-month total $NO_X$ emissions to assure compliance with this avoidance limit.

HAP Emissions

The facility has requested a 10/25 tpy HAP limitation to be classified as an area source under 40 CFR 63, thus removing applicability to several NESHAPs. HAP is emitted from all combustion sources, as well as from processes that utilize electrolyte. The largest single HAPs emitted are 1,3-propane sultone at 3 tons per year, and chlorine, hydrochloric acid (HCl), and hydrofluoric acid (HF) at less than 2 tons each per year. These emissions are created when the cells that do not meet quality standards are removed from the line and submerged in salt water to discharge the electronic potential. Emission factors from AP-42 Tables 1.4-3, 1.4-4, 3.3-2, and 3.4-1 were used to calculate both individual and total HAP emissions from the fuel-burning equipment. Information from the MSDS were used to calculate the percentage of HAP emitted from the activated carbon towers, and a facility-provided emission factor for chlorine, HCl, & HF of 0.00218 $gr/ft^3$ (each) from AC15 and AC16 was utilized. Air flows as stated in the SIP application were used in calculations as well.

Total controlled HAP is calculated to be under 10 tpy. In order to be a synthetic minor for HAP, as well as to ensure meeting Georgia Air Toxics Guidelines, the facility will be required to create a protocol for calculating emissions and track monthly and rolling 12-month individual and total HAP emissions to assure compliance with these avoidance limits.

Filterable PM, PM Total, $PM_{10}$, $PM_{2.5}$ Emissions

Conservatively, it was assumed that total PM, total $PM_{10}$, and total $PM_{2.5}$ were all equal and calculated in the same manner. Air flows as stated in the SIP application were used in calculations.

PM emissions from all fuel-burning equipment were calculated with emission factors from AP-42 Tables 1.4-2, 3.3-1, and 3.4-1.

The facility has indicated that dust and fume collectors will control PM emissions from the cathode and anode measuring, feed, separation, and notching operations. Many dust collectors do not vent outside and instead clean and recycle air back into the facility. For the collectors that do vent to atmosphere through a stack, the facility will be required to establish pressure drop differential which will be monitored once per week of operation, perform weekly VE checks of the stacks, and develop and implement a preventative maintenance program (PMP) for the dust and fume collectors that vent to atmosphere.

The facility used an emission factor of 0.001 gr/dscf from all dust and fume collectors for PM emissions based on data from a similar facility. There are 36 dust collectors in the assembly operations that only vent indoors and cannot discharge to atmosphere.

The facility will install six identical cooling towers at a total circulating water rate of 56,244 gal/min and five smaller air compressors at 3,190 gpm total. The facility has a target of 800 ppm total dissolved solids (TDS) due to 8 repeated pass-throughs in order to keep the water use in check (a typical value would be 500 ppm). The facility has calculated emissions from the cooling towers at 1 tpy PM/0.84 tpy $PM_{10}$/0.004 tpy $PM_{2.5}$.

The facility has estimated emissions from roadways at 1.6 tpy.

The facility will be capped at 100 tpy of total PM emissions. However, proper operation of the dust collectors and fume collectors will keep the potential emissions well below the cap of 100 tpy. Permit conditions requiring such maintenance as part of the permit. Therefore, the facility will not be required to calculate PM emissions.

$SO_2$ Emissions

$SO_2$ emissions are calculated at less than 1 tpy from natural gas and ULSD combustion, so no further monitoring, recordkeeping, or reporting is required.

**Facility-Wide Emissions**
(in tons per year)

| Pollutant | Potential Controlled Emissions | Facility Provided Controlled Potential Emissions |
|---|---|---|
| $PM/PM_{10}/PM_{2.5}$ | <100* | 15.76/5.12/3.89 |
| NOx | <100* | 106.68 |
| $SO_2$ | 0.8 | 0.8 |
| CO | <100* | 114.27 |
| VOC | <100* | 97.53 |
| Max. Individual HAP<br>1,3 Propane sultone<br>HCl, HF, & Chlorine | <10* | 2.97<br>1.73 (each) |
| Total HAP | <25* | 10.67 |
| Total GHG (if applicable) | 140,000 | 140,000 |

* Potential emissions based on emission limits requested in permit

**Regulatory Applicability**

*FEDERAL RULES*

Prevention of Significant Deterioration (40 CFR 52.21)

The facility's SIC code of 3691 – Storage Battery Manufacturing – is not included in the 28 source categories listed in 40 CFR 52.21(b)(1). While the sum of the heat input from the boilers, hot water/oil heaters, and HVAC equipment exceed the 250 MMBtu/hr threshold for fossil fuel-fired boilers (singularly or in combination) in the listed PSD 28 source categories in 40 CFR 52.21(b)(1)(iii)(u), there is not a "nested" PSD source within the facility, because the Division has previously determined that the hot oil heaters and HVAC equipment should not be included as a "fossil-fueled boiler" under 40 CFR 52.21. Therefore the provisions of 40 CFR 52.21 do not apply to this facility.

40 CFR 60 Subpart Dc – NSPS for Small Industrial-Commercial-Institutional Steam Generating Units

This rule applies to steam generating units with a heat input capacity between 10 and 100 MMBtu/hr, constructed after June 9, 1989. All hot oil heaters are classified as "steam-generating units" and are subject to this regulation. The hot oil heaters do not meet the definition of "process heaters" under this regulation. The smaller boilers and hot water heaters do not exceed 10 MMBtu/hr, so these units are not subject to this regulation. All units are restricted to firing natural gas only, so the PM, opacity, and $SO_2$ emission limitations and associated monitoring do not apply to the hot oil heaters. The facility will be required to submit reports upon construction and startup of the hot oil heaters OH01 through OH05 and maintain records of monthly natural gas usage. The facility has requested to keep plant-wide natural gas usage.

40 CFR 63 Subpart CCCCCCC – Area Source NESHAP for Paints and Allied Products Manufacturing

This rule regulates area source manufacturers of paints and allied products that contain metal-containing HAP – defined as a material containing benzene, methylene chloride, or compounds of cadmium, chromium, lead, and/or nickel, in amounts greater than or equal to 0.1% by weight for carcinogens, or 1% by weight for non-carcinogens. Paints and allied products manufacturing operations include the production of paints, inks, adhesives, stains, varnishes, shellacs, putties, sealers, caulks, and other coatings from raw materials, the intended use of which is to leave a dried film of solid material on a substrate.

The affected source is only those processes that process, use, or generate the target HAP, not the entire facility. The facility must comply with the requirements of this rule upon startup of the affected sources. Affected sources must operate a particulate control device during the addition of pigments or during grinding/milling of pigments that contain the listed compounds. PM control devices must be maintained such that visible emissions do not exceed 10% opacity when averaged over three 1-minute periods if the device vents to atmosphere.

As previously described, the cathode preparation process includes the weighing and blending of the powdered components, which includes nickel (a listed metal HAP), with NMP to create the slurry that is applied to the foil substrate and dried. Affected sources must meet the following requirements:

- The facility must operate a capture system that minimizes fugitive particulate emissions when adding dry solids that contain compounds of nickel to a process vessel or to a grinding or milling operation, and route them to a particulate control device. This requirement does not apply to solids that are in paste, slurry, or liquid form.

- The facility must conduct an initial inspection of each particulate control device. The facility must visually inspect the ductwork and control equipment for leaks and inspect the interior of the control device for structural integrity. Conduct daily inspections to verify the presence of water flow (if applicable). Conduct weekly visual inspections of any flexible ductwork for leaks. Conduct annual inspections of the rigid ductwork, and the interior of the control system.
- For each dry particulate control system, inspect the system ductwork and control device for leaks. Perform weekly visual inspections of any flexible ductwork for leaks. Inspect rigid ductwork for leaks and the interior of the dry particulate control device on an annual basis.
- Perform quarterly visual determination of emissions.

The affected equipment is the CM process, controlled by dust collectors DC01-DC03, due to the cathode powder containing nickel compounds.

40 CFR 60 Subpart IIII – NSPS for Stationary Compression Ignition Internal Combustion Engines and 40 CFR 63 Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

The facility has two diesel fired fire pumps and seven emergency generators that are classified as a reciprocating internal combustion engine (RICE) unit. The fire pumps operate on diesel at 500 hr/yr or less. Compliance with 40 CFR 60 Subpart IIII is demonstrated by purchasing engines certified to the emissions standards in 40 CFR 60.4205(c) and emission limitations of Table 4. 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).

*GEORGIA RULES*

Georgia Rule 391-3-1-.02(2)(b) – Visible Emissions

Georgia Rule (b) limits the opacity of emissions from any source to less than 40%, unless a more restrictive limit applies. The rule will apply to all process equipment at the facility. Violation of the rule is not likely due to the nature of the process and the use of control equipment.

Georgia Rule 391-3-1-.02(2)(d) – Fuel-Burning Equipment

Georgia Rule (d) contains provisions for PM, opacity, and $NO_X$ emissions from fuel-burning equipment. The boilers and water/oil heaters will be constructed after January 1, 1972 and have a heat input capacities of both less than 10 MMBtu/hr, and greater than 10 MMBtu/hr but less than 250 MMBtu/hr. The filterable PM emissions from the boilers and water/oil heaters are limited to 0.5 lb/MMBtu for units less than 10 MMBtu/hr heat input, and $0.5(10/R)^{0.5}$ lb/MMBtu for units over 10 MMBtu/hr heat input.

Georgia Rule (d) also limits the opacity from the boilers and oil heaters to less than 20% opacity (6-minute average), except for one 6-minute period per hour of not more than 27% opacity. These units will not be subject to the $NO_X$ limit under 391-3-1-.02(2)(d)4. because the capacity for each unit is less than 250 MMBtu/hr.

Georgia Rule 391-3-1-.02(2)(e) – Particulate Emission from Manufacturing Processes

Georgia Rule (e) limits the emission of particulate matter on a pound per hour basis from a source based on the ton per hour of material input. The rule applies to all process equipment at the facility. Violation of the rule is not likely due to the use of control equipment.

Georgia Rule 391-3-1-.02(2)(g) – Sulfur Dioxide

Georgia Rule (g) limits the sulfur content of fuel burned in a unit below 100 MMBtu/hr to 2.5% or less. The facility will only fire natural gas in the boilers and hot oil heaters, which subsumes this limit and ensures compliance.

Georgia Rule 391-3-1-.02(2)(n) – Fugitive Emissions

Georgia Rule (n) limits the opacity of fugitive emissions to 20% and requires the facility to take precautions to prevent dust from becoming airborne. It is not likely this rule would be violated because all operations are in an enclosed building.

*RULES AND REGULATIONS THAT ARE NOT APPLICABLE*

Since the facility is a synthetic minor source of HAP, it is not subject to any major source NESHAPs, including 40 CFR 63 Subpart DDDDD – NESHAP for Industrial, Commercial, and Institutional Boilers (major sources).

40 CFR 60 Subpart K, Ka, and Kb – NSPS for Volatile Organic Liquid Storage Vessels

The facility will have volatile organic liquid (VOL) storage tanks on site for NMP that exceed the threshold of 75 $m^3$ (19,813 gallons). NMP Tanks TK1-TK3 have a 26,930-gallon capacity storing pure NMP, waste NMP, and electrolyte, which meet the VOL definition. The vapor pressure of NMP is 0.05 kPa at 25C, which is below the threshold listed in 40 CFR 60.110b(b). Therefore, none of the 40 CFR 60 Subparts K, Ka, or Kb apply. All tanks are exempt from permitting by Georgia Rule 391-3-1-.03(6)(c)7.

40 CFR 60 Subpart VVa – NSPS for Equipment Leaks of VOC in the SOCMI Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

The facility does not produce any of the chemicals listed in 40 CFR 60.489 as either a product, co-product, by-product, or intermediate. The recovery of NMP is not covered by this regulation; therefore, this rule is not applicable.

40 CFR 60 Subparts III, NNN, and RRR – NSPSs for Volatile Organic Compound (VOC) Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) – Air Oxidation Unit Processes, Distillation Operations and Reactor Processes

The facility is not subject to 40 CFR 60 Subparts III and RRR as the proposed NMP solvent recovery process does not contain air oxidation processes or reactors. The facility furthermore is not subject to 60 Subpart NNN because, even though NMP is listed in 40 CFR 60.667, the facility does not produce NMP – they purchase bulk NMP, then recover and reuse. Therefore, these rules do not apply.

40 CFR 63 Subpart JJJJJJ – NESHAP for Industrial, Commercial, and Institutional Boilers (area sources)

40 CFR 63 Subpart JJJJJJ applies to each boiler at area sources of HAP. However, under §63.11195(e), gas-fired boilers, as defined in §63.11237, are not subject to 63 Subpart JJJJJJ. Under §63.11237, a gas-fired boiler is defined as "any boiler that burns gaseous fuels," which includes natural gas. None of these units will be connected to a fuel oil source. Because the boilers meet this definition, they are not subject to 40 CFR 63 Subpart JJJJJJ. The §63.11237 definition of "boiler," which also defines "process heaters," specifically excludes process heaters; therefore, the hot oil heaters are also not subject to 63 Subpart JJJJJJ. None of the sources at the facility are subject to this regulation.

Georgia Rule 391-3-1-.02(2)(bb) – Petroleum Liquid Storage

This rule applies to tanks that have a capacity of greater than 40,000 gallons that store a petroleum liquid. All tanks at the facility are less than 40,000 gallons and NMP is not a petroleum liquid.

Georgia Rule 391-3-1-.02(2)(nn) – VOC Emissions from External Floating Roof Tanks

This rule applies to tanks that have a capacity of greater than 40,000 gallons. All tanks at the facility are less than 40,000 gallons and have fixed roofs.

Georgia Rule 391-3-1-.02(2)(vv) – Volatile Organic Liquid Handling and Storage

This rule applies to the transfer of VOLs in quantities greater than 4,000 gallons without tanks being equipped with submerged fill pipes and in specified counties. While NMP is classified as a VOL, Bryan County is not listed as an applicable county; therefore, the facility is not subject to this rule.

Georgia Rule 391-3-1-.02(2)(lll) – $NO_X$ Emissions from Fuel-Burning Equipment

Georgia Rule (lll) limits $NO_X$ emissions from all fuel-burning equipment with a heat input capacity between 10 and 250 MMBtu/hr installed after May 1, 1999, in specific counties. Bryan County is not listed as an applicable county; therefore, the facility is not subject to this rule.

Georgia Rule 391-3-1-.02(2)(mmm) – NOx Emissions from Stationary Gas Turbines and Stationary Engines used to Generate Electricity

This rule applies to stationary gas turbines or stationary engines used to generate electricity with a nameplate capacity greater than 100 kilowatts. Bryan County is not listed as an applicable county; therefore, the facility is not subject to this rule.

*TESTING AND MONITORING REQUIREMENTS*

Scrubbers

There are six scrubbers at the facility that are classified as absorbers used in the NMP recovery system and are not considered to be APCE. The facility has proposed monitoring absorber water flow rate and outlet temperature for these scrubbers on a daily basis. The facility will be required to test the VOC emissions from these units in order demonstrate compliance with the synthetic minor VOC emission limitation. Tests on all six will be repeated every 60 months.

Activated Carbon Towers

There are sixteen activated carbon towers of varying sizes at the facility. The facility has proposed monitoring the carbon beds using a hand-held or similar monitoring device to measure total hydrocarbons (THC) on a propane basis. The facility has stated that a breakthrough of 3 ppm THC is equivalent to 2 ppm NMP and will trigger a replacement of the activated carbon for all activated carbon towers other than those from degas. AC08 through AC12 will use a breakthrough of 27 ppm THC (equivalent to 42 ppm ethylene) to trigger a replacement of the activated carbon. The facility will monitor the carbon towers every week and make a note in the log when the carbon is replaced. Additionally, the facility will test emissions from one unit out of each grouping of AC04-AC07, AC08-AC12, and AC15-AC16 to determine site-specific emission factors for HAP/VOC/HCl/HF/chlorine emissions (as applicable) from these units to calculate facility-wide emissions.

**Permit Conditions**

Conditions 1.1 through 1.5 are general conditions that apply to all SIP sources.

Condition 2.1 limits the facility to less than 10 tpy of any individual HAP/25 tpy of all combined HAP. The facility requested this limit to be classified as an area source for HAP.

Condition 2.2 limits the facility to less than 100 tpy each VOC, CO, $NO_X$, and PM emissions. The facility requested these limits to avoid applicability to 40 CFR Part 70.

Condition 2.3 requires the facility to operate the wet scrubbers, activated carbon towers, and dust and fume collectors at all times the associated process equipment is in operation.

Condition 2.4 subjects the hot oil heaters at the facility to all applicable requirements of 40 CFR 60 Subparts A and Dc.

Condition 2.5 subjects the boilers, hot water heaters, and hot oil heaters to the PM emission limits and opacity requirements of Georgia Rule (d).

Condition 2.6 restricts the boilers, hot water heaters, and hot oil heaters to firing natural gas only in order to remove the facility from applicability to 40 CFR 63 Subpart JJJJJJ, as well as many requirements of 40 CFR 60 Subpart Dc.

Condition 2.7 requires the facility to comply with all requirements of 40 CFR 63 Subpart CCCCCCC and 40 CFR 63 Subpart A for the metal HAP emissions from the CM Electrode Mixing – Cathode area, controlled by Dust Collectors DC01 through DC03.

Condition 2.8 outlines the controls needed for the CM Electrode Mixing – Cathode area under 40 CFR 63 Subpart CCCCCCC.

Condition 2.9 subjects the emergency generators and fire pumps to the general requirements of 40 CFR 60 Subpart IIII.

Condition 2.10 subjects all process equipment to an opacity of less than 40% (Georgia Rule (b)).

Condition 2.11 subjects to all applicable equipment to the requirements of Georgia Rule (e).

Condition 3.1 is the general fugitive emission requirement under Georgia Rule (n).

Condition 4.1 is a general condition that requires the facility to perform routine maintenance in order to keep air pollution control equipment in good working order.

Condition 4.2 requires the facility to keep an inventory of filter bags/cartridges on hand to replace any defective bags in any of the dust collectors.

Condition 4.3 outlines the parameter ranges the facility must adhere to for the scrubbers after performance testing.

Condition 5.1 lists the monitoring parameters and frequency of data collection for the dust and fume collectors, scrubbers, and activated carbon towers.

Condition 5.2 requires the facility to monitor the VOC concentration from the activated carbon towers weekly and to replace the carbon in the unit when the concentration exceeds 3 ppm THC as propane, except for units AC08-AC12, which will be 27 ppm, within 7 days of such reading.

Condition 5.3 requires a weekly VE check from stacks ST03 through ST05 and ST08 through ST10.

Condition 5.4 requires the facility to develop a preventative maintenance program for the dust collectors.

Conditions 5.5 and 5.6 require the facility to inspect and conduct visible emission tests of Dust Collectors DC01 through DC03 under 40 CFR 63 Subpart CCCCCCC, and then make periodic inspections.

Condition 6.1 and 6.2 are general testing provisions that apply to all sources.

Condition 6.3 outlines the specific test methods for the facility.

Condition 6.4 requires the facility to conduct performance tests for VOC emissions from the solvent recovery area wet scrubbers WS01 through WS06, VOC emissions from the electrolyte fill activated carbon towers AC04 through AC07, VOC/HAP emissions from the degas area activated carbon towers AC08 through AC12, HAP/HCl/HF/chorine emissions from the safety building area activated carbon towers AC15 and AC16, and inorganic HAP from cathode mixing area dust collectors DC01 through DC03 and establish lb/hr emission rates from these scrubbers, carbon towers, and baghouses. The facility is required to test all 6 scrubbers initially and then on-going every 60 months. The facility must test one of each grouping of carbon towers one each of AC04-AC07, AC08-AC12, and AC15-AC16) in order to establish site-specific emission factors/rates to be used in facility-wide emissions calculations. These carbon tower tests will be repeated only if requested by the Division. The testing requirements of 40 CFR 63 Subpart CCCCCCC for baghouses DC01-DC03 are included.

Condition 6.5 requires the facility to test the hot oil heaters for unit-specific $NO_X$ and CO emission factors.

Conditions 7.1 and 7.2 are general provisions that apply to all sources.

Condition 7.3 requires the facility to notify the Division of construction and startup of the hot oil heaters under 40 CFR 60 Subpart Dc.

Condition 7.4 outlines the natural gas usage records for the boilers, hot water heaters, and hot oil heaters under both Part 70 avoidance and 40 CFR 60 Subpart Dc.

Condition 7.5 requires the facility to track hours of usage and gallons of ULSD for the fire pumps and emergency generators.

Condition 7.6 requires the facility to maintain a log for carbon replacement in the activated carbon towers.

Condition 7.7 requires the facility to submit for approval an emission calculation protocol that will be used to calculate monthly and 12 month rolling totals of VOC, PM, $NO_X$, CO, and HAP emissions.

Conditions 7.8 and 7.9 require the facility to calculate monthly and 12 month rolling total HAP emissions. Prior to site-specific performance testing, the facility will use the emission factors as described in Application No. 28892.

Conditions 7.10 and 7.11 require the facility to calculate monthly and 12 month rolling total VOC emissions. Prior to site-specific performance testing, the facility will use the emission factors as described in Application No. 28892.

Conditions 7.12 and 7.13 require the facility to calculate monthly and 12 month rolling total $NO_X$ emissions. Prior to site-specific performance testing, the facility will use the emission factors as described in Application No. 28892.

Conditions 7.14 and 7.15 require the facility to calculate monthly and 12 month rolling total CO emissions. Prior to site-specific performance testing, the facility will use the emission factors as described in Application No. 28892.

Condition 7.16 outlines the information required to be submitted in the semi-annual reports.

Condition 7.17 requires the facility to send in notification of startup.

Conditions 7.18 through 7.23 outline the various 40 CFR 63 Subpart CCCCCCC recordkeeping and reporting requirements, including initial notifications, Notification of Compliance Status, and deviation reports.

Condition 8.1 is a general condition that applies to all Georgia air permits.

Condition 8.2 requires the facility to calculate and pay air permit fees.

**Toxic Impact Assessment**

Facility-wide emissions for arsenic, cadmium, chlorine, copper, graphite, and hydrofluoric acid (HF) exceeded the minimum emission rates (MER) as outlined in EPD's *Guidelines for Ambient Impact Assessment of Toxic Air Pollutants (TAP)*. Additionally, the emissions for lead and formaldehyde, while under their respective MERs, are primarily from combustion (volume) sources and must be evaluated as well. Note that the facility emits 16.6 tpy of isopropyl alcohol (IPA), which is still below its MER of 56.77 tpy. The facility provided a facility wide toxic impact assessment for these TAP using AERMOD.

The Division reviewed the calculations, inputs, and results and agrees with the finding that all pollutants are less than the applicable acceptable ambient concentrations. Please see the application for a complete copy of the report. Note that the solvent NMP is not assessed in Georgia's current Toxics Guidelines.

| TAP | Ave. Period | AAC (μg/m³) | MER (lb/yr) | Facility emissions (lb/yr) | Emission rate (lb/hr) | Total (μg/m³) | % of AAC | Pass |
|---|---|---|---|---|---|---|---|---|
| Arsenic | 15-min | 0.2 | 0.0567 | 0.52 | 0.0000594 | 0.0006996 | 0.35 | Yes |
| | Annual | 0.000233 | | | | 0.00003 | 12.88 | Yes |
| Cadmium | 15-min | 30 | 1.353 | 2.88 | 0.000329 | 0.0038676 | 0.013 | Yes |
| | Annual | 0.00556 | | | | 0.00015 | 2.70 | Yes |
| Copper | 24-hour | 2.4 | 116.81 | 1,135.80 | 0.1297 | 0.90242 | 37.60 | Yes |
| Chlorine | 15-min | 300 | 175.21 | 3,468.33 | 0.3959 | 14.8574184 | 4.95 | Yes |
| | 24-hour | 3.6 | | | | 3.11374 | 86.49 | Yes |
| Formaldehyde | 15-min | 245 | 267 | 210.28 | 0.02400 | 1.0342464 | 0.42 | Yes |
| | Annual | 1.10 | | | | 0.01151 | 1.05 | Yes |
| Graphite | 24-hour | 5.95 | 289.7 | 1,019.98 | 0.1164 | 0.86701 | 14.57 | Yes |
| HF | 15-min | 245 | 284.23 | 3,468.33 | 0.3959 | 14.8574184 | 6.06 | Yes |
| | 24-hour | 5.84 | | | | 3.11374 | 53.31 | Yes |
| Lead | 3-month rolling | 0.15 | 5.84 | 1.31 | 0.0001495 | 0.0029967* | 2.00 | Yes |

* Includes the 2021 background concentration from General Coffee monitor of 0.0029 μg/m³

**Summary & Recommendations**

The public advisory for the LG Energy Solution, Ltd. facility expired on July 7, 2023, and no comments were received. The facility has been classified as a synthetic minor source for HAP, VOC, PM, CO, and $NO_X$ emissions, and the appropriate operating, testing, recording, and reporting requirements have been included in this "S" permit. The facility has indicated that it can comply with all applicable rules and regulations; therefore, I recommend that Air Quality Permit No. 3691-029-0021-S-01-0 be issued to LG Energy Solution, Ltd.