NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: 12/11/2018

Region: Washington Regional Office
County: Wayne
NC Facility ID: 9600017
Inspector's Name: Robert Bright
Date of Last Inspection: 02/22/2017
Compliance Code: 3 / Compliance - inspection

Facility Data

Applicant (Facility's Name): Duke Energy Progress, LLC - H.F. Lee Steam Electric Plant

Facility Address:
Duke Energy Progress, LLC - H.F. Lee Steam Electric Plant
1199 Black Jack Church Road
Goldsboro, NC 27530

SIC: 4911 / Electric Services
NAICS: 221112 / Fossil Fuel Electric Power Generation

Facility Classification: Before: Title V **After:** Title V
Fee Classification: Before: Title V **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02D .0515, .0516, .0521, .0540
NSPS: NA
NESHAP: NA
PSD: NA
PSD Avoidance: 15A NCAC 02Q .0317
NC Toxics: 15A NCAC 02D .1100
112(r): NA
Other: NA

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Mike Graham Sr. EHS Professional (919) 722-6551 1199 Black Jack Church Road Goldsboro, NC 27530	Jeffery Hines General Manager II (919) 722-6450 H.F. Lee Steam Electric Plant Goldsboro, NC 27530	Erin Wallace Sr. Environmental Specialist (919) 546-5797 410 South Wilmington Street Raleigh, NC 27601

Application Data

Application Number: 9600017.17A
Date Received: 11/13/2017
Application Type: Modification
Application Schedule: TV-Sign-501(c)(2) Part I

Existing Permit Data

Existing Permit Number: 01812/T42
Existing Permit Issue Date: 09/08/2016
Existing Permit Expiration Date: 06/30/2020

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2016	15.59	1060.46	35.69	223.78	159.34	6.30	4.25 [Formaldehyde]
2015	17.62	1156.11	25.61	271.41	158.83	5.31	3.32 [Formaldehyde]
2014	17.10	1029.78	12.85	529.22	136.88	3.54	2.15 [Formaldehyde]
2013	14.59	1019.21	11.70	144.08	146.77	3.47	2.30 [Formaldehyde]
2012	5931.08	1717.47	49.52	330.21	220.14	350.00	318.79 [Hydrogen chloride (hydrochlori]

Review Engineer: Ed Martin

Review Engineer's Signature: **Date:** 12/11/2018

Edward L. Martin

Comments / Recommendations:
Issue 01812/T43
Permit Issue Date: 12/11/2018
Permit Expiration Date: 06/30/2020

Chronology

November 13, 2017	Application received.
June 10, 2015 (attached)	In a letter to Mr. Jim Clayton with The SEFA Group, in response to their request, the Division of Air Quality (DAQ) made a determination of regulatory status, with respect to 40 CFR 241 "Solid Wastes Used as Fuels or Ingredients in Combustion Units," that flyash received directly from a coal-fired power plant's particulate collection device (i.e., electrostatic precipitator or baghouse), and flyash received from landfills and ash ponds to be used in the STAR® reactor is a "non-hazardous secondary material" (NHSM), is an "ingredient," meets the legitimacy criteria, and is not a solid waste. Therefore, the STAR® reactor is not subject to the Commercial and Industrial Solid Waste Incineration (CISWI) requirements in 40 CFR 60 Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units" or, Subpart DDDD "Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units." (see Section VII.A.2, under Non-applicable Regulations)
December 18, 2017 (attached)	A letter was sent to Jeffery D. Hines (facility RO) at Duke informing them that the STAR® modification emissions cannot be included under the existing Prevention of Significant Deterioration (PSD) avoidance limits since those limits were for an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD. This additional information on PSD applicability is needed in order to determine that the application is complete for further processing. The letter also informs Duke that the draft CAM Plan, as submitted with the application, is not necessary at this time since a construction permit is to be issued initially, with the Part 70 Title V permit application to be filed within 12 months after commencing operation in accordance with 02D .0501(c)(2). (see Section VII.A.3, under Non-applicable Regulations)
January 5, 2018	Meeting with Duke (William Willets, Cyndi Winston, Erin Wallace and Ed Martin) to discuss DAQ's request in the December 18, 2017 letter (item 1) for more information regarding PSD applicability. Duke presented their reasoning why they believed the project emissions should be included under the existing PSD avoidance limits. Duke was to provide additional information for DAQ's review.
January 8, 2018	Duke's original toxics dispersion modeling analysis was approved by Alex Zarnowski, AQAB (see memo to Ed Martin dated January 8, 2018).
February 1, 2018 (attached)	In an email, Duke was asked to complete 1-hour NO_2 and SO_2 NAAQS modeling, as internal DAQ discussions indicated this was needed to be consistent with the Buck STAR® application.

February 5, 2018	Conference call (William Willets, Mark Cuilla, Booker Pullen, Cyndi Winston, Erin Wallace and Ed Martin) with Duke to discuss Duke's proposed reasoning to include the project emissions under the existing PSD avoidance limits. DAQ asked Duke to provide their reasoning in a letter. Also, Duke mentioned there may be differences between the Buck and Lee projects regarding whether it was necessary to conduct 1-hour NO_2 and SO_2 NAAQS modeling for Lee.
February 13, 2018	DAQ internal meeting (William Willets, Tom Anderson, Matt Porter and Ed Martin) to discuss how the Buck 1-hour NO_2 and SO_2 NAAQS modeling was conducted and whether this modeling may be needed for Lee. DAQ's decision depended on receipt of Duke's additional information regarding whether the project emissions can be included under the existing PSD avoidance limits.
February 19, 2018 (attached)	A letter (dated February 7, 2018) was received from Duke with additional information explaining their rationale that the STAR® project should be considered part of the same project that retired the coal-fired boilers and installed the three new combined cycle turbines and to therefore include the STAR® project emissions under the existing PSD avoidance limits.
February 20, 2018	After reviewing Duke's rationale in their February 7, 2018 letter that the STAR® ash beneficiation project should be considered as part of the same project that retired the three coal-fired boilers and installed the three new combined cycle turbines, Duke was informed that DAQ agreed and that the STAR project emissions can be included under the existing PSD avoidance limits. Also, as a result, the 1-hour SO_2 and NO_2 NAAQS modeling will not be needed (see Section IX, 1-hour NO_2 and SO_2 NAAQS Modeling).
February 23, 2017 (attached)	In an email, Duke responded to DAQ's request of January 11, 2018 for additional information and answered some of the questions. However, many items remained unanswered and the application processing clock remained on hold.
March 14, 2018 (attached)	In an email, DAQ responded to Duke's February 23, 2018 response to elaborate information needed for items not fully addressed by Duke. Duke was asked several questions for additional information related to emission calculations, sources of emission factors, design capacity of the STAR® unit, actual emissions versus potential emissions for a proposed PSD avoidance condition, how the emission rates used in their toxics modeling analysis were determined, Duke's proposed monitoring for SO_2 for compliance with 02D .0516, etc. The application processing clock was stopped awaiting the additional information. The application remained on hold.
April 4, 2018 (attached)	In an email, Duke responded to DAQ's request of March 14, 2018 and provided further information. The only missing requested information was the source of the CO and VOC emission factors referenced in the application for reactor ES-31. The application remained on hold.
April 17, 2018 (attached)	In an email, DAQ again asked for the source of the CO and VOC emission factors for reactor ES-31.
April 25, 2018 (attached)	In an email to Duke, DAQ asked if the existing gasoline storage tank (ID No. 4) was modeled.

April 25, 2018 (attached)	In an email, regarding the above question on whether the gasoline tank was modeled, Duke responded it would appear that the gasoline storage was inadvertently left out of the air dispersion analysis (for Benzene, Hexane, and Toluene). Duke provided potential emissions for the tank for DAQ's use in the Health Risk Assessment.
May 25, 2018	Sent draft permit to Duke, Washington Regional Office and Stationary Source Compliance for review.
May 29, 2018 (attached)	Email from Washington Regional Office with comment on the draft permit (see Section XII).
June 4, 2018 (attached)	Email from Duke with comments on the draft permit (see Section XII).
June 8, 2018	The draft permit was issued to provide for a 30-day comment period.
June 8, 2018	A notice of public hearing for the draft permit was published in the Goldsboro News-Argus newspaper and placed on the DAQ website along with the draft permit and review.
July 10, 2018	A public hearing was held at 7:00 pm on July 10, 2018 at the Wayne Community College in Goldsboro.
July 13, 2018	The public comment period ended.
August 1, 2018 (attached)	In an email, DAQ requested additional information needed as a result of public comments regarding: fugitive emissions, ash pond test methods, HCl and HF emissions, off-site ash processing and other permit changes to be made (see Section XIII).
August 9, 2018 (attached)	In an email, Duke responded to the additional information request of August 1, 2018 (see Section XIII).
August 21, 2018 (attached)	In an email, DAQ requested additional information on the ash pond test methods, and HCl and HF emissions that Duke provided on August 9, 2018 (see Section XIII).
August 27, 2018 (attached)	In an email, Duke provided HCl and HF emission calculations.
October 26, 2018	Duke submitted an application addendum to include revised toxic modeling for the new emission rates as a result of the revised ash metal concentrations from re-analyzing the original ash samples as requested by DAQ. Also, Duke requested the addition of two new insignificant activities. The revised toxics modeling included these two new sources and the gasoline tank previously omitted. (see Section XIII)
November 20, 2018	Duke's revised toxics dispersion modeling analysis was approved by Alex Zarnowski, AQAB (see memo to Ed Martin dated November 20, 2018).
November 29, 2018	The Hearing Officer's Report with recommendations was issued.
December 10, 2018	A memorandum from Michael A. Abraczinskas, Director, Division of Air Quality, to Mark Cuilla, Acting Chief, Permitting Section, approved the issuance of the air permit.
December 11, 2018	The final permit was issued.

I. Purpose of Application

Duke has applied to install and operate a flyash processing facility consisting of a Staged Turbulent Air Reactor (STAR®) with supporting ancillary sources at the H.F. Lee Steam Electric Plant as shown in Section X below. This is one of three flyash beneficiation projects in North Carolina (the others are at Duke's Buck and Cape Fear plants) mandated by HB 630 (Session Law 2016), which modified the closure requirements for coal combustion residuals surface impoundments under the Coal Ash Management Act (CAMA) of 2014. The law requires the impoundment owner (Duke) to identify, on or before July 1, 2017, a total of three impoundment sites (located within the State) with ash stored in the impoundments on that date that is suitable for processing for cementitious purposes. The CAMA requires Duke to enter into a binding agreement for the installation and operation of the ash beneficiation projects capable of annually processing 300,000 tons of ash each to specifications appropriate for cementitious products with all ash processed to be removed from the impoundment located at the sites. No later than 24 months after issuance of all necessary permits, operation of each ash beneficiation project is to commence.

The facility will process wet or dry flyash feedstock containing various amounts of unburned carbon into a variety of commercial applications including partial cement replacement and other commercial and industrial applications. The actual design capacity of the H.F. Lee STAR® facility is to produce up to 400,000 tons of flyash product annually.

The STAR® system is a patented technology developed by The SEFA Group Inc. (SEFA) to process feedstock (of any carbon content) like flyash (wet or dry) along with other ingredient materials into a variety of commercial products. These products are used, not only for application as a partial cement replacement, but for many other commercial and industrial applications.

The first STAR® plant began commercial operation in February 2008 at SCE&G's McMeekin Station in Lexington, South Carolina. Lessons learned from the first STAR® Plant were incorporated into the design of the next generation STAR® II Facility, which began commercial operations in September 2012 at NRG located in Newburg, Maryland. The third STAR® facility began operations in 2015, and is located in Georgetown, South Carolina, at the Santee Cooper Winyah Generating Station. It is the only facility capable of processing ash from surface ponds.

This is the first step of a significant permit modification pursuant to rule 15A NCAC 02Q .0501(b)(2). The application was received on November 13, 2017 and deemed complete for processing on that date. Public notice of the draft permit for Title V purposes is not required at this time. The Permittee must file a Title V Air Quality Permit Application pursuant to 15A NCAC 02Q .0504 for these changes on or before 12 months after commencing operation in accordance with General Condition NN.1, at which time the changes will go through the second step of the 15A NCAC 02Q .0501(c)(2) Title V permitting process. The permit shield described in General Condition R does not apply to these changes. The only public notice at this time is a notice of public hearing pursuant to the construction and operating permit under rule 15A NCAC 2Q .0300 and the Coal Ash Management Act.

II. Permit Changes

The following changes were made to the Duke Energy Progress - H. F. Lee Steam Electric Plant Air Permit No. 01812T42:

Old Page	Old Section	New Page	New Section	Description of Change(s)
Cover		Cover		Amended permit numbers and dates.
Insignificant Activities List		Insignificant Activities List		Added I-ES-39A, I-ES-39B, I-ES-40A, I-ES-40B, I-F-1, I-F-2, I-F-3, I-F-5, I-F-6, I-ES-41 and I-ES-42.
3-4	1, table of permitted emission sources	3-5	1, table of permitted emission sources	Added emission sources: ID Nos. ES-30, ES-31, ES-32, ES-33, ES-34, ES-35, ES-36, ES-37, ES-38, ES-38A, ES-38B and F-4; with footnote **.

23-27	2.1.D.5	47-53	2.2.B	Relocated this PSD avoidance condition for turbines 1A, 1B and 1C from Section 2.1.D.5 to Section 2.2.B.1 and revised the limits to also include the new STAR® project sources.
--	--	36-39	2.1.J	Added this section for new STAR® reactor.
--	--	39-41	2.1.K	Added this section for new STAR® supporting sources.
--	--	42-43	2.1.L	Added this section for new STAR® ash basin (ID No. F-4) fugitive source.
40-41	2.2.A.1.a	43-46	2.2.A.1.a	Revised this 02D .1100 condition to include emission limits for new facility-wide toxics modeling.
44	2.2.A.2.e	47	2.2.A.2.e	Added TPER limits for toluene (lb/hr only), hydrogen chloride and hydrogen fluoride.
46-54	3	58-66	3	Updated General Conditions to version 5.3, 08/21/2018. Condition K changed: Permit expiration terminates the facility's right to operate unless a complete 15A NCAC 02Q .0500 renewal application is submitted at least six months before the date of permit expiration.
59	List of Acronyms	67	List of Acronyms	Corrected definition of AOS to Alternative Operating Scenario.

III. Facility Description

Duke Energy's H. F. Lee Steam Electric Plant is an electric utility facility that generates electrical power. The facility previously had two main parts – the old coal-fired Lee plant (which was retired in 2012) and the "Wayne County" combustion turbine plant. Currently the main emission sources are five No. 2 fuel oil/natural gas-fired simple-cycle internal combustion turbines (Lee IC Unit Nos. 10, 11, 12, 13 and 14). Also, the following sources were added in Permit No. 01812T35 issued August 11, 2010, and began commercial operation on January 1, 2013: three nominal 170 MW natural gas/No. 2 fuel oil-fired simple/combined-cycle internal combustion turbines (Lee IC Unit Nos. 1A, 1B and 1C). Other sources include: one natural gas-fired auxiliary boiler (AB1), three natural gas-fired dew point heaters (DPH1, DPH2 and DPH3), one diesel-fired firewater pump engine (FWP1), one multi-cell wet surface air cooler with drift eliminators (CT1), one multi-package/multi-cell turbine inlet chiller with drift eliminators (CT2), and one No. 2 fuel oil fixed-roof storage tank with atmospheric vents (ST3).

IV. STAR Project Equipment Description

The associated sources of air emissions proposed to support the STAR® system includes the following:

• Ash Basin excavation.
• Ash Handling/Processing.
• Haul Roads.
• Screener.
• Crusher.
• Two diesel engines associated with a Screener and a Crusher.
• Wet ash receiving area and storage shed.
• Wet ash feed hopper.
• Wet ash unloading pile.
• Two External heat exchangers (EHE) (with baghouses).
• Transfer silo filling and unloading (with bin vent product capture device).

• Feed silo filling and unloading (with bin vent product capture device).
• Storage dome filling and unloading (with bin vent product capture device).
• Loadout silo (with bin vent product capture device).
• Loadout silo chute 1A (with bin vent product capture device).
• Loadout silo chute 1B (with bin vent product capture device).
• FGD Byproduct Silo (with bin vent product capture device).
• FGD Absorbent Silo (with bin vent product capture device).

Pre-reactor Material Handling Equipment
Excavation and processing of materials from the ash ponds to meet the STAR® system flyash ingredient (feedstock) specifications will be under the control of Duke Energy. All flyash reclaimed from an ash pond delivered for use as an ingredient in the STAR® system must first undergo processing by the owner to be:

- free of all, but minimal contaminants (e.g., organic debris, slag);
- finely-divided and free-flowing;
- have consistent moisture content below 25%; and
- have a consistent chemical composition, including organic content measured by loss on ignition.

The processing sequence of events will include flyash being excavated and staged to allow for dewatering to ensure a moisture content below 25%. Dewatered flyash will then be screened to remove contaminants (organic debris, slag, etc.), to produce a consistent chemical composition and a finely divided free-flowing material.

Wet flyash with a nominal 15% moisture content is delivered via trucks. The wet flyash can be unloaded from the trucks into the storage shed, to a pile, or directly into the feed hopper at up to 70 tons per hour then conveyed to the mechanical conveyance equipment. The material is discharged from the mechanical conveyance equipment into a material delumper unit to reduce large size material. The material is then discharged from the delumper into the external heat exchanger (EHE) by gravity, where it is continually fluidized using preheated air.

The fluidized material is dried in the EHE both by intimate contact with the heated fluidizing air and by direct contact with hot water heat exchangers located in the EHE. The material is discharged from the EHE at less than 2% moisture content and at a temperature range of 150 to 300°F to downstream material-handling equipment (transfer silos).

The exhaust air is discharged from each EHE through interconnecting ductwork to a high efficiency baghouse for feedstock recovery and exhaust air treatment to achieve a PM exhaust rate of 0.025 gr/dscf.

After leaving the baghouse, the cleaned exhaust air stream passes through interconnecting ductwork to the exhaust air fan before being discharged to atmosphere. The exhaust air volumetric rate is estimated at approximately 41,550 acfm at 10 inches of water column above atmospheric pressure and at approximately 150-300 °F.

STAR® Reactor
STAR® technology transforms and recycles coal ash from surface impoundments or ponds into a high-quality, sustainable environmentally-responsible class F flyash product for the concrete industry for beneficial reuse. The process treats flyash in such a way as to lower the "loss on ignition" (LOI - residual carbon in flyash) for use as pozzolan in concrete and can also remove all the carbon in flyash so that the purified mineral material can be used as raw feed material in other specialty products and processes that historically have been unable to use flyash as raw feed material because of the deleterious effect of the residual carbon in flyash. Using recycled STAR® ash in place of Portland cement in concrete reduces the virgin material required in concrete manufacturing, and for every ton of flyash used in concrete, there is approximately one less ton of CO_2 released into the atmosphere.

The STAR® process is inherently flexible in that operating parameters can be varied and different ingredients can be added to produce a desired product. The primary component of the STAR® is a cylindrical refractory-lined reactor vessel in which the majority of the process reactions take place including both chemical and physical reactions. Air required for the process reactions enters through the floor of the STAR® system as well as through the walls at multiple locations.

The raw flyash feedstock and any other ingredients are introduced through the walls of the STAR®. All of the solids and gases exit together at the top of the reactor. Due to the high gas velocity, multiple injection points, and recycled solids returned, there is a significant amount of turbulence created that enhances the mixing of the ingredients and optimizes the reactions.

The STAR® reactor will normally fire auxiliary fuels during system startup and will cut back on auxiliary fuel (i.e., natural gas or propane) as the reactor reaches auto-ignition and self-sustaining conditions. At this point, the residual carbon in the flyash reacts and becomes the heat source and the process is normally self-sustaining except under certain conditions.

The STAR® reactor design capacity is based on two factors: heat input and flyash throughput. The reactor's short term maximum heat input capacity is 140 mmBtu/hr. The reactor's flyash throughput, however, varies based on the percent LOI (residual carbon) content of the flyash, to achieve the 140 mmBtu/hr maximum design heat input. Duke expects the LOI to be from 6 to 15 percent. Based on the heat content of the residual carbon (14,500 Btu/lb), the throughput will be limited to achieve the maximum 140 mmBtu/hr heat input. At 6 percent LOI and 140 mmBtu/hr heat input, the resulting throughput is 80.5 tons per hour. As the LOI increases, the throughput decreases in order to keep the heat input below the maximum of 140 mmBtu/hr. The reactor system is actually designed to process 75 tons per hour rather than the 80.5 tons per hour, which corresponds to a nominal heat input of 130 mmBtu/hr.

POST-Reactor Material Handling Equipment

After exiting the reactor, the flue gas with entrained flyash enters a hot cyclone where the majority of solids are separated from the gas and recycled back to the reactor for temperature control. The flue gas with entrained flyash leaving the hot cyclone is conveyed to an air preheater, which is designed to preheat the incoming process air (by heat recovery) or cool the flue gas/solids mixture, then passes through a flue gas cooler. The cooled flue gas and flyash then passes through a baghouse for product capture, and then exhausts to a dry flue gas desulfurization (FGD) system (using hydrated lime as a reagent) to reduce SO_2 emissions. The clean FGD exhaust will then flow to an induced draft fan to be discharged to the atmosphere through a stand-alone stack. The captured flyash is pneumatically transferred from the baghouse to either the storage dome or the loadout silo, each equipped with a bin vent, then to a truck loadout station.

V. Summary of Changes to Emission Sources and Control Devices

The following sources and control device descriptions are being added to the permit for this modification:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-30	Feed silo (125 tons per hour maximum fill rate, 75 tons per hour maximum unload rate, 400,000 tons per year fill and unload rate)	CD-30	Bin vent filter (4:1 air-to-cloth ratio)
ES-31	STAR® feedstock processing reactor (140 million Btu per hour maximum heat input rate, 130 million Btu per hour nominal heat input rate, designed to process 75 tons per hour and 400,000 tons per year flyash feedstock process rates), equipped with natural gas/propane burners for startup or to maintain temperature with a combined heating capacity of 60 million Btu per hour heat input rate.	CD-31A CD-31B	Dry scrubber (77,500 ACFM maximum inlet flue gas flow rate) Baghouse (26,790 total filter surface area, 2.18:1 air-to-cloth ratio, 77,500 ACFM maximum inlet flue gas flow rate)

ES-32	FGD byproduct storage silo (3120 cubic feet capacity, 1.75 tons per hour maximum fill rate, 300 tons per hour maximum unload rate)	CD-32	Bin vent filter (4:1 air-to-cloth ratio)
ES-33	FGD absorbent storage silo (10,000 cubic feet capacity, 25 tons per hour maximum fill rate, 1.5 tons per hour unload rate)	CD-33	Bin vent filter (4:1 air-to-cloth ratio)
ES-34	EHE- external heat exchanger 1 (70 tons per hour maximum process rate)	CD-34	Baghouse (3:1 air-to-cloth ratio, 32,000 dSCFM exhaust flow rate)
ES-35	EHE- external heat exchanger 2 (70 tons per hour maximum process rate)	CD-35	Baghouse (3:1 air-to-cloth ratio, 32,000 dSCFM exhaust flow rate)
ES-36	Transfer silo filling (125 tons per hour fill rate, 75 tons per hour maximum unload rate, 400,000 tons per year maximum fill and unload rate)	CD-36	Bin vent filter (4:1 air-to-cloth ratio)
ES-37	Storage dome filling (75 tons per hour fill rate, 275 tons per hour maximum unload rate, 400,000 tons per year maximum fill and unload rate)	CD-37	Bin vent filter (4:1 air-to-cloth ratio)
ES-38	Loadout silo (300 tons per hour maximum unload rate, 400,000 tons per year maximum unload rate)	CD-38	Bin vent filter (4:1 air-to-cloth ratio)
ES-38A	Loadout silo chute 1A (100 tons per hour maximum unload rate, 400,000 tons per year maximum unload rate)	CD-38A	Bin vent filter (4:1 air-to-cloth ratio)
ES-38B	Loadout silo chute 1B (100 tons per hour maximum unload rate, 400,000 tons per year maximum unload rate)	CD-38B	Bin vent filter (4:1 air-to-cloth ratio)
F-4*	Ash basin (321 acres)	N/A	N/A

* Fugitive source

VI. Emissions

The proposed project emission rates for criteria pollutants and toxic air pollutants (TAPs) are based on process information developed and provided by SEFA, Duke, manufacturers' data, and/or the Environmental Protection Agency's (EPA) AP-42 emission factors. Unit design parameters and operational practices have been incorporated into the analysis to make the emission estimates conservative and representative of on-site conditions.

STAR® Reactor Emissions

Emissions from the STAR® reactor include PM/particulate matter with a diameter less than 10 microns (PM_{10}), particulate matter with a diameter less than 2.5 microns ($PM_{2.5}$), SO_2, nitrogen dioxide (NOx), carbon monoxide (CO), volatile organic compounds (VOC), and greenhouse gases (GHG) from the auxiliary fuels and residual carbon in the flyash. Emissions from the auxiliary fuels were estimated using the most recent emissions factors for natural gas and propane-fired boilers contained in AP-42. The auxiliary fuel burners are a low-NOx design.

Flyash generated from the combustion of coal contains trace quantities of heavy metals. Duke Energy performed a site-specific ash analysis taking samples from the ash pond to calculate the emission rates for each toxic metal. Emission factors of the heavy metal toxics in the flyash before entering the reactor are based on the site-specific ash analysis data. Emission factors of the heavy metals in the flyash after exiting from the reactor are based on the site-specific ash analysis data with a contribution from the use of process water in the reactor.

Emissions of NOx and CO from the processing of the residual carbon in the flyash were estimated based on emissions estimates from other existing STAR® reactor units. Particulate emissions for the STAR® are based on the baghouse manufacturer's data of 0.025 grains per actual cubic foot (gr/acf). The induced draft fan providing the motive force for the product transfer is rated at 77,500 acfm, at the expected process conditions of 350°F and nominal atmospheric pressure.

SO_2 emissions are a function of the amount of flyash processed through the reactor, the sulfur content of the flyash, the amount of sulfur remaining in the product ash exiting the reactor, and an SO_2 removal efficiency of the dry scrubber. Potential emissions of SO_2 are based on a flyash sulfur content of 0.15 percent, 100 percent oxidation of the sulfur, a LOI of 6%, a carbon heat value of 14,500 Btu/lb, and a dry scrubber control efficiency of 95 percent.

Emissions for the STAR® reactor have been estimated conservatively by combining the total emissions associated with firing the worst-case auxiliary fuel at full capacity with the total emissions from flyash processing.

GHG emissions for the STAR® reactor were based on the annual natural gas and propane usages and emissions factors from Table C-1 of Chapter 40, Part 98, Code of Federal Regulations (CFR), Subpart C, along with the residual carbon content (LOI) of the flyash. As discussed in Section VII below, even though the GHG emissions of 116,604 tons per year as shown in Table 2 are greater than the otherwise PSD significant increase rate of 75,000 tons per year, the proposed project does not result in an increase of a regulated NSR pollutant that is not GHGs, and GHGs are not subject to PSD review.

Material Handling Emissions

The material handling system includes one wet ash raw feed unloading pile, one wet ash storage shed, one wet ash EHE feed hopper, two EHEs, raw feed silo, one loadout silo, two loadout chutes, transfer silo, a product storage dome, FGD byproduct silo, FGD absorbent silo, screener, crusher, ash basin and handling, and haul roads. The silos are each equipped with a bin vent filter to minimize product losses associated with the pneumatic transfer process. The truck loadout station uses telescoping chutes and a negative pressure ventilation system to reduce fugitive emissions. Particulate emissions from the silos, loadout chutes and product dome were estimated using the maximum short- and long-term transfer rates and appropriate emission factors from AP-42, Section 13.2.4 and 99% bin vent filter control.

Trace metal concentration data discussed above for the STAR® system were used in conjunction with the calculated PM emissions rates to estimate emissions of trace metal from the material handling activities.

Fugitive Emissions

Additional particulate emissions were also calculated for the wet ash receiving process, ash handling process (including screening and crushing activities) and haul roads. Windblown fugitive dust emissions were also calculated from the unloading pile. The emissions were calculated using the appropriate emissions factors from AP-42.

Potential Emissions

The potential emissions for the project are calculated based on the emission factors and other design parameters as shown in Table 1 below along with the system design process throughput capabilities for the ancillary sources as a function of the reactor throughput as shown in the table in Section VIII.B.1 below. The reactor ES-31 throughput establishes the needed throughput for all other STAR® project ancillary sources and therefore establishes their potential emissions. Potential emissions for all STAR® sources is shown in Table 2.

The emission calculation methodologies and detailed calculations for the STAR® system sources can be found in Appendix B of the application.

Table 1
Emission Factors Used to Determine Emissions

<table>
<tr><th colspan="2">Source</th><th colspan="2">Emissions Factors</th></tr>
<tr><th>ID No.</th><th>Emission Source Description</th><th>Pollutant</th><th>Flyash</th></tr>
<tr><td rowspan="9">ES-31</td><td rowspan="9">STAR® reactor*

* includes emissions from worst case startup fuel:
propane: AP-42, Table 1.5-1, or
natural gas: AP-42, Table 1.4-2</td><td>PM, PM_{10}, $PM_{2.5}$</td><td>Gas flow of 77,500 acfm and loading rate of 0.025 gr/acf
PM10 = 92% of Total PM and PM2.5 = 53% of Total PM (AP-42 Table 1.1-6, Bituminous and Subbituminous Coal Combustion)</td></tr>
<tr><td>SO_2</td><td>Based on 6% LOI, 0.15% flyash sulfur content, 14,500 Btu/lb carbon heat value, 95% scrubber control efficiency,</td></tr>
<tr><td>NO_x</td><td>Based on SEFA operation experience</td></tr>
<tr><td>CO</td><td>Based on SEFA operation experience</td></tr>
<tr><td>VOC</td><td>Based on stack test performed at an existing STAR facility, CO emissions are expected to be 10% (or less) of VOC emissions.</td></tr>
<tr><td>GHG CO_2e</td><td>Based on the annual natural gas and propane usages and emission factors from Table C-1 of Chapter 40, Part 98, CFR, Subpart C, along with the LOI of the flyash.</td></tr>
<tr><td>H_2SO_4</td><td>Based on SEFA stack test performed September 2016. Sulfuric Acid Mist was 0.05 lb/hr for contingency was doubled to 0.1 lb/hr.</td></tr>
<tr><td>Pb</td><td>Duke site-specific average ash analysis</td></tr>
<tr><td></td><td></td></tr>
<tr><th colspan="4">Material Handling Emissions (PM, PM_{10}, $PM_{2.5}$, Pb)</th></tr>
<tr><td>ES-30</td><td>Feed silo</td><td colspan="2" rowspan="2">AP-42, Section 13.2.4 and 99% bin vent filter control
Duke site-specific average ash analysis</td></tr>
<tr><td>ES-36</td><td>Transfer silo</td></tr>
<tr><td>ES-32</td><td>FGD byproduct storage silo</td><td colspan="2" rowspan="2">Gas flow: 1300 acfm and PM loading rate of 0.005 gr/acf
PM10 = 92% of Total PM and PM2.5 = 53% of Total PM (AP-42 Table 1.1-6, Bituminous and Subbituminous Coal Combustion)
Duke site-specific average ash analysis</td></tr>
<tr><td>ES-33</td><td>FGD absorbent storage silo filling</td></tr>
<tr><td>ES-34
ES-35</td><td>EHE (Units1 and 2)</td><td colspan="2">Exhaust Flow: 32,000 dscfm and PM loading at 0.025 grains/dscf
PM10 = 92% of Total PM and PM2.5 = 53% of Total PM (AP-42 Table 1.1-6, Bituminous and Subbituminous Coal Combustion)
Duke site-specific average ash analysis</td></tr>
<tr><td>ES-37</td><td>Storage dome</td><td colspan="2" rowspan="4">AP-42, Section 13.2.4 and 99% bin vent filter control
Duke site-specific average ash analysis</td></tr>
<tr><td>ES-38</td><td>Loadout silo</td></tr>
<tr><td>ES-38A</td><td>Loadout silo chute 1A</td></tr>
<tr><td>ES-38B</td><td>Loadout silo chute 1B</td></tr>
<tr><td>I-ES-39A</td><td>Screener</td><td colspan="2" rowspan="2">AP-42, Table 11.19.2-2
Duke site-specific average ash analysis</td></tr>
<tr><td>I-ES-40A</td><td>Crusher</td></tr>
<tr><th colspan="4">Engine Emissions</th></tr>
<tr><td>I-ES-39B</td><td>No. 2 fuel oil-fired screener engine (91 HP)</td><td colspan="2">AP-42 Chapter 3.3, Table 3.3-1 (Gasoline & Diesel Industrial Engines)</td></tr>
</table>

I-ES-40B	No. 2 fuel oil-fired crusher engine (300 HP)	
Fugitive Emissions (PM, PM_{10}, $PM_{2.5}$, Pb)		
I-F-1	Wet ash receiving transfer to shed	AP-42 Section 13.2-4 (Aggregate Handling and Storage Piles) Duke Energy Average Ash Analysis
I-F-2	Wet ash receiving transfer to hopper	
I-F-3	Wet ash receiving unloading pile	AP-42 Section 13.2.5 (Industrial Wind Erosion) Duke Energy Average Ash Analysis
F-4	Ash basin	
I-F-5	Ash handling	AP-42 Section 13.2.4 (Aggregate Handling and Storage Piles) Duke Energy Average Ash Analysis
I-F-6	Haul roads	AP-42 Section 13.2.2 (Unpaved Roads) No Pb emissions.

Table 2
Potential Annual Project Emission Increases

Source		Emissions (ton/yr)									
ID No.	**Emission Source Description**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_x**	**CO**	**VOC**	**GHG CO_2e**	**H_2SO_4**	**Pb**
ES-31	STAR® reactor	72.74	66.92	38.55	98.18[1]	193.60	91.10	9.11	116,406[2]	0.44	1.57E-03
ES-30	Feed silo	0.04	0.02	0.02							7.73E-07
ES-36	Transfer silo										
ES-32	FGD byproduct storage silo	0.24	0.22	0.13							
ES-33	FGD absorbent storage silo filling	0.24	0.22	0.13							
ES-34 ES-35	EHE (Units1 and 2)	30.03	27.63	15.92							5.96E-04
ES-37	Storage dome	0.04	0.02	0.02							7.73E-07
ES-38	Loadout silo										
ES-38A	Loadout silo chute 1A										
ES-38B	Loadout silo chute 1B										
I-ES-39A	Screener	0.020	0.007	0.0004							3.90E-07
I-ES-39B	No. 2 fuel oil-fired screener engine (91 HP)	0.26	0.26	0.26	0.243	3.667	0.79	0.292	135.45	NA[3]	7.45E-06
I-ES-40A	Crusher	0.002	0.001	0.0001							2.99E-08
I-ES-40B	No. 2 fuel oil-fired crusher engine (300 HP)	0.120	0.120	0.120	0.112	1.697	0.366	0.135	62.69	NA[3]	3.45E-06
I-F-1	Wet ash receiving transfer to shed	0.0129	0.00608	0.000921							2.55E-07
I-F-2	Wet ash receiving transfer to hopper										
I-F-3	Wet ash receiving unloading pile	0.0137	0.00687	0.00103							2.73E-07
I-F-4	Ash basin	7.05	3.53	0.53							1.40E-04
I-F-5	Ash handling	0.141	0.0666	0.0101							2.80E-06
I-F-6	Haul roads	1.53	0.395	0.0395							
I-ES-41	Ball Mill Classifier	3.43	3.15	1.82							
I-ES-42	Ball Mill Feed Silo	0.00217	0.00103	0.00103							
	Total	**115.92**	**102.58**	**57.55**	**98.53**	**198.96**	**92.26**	**9.54**	**116,604**	**0.44**	**2.32E-03**

1 SO_2 for ES-31 based on 6% LOI, 0.15% flyash sulfur content, 14,500 Btu/lb carbon heat value, 95% scrubber control efficiency, flyash process rate of 75 tons per hour and 8760 hours per year operation.

2 GHG emissions for ES-31 based on an average flyash LOI of 7.80%. Duke expects 6%-15% LOI.

3 H_2SO_4 not listed in AP-42 Section 3.3 or DAQ's spreadsheet.

VII. Regulatory Analysis

A. New Source Review Evaluation

Under Prevention of Significant Deterioration (PSD) requirements, all major new or modified stationary sources of air pollutants as defined in Section 169 of the Federal Clean Air Act (CAA) must be reviewed and permitted prior to construction by EPA or permitting authority, as applicable, in accordance with Section 165 of CAA. A *major stationary source* is defined as any one of 28 named source categories, which emits or has a potential to emit (PTE) 100 tons per year of any regulated pollutant, or any other stationary source, which emits or has the potential to emit 250 tons per year of any PSD regulated pollutant.

The Lee facility is an existing PSD major stationary source of criteria air pollutants as defined at 40 CFR 51.166(b)(1)(i)(a), and is classified as one of the 28 named source categories under the category of "fossil fuel-fired steam electric plants of more than 250 million Btu per hour heat input," which emits or has a potential to emit (PTE) 100 tons per year of any regulated pollutant.

For existing major stationary sources, there are several steps to determine whether the modification is a *major modification* and therefore subject to PSD preconstruction review. The first step is to determine whether there is a physical change or change in the method of operation. Second, there must be an emissions increase. And third, the emissions increase must be equal to or greater than the "significance levels" as listed in 40 CFR 51.166(b)(23)(i) for the regulated pollutants.

Because the STAR modification involves a physical change with an emissions increase, it must be determined whether the modification results in an emission increase for any regulated pollutant in the amounts equal or greater than the significance levels, which would therefore trigger a PSD review for those pollutants.

Existing PSD Avoidance Condition

Duke is proposing to include emissions from the STAR® project under the existing PSD avoidance limits in Section 2.1.D.5.a of the current permit 01812T42. The existing PSD avoidance condition was established in permit 01812T35 when the three natural gas/No. 2 fuel oil-fired simple/combined-cycle internal combustion turbines (Lee IC Unit 1A, Lee IC Unit 1B and Lee IC Unit 1C) were first permitted in 2010. At that time, since the three coal-fired boilers (Unit 1 Boiler, Unit 2 Boiler and Unit 3 Boiler) were soon to be retired, Duke began reducing the hours of operation of the boilers as the new turbines came on line. The avoidance limits were based on actual baseline emissions for the three boilers to establish (with the added PSD significance thresholds for each pollutant) the allowable PSD avoidance limits as a "project net" to ensure there was no increase in emissions (beyond PSD significance) above baseline so that emissions from the three boilers plus the three new combustion turbines remain below the limits.

DAQ had initially told Duke in a letter dated December 18, 2017, that the STAR® modification emissions could not be included under the existing PSD avoidance limits since those limits were for an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD. DAQ discussed this in a meeting with Duke on January 5, 2018 and in a conference call on February 5, 2018, and asked Duke to provide their reasoning in a letter. In the letter, received on February 19, 2018 (dated February 7, 2018), Duke explained their rationale why the STAR® project should be considered part of the same project that retired the coal-fired boilers and installed the three new combined cycle turbines, and that therefore the STAR® project emissions should be included under the existing PSD avoidance limits.

Duke's rationale for considering the STAR® project to be part of the same project that retired the coal-fired boilers and installed the three new combined cycle turbines is based on the following events that led to the proposed STAR® ash beneficiation project to facilitate retirement of the coal-fired boilers.

- Duke submitted the application to repower the facility with the three new turbines as part of the preparation for retiring the three coal-fired boilers in December 2009. The three boilers were retired on October 1, 2012, and Duke requested the boilers be removed from the permit on November 27, 2012. The boilers were then removed from the permit in 2015 (permit 01812T40).

- At the time the boilers were being planned for retirement, Duke was tracking potential regulations for long-term management of coal combustion products (CCP) at the state and federal levels.
- The regulations were a result of the December 2008 ash release at the Tennessee Valley Authority's Kingston facility and the beginning of EPA's process of assessing ash impoundments to determine where corrective measures may be needed to prevent failures at other facilities.
- EPA sent an information request out to coal-fired electric utilities in February 2009 inquiring about the safety of surface impoundments and basins used to store coal combustion residue.
- EPA published a proposed rule to regulate coal ash on June 21, 2010, and the Disposal of Coal Combustion Residuals from Electric Utilities final rule was signed on December 19, 2014.
- The North Carolina Coal Ash Management Act (CAMA) became law in 2014 and required Duke to begin closure of ash basins and to evaluate beneficial reuse for ash stored in the basins.

DAQ agrees that, based on Duke's explanation, the STAR® project can be considered to be part of the same project that retired the coal-fired boilers and installed the three new combined cycle turbines and can be included in the existing PSD condition.

At the time the boilers were removed from the permit in 2015, the PSD avoidance condition became applicable only to the three turbines with the limits unchanged. Now, with this permit modification, the PSD avoidance condition (moved to Section 2.2.B of the permit) will include the turbines and the new STAR® project sources as discussed below.

Table 3 shows the potential emissions for the STAR® project (row A) and potential emissions for the existing turbines (row B). To determine the possibility that the total potential emissions under the avoidance condition (row A+B) could exceed the limits, the amount by which the total potential emissions from the turbines and from the main STAR® sources (ES-31, ES-34 and ES-35) exceeds the PSD avoidance limits (row C) is determined (row A+B-C). Even though the total potential emissions of all sources have the potential to exceed the existing PSD avoidance limit for some pollutants (PM, PM_{10}, $PM_{2.5}$, CO and VOCs), the total actual emissions of each pollutant are expected to be below the PSD avoidance condition limits. Monitoring, recordkeeping and reporting of actual emissions will be required for the STAR® reactor (ES-31) for all pollutants (NOx, SO_2, PM, PM_{10}, $PM_{2.5}$, CO and VOCs), except for H_2SO_4 or Pb, since those emissions are negligible with respect to the limits, and for EHE ES-34 and EHE-35 for those pollutants which these sources emit (PM, PM_{10} and $PM_{2.5}$ only). To simplify the monitoring of emissions, the total potential emissions from the small-emitting STAR® project ancillary sources (all except STAR® reactor ES-31, EHE ES-34 and EHE ES-35), as shown in Table 3 (row D), have been added separately in the condition equations as shown in Section VIII.D.2 below with the note that that number represents the potential emissions from the small-emitting STAR® ancillary sources. Since the maximum potential emissions for all STAR® project small-emitting ancillary sources are assumed, no monitoring or recordkeeping of actual emissions is required for those sources. The only monitoring of the STAR® project sources needed is for the STAR® reactor ES-31, EHE ES-34 and EHE ES-35, in addition to the turbines.

The reactor ES-31 throughput establishes the throughput for all other STAR® project ancillary sources and therefore establishes their potential emissions. The system design process throughput capabilities for the ancillary sources as a function of the reactor throughput are shown in the table in Section VIII.B.1 below. Monitoring of reactor emissions will ensure the potential emissions for the ancillary sources are not exceeded.

GHGs. In accordance with PSD regulation 51.166(b)(48)(iv)(b), GHGs are only subject to regulation in the case of an existing major stationary source for a regulated NSR pollutant that is not GHGs if the source will also have an emissions increase of a regulated NSR pollutant (as defined in 51.166(b)(48)(iii) for GHGs), and an emissions increase of 75,000 tpy CO_2e or more. Also, in accordance with NCAC 02D .0544(a), a major stationary source or major modification shall not be required to obtain a prevention of PSD permit on the sole basis of its greenhouse gases emissions. Therefore, even though the GHG emissions of 116,604 tons per year as shown in Table 2 are greater than the otherwise PSD significant increase rate of 75,000 tons per year, the proposed project does not result in an increase of a regulated NSR pollutant that is not GHGs, and GHGs are not subject to PSD review.

Table 3
Emissions Summary for the Revised PSD Avoidance Condition

Category		Emissions (ton/yr)									
		PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO	VOC	GHG CO_2e	H_2SO_4	Pb
A	Potential emission increases for the proposed STAR® Project[1]	115.92	102.58	57.55	98.53	198.96	92.26	9.54	116,604	0.44	0.00232
B	Potential emissions for turbines 1A, 1B and 1C[3]	214.26	214.26	214.26	21.93	902.13	841.11	122.19		15.39	0.06
A+B	Total potential all sources under the PSD avoidance condition	329.75	316.84	271.81	120.46	1101.09	933.37	131.73		15.83	0.06232
C	Existing PSD avoidance limits	218.2	218.2	218.2	14,663.1	3,414.6	829.3	65.1	see note 2	64.3	0.77
D	Potential emissions from STAR® ancillary sources[4]	13.14	8.024	3.083	0.35	5.36	1.16	0.43		NA	NA
A+B-C	Total of all PSD avoidance source emissions above the PSD avoidance limits	111.55	98.64	53.61	-14,542.64	-2313.51	104.07	66.63		-48.47	-0.70768

1 from Table 2
2 PSD avoidance applicability only applies to "anyway sources"
3 from review for permit T35, Table 2
4 from Table 2 (total potential emissions from all sources except STAR® reactor ES-31, EHE ES-34 and EHE ES-35). These amounts are included in the monitoring equations in in Section VIII.E.2.

VIII. Source-by-Source Requirements

A. One STAR® flyash feedstock processing reactor equipped with natural gas/propane startup burners (ID No. ES-31) and associated dry scrubber (ID No. CD-31A) and baghouse (ID No. CD-31B)

Applicable Regulations

1. 15A NCAC 2D .0515: PARTICULATES FROM MISCELLANEOUS INDUSTRIAL PROCESSES
Emissions of particulate matter from this source (ID No. ES-31) shall not exceed an allowable emission rate as calculated by the following equation:

$$E = 4.10 \times P^{0.67} \quad \text{for } P \leq 30 \text{ tons per hour}$$

or

$$E = 55.0 \times P^{0.11} - 40 \quad \text{for } P > 30 \text{ tons per hour}$$

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

Liquid and gaseous fuels and combustion air are not considered as part of the process weight.

Testing
Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the emission limit above by testing the reactor (ID No. ES-31) for particulate emissions in accordance with a testing protocol approved by the DAQ. Testing shall be completed within 90 days of initial start-up of the reactor (ID No. ES-31).

Compliance
The following table shows the allowable PM emission rate according to this rule compared to the potential after control PM emissions rate for this source.

Emissions Source	ID No.	Process Rate (tph)	Allowable PM Emission Rate (lb/hr)	Potential PM Emission Rate (lb/hr)*	Compliance Expected?
STAR® reactor	ES-31	75	48.4	16.61	yes

* after control

Since compliance is expected well within the allowable emission rate, the following monitoring applies in order to ensure the control devices are being properly maintained and that the above after control rates are not exceeded.

Particulate matter emissions from this source (ID No. ES-31) shall be controlled by the baghouse (ID No. CD-31B). To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:

i. a monthly visual inspection of the system ductwork and material collection unit for leaks;
ii. a monthly reading of the pressure gauges on the bagfilter (ID Nos. CD-31B); and
iii. an annual (for each 12-month period following the initial inspection) internal inspection of the baghouse's structural integrity.

The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. the date and time of each recorded action;
ii. the results of each inspection;
iii. the results of any maintenance performed on the dust extraction system; and
iv. any variance from manufacturer's recommendations, if any, and corrections made.

Reporting

The Permittee shall submit the results of any maintenance performed on any control device within 30 days of a written request by the DAQ.

The Permittee shall submit a summary report of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December and July 30 of each calendar year for the preceding six-month period between January and June.

2. 15A NCAC 02D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES

Emissions of sulfur dioxide from this source (ID No. ES-31) shall not exceed 2.3 pounds per million Btu heat input. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard.

Testing

Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the emission limit in Section 2.1.J.2.a above by conducting an initial stack test for sulfur dioxide emissions, with the reactor operating within 10% of its maximum heat input rate, in accordance with a testing protocol approved by the DAQ. Details of the emissions testing and reporting requirements can be found in Section 3 - General Condition JJ. Testing shall be completed within 90 days of initial start-up of the reactor (ID No. ES-31). Test results shall be the average of 3 valid test runs each when the source is processing flyash with: (1) a low sulfur content, (2) a medium sulfur content, and (3) a high sulfur content; to establish a minimum lime-to-sulfur ratio for the dry scrubber (ID No. CD-31A) for each fly ash sulfur content range that demonstrates compliance with the emissions limit in paragraph a above. In addition, the Permittee shall measure the pressure drop across the baghouse (ID No. 31B) during each test.

Test results shall include the following test condition information for each run:

i. Sulfur dioxide emission rate (lb/mmBtu).

ii. Dry scrubber lime-to-sulfur ratio.
iii. Reactor heat input (mmBtu/hr).
iv. Reactor flyash raw feed rate (tons per hour).
v. Flyash loss on ignition (% carbon).
vi. Flyash sulfur content (%).
vii. Baghouse pressure drop (Δp).

Compliance

a. The Permittee shall operate the dry scrubber at any time the reactor is in operation other than during startup, shutdown or malfunction, with a lime-to-sulfur ratio necessary to achieve a 95% sulfur dioxide removal efficiency.
b. Any time the reactor is in operation, the dry scrubber shall be operated at the minimum lime-to-sulfur ratio established during initial stack testing for each flyash sulfur content range.
c. Once per hour, the Permittee shall record in a logbook (written or electronic format) on-site and made available to an authorized representative upon request, the following information:
   i. Flyash sulfur content (%).
   ii. Dry scrubber lime-to-sulfur ratio.
   iii. Baghouse pressure drop (Δp).

Reporting

The Permittee shall submit to the DAQ Permitting Section a summary of the results of the initial stack testing that includes the information in Section 2.1.J.2.b above for each of the three sulfur content ranges of fly ash being processed, no later than 30 days after completing the initial stack test in accordance with General Condition JJ; and submit a complete permit application to revise the permit accordingly.

3. 15A NCAC 02D .0521: CONTROL OF VISIBLE EMISSIONS

Visible emissions from this source (ID No. ES-31) shall not be more than 20 percent opacity (except during startups, shutdowns, and malfunctions) when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

Compliance

To ensure compliance, once a month the Permittee shall observe the emission points of this source (ID No. ES-31) for any visible emissions above normal. The monthly observation must be made for each month of the calendar year period to ensure compliance with this requirement. The Permittee shall establish "normal" for this source in the first 30 days following the effective date of beginning operation. If visible emissions from this source are observed to be above normal, the Permittee shall either:

i. take appropriate action to correct the above-normal emissions as soon as practicable and within the monitoring period and record the action taken as provided in the recordkeeping requirements below, or
ii. demonstrate that the percent opacity from the emission points of the emission source in accordance with 15A NCAC 02D .2610 (Method 9) for 12 minutes is below the emission limit.

The results of the monitoring shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. the date and time of each recorded action;
ii. the results of each observation and/or test noting those sources with emissions that were observed to be in noncompliance along with any corrective actions taken to reduce visible emissions; and
iii. the results of any corrective actions performed.

Reporting

The Permittee shall submit a summary report of the monitoring and recordkeeping postmarked on or before January 30 of each calendar year for the preceding six-month period between July and

December and on or before July 30 of each calendar year for the preceding six-month period between January and June.

Non-applicable Regulations
The STAR reactor (ID No. ES-31) is not subject to the following regulations:

1. 15A NCAC 2D .0503 – PARTICULATES FROM FUEL BURNING INDIRECT HEAT EXCHANGERS
This rule applies to installations burning fuel, including natural gas and fuel oils, for the purpose of producing heat or power by indirect heat transfer. The STAR® is not an indirect heat exchanger, therefore this regulation does not apply.

2. 15A NCAC 02D .0524 - NSPS for Commercial and Industrial Solid Waste Incineration Units (40 CFR 60, Subpart CCCC)
Unless exempt, combustion of a "non-hazardous secondary material" (NHSM), as defined in §241.2 would subject the STAR® reactor to requirements in 40 CFR 60 Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units" or, Subpart DDDD "Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units." These regulations are known as the CISWI ("Commercial and Industrial Solid Waste Incineration") rules. In 2014, The SEFA Group requested DAQ's determination of regulatory status, with respect to 40 CFR 241 "Solid Wastes Used as Fuels or Ingredients in Combustion Units," for using flyash in its STAR® reactor. In a letter dated June 10, 2015 (Appendix F of the application) to Mr. Jim Clayton with The SEFA Group, the DAQ made a determination that flyash received directly from a coal-fired power plant's particulate collection device (i.e., electrostatic precipitator or baghouse) and flyash received from landfills and ash ponds is a NHSM and is an "ingredient", as defined in §241.2. §241.3(b)(4) of the rule states that NHSMs used as fuel or ingredient products in a combustion unit, and that are produced from the processing of discarded NHSMs and that meet the legitimacy criteria specified in §241.3(d)(l), with respect to fuels, and in §241.3(d)(2), with respect to ingredients, are not solid waste. §241.3(b)(3) states that NHSMs when used as an ingredient in a combustion unit that meet the legitimacy criteria specified in paragraph §241.3(d)(2) are not solid waste. Therefore, the STAR® reactor is not subject to the CISWI requirements.

3. 15A NCAC 02D .0614 – Compliance Assurance Monitoring (40 CFR 64)
The CAM rule applies to each pollutant-specific emissions unit at a Title V facility if the individual emissions unit uses a control device to achieve compliance with an emission limit or standard, and if the potential pre-control emissions from that specific source are equal to or greater than the major source threshold (100 tons per year each) of any regulated air pollutant. The STAR® reactor will have potential pre-control SO_2 emissions greater than 100 tons per year and will employ a dry scrubber for control of SO_2 to meet the emission limit of 2.3 lb/mmBtu in rule 15A NCAC 02D .0516. However, the draft CAM Plan, as submitted with the application, is not necessary at this time since a construction permit is to be issued initially; with the Part 70 Title V permit application to be filed within 12 months after commencing operation in accordance with 02D .0501(c)(2). The deadline for submittal of a CAM Plan is that it is to be part of an application for a significant permit revision under 40 CFR Part 70 as specified in 40 CFR §64.5. Therefore, the final CAM Plan will be required to be submitted along with the Part 70 application for this modification, for inclusion into the Title V permit at that time.

B. Feed silo (ID No. ES-30) and associated bin vent filter (ID No. CD-30), FGD byproduct storage silo (ID No. ES-32) and associated bin vent filter (ID No. CD-32), FGD absorbent storage silo (ID No. ES-33) and associated bin vent filter (ID No. CD-33), EHE- external heat exchanger 1 (ID No. ES-34) and associated baghouse (ID No. CD-34), EHE- external heat exchanger 2 (ID No. ES-35) and associated baghouse (ID No. CD-35), transfer silo (ID No. ES-36) and associated bin vent filter (ID No. CD-36), storage dome (ID No. ES-37) and associated bin vent filter (ID No. CD-37), loadout silo (ID No. ES-38) and associated bin vent filter (ID No. CD-38), loadout silo chute 1A (ID No. ES-38A) and associated bin vent filter (ID No. CD-38A) and loadout silo chute 1B (ID No. ES-38B) and associated bin vent filter (ID No. CD-38B)

Applicable Regulations

1. 15A NCAC 2D .0515: PARTICULATES FROM MISCELLANEOUS INDUSTRIAL PROCESSES

   Emissions of particulate matter from these sources (ID Nos. ES-30, ES-32, ES-33, ES-34, ES-35, ES-36, ES,37, ES-38, ES-38A, ES-38B) shall not exceed an allowable emission rate as calculated by the following equation:

$$E = 4.10 \times P^{0.67} \quad \text{for } P \leq 30 \text{ tons per hour}$$

or

$$E = 55.0 \times P^{0.11} - 40 \quad \text{for } P > 30 \text{ tons per hour}$$

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

Liquid and gaseous fuels and combustion air are not considered as part of the process weight.

Testing

Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the emission limit above by testing either external heat exchangers 1 or 2 (ID Nos. ES-34 or ES-35) for particulate emissions in accordance with a testing protocol approved by the DAQ. Testing shall be completed within 90 days of initial start-up of either source (ES-34 or ES-35).

Compliance

The following table shows the allowable PM emission rate according to this rule compared to the potential after control PM emissions rate for these sources.

Emissions Source	**ID No.**	**Process Rate (tph)**	**Allowable PM Emission Rate (lb/hr)**	**Potential PM Emission Rate (lb/hr)***	**Compliance Expected?**
Feed silo filling	ES-30	125	53.5	0.00609	yes
Feed silo unloading		75	48.4	0.00365	yes
STAR® reactor	ES-31	75	48.4	16.61	yes
FGD Byproduct Silo filling	ES-32	1.75	5.97	0.06	yes
FGD Byproduct Silo unloading		300	63		
FGD Absorbent Silo filling	ES-33	25	35.4	0.06	yes
FGD Absorbent Silo unloading		1.5	5.4		
EHE (Units1 and 2)	ES-34 ES-35	70	47.8	6.86	yes
Transfer silo filling	ES-36	125	53.5	0.006093	yes
Transfer silo unloading		75	48.4	0.00365	yes
Storage dome filling	ES-37	75	48.4	0.00365	yes
Storage dome unloading		275	62.02	0.0134	yes
Loadout silo	ES-38	300	63	0.0146	yes
Loadout silo chute 1A	ES-38A	100	51.3	0.00487	yes
Loadout silo chute 1B	ES-38B	100	51.3	0.00487	yes

Since compliance is expected well within the allowable emission rates, the following monitoring applies in order to ensure the control devices are being properly maintained and that the above after control rates are not exceeded.

Particulate matter emissions from these emission sources (ID Nos. ES-30, ES-32, ES-33, ES-34, ES-35, ES-36, ES-37, ES-38, ES-38A, ES-38B) shall be controlled by bin vent filters and baghouses (ID Nos. CD-30, CD-32, CD-33, CD-34, CD-35, CD-36, CD,37, CD-38, CD-38A, CD-38B). To assure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there is no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:

i. a monthly visual inspection of the system ductwork and material collection unit for leaks;
ii. a monthly reading of the pressure gauges on the bagfilters (ID Nos. CD-34 and CD-35); and
iii. an annual (for each 12-month period following the initial inspection) internal inspection of the baghouse's structural integrity.

The results of inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. the date and time of each recorded action;
ii. the results of each inspection;
iii. the results of any maintenance performed on the dust extraction system; and
iv. any variance from manufacturer's recommendations, if any, and corrections made.

Reporting

The Permittee shall submit the results of any maintenance performed on any control device within 30 days of a written request by the DAQ.

The Permittee shall submit a summary report of monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December and July 30 of each calendar year for the preceding six-month period between January and June.

2. 15A NCAC 02D .0521: CONTROL OF VISIBLE EMISSIONS

Visible emissions from these sources (ID Nos. ES-30, ES-32, ES-33, ES-34, ES-35, ES-36, ES-37, ES-38, ES-38A, ES-38B, ES-39A and ES-40A) shall not be more than 20 percent opacity (except during startups, shutdowns, and malfunctions) when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

Compliance

To ensure compliance, once a month the Permittee shall observe the emission points of this source (ID No. ES-31) for any visible emissions above normal. The monthly observation must be made for each month of the calendar year period to ensure compliance with this requirement. The Permittee shall establish "normal" for this source in the first 30 days following the effective date of beginning operation. If visible emissions from this source are observed to be above normal, the Permittee shall either:

i. take appropriate action to correct the above-normal emissions as soon as practicable and within the monitoring period and record the action taken as provided in the recordkeeping requirements below, or
ii. demonstrate that the percent opacity from the emission points of the emission source in accordance with 15A NCAC 02D .2610 (Method 9) for 12 minutes is below the emission limit.

The results of the monitoring shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. the date and time of each recorded action;
ii. the results of each observation and/or test noting those sources with emissions that were observed to be in noncompliance along with any corrective actions taken to reduce visible emissions; and
iii. the results of any corrective actions performed.

Reporting
The Permittee shall submit a summary report of the monitoring and recordkeeping activities postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December and on or before July 30 of each calendar year for the preceding six-month period between January and June.

C. Ash basin (ID No. F-4)

Applicable Regulations

1. 15A NCAC 02D .0540: PARTICULATES FROM FUGITIVE NON-PROCESS DUST EMISSION SOURCES
   a. For the purpose of this Rule the following definitions shall apply:
      i. "Fugitive non-process dust emission" means particulate matter that is not collected by a capture system and is generated from areas such as pit areas, process areas, haul roads, stockpiles, and plant roads.
      ii. "Substantive complaints" means complaints that are verified with physical evidence acceptable to the DAQ.
   b. The Permittee shall not cause or allow fugitive non-process dust emissions to cause or contribute to substantive complaints.
   c. If fugitive non-process dust emissions from a facility required complying with this Rule cause or contributing to substantive complaints, the Permittee shall:
      i. Within 30 days upon receipt of written notification from the Director of a second substantive complaint in a 12-month period, submit to the Director a written description of what has been done and what will be done to reduce fugitive non-process dust emissions from that part of the facility that caused the second substantive complaint;
      ii. Within 90 days of receipt of written notification from the Director of a second substantive complaint in a 12-month period, submit to the Director a control plan as described in Paragraph (e) of this Rule; and
      iii. Within 30 days after the Director approves the plan, be in compliance with the plan.
   d. The Director may require that the Permittee develop and submit a fugitive non-process dust control plan as described in Paragraph (e) of this Rule if:
      i. Ambient air quality measurements or dispersion modeling acceptable to the DAQ show violation or a potential for a violation of an ambient air quality standard for particulates in 15A NCAC 02D .0400 "Ambient Air Quality Standards;" or
      ii. If the DAQ observes excessive fugitive non-process dust emissions from the facility beyond the property boundaries.

      The control plan shall be submitted to the Director no later than 90 days after notification. The facility shall be in compliance with the plan within 30 days after the Director approves the plan.
   e. The fugitive dust control plan shall:
      i. Identify the sources of fugitive non-process dust emissions within the facility;
      ii. Describe how fugitive non-process dust will be controlled from each identified source;
      iii. Contain a schedule by which the plan will be implemented;
      iv. Describe how the plan will be implemented, including training of facility personnel; and
      v. Describe methods to verify compliance with the plan.
   f. The Director shall approve the plan if:
      i. The plan contains all required elements in Paragraph (e) of this Rule;
      ii. The proposed schedule contained in the plan will reduce fugitive non-process dust emissions in a timely manner;
      iii. The methods used to control fugitive non-process dust emissions are sufficient to prevent fugitive non-process dust emissions from causing or contributing to a violation of the ambient air quality standards for particulates; and
      iv. The described compliance verification methods are sufficient to verify compliance with the plan.

If the Director finds that the proposed plan does not meet the requirements of this Paragraph he shall notify the Permittee of any deficiencies in the proposed plan. The Permittee shall have 30 days after receiving written notification from the Director to correct the deficiencies.

g. If, after a plan has been implemented, the Director finds that the plan inadequately controls fugitive non-process dust emissions, the Permittee shall be required to correct the deficiencies in the plan. Within 90 days after receiving written notification from the Director identifying the deficiency, the Permittee shall submit a revision to his plan to correct the deficiencies.

D. Multiple Emission Sources

Applicable Regulations

1. Facility-wide Toxics Demonstration

State-Only Requirement
15A NCAC 02D .1100 CONTROL OF TOXIC AIR POLLUTANTS
As a result of this modification to add the STAR® reactor and supporting ancillary sources emitting toxic air pollutants, a facility-wide toxics modeling demonstration is triggered.

In accordance with 15A NCAC 02Q .0709(a), the owner or operator of a source who is applying for a permit or permit modification to emit toxic air pollutants shall:

i. demonstrate to the satisfaction of the Director through dispersion modeling that the emissions of toxic air pollutants from the facility will not cause any acceptable ambient level listed in 15A NCAC 02D .1104 to be exceeded beyond the premises (adjacent property boundary); or
ii. demonstrate to the satisfaction of the Commission or its delegate that the ambient concentration beyond the premises (adjacent property boundary) for the subject toxic air pollutant shall not adversely affect human health (e.g., a risk assessment specific to the facility) though the concentration is higher than the acceptable ambient level in 15A NCAC 02D .1104.

As required by NCAC 02Q .0706(b), the owner or operator of the facility shall submit a permit application to comply with 15A NCAC 02D .1100 if the modification results in:

i. a net increase in emissions or ambient concentration of any toxic air pollutant that the facility was emitting before the modification; or
ii. emissions of any toxic air pollutant that the facility was not emitting before the modification if such emissions exceed the levels contained in 15A NCAC 02Q .0711.

As required by NCAC 02Q .0706(c), the permit application shall include an evaluation for all toxic air pollutants covered under 15A NCAC 02D .1104 for which there is:

i. a net increase in emissions of any toxic air pollutant that the facility was emitting before the modification; and
ii. emission of any toxic air pollutant that the facility was not emitting before the modification if such emissions exceed the levels contained in 15A NCAC 02Q .0711.

All sources at the facility, excluding sources exempt from evaluation in 15A NCAC 02Q .0702, emitting these toxic air pollutants shall be included in the evaluation.

Duke performed a facility-wide air toxics analysis, for all new and existing sources being permitted, including the existing MACT sources, except the new MACT diesel engines (ID Nos. I-ES-39B and I-ES-40B) were not included. Air toxics emissions for the sources in this permit subject to a Part 63 MACT are exempt from air permitting, pursuant to 02Q .0702(a)(27)(B) and a Permittee is not required to model exempt MACT sources. Nevertheless, except for the above two MACT engines, the Permittee has volunteered to include emissions for all such exempt sources in the modeling analysis. Potential toxic emissions from these sources were determined to be insignificant as shown in the Health Risk Assessment below, which addresses the omission of the two engines from the toxics demonstration.

The first step in the toxics analysis, as stated above, is to determine if the modification results in a net increase in emissions or ambient concentration of any toxic air pollutant that the facility was emitting before the modification, or if the modification results in emissions of any toxic air pollutant that the facility was not emitting before the modification if such emissions exceed the levels contained in 15A NCAC 02Q .0711. Table 4 presents the potential emissions for the short-term and annual pollutants for the TAPs for which the modification results in a net increase in emissions that the facility was emitting before the modification. There are no new TAPs being emitted for which the facility was not emitting before the modification.

Table 4
Potential Toxic Emissions Increase for the Proposed STAR® Project*

Compound	Total Emission Increases		
	lb/hr	lb/day	lb/yr
Sulfuric acid	1.00E-01	2.40	
Benzene			3.34
Formaldehyde	7.64E-03		
Hexane		2.54	
Toluene	1.32E-03	3.17E-02	
Arsenic			15.0
Beryllium			3.36
Cadmium			1.49
Chromium VI		4.18E-04	
Manganese		4.86E-02	
Mercury		4.67E-04	
Nickel		5.95E-02	

* Emission rates taken from Duke's application addendum Table 1A.

Once it had been determined which TAP emissions were being increased due to the modification, the next step of the modeling analysis is to perform a toxic pollutant emission rate (TPER) analysis using total facility-wide potential emissions from the proposed modification (Table 4) and the existing sources, to determine if the TPERs in rule 02Q .0711 were exceeded for each TAP emission being increased.

The TPER analysis showed that all facility-wide (except for the two engines I-ES-39B and I-ES-40B) toxic potential emissions exceeded their respective TPERs, except for the hourly toluene emission rate, as shown in Table 5 below.

Table 5
Toxic Pollutant Emission Rate (TPER) Analysis*

Compound	Facility-wide Potential Emission Rates			Toxic Pollutant Emission Rates (TPER)			TPER Exceeded?		
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
Sulfuric acid	270.61	6494.64		0.025	0.25		yes	yes	
Benzene			1787.54			8.1			yes
Formaldehyde	11.61			0.04			yes		
Hexane		64.18			23.0			yes	
Toluene	4.42	106.11		14.4	98.0		no	yes	
Arsenic			295.66			0.053			yes
Beryllium			11.28			0.28			yes
Cadmium			125.01			0.37			yes
Chromium VI		2.12			0.013			yes	
Manganese		302.93			0.630			yes	
Mercury		0.46			0.013			yes	
Nickel		1.83			0.013			yes	

* Emission rates taken from Duke's application addendum Table 1A.

After the toxics exceeding their TPERs were identified, an air dispersion modeling analysis was completed using potential emissions for comparison to the allowable Acceptable Ambient Levels (AALs).

The toxic modeling analysis was conducted with emissions rates and exhaust characteristics (flow rate and temperature) that are expected to represent the worst-case parameters for the proposed and existing sources.

The analysis included all existing sources (except for the gasoline storage tank as discussed above) including the five existing simple-cycle combustion turbines (Lee IC Unit Nos. 10-14) and the three existing combined-cycle/simple-cycle combustion turbines (Lee IC Unit No. 1A, 1B and 1C). The existing combined-cycle turbines were modeled in combined-cycle mode at 100 percent load with duct burners and in simple-cycle mode at 100 percent load with evaporative coolers to account for the worst-case stack parameters. The annual emissions were modeled with four scenarios that are based on the following combinations:

Scenario #1 Each combined-cycle combustion turbine operating in:

- Combined-cycle mode for 6,760 hours per year (hr/yr) operating on natural gas.
- Simple-cycle mode for 1,000 hr/yr operating on natural gas and 1,000 hr/yr operating on fuel oil.

Scenario #2 Each combustion turbine operating in:

- Combined-cycle mode for 5,760 hr/yr operating on natural gas and 1,000 hr/yr operating on fuel oil.
- Simple-cycle mode for 2,000 hr/yr operating on natural gas.

Scenario #3 Each combustion turbine operating in combined-cycle mode for 8,760 hr/yr operating on natural gas.

Scenario #4 Each combustion turbine operating in combined-cycle mode for 7,760 hr/yr operating on natural gas and 1,000 hr/yr operating on fuel oil.

For each of the four combined-cycle annual scenarios above, there were 3 corresponding scenarios for the 5 simple cycle turbines, for a total of 12 scenarios for the turbines:

- All 5 simple cycle turbines on oil for 2000 hours.
- All 5 simple cycle turbines on gas for 2000 hours.
- All 5 simple cycle turbines 1000 hours gas/1000 hours oil.

To maximize operational flexibility and to possibly reduce the need for future TAP modeling analyses for these sources at the facility, Duke requested permit limits based on "optimized" emission rates. That is, based on the resulting concentrations from the potential model run, the potential emission rates for each source were increased to optimized rates which result in ambient concentrations that are a greater percent of the AALs than for the potential model run while still staying below 100% the AALs. A comparison of the potential (baseline) and optimized rates is shown in Table 6 with the ratio of increase from potential emissions to optimized emissions (Optimization Factor) indicated. Results for the optimized modeling analysis are shown in Table 7 below with the resulting percent of the AAL for each toxic.

Table 6
Comparison of Potential Emissions to Optimized Emissions*

Compound	Facility-wide Potential Emission Rates			Facility-wide Optimized Emission Rates			Optimization Factor		
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
Sulfuric acid	270.61	6494.64		1014.79	12,015.08		3.75	1.85	
Benzene			1787.54			15,104.68			8.45
Formaldehyde	11.61			1857.57			160		
Hexane		64.18			138,159.11			2300	
Toluene	4.42	106.11		19,453.61	568,116.07		4400	5354	
Arsenic			295.66			410.97			1.38
Beryllium			11.28			278.59			24.7
Cadmium			125.01			14,469.67			116
Chromium VI		2.12			646.07			305	
Manganese		302.93			65,129.83			215	
Mercury		0.46			1237.52			2685	
Nickel		1.83			238.59			130.5	

* Emission rates taken from Duke's application addendum Tables 1A (potential) and 1B (optimized).

Table 7
Results of Optimized Modeling Analysis

Compound	Averaging Period	Maximum Impact (µg/m^3)*	Maximum Allowable Concentration (µg/m^3)	Percent of AAL (%)	Complies?
Sulfuric acid	1-hr	98.43	100	98	yes
	24-hr	11.75	12.00	98	yes
Benzene	annual	1.18E-01	1.20E-01	98	yes
Formaldehyde	1-hr	147.64	150	98	yes
Hexane	24-hr	1082.10	1100	98	yes
Toluene	1-hr	54,829.28	56,000	98	yes
	24-hr	4619.28	4,700	98	yes
Arsenic	annual	2.05E-03	2.10E-03	98	yes
Beryllium	annual	4.02E-03	4.10E-03	98	yes
Cadmium	annual	5.40E-03	5.50E-03	98	yes
Chromium VI	24-hr	0.61	0.62	98	yes
Manganese	24-hr	30.29	31	98	yes
Mercury	24-hr	0.59	0.60	98	yes
Nickel	24-hr	0.59	0.60	98	yes

* Maximum impact over 5-years (2012-2016) of meteorological data

Duke's original toxics dispersion modeling analysis was approved by Alex Zarnowski, AQAB, (see memo to Ed Martin dated January 8, 2018). The revised dispersion modeling analysis, received on October 26, 2018 with Duke's addendum, was approved by Alex Zarnowski on November 20, 2018.

Health Risk Assessment

As stated above, Duke performed a facility-wide air toxics analysis for all new and existing sources being permitted, except the new MACT diesel engines I-ES-39B and I-ES-40B were not included. Therefore, to demonstrate that the modification would not present an unacceptable risk to human health, the following evaluation is made to determine the effect by not including these sources in the facility-wide modeling. Even though MACT sources are exempt from toxics permitting, they must be evaluated in the health risk assessment.

Engines I-ES-39B and I-ES-40B

Engine I-ES-39B is a 91 hp No. 2 fuel oil-fired screener engine that operates 2600 hours per year and engine I-ES-40B is a 300 hp No. 2 fuel oil-fired crusher engine that operates one hour per day. The potential toxics emitted by these engines are determined using DAQ's spreadsheet for Gas and Diesel Internal Combustion Engines with power rating less than or equal to 600 hp for diesel fueled engines, as shown in Table 8.

Table 8
Toxic Emission Increases from Engines I-ES-39B and I-ES-40B*

Compound	Engine I-ES-39B			Engine I-ES-40B			Total Engines I-ES-39B and I-ES-40B		
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
Sulfuric acid **									
Benzene			1.55E+00			7.15E-01			2.26E+00
Formaldehyde	7.52E-04			2.48E-03			3.23E-03		
Hexane***									
Toluene	2.61E-04	6.25E-03		8.59E-04	2.06E-02		1.12E-03	2.68E-02	
Arsenic			6.62E-03			3.07E-03			9.69E-03
Beryllium			4.97E-03			2.30E-03			7.27E-03
Cadmium			4.97E-03			2.30E-03			7.27E-03
Chromium VI		4.59E-05			1.51E-04			1.97E-04	
Manganese		9.17E-05			3.02E-04			3.94E-04	
Mercury		4.59E-05			1.51E-04			1.97E-04	
Nickel		4.59E-05			1.51E-04			1.97E-04	

* From DAQ spreadsheet for Gas and Diesel Internal Combustion Engines with power rating less than or equal to 600 hp for diesel fueled engines.
** Sulfuric acid not listed in AP-42 Section 3.3 or DAQ's spreadsheet.
*** Not emitted from diesel fuel.

The total TAP emissions for the engines from Table 8, are taken to Table 9 for comparison to the total facility-wide optimized emissions as modeled without the emissions from the two engines as taken from Table 6 above.

Table 9
Toxic Emission Increases from Engines I-ES-39B and I-ES-40B

Compound	Emission Rates from Engines I-ES-39B and I-ES-40B*			Facility-wide Optimized Emission Rates** without Engines I-ES-39B and I-ES-40B			Percent Increase due to Engines I-ES-39B and I-ES-40B (%)		
	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr	lb/hr	lb/day	lb/yr
Benzene			2.26E+00			15,104.68			1.50E-04
Formaldehyde	3.23E-03			1857.57			1.74E-06		
Toluene	1.12E-03	2.68E-02		19,453.61	568,116.07		5.76E-08	4.71E-08	
Arsenic			9.69E-03			410.97			2.36E-05
Beryllium			7.27E-03			278.59			2.61E-05
Cadmium			7.27E-03			14,469.67			5.02E-07
Chromium VI		1.97E-04			646.07			3.05E-07	
Manganese		3.94E-04			65,129.83			6.05E-09	
Mercury		1.97E-04			1237.52			1.59E-07	
Nickel		1.97E-04			238.59			8.28E-07	

* From Table 8
** From Table 6

It can be seen that the percent increase contribution from the two engines is insignificant; therefore, there is not an unacceptable risk to human health from the modification.

No toxics monitoring is required since the potential emissions are significantly below the optimized emissions as seen from the ratio of optimized to potential emissions (Optimization Factor) in Table 6 which results in compliance with the AALs as shown in Table 7.

Detailed toxic emission calculations are presented in Duke's application Appendix B.

The permit toxic limits for all sources modeled, except for the MACT sources, which are exempt from toxics permitting, are shown below in Table 10 and in permit condition 2.2.A.1.a. TEPR limits for toluene (lb/hr only, since this TPER was not exceeded) were added to permit TEPR condition 2.2.A.2.e.

Table 10
Permit Toxic Emission Limits

Emission Source	Toxic Air Pollutant	Emission Limit		
		(lb/yr)	(lb/day)	(lb/hr)
Lee IC Units No. 10 and 11 (per turbine)	Sulfuric acid		3.60E+02	3.04E+01
	Benzene	4.09E+02		
	Formaldehyde			2.19E+02
	Toluene		9.19E+04	3.15E+03
	Arsenic	1.35E+01		
	Beryllium	6.72E+00		
	Cadmium	4.90E+02		
	Chromium VI		2.52E+01	
	Manganese		7.84E+03	
	Mercury		1.49E+02	
	Nickel		2.77E+01	
Lee IC Units No. 12 and 13 (per turbine)	Sulfuric acid		3.59E+02	3.03E+01
	Benzene	3.85E+02		
	Formaldehyde			2.06E+02
	Toluene		8.69E+04	2.97E+03
	Arsenic	1.27E+01		
	Beryllium	6.37E+00		
	Cadmium	4.62E+02		
	Chromium VI		2.38E+01	
	Manganese		7.43E+03	
	Mercury		1.40E+02	
	Nickel		2.62E+01	
ID No.4 Gasoline storage tank - 1,000 gallons	Benzene	3.13E+02		
	Hexane		1.90E+02	
	Toluene		2.78E+03	9.50E+01
ES-30 Feed silo	Arsenic	2.09E-03		
	Beryllium	4.09E-03		
	Cadmium	8.14E-04		
	Chromium VI		4.78E-05	
	Manganese		2.73E-03	

	Mercury		1.01E-04	
	Nickel		7.11E-04	
ES-31 STAR® feedstock processing reactor	Sulfuric acid		4.44E+00	3.75E-01
	Benzene	9.14E+00		
	Formaldehyde			7.06E-01
	Hexane		5.85E+03	
	Toluene		2.57E+01	8.80E-01
	Arsenic	7.95E+00		
	Beryllium	1.54E+01		
	Cadmium	6.89E+01		
	Chromium VI		8.13E-02	
	Manganese		4.77E+00	
	Mercury		1.16E+00	
	Nickel		1.60E+00	
ES-34 EHE- external heat exchanger 1	Arsenic	3.22E+00		
	Beryllium	6.32E+00		
	Cadmium	1.26E+00		
	Chromium VI		3.36E-02	
	Manganese		1.92E+00	
	Mercury		7.09E-02	
	Nickel		5.01E-01	
ES-35 EHE- external heat exchanger 2	Arsenic	3.22E+00		
	Beryllium	6.32E+00		
	Cadmium	1.26E+00		
	Chromium VI		3.36E-02	
	Manganese		1.92E+00	
	Mercury		7.09E-02	
	Nickel		5.01E-01	
ES-36 Transfer silo	Arsenic	2.09E-03		
	Beryllium	4.09E-03		
	Cadmium	8.14E-04		
	Chromium VI		4.78E-05	
	Manganese		2.73E-03	
	Mercury		1.01E-04	
	Nickel		7.11E-04	
ES-37 Storage dome	Arsenic	2.09E-03		
	Beryllium	4.09E-03		
	Cadmium	8.14E-04		
	Chromium VI		8.34E-05	
	Manganese		4.78E-03	
	Mercury		1.76E-04	
	Nickel		1.25E-03	
ES-38	Arsenic	1.05E-03		

Loadout silo	Beryllium	2.05E-03		
	Cadmium	4.08E-04		
	Chromium VI		7.17E-05	
	Manganese		4.09E-03	
	Mercury		1.51E-04	
	Nickel		1.07E-03	
ES-38A Loadout silo chute 1A	Arsenic	5.23E-04		
	Beryllium	1.02E-03		
	Cadmium	2.04E-04		
	Chromium VI		2.39E-05	
	Manganese		1.36E-03	
	Mercury		5.02E-05	
	Nickel		3.57E-04	
ES-38B Loadout silo chute 1B	Arsenic	5.23E-04		
	Beryllium	1.02E-03		
	Cadmium	2.04E-04		
	Chromium VI		2.39E-05	
	Manganese		1.36E-03	
	Mercury		5.02E-05	
	Nickel		3.57E-04	
I-ES-41 Grinding Circuit Discharge Stack (Grinding Circuit Discharge Stack)	Arsenic	3.46E-04		
	Beryllium	2.34E-03		
	Cadmium	3.01E-03		
	Chromium VI		3.84E-03	
	Manganese		3.11E-01	
	Mercury		8.07E-03	
	Nickel		2.22E-01	
I-ES-42 Mill Feed Hopper (Mill Feed Hopper)	Arsenic	3.46E-04		
	Beryllium	2.34E-03		
	Cadmium	3.01E-03		
	Chromium VI		7.18E-06	
	Manganese		5.83E-04	
	Mercury		1.51E-05	
	Nickel		4.17E-04	
I-F-1 Wet ash receiving transfer to shed	Arsenic	4.59E-04		
	Beryllium	8.99E-04		
	Cadmium	1.79E-04		
	Chromium VI		7.32E-06	
	Manganese		4.20E-04	
	Mercury		1.55E-05	
	Nickel		1.10E-04	
I-F-2	Arsenic	9.17E-04		

Wet ash receiving transfer to hopper	Beryllium	1.80E-03		
	Cadmium	3.57E-04		
	Chromium VI		1.47E-05	
	Manganese		8.41E-04	
	Mercury		3.09E-05	
	Nickel		2.19E-04	
I-F-3 Wet ash receiving unloading pile	Arsenic	1.47E-03		
	Beryllium	2.88E-03		
	Cadmium	5.73E-04		
	Chromium VI		1.54E-05	
	Manganese		8.77E-04	
	Mercury		3.23E-05	
	Nickel		2.29E-04	
I-F-4 Ash basin	Arsenic	7.73E-01		
I-F-5 Ash handling	Beryllium	1.52E+00		
I-ES-39A Screener	Cadmium	3.02E-01		
I-ES-40A Crusher	Chromium VI		8.20E-03	
	Manganese		4.66E-01	
	Mercury		1.72E-02	
	Nickel		1.22E-01	

2. Three natural gas/No. 2 fuel oil-fired simple/combined cycle internal combustion turbines (ID Nos. Lee IC Unit No. 1A, Lee IC Unit No. 1B and Lee IC Unit No. 1C), each equipped with dry low-NO_x combustors and water injection control, a heat recovery steam generator with natural gas-fired duct burner, and a common steam turbine; and associated selective catalytic reduction (ID Nos. Unit 1A SCR, Unit 1B SCR and Unit 1C SCR) and oxidation catalyst (ID Nos. Unit 1A OxdnCat, Unit 1B OxdnCat and Unit 1C OxdnCat)

   One STAR® flyash feedstock processing reactor equipped with natural gas/propane startup burners (ID No. ES-31) and associated dry scrubber (ID No. CD-31A) and baghouse (ID No. CD-31B)

   EHE- external heat exchanger 1 (ID No. ES-34) and associated baghouse (ID No. CD-34), and EHE- external heat exchanger 2 (ID No. ES-35) and associated baghouse (ID No. CD-35)

   Applicable Regulations
   15A NCAC 02Q .0317: AVOIDANCE CONDITION for
   15A NCAC 02D .0530: PREVENTION OF SIGNIFICANT DETERIORATION

a. In order to avoid applicability of 15A NCAC 02D .0530(g), the combined emissions of nitrogen oxides, sulfur dioxide, particulate matter, PM-10, PM-2.5, carbon monoxide, VOCs, sulfuric acid and lead from these sources (ID Nos. Lee IC Unit 1A, Lee IC Unit 1B, Lee IC Unit 1C, ES-31, EHE-34 and EHE-35) shall not exceed the following limits.

Regulated Pollutant	Limits/Standards (tons per year)	Applicable Regulation
nitrogen oxides	3414.6	15A NCAC 02Q.0317(a)(1) (PSD avoidance)
sulfur dioxide	14,663.1	
particulate matter	218.2	

PM-10	218.2	
PM-2.5	218.2	
carbon monoxide	829.3	
VOCs	65.1	
sulfuric acid	64.3	
lead	0.77	

Compliance

b. The Permittee shall keep records of the monthly emissions from each source (ID Nos. Lee IC Unit 1A, Lee IC Unit 1B, Lee IC Unit 1C, ES-31, EHE-34 and EHE-35) in a logbook (written or in electronic format). The Permittee shall be deemed in noncompliance with 15A NCAC 02D .0530(g) if these records are not kept or if any of the above limits are exceeded. Emissions shall be determined as follows:

Total emissions of nitrogen oxides =

$$\text{Lee IC Unit 1A CEMS} + \text{Lee IC Unit 1B CEMS} + \text{Lee IC Unit 1C CEMS} + \left(\frac{hours\ operated, ES-31}{rolling\ 12\ months}\right)\left(\frac{140\ mmBtu}{hr}\right)\left(\frac{0.34\ lb}{mmBtu}\right) +$$

$$5.36^{*}\frac{tons}{rolling\ 12\ months} \leq 3414.6\ \frac{tons}{rolling\ 12\ months}$$

* This number represents the potential emissions from the STAR® ancillary sources (all sources except ES-31, ES-34 and ES-35) in this and the following equations (see Table 3 above).

Sulfur Dioxide

Emissions of sulfur dioxide shall be determined in accordance with the following equation.

$$Total\ emissions\ of\ sulfur\ dioxide =$$

$$\left(\frac{0.00152\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.0006\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.00152\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.0006\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{hours\ operated,ES\text{-}31}{rolling\ 12\ months}\right)\left(\frac{140\ mmBtu}{hr}\right)\left(\frac{lb\ carbon}{14{,}500\ Btu}\right)\left(\frac{lb\ flyash}{0.06\ lb\ carbon}\right)\left(\frac{0.0015\ lb\ S}{lb\ flyash}\right)\left(\frac{32\ lb\ SO2}{16\ lb\ S}\right)\left(\frac{ton}{2000\ lb}\right)(1 - 0.95\ scrubber\ eff) +$$

$$0.35^{*}\ \frac{tons}{rolling\ 12\ months} \leq 14{,}663.1\ \frac{tons}{rolling\ 12\ months}$$

Particulate Matter

Emissions of particulate matter shall be determined in accordance with the following equation.

$$Total\ emissions\ of\ particulate\ matter =$$

$$\left(\frac{0.0232\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.0074\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ SC\text{-}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.0244\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{0.0062\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months} + \frac{mmBtu\ CC\text{-}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right) +$$

$$\left(\frac{number\ hours\ operated,ES\text{-}31}{rolling\ 12\ months}\right)(77{,}500\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right) +$$

$$\left(\frac{number\ hours\ operated,ES\text{-}34}{rolling\ 12\ months}\right)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right) +$$

$$\left(\frac{number\ hours\ operated,ES\text{-}35}{rolling\ 12\ months}\right)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right) +$$

$$13.14^{*}\ \frac{tons}{rolling\ 12\ months} \leq 218.2\ \frac{tons}{rolling\ 12\ months}$$

where:

mmBtuSC-oil	=	heat input for last 12 month period when burning fuel oil in simple-cycle mode
mmBtuSC-gas	=	heat input for last 12 month period when burning natural gas in simple-cycle mode
mmBtuCC-oil	=	heat input for last 12 month period when burning fuel oil in combined-cycle mode
mmBtuCC-gas	=	heat input for last 12 month period when burning natural gas in combined-cycle mode

PM-10

Emissions of PM-10 shall be determined in accordance with the following equation.

$$Total\ emissions\ of\ PM-10 =$$

$$\left(\frac{0.0232\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0074\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0244\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0062\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}31}{rolling\ 12\ months}\right)(0.92)(77{,}500\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}34}{rolling\ 12\ months}\right)(0.92)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}35}{rolling\ 12\ months}\right)(0.92)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$8.024^{*}\ \frac{tons}{rolling\ 12\ months}\leq 218.2\frac{tons}{rolling\ 12\ months}$$

PM-2.5

Emissions of PM-2.5 shall be determined in accordance with the following equation.

$$Total\ emissions\ of\ PM-2.5 =$$

$$\left(\frac{0.0232\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0074\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ SC\text{–}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0244\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}oil,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0062\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1A}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1B}{rolling\ 12\ months}+\frac{mmBtu\ CC\text{–}gas,Lee\ IC\ Unit\ 1C}{rolling\ 12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}31}{rolling\ 12\ months}\right)(0.53)(77{,}500\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}34}{rolling\ 12\ months}\right)(0.53)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$\left(\frac{number\ hours\ operated,ES\text{–}35}{rolling\ 12\ months}\right)(0.53)(32{,}000\ acfm\ baghouse\ flow\ rate)\left(\frac{0.025\ grains}{acf}\right)\left(\frac{60\ min}{hour}\right)\left(\frac{lb}{7000\ grains}\right)+$$

$$3.083^{*}\ \frac{tons}{rolling\ 12\ months}\leq 218.2\frac{tons}{rolling\ 12\ months}$$

Carbon Monoxide

Emissions of carbon monoxide shall be determined in accordance with the following equation.

$$Total\ emissions\ of\ CO = Lee\ IC\ Unit\ 1A\ CEMS + Lee\ IC\ Unit\ 1B\ CEMS + Lee\ Unit\ 1C\ CEMS\ +$$

$$\left(\frac{lb\ CO,ES-31}{mmBtu}\right)\left(\frac{mmBtu,ES-31}{rolling\ 12\ months}\right)\left(\frac{tons}{2000\ lb}\right) + 1.16^{*}\left(\frac{tons}{rolling\ 12\ months}\right) \leq 829.3\ \frac{tons}{rolling\ 12\ months}$$

where: $\left(\frac{lb\ CO,ES-31}{mmBtu}\right) = CO\ Emission\ factor\ for\ reactor\ ES-31\ to\ be\ determined\ by\ the\ following\ stack\ test:$

Testing [15A NCAC 02Q .0508(f)]

Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the CO emission limit above by conducting an initial stack test for CO emissions, with the reactor operating within 10% of its maximum heat input rate, in accordance with a testing protocol approved by the DAQ. Details of the emissions testing and reporting requirements can be found in Section 3 - General Condition JJ. Testing shall be completed within 90 days of initial start-up of the reactor (ID No. ES-31) and the results submitted according to Section 3 - General Condition JJ. Test results shall be the average of 3 valid test runs.

Test results shall be submitted as required in Section VIII.E.2.c below and the following information for each test run shall be included:

i. CO emissions (lb/mmBtu).
ii. Reactor heat input (mmBtu/hr).
iii. Reactor flyash raw feed rate (tons per hour).
iv. Flyash loss on ignition (% carbon).

The CO test results (lb/mmBtu) shall be used for ES-31 to calculate the total CO emissions each month in the above equation as soon as the test results have been completed regardless of whether the results have been approved by NCDAQ.

Carbon Monoxide Continuous Emissions Monitoring

The CO CEMS for Lee IC Unit 1A, Lee IC Unit 1B, Lee IC Unit 1C shall meet the requirements of 15A NCAC 02D .0613 except that:

i. A Cylinder Gas Audit (CGA) shall be conducted at least once each QA operating quarter on each simple-cycle stack CO CEMS and each combined-cycle stack CO CEMS in accordance with 40 CFR Part 75, Appendix B, §2.2.1 instead of once every calendar quarter. A QA operating quarter for each CO CEMS is defined as a calendar quarter in which the unit operates at least 168 unit operating hours (in simple-cycle or combined-cycle mode), and a unit operating hour is a clock hour during which a unit combusts any fuel, either for part of the hour or for the entire hour. Regardless of the number of hours of operation, at a minimum, a CGA shall be conducted at least once every four calendar quarters on each CO CEMS consistent with the requirements in 40 CFR Part 75, Appendix B, §2.2.3(f).
ii. A Relative Accuracy Test Audit (RATA) shall be conducted once every four successive QA operating quarters (as defined above) in accordance with 40 CFR Part 75, Appendix B, §2.3.1.2 instead of once every four calendar quarters. Regardless of the number of hours of operation, at a minimum, a RATA shall be conducted at least once every eight calendar quarters on each CO CEMS consistent with the requirements in 40 CFR Part 75, Appendix B, §2.3.1.1(a). The frequency timeline for the RATAs shall begin with the last RATA conducted prior to July 16, 2014.
iii. All grace period provisions from Part 75, Appendix B, §2.2.4 and, §2.3.3 apply.

VOCs

Emissions of VOCs shall be determined in accordance with the following equation.

Total emissions of VOCs =

$$\left(\frac{0.00085\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.00077\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0004\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0004\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{lb\ VOCs, ES-31}{mmBtu}\right)\left(\frac{mmBtu, ES-31}{rolling\ 12\ months}\right)\left(\frac{tons}{2000\ lb}\right)+0.43^{*}\left(\frac{tons}{rolling\ 12\ months}\right)\leq 65.1\ \frac{tons}{rolling\ 12\ months}$$

where: $\left(\frac{lb\ VOCs, ES-31}{mmBtu}\right) = VOC\ Emission\ factor\ for\ reactor\ ES-31\ to\ be\ determined\ by\ the\ following\ stack\ test:$

Testing [15A NCAC 02Q .0508(f)]

Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the VOC emission limit above by conducting an initial stack test for VOC emissions, with the reactor operating within 10% of its maximum heat input rate, in accordance with a testing protocol approved by the DAQ. Details of the emissions testing and reporting requirements can be found in Section 3 - General Condition JJ. Testing shall be completed within 90 days of initial start-up of the reactor (ID No. ES-31) and the results submitted according to Section 3 - General Condition JJ. Test results shall be the average of 3 valid test runs.

Test results shall be submitted as required in Section VIII.E.2.c below and the following information for each test run shall be included:

i. VOC emissions (lb/mmBtu).
ii. Reactor heat input (mmBtu/hr).
iii. Reactor flyash raw feed rate (tons per hour).
iv. Flyash loss on ignition (% carbon).

The VOC test results (lb/mmBtu) shall be used for ES-31 to calculate the total VOC emissions each month in the above equation as soon as the test results have been completed regardless of whether the results have been approved by NCDAQ.

Sulfuric Acid

Emissions of sulfuric acid shall be determined in accordance with the following equation.

$$\left(\frac{0.000232\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ SC\text{-}oil, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.0000857\ lb}{mmBtu}\right)\left(\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ SC\text{-}gas, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.00107\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ CC\text{-}oil, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{0.000402\ lb}{mmBtu}\right)\left(\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1A}{12\ months}+\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1B}{12\ months}+\frac{mmBtu\ CC\text{-}gas, Lee\ IC\ Unit\ 1C}{12\ months}\right)\left(\frac{ton}{2000\ lb}\right)+$$

$$\left(\frac{hours\ operated, ES-31}{rolling\ 12\ months}\right)\left(\frac{0.10\ lb}{hr}\right)\left(\frac{ton}{2000\ lb}\right)\leq 64.3\ \frac{tons}{rolling\ 12\ months}$$

Lead
No monitoring is required for lead.

Reporting [15A NCAC 02Q .0508(f)]

c. The Permittee shall submit to the DAQ Permitting Section a summary of the results of the initial stack testing for the reactor ES-31 for CO and VOCs, that includes the information in Section 2.2.B.1.b above, and submit a complete permit application to revise the permit accordingly, no later than 30 days after completing the initial stack tests in accordance with General Condition JJ.
d. The Permittee shall submit a semi-annual summary report, acceptable to the Regional Air Quality Supervisor, of emissions of the above pollutants as applicable from each source (Lee IC Unit 1A, Lee IC Unit 1B, Lee IC Unit 1C, ES-31, ES-34 and ES-35) and the total for all sources based on the calculations above (tons per rolling consecutive 12-month period) including the potential emissions from the small-emitting STAR® ancillary sources, postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The emissions must be calculated for each of the 12-month periods over the previous 17 months. The report shall note any monthly emissions that do not include CO or VOC emissions from the reactor ES-31 or do not include DAQ-approved CO or VOC emissions from the reactor ES-31.

IX. 1-hour NO_2 and SO_2 NAAQS Modeling

In an email dated February 1, 2018, Duke was asked to complete 1-hour NO_2 and SO_2 NAAQS modeling, as internal DAQ discussions indicated this modeling was needed to be consistent with the Buck STAR® application.

The necessity of the 1-hour modeling is related to how the emissions from the project are handled with respect to PSD. Previously, before asking Duke to model, a letter had been sent to Duke on December 18, 2017, informing them that the STAR® modification emissions cannot be included under the existing Prevention of Significant Deterioration (PSD) avoidance limits since those limits were for an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD.

In a meeting with Duke on January 5, 2018 (William Willets, Cyndi Winston, Erin Wallace and Ed Martin), to discuss DAQ's request in the above December 18, 2017 letter (item 1) for more information regarding PSD applicability, Duke presented their reasoning why they believed the project emissions should be included under the existing PSD avoidance limits as originally requested in the application and was asked to provide additional information for DAQ's review.

In a conference call on February 5, 2018 with Duke (William Willets, Mark Cuilla, Booker Pullen, Cyndi Winston, Erin Wallace and Ed Martin), to discuss Duke's proposed reasoning to include the project emissions under the existing PSD avoidance limits, Duke mentioned there may be differences between the Buck and Lee projects regarding whether it was necessary to conduct 1-hour NO_2 and SO_2 NAAQS modeling for Lee. DAQ asked Duke to provide their reasoning in a letter.

In an internal DAQ meeting (William Willets, Tom Anderson, Matt Porter and Ed Martin) on February 13, 2018, the Buck 1-hour NO_2 and SO_2 NAAQS modeling, recently reviewed and approved by DAQ, was discussed with respect to whether this modeling was needed for Lee. The decision depended on receipt of Duke's letter (for which DAQ was awaiting) with their reasons and justification regarding whether the project emissions can be included under the existing PSD avoidance limits.

In a letter received February 19, 2018 (dated February 7, 2018), Duke submitted their rationale that the STAR® project should be considered part of the same project that retired the coal-fired boilers and installed the three new combined cycle turbines and to therefore include the STAR® project emissions under the existing PSD avoidance limits.

On February 20, 2018, after reviewing Duke's rationale in their February 7, 2018 letter that the STAR® ash beneficiation project should be considered as part of the same project that retired the three coal-fired boilers and installed the three new combined cycle turbines, Duke was informed that DAQ agreed and that the STAR® project emissions can be included under the existing PSD avoidance limits (see Existing PSD Avoidance Condition in Section VII.A).

For the Lee STAR® project, there are no modeling requirements because emissions will be included under the existing PSD avoidance limits and therefore the allowable emission limits are not being increased.

Note, for comparison, in the proposed Buck STAR® project, Duke was requested to model 1-hour NO_2 and SO_2 NAAQS emissions to demonstrate that the contemporaneous emissions decreases used in the PSD netting exercise are creditable. This modeling was required to demonstrate compliance with the requirement under the PSD regulations in 51.166(b)(3)(vi)(*c*), that for a contemporaneous decrease (used for netting): "A decrease in actual emissions is creditable only to the extent that: ... (c) It has approximately the same qualitative significance for public health and welfare as that attributed to the increase from the particular change."

The Lee STAR® project is not using contemporaneous emission decreases; therefore, the 1-hour SO_2 and NO_2 NAAQS modeling is not needed.

X. Public Hearing on the Draft Permit

In accordance with SESSION LAW 2016-95, HOUSE BILL 630 (Coal Ash Management Act of 2014) §130A-309.203, the Department shall hold a public hearing and accept written comment on the draft permit decision for a period of not less than 30 or more than 60 days after the Department issues a draft permit decision.

A notice for the public hearing for the draft permit was published in the Goldsboro News-Argus newspaper and placed on the DAQ website along with the draft permit and review on June 8, 2018, to provide for a 30-day comment period in accordance with the public participation procedures in 15A NCAC 2Q .0307. The public comment period was June 8, 2018 through July 13, 2018. The public hearing was held at 7:00 pm on July 10, 2018 at the Wayne Community College in Goldsboro. The public comments are addressed in the Hearing Officer's Report and Recommendations dated November 29, 2018 and discussed in Section XIII below.

The public notice requirement is for a construction and operating permit under the 15A NCAC 2Q .0300 procedures. EPA does not review the draft permit for the first step of a two-step 15A NCAC 2Q .0501(c)(2) Title V process. The second step of the 15A NCAC 2Q .0501(c)(2) Title V process will occur on or before 12 months after commencing operation.

XI. Other Requirements

PE Seal

The control device form (Form D) for this modification was dated October 30, 2017 and stamped by Mr. Thomas Pritcher (Environmental Consulting & Technology of North Carolina), providing the PE review and seal. The PE number for Mr. Pritcher is 025453. The NCBELS website shows Mr. Pritcher's license status as "current" through 12/31/2018.

Zoning

In accordance with SESSION LAW 2016-95, HOUSE BILL 630 (Coal Ash Management Act of 2014) §130A-309.205, Local ordinances regulating management of coal combustion residuals and coal combustion products invalid; petition to preempt local ordinance, notwithstanding any authority granted to counties, municipalities, or other local authorities to adopt local ordinances, all provisions of local ordinances that regulate or have the effect of regulating the management of coal combustion residuals and coal combustion products, including regulation of carbon burn-out plants, within the jurisdiction of a local government are invalidated and unenforceable, to the extent necessary to effectuate the purposes of the law.

Nevertheless, a Zoning Consistency Determination was received on November 13, 2017, for this modification from Wayne County Planning signed by Chip Crumpler, Planning Director, dated October 20, 2017, stating the agency received a copy of the application and that the proposed project is consistent with local zoning ordinances.

Fee Classification

The facility fee classification after this modification will remain as "Title V" as before.

PSD Increment Tracking
The PSD Minor Baseline Dates for Wayne County are: October 2, 1979 for PM-10 and February 9, 1995 for SO_2 and NOx. Therefore, the addition of the above sources emitting PM-10, SO_2 and/or NOx will consume increment in Wayne County.

Hourly emission rates for PM-10, NOx and SO2 are taken from the application Table 2A for all new STAR® project sources. The following statement is placed in the permit cover letter:

> *Wayne County has triggered increment tracking under PSD for PM-10, SO_2 and NOx. This modification will result in an increase in 23.50 pounds per hour of PM-10, 24.94 pounds per hour of SO_2, and 59.72 pounds per hour of NOx.*

XII. Comments on Pre-Draft Permit

Comments from Duke
The pre-draft permit and review were sent was sent to Erin Wallace at Duke on May 25, 2018 for review. Duke responded on June 4, 2018 with the following comments:

1. Duke is requesting an amendment to the application to put the following sources on the insignificant activities list rather than in the permit itself:

Emission Source I.D.	Emission Source Description
I-ES-39A	Screener
I-ES-39B **NSPS Subpart IIII** **MACT Subpart ZZZZ**	No. 2 fuel oil-fired screener engine (91 HP) (2007 model year or later)
I-ES-40A	Crusher and No. 2 fuel oil-fired engine (300 hp)
I-ES-40B **NSPS Subpart IIII** **MACT Subpart ZZZZ**	No. 2 fuel oil-fired crusher engine (300 HP) (2007 model year or later)
I-F-1	Wet Ash Receiving Transfer to Shed
I-F-2	Wet Ash Receiving Transfer to Hopper
I-F-3	Wet Ash Receiving Unloading Pile
I-F-5	Ash Handling
I-F-6	Haul Roads

These sources qualify as insignificant activities under 15A NCAC 02Q .0503(8) because of size or production rate since emissions would not violate any applicable emissions standard and whose potential emission of particulate, sulfur dioxide, nitrogen oxides, volatile organic compounds, and carbon monoxide before air pollution control devices, are each no more than five tons per year and whose potential emissions of hazardous air pollutants before air pollution control devices, are each below 1000 pounds per year.

DAQ Response
This change was made.

2. For the monitoring, recordkeeping and reporting for 02D .0515 for the reactor ES-31 in Section 2.1.J.1.c, d, e and f of the permit, Duke commented that Buck's permit (similar ash beneficiation permit) did not require monitoring, recordkeeping or reporting for this condition.

DAQ Response

Monitoring, recordkeeping and reporting for 02D .0515 is always required if there is a particulate control device (e.g., baghouse CD-31 in this case) on the source. Therefore, there is no change.

3. For the initial stack test for sulfur dioxide in Section 2.1.J.2.b of the permit, testing was to be completed and the results submitted within 90 days of initial start-up of the reactor. Duke requested that testing be completed within 90 days of initial start-up of the reactor and the results of the testing be submitted no later than 30 days after completing the initial stack test in accordance with General Condition JJ.

   DAQ Response
   This change was made.

4. For the monitoring of emissions in Section 2.2.B.1.b of the permit, Duke requested that the PSD avoidance limit equations be revised to simply subtract off the ancillary sources' emissions.

   DAQ Response
   To simplify the monitoring of emissions, the total potential emissions from the small-emitting STAR® project ancillary sources (all except STAR® reactor ES-31, EHE ES-34 and EHE ES-35), as shown in Section VIII.D.2 above has been added separately in the condition equations with the note that that number represents the potential emissions from the small-emitting STAR® ancillary sources. Rather than subtract the ancillary sources' emissions from the old PSD avoidance limits to arrive at new limits as Duke requested, DAQ wants to keep the old limits in place and show the potential ancillary sources' emissions as a separate contribution in the equations so that it is more straightforward to show that the limits remain unchanged from the old limits. Therefore, no change was made.

5. For the initial stack testing for CO and VOCs in Section 2.2.B.1.b, Duke proposes to use the emission factors used for permitting in lieu of testing. The factors were based on testing at a similar facility and Duke feels they are appropriate for this facility. This would also be consistent with the Buck Facility monitoring.

   DAQ Response
   The application references SEFA operation experience for the CO factor and a stack test for the VOCs factor, but does not provide any other details. DAQ requested additional information on these factors in the March 14, 2018 and April 17, 2018 emails to substantiate the accuracy of the factors to determine if they were appropriate to use in lieu of stacks tests. However, since no further information was provided, stack testing is necessary to determine the factors. Duke was informed that if DAQ can get substantiated emission factors that are based on stack tests or something equivalent, stack testing may not be required to verify the factors. Therefore, no change was made.

6. For the initial stack testing and reporting for CO and VOCs in Sections 2.2.B.1.b and c of the permit, testing was to be completed and the results submitted within 90 days of initial start-up of the reactor. Duke requested this be changed to allow testing to be completed within 90 days of initial start-up of the reactor and the results of the testing be submitted no later than 30 days after completing the initial stack tests in accordance with General Condition JJ.

   DAQ Response
   This change was made.

Comments from WaRO and SSCB
The draft permit and review were sent to Samir Parekh with SSCB and Robert Bright at the Washington Regional Office on May 25, 2018 for review.

On May 29, 2018, in an email Robert Bright responded with the following comment:

1. For the initial stack test for sulfur dioxide in Section 2.1.J.2 of the permit, testing was to be completed and the results submitted within 90 days of initial start-up of the reactor. Robert suggested giving Duke 90 days to complete the testing, and to submit the results, in accordance with General Condition JJ, no later than 30 days after the test.

Permitting Response
This change was made.

No comments were received from SSCB.

XIII. Changes to Draft Permit

The following changes were made to the draft permit that went to public notice on June 8, 2018, as recommended in Brendan Davey's Hearing Officer's Report dated November 29, 2018:

1. Particulate stack testing

Report Recommendation
Add a stack testing requirement for particulate emissions for one of the two external heat exchangers; and the reactor system. This will verify compliance not only with applicable particulate emission standards but will verify emissions estimations used in the toxic air pollutant analysis. The toxic air pollutant emissions are based on estimated particulate emission rates in conjunction with the coal ash metals analysis.

Resolution
This was added in Sections 2.1.J.1.b and 2.1.K.1.b of the permit as shown in Sections VIII.A.1 and B.1 above.

2. Hydrogen chloride (HCl) and hydrogen fluoride (HF) emissions

Report Recommendation
Coal combustion typically has hydrogen chloride (HCl) and hydrogen fluoride (HF) air emissions from chlorine (Cl) and fluorine (F) in the coal. The coal ash being burned in the reactor does have remaining chloride per the analysis received by Edward Martin and subsequently HCl emissions could be expected by the combustion process. HF emissions could be expected by the same reasoning. These possible emissions should be considered in the permit review process. After discussion, Edward Martin requested additional information from Duke Energy Progress regarding this topic. Information was received from Duke Energy Progress on August 27, 2018 addressing these issues and demonstrating the estimated HCl and HF emissions are well below the Toxic Permitting Emission Rate (TPER) listed in 15A NCAC 02Q .0711.

Resolution
Since combustion of coal results in emissions of hydrogen chloride and hydrogen fluoride, these may or may not be included in toxics modeling for a facility on a case-by-case basis. A portion of the chlorine and fluorine in the coal may be absorbed onto the flyash. Duke's sampling included chlorides but no fluorides. DAQ asked Duke if HCl and HF would not both be expected to be emitted from burning the flyash and therefore be included in a toxics demonstration.

Duke explained that much of the Cl and F in the original coal will have been emitted as HCl and HF from the original combustion process at the plant, such that the remaining Cl and F left with the ash is likely significantly lower and would result in much lower levels of HCl and HF in the ash beneficiation facility flue gas. Total chloride concentrations were measured in the ash samples rather than fluorides, as chloride concentrations are typically higher. In any case, the Circulating Dry Scrubbing (CDS) technology is ideal for the removal of acid gases (SO2, SO3, HCl and HF) from the flue gas leaving a combustion process burning coal or residual flyash. The technology is based on the circulating fluidized bed (CFB) principle and uses dry calcium hydroxide (Ca(OH)2, also known as hydrated lime) as the reagent. Since Cl and F are typically more reactive than SO2 and SO3, the dry scrubber will preferentially remove HCl and HF in addition to the SO2 and SO3 it is designed to remove. The dry scrubber operates with recirculating excess hydrated lime to ensure proper contact and residence time for acid gas removal.

Regardless of the above arguments, DAQ requested numerical estimates of HCl and HF emissions and a comparison to the Toxic Air Pollutant Emission Rates (TPERs) listed in NCAC 02Q .0711.

Duke provided the following calculations on August 27, 2018, to demonstrate that HCl and HF emissions were below the TPERs and therefore toxics modeling is not required:

HCl

Using: chlorides concentration in the ash — 10.933 mg/kg
ash throughput — 125 tons/hr *
control efficiency — 95%

* Conservatively greater than the designed flyash feedstock process rate of 75 tons per hour or 400,000 tons per year.

Resulting in an HCl emission rate of 0.14 lb/hr (see table below compared to the TPER)

HF

Using: A similar ratio between coal/ash for fluorides and chlorides (since fluorides are not directly measured):

chlorides concentration in the ash — 10.933 mg/kg
fluoride coal concentration — 1468 mg/kg (historical from 1999 Hg ICR efforts)

Then: 10.933 mg/kg ÷ 1468 mg/kg = 0.74% percentage of chloride retained in the ash

Then using a fluoride concentration in coal of 77 ppm (from EPRI):

77 ppm x 0.74% = 0.57 ppm calculated fluoride concentration retained in ash

Resulting in an HF emission rate of 0.008 lb/hr or 0.18 lb/day (see table below compared to the TPERs).

Compound	Emissions		TPER		Modeling Required?
	lb/hr	lb/day	lb/hr	lb/day	
HCl	0.14	--	0.74	--	No
HF	0.008	0.18	0.26	1.3	No

TEPR limits for HCl and HF were added to permit TEPR condition 2.2.A.2.e.

3. Pressure drop monitoring

Report Recommendation

The Duke Buck STAR® plant requires monthly pressure drop recording for the two bagfilters installed on the external heat exchangers. For consistency and good inspection and maintenance practices I recommend the same for the H. F. Lee location.

Resolution

This pressure drop monitoring was added as shown in Sections 2.1.J.1.c.ii and 2.1.K.1.c.ii of the permit as shown in Sections VIII.A.1 and B.1 above.

4. Typos and minor corrections in the draft air permit

Report Recommendation

(a) On page 38 the reactor visible emissions monitoring indicates "monthly" in one spot and "weekly" in another. This frequency should be consistent.

(b) On pages 48-53 the PSD calculations for NOx, SO_2, and sulfuric acid do not seem to include the emission source ES-31 (the STAR® reactor). This should be corrected.

Resolution
These changes were made. The PSD calculations for NOx, SO_2, and sulfuric acid were revised to include source ES-31 in Section 2.2.B.1.b of the permit as shown in Section VIII.D.2.b above.

5. Coal ash metals analysis
Report Recommendation
The sampling methodology used for coal ash analysis in support of the air permit application was questioned. Review of the methodology uncovered some concerns which were presented to Duke Energy. Ultimately the ash was re-analyzed using more appropriate methodology for the air permit application. A revised permit application and toxics analysis was received October 26, 2018 and indicated compliance with NC Air Toxics Regulations.

Resolution
The public comment questioning the ash sampling methodology stated that:

DEQ continues to support the use of the "Toxicity Characteristic Leaching Procedure" (TCLP) for the characterization of coal ash. The test was never intended for this use and may underestimate the toxicity of the ash. The US Environmental Protection Agency (EPA) does not recommend that the test be used for the characterization of coal ash waste. In its final rule on the disposal of coal combustion residuals EPA said that, "For landfills, EPA agrees that TCLP, SPLP and other single pH test methods may not be the most appropriate leachate extraction methods for all waste streams and all disposal scenarios."

On August 1, 2018, DAQ requested additional information on the ash pond test methods. On August 9, 2018, Duke responded that the test method used to determine the concentrations of metals in the ash was SW-846 *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* The methods are approved by the U.S. Environmental Protection Agency for obtaining data to satisfy the requirements of 40 Code of Federal Regulations (CFR) Parts 122 through 270 promulgated under the Resource Conservation and Recovery Act (RCRA), as amended. These methods provide the concentration of metals in the ash rather than the Toxicity characteristic leaching procedure (TCLP) which is a method to simulate leaching through a landfill. On August 21, 2018, DAQ informed Duke that they (DAQ) agreed that method Duke used for metals (SW846 3050B) is not the TCLP. DAQ further stated they understood that Method SW846 3050B can be used for RCRA, where the purpose would be to evaluate coal-ash contaminated soil or remediated soil to see if it releases elements of environmental concern, but it is not a total digestion method. In the case of burning flyash, DAQ believes that Method SW846 3052, resulting in absolute digestion of the sample, was required, since flyash can contain large amounts of silicate structures.

Method SW846 3050B states:

This method is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment. If absolute total digestion is required use Method 3052.

DAQ asked Duke to provide their assessment of the appropriateness of using Method SW846 3050B for the flyash samples in support of the application. Duke agreed Method SW846 3052 was required to accurately determine the toxic characteristics of the coal ash and had the original 41 samples re-analyzed using this method.

On October 26, 2018, Duke submitted an addendum to the application that included revised toxic modeling for the new emission rates as a result of the revised ash metal concentrations from re-analyzing the original ash samples as requested by DAQ. Also, in the addendum Duke requested the addition of two new insignificant activities (Ball Mill Classifier I-ES-41 and Ball Mill Feed Silo I-ES-42). The revised toxics modeling included these two new sources and the gasoline tank previously omitted. The potential emissions (PM, PM-10 and PM-2.5) for the two new sources have been added in Table 2 above and the potential emissions in Table 3 above have been revised to reflect the new total STAR® project increases and the new total potential emissions from the STAR® ancillary sources. In addition, the new total potential emissions from the STAR® ancillary sources have been revised in the monitoring equations in Section VIII.D.2.b above for PM, PM-10 and PM-2.5.

The toxic emission rates used in the revised modeling analysis and the corresponding permit emission limits were revised from those in Section VIII.D.1 above in the draft review that went through public notice.

The revised site-specific average ash analysis used in the revised toxic modeling for the new emission rates as a result of the revised ash metal concentrations from re-analyzing the original are as follows:

	Method 3052 (ppm)
Antimony	6.24
Arsenic	38.76
Beryllium	14.77
Cadmium	4.05
Chromium	124.71
Cobalt	44.20
Lead	58.20
Manganese	77.05
Nickel	90.59
Selenium	8.17

XIV. Recommendations

Issuance is recommended.

NCDENR
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

June 10, 2015

Mr. Jim Clayton
The SEFA Group
217 Cedar Road
Lexington, SC 29073

SUBJECT: Applicability Determination No. 2501
The SEFA Group
Lexington, SC

Dear Mr. Clayton:

The North Carolina Division of Air Quality (DAQ) received your letter dated September 5, 2014, requesting the DAQ's concurrence with its determination of regulatory status of certain coal combustion residues, when used in its Staged Turbulent Air Reactor (STAR Reactor), in accordance with 40 CFR 241 "Solid Wastes Used As Fuels or Ingredients in Combustion Units" ("Solid Waste Definition Rule" or "Rule" hereinafter).

Specifically, SEFA Group (SEFA) requests the confirmation that coal ash obtained from the following specific sources meets the requirements in §241: flyash received directly from coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse), and processed flyash received from landfills and ash ponds.

Unless exempt, combustion of "non-hazardous secondary material (NHSM), as defined in §241.2 would subject the emissions unit (such as STAR reactor) to requirements in 40 CFR 60 Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units" or, Subpart DDDD "Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units". These regulations are commonly known as CISWI ("Commercial and Industrial Solid Waste Incineration").

The DAQ has determined that the coal ash received directly from the coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse) is a NHSM and an "ingredient", as defined in §241.2. DAQ has further determined that this flyash meets the legitimacy criteria included in §241.3(d)(2) and thus, concludes that it is not a solid waste. Therefore, the STAR Reactor is not subject to the requirements in CISWI.

Moreover, the processed flyash received from landfills or ash ponds is a NHSM and an ingredient, and DAQ has determined that this flyash also meets the legitimacy criteria included in §241.3(d)(2), and thus, concludes that it is not a solid waste. Therefore, the STAR Reactor is not subject to the requirements in CISWI.

The following includes discussion on STAR Reactor, and technical and regulatory analysis supporting these conclusions for each of the above types of flyash:

STAR Reactor

The STAR Reactor is a patented technology developed by SEFA for thermal beneficiation / processing of either a low or high-Btu value fine particulate matter, such as the above described flyash [hereinafter "feedstock"], along with other ingredient materials (gas, solids, and liquids) into a variety of commercial products. These products are used not only for application as a partial cement replacement but for many other commercial and industrial applications. There are several products which SEFA is currently capable of producing because of the flexibility embodied in this reactor. For example, STAR® RP, Ultrix®, Spherix®, Fortimix®, and Permanix™.

The STAR Reactor process is inherently flexible in that operating parameters can be varied and different ingredients can be added to produce a desired product. The primary component of the STAR Reactor is a cylindrical refractory-lined vessel in which the majority of the process reactions take place. These reactions can include a range of both chemical and physical reactions. Air is required for pneumatic uplift of the solids and for the process reactions enters through the floor of the STAR Reactor as well as through the walls at multiple locations. The raw feedstock and any other ingredients are introduced through the walls of the STAR Reactor. All of the solids and gases exit together at the top of the reactor. The gas/solids mixture enters a hot cyclone where the majority of solids are separated from the gas and recycled back to the STAR Reactor. The very high rate of hot recycle solids increases the operating flexibility of the process. The process reactions can occur through this reactor/hot cyclone loop. Due to the high gas velocity, the multiple injection points, and the recycle solids, there is a significant amount of turbulence created which enhances the mixing of the ingredients and optimizes the reactions. The gas and remaining solids not collected by the hot cyclone are passed over a heat exchanger which can be designed to preheat the process air, used in heat recovery, or to simply cool the gas/solids mixture. Once cooled, the solids are separated from the gas in a fabric filter recovery device. Solids can also exit the STAR Reactor at the bottom or from the recycle loop. These solids can be combined with the solids/gas stream before the heat recovery equipment or, since they have different characteristics as compared to the solids exiting the hot cyclone, they can be processed separately for a particular application. By design the STAR Reactor operates under a wide range of process parameters.

Technical and Regulatory Analysis

Flyash Received Directly from Coal-fired Power Plant's Particulate Collection Infrastructure (i.e., Electrostatic precipitator or Baghouse)

As described above, the STAR Reactor is capable of utilizing flyash, received directly from coal-fired power plant's particulate emissions controls, as its primary ingredient along with other select ingredients in order to produce a variety of products for markets.

§241.2(b)(3) of the rule defines NHSM as "a secondary material that, when discarded, would not be identified as a hazardous waste under Part 261 of this chapter". Further the same section defines secondary material as "any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap."

It is indisputable that flyash generated from combustion of coal is not a "primary product of a manufacturing" facility (such as electric generating facility) and this product can be deemed as "post-industrial material". Moreover, coal flyash is not regulated as a hazardous waste as per Part 261 of 40 CFR "Identification and Listing of Hazardous Waste". In fact, EPA has promulgated a rule on April 17, 2015 (80 FR 21302) to regulate disposal of coal combustion residues (fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers) [CCR] as solid waste under Subtitle D "State or Regional Solid Waste Plans" of the Resource Conservation Act (RCRA) [administrative regulations included in 40 CFR 257) and not under the Subtitle C of the RCRA "Hazardous Waste Management" [administrative regulations included in 40 CFR 261]. In addition, the beneficial uses (e.g., use of flyash in concrete manufacturing replacing traditional product cement) of CCR is exempt from this regulation.

Based, on the above discussion, it is concluded that the flyash generated from the coal combustion and received directly from coal-fired power plant's particulate emissions control devices, is a NHSM.

§241.3(b)(3) of the Solid Waste Definition Rule provides that NHSMs are not solid waste when "used as an ingredient in a combustion unit that meet the legitimacy criteria specified in paragraph (d)(2) of this section." §241.2 of the Solid Waste Definition Rule defines "ingredient" as "a non-hazardous secondary material that is a component in a compound, process or product." The feedstock is merely one component among a number of variables which are introduced to the STAR Reactor to produce many different products. Therefore, feedstock processed in the STAR Reactor is an ingredient under the Solid Waste Definition Rule.

Legitimacy Criteria

For a non-hazardous secondary material used as an ingredient to be excluded from the definition of solid waste under §241.3 of the Solid Waste Definition Rule, the material must satisfy the following legitimacy criteria under Subsection (d)(2):

(i) The non-hazardous secondary material must be managed as a valuable commodity;

(ii) The non-hazardous secondary material must provide a useful contribution to the production or manufacturing process.

(iii) The non-hazardous secondary material must be used to produce a valuable product or intermediate.

(iv) The non-hazardous secondary material must result in products that contain contaminants at levels that are comparable in concentration to or lower than those found in traditional products that are manufactured without the non-hazardous secondary material.

Managed as a Valuable Commodity - §241.3(d)(2)(i)

SEFA stores its feedstock in silos and or covered shelters prior to using it as an ingredient in the STAR Reactor and conveys the material to the process equipment pneumatically. As per §241.3(d)(2)(i), the Solid Waste Definition Rule identifies the following three factors to be considered in determining whether a material is managed as a valuable commodity:

(A) The storage of the non-hazardous secondary material prior to use must not exceed reasonable time frames;

(B) Where there is an analogous ingredient, the non-hazardous secondary material must be managed in a manner consistent with the analogous ingredient or otherwise be adequately contained to prevent releases to the environment;

(C) If there is no analogous ingredient, the non-hazardous secondary material must be adequately contained to prevent releases to the environment;

As per SEFA, in a previously permitted design, the storage capacity of the silos and partially enclosed storage bins for incoming feedstock ranges from 800-2000 tons and could accommodate approximately three to ten days of production when the STAR Reactor is operating on SEFA's normal production schedule. As such, under normal operations, the incoming feedstock is typically stored no more than three days prior to introduction into the STAR Reactor process. However, during shutdown of the STAR Reactor or when off-specification feedstock is received from a supplier, the feedstock may be stored for longer periods of time, but usually no more than sixty days. In the past, as per SEFA, shutdown of the STAR Reactor has generally not exceeded twenty days. With respect to the management of off-specification feedstock, SEFA has indicated that if this off-specification material can be blended with other feedstock at ratios which ensure that processing in the STAR Reactor produces an end product which meets SEFA's quality control standards, it will attempt to do so. Depending on the nature and amount of the material's deviation from SEFA's feedstock specifications, if it cannot be blended, the off-specification feedstock will have to be rejected and returned to the supplier. If it is capable of being blended, the blending process may require storage of the off-specification feedstock for as long as 60 days depending upon the quantity involved. Accordingly, even outside of the normal three-day processing scheduling for incoming feedstock, SEFA's storage of incoming feedstock does not exceed a reasonable time frame.

Additionally, SEFA manages the incoming feedstock as a valuable commodity and takes measures to prevent loss of material during off-loading and storage. In the preamble to the rule, EPA explains that "If on the other hand, a company does not manage the non-hazardous secondary material as it would traditional ingredients, that behavior may indicate that the non-hazardous secondary material is being discarded." Refer to 76 FR 15543. The material must be "stored in a manner that both adequately prevents releases or other hazards to human health and the environment, considering the nature and toxicity of the non-hazardous secondary material." *Id.* In most cases, this requirement is satisfied if the material is in some manner "contained." *Id.* As noted, SEFA stores its feedstock in enclosed silos or covered and partially enclosed storage bins and therefore meets this criterion. Additionally, at all times prior to processing, SEFA handles the material in a manner consistent with this criterion. Feedstock is transferred from its suppliers (typically, coal-fired power plants) to SEFA either (i) directly by pneumatic conveyor into the silos or (ii) by truck to the SEFA facility. All bin vents within the pneumatic conveyer system are equipped with fabric filter recovery devices to minimize loss of this valuable material. Thus, SEFA believes that it unquestionably manages its feedstock as a valuable commodity.

Useful Contribution to the Production or Manufacturing Process - §241.3(d)(2)(ii)

SEFA believes that there is no question that the feedstock processed in the STAR Reactor provides a useful contribution to its production of the various end products marketed by SEFA. In the preamble to the Solid Waste Definition Rule, at 76 FR 15543, EPA explains the rationale behind this criterion for legitimacy:

> A non-hazardous secondary material used as an ingredient in combustion systems provides a useful contribution if it contributes valuable ingredients to the production/manufacturing process or to the product or intermediate of the production/manufacturing process. This criterion is an essential component in the determination of legitimacy because legitimate use is not occurring if the non-hazardous secondary material doesn't add anything to the process, such that the non-hazardous secondary material is basically being disposed of or discarded. This criterion is intended to prevent the practice of "sham" recycling by adding non-hazardous secondary materials to a manufacturing operation simply as a means of disposing of them.

SEFA states that the feedstock processed in the STAR Reactor is clearly not added to dispose of that material and the processing of the feedstock in the STAR Reactor can in no manner be characterized as "sham" recycling. Additionally, the fact that some of the constituents of the feedstock are not needed or desirable for the STAR Process does not affect the status of the "useful contribution" of the feedstock:

> For purposes of satisfying this criterion, not every constituent or component of the non-hazardous secondary material has to make a contribution to the production/manufacturing activity. **For example, non-hazardous secondary materials used as ingredients may contain some constituents that are needed in the manufacturing process, such as, for example, zinc in non-hazardous secondary materials that are used to produce zinc-containing micronutrient fertilizers, while other constituents in the non-hazardous secondary material, such as lead, do not provide a useful contribution.** Provided the zinc is at levels that provides a useful contribution, we believe the non-hazardous

> secondary material would satisfy this criterion, although we would note that the constituents not directly contributing to the manufacturing process could still result in the non-hazardous secondary material not meeting the contaminant part of the legitimacy criteria. The Agency is not quantitatively defining how much of the non-hazardous secondary material needs to provide a useful contribution for this criterion to be met, since we believe that defining such a level would be difficult and is likely to be different, depending on the non-hazardous secondary material. The Agency recognizes that this could be an issue if persons argue that a non-hazardous secondary material is being legitimately used as an ingredient, but in fact, only a small amount or percentage of the non-hazardous secondary material is used.
>
> 76 FR 15543-44 (emphasis added).

The fact that reactions in the STAR Reactor eliminate certain undesirable constituents of the feedstock material does not preclude a determination that the feedstock meets the legitimacy criteria as an ingredient. As described above, the STAR Reactor has the capability to control the chemical and physical reactions in the process to produce marketable materials with a broad range of characteristics. The constituents and characteristics of each STAR Reactor product are tailored to the intended market and vary depending on the needs of that market. The elimination of certain constituents does not affect the determination that the feedstock is an ingredient which makes a useful contribution to the products produced in the STAR Reactor.

Produces a Valuable Product or Intermediate - §241.3(d)(2)(iii)

As per SEFA, it is undisputed that feedstock material is used in the STAR Reactor to make valuable products. "The product or intermediate is valuable if it is (i) sold to a third party or (ii) used as an effective substitute for a commercial product or as an ingredient or intermediate in an industrial process." Refer to 76 FR 15544. Also, as discussed above, the STAR Reactor has the capability to process its fly ash and other materials to produce a broad range of products. All of the products currently produced in the STAR Reactor are sold to third parties. Additionally, the various products produced in the STAR Reactor have application as both substitutes for commercial products and as ingredients in an industrial process. Ultrix® and STAR RP® are sold for use as partial replacement for Portland cement. Fortimix® is sold for use as an additive for rubber compounds. Permanix™ is designed for use as a broad-spectrum UV blocker. Accordingly, in all respects, SEFA's feedstock processed in the STAR Reactor satisfies this criterion for legitimacy as an ingredient.

Comparable Contaminants Concentration of End Product - § 241.3(d)(2)(iv)

Again, as discussed above, the STAR Reactor has the capability to process its feedstock to reduce or eliminate some undesirable constituents and to alter the chemical and physical characteristics of others in its various end products. The Solid Waste Definition Rules provides as follows:

> The non-hazardous secondary material must result in products that contain contaminants at levels that are comparable in concentration to or lower than those found in traditional products that are manufactured without the non-hazardous secondary material.
>
> Refer to §241.3(d)(2)(iv).
>
> The preamble to the Rule includes the following:
>
> The assessment of whether the products produced from the use of nonhazardous secondary materials that have contaminants that are comparable to (or lower) in concentration can be made by a comparison of contaminant levels in the ingredients themselves to the traditional ingredients they are replacing, or by comparing the contaminant levels in the product itself with and without the use of the nonhazardous secondary material.
>
> Refer to 76 FR 15544.

As applied to the use of the feedstock as an ingredient in the STAR Reactor, the relevant comparison is a comparison of the various STAR Reactor end products to comparable products in the industries in which each is used. For example, Ultrix® and STAR RP® are both used as supplementary cementitious materials in concrete, but, due to the unique processing regime of the STAR Reactor, neither has varying quantities of adsorptive unburned carbon, which characterize by-product fly ashes typically used in the marketplace. In fact, the air-entraining characteristics of Ultrix® and STAR RP® are tailored by STAR Reactor to exactly match the air-entraining characteristics of plain cement concrete.

The preamble to the proposed rule for the Solid Waste Definition Rule explains the rationale for and purpose of the comparison of contaminants in the legitimacy criteria for use of a non-hazardous secondary material as an ingredient:

> The Agency recognizes that there may be instances where the contaminant levels in the products manufactured from non-hazardous secondary material ingredients may be somewhat higher than found in the traditional products that are manufactured without the non-hazardous secondary material, but the resulting concentrations would not be an indication of discard and would not pose a risk to human health and the environment.
>
> Refer to 75 FR 31844, 31885 (Jun. 4, 2010).

In addition, EPA has recognized that contaminant levels in the products made from NHSM can have contaminant levels within a "small acceptable range" at 76 FR 15523 (March 21, 2011).

The above discussion clearly provides that it may be allowable under §241.3(d)(2)(iv) for certain contaminants in the end product made with non-hazardous secondary materials ingredients to be "somewhat higher" or within a "small acceptable range" than those in traditional products. Thus, SEFA's fly ash feedstock satisfies the legitimacy criterion in §241.3(d)(2)(iv) despite the slightly higher concentrations of arsenic and beryllium in the STAR RP® as compared to Portland Cement, as included in Attachment A to the SEFA's September 2014 letter. Also, using additional analytical data received from SEFA[1], it can be said that the contaminant levels in the SEFA product are within the range of contaminants levels or within a "small acceptable range" for Portland Cement (traditional product).

Additionally, as stated in the preamble to the proposed rule above, the purpose of the contaminant comparison criterion is to demonstrate that the use of the non-hazardous secondary material ingredient is not indicative of discard and does not pose a risk to human health and the environment. Expanding of the "indication of discard" aspect of this component of the legitimacy criteria, EPA further explains:

> Based on our assessment of all of the comments, we believe it appropriate to include contaminant levels as a legitimacy criterion. Thus, we do not agree with those commenters that assert that contaminant comparisons are not appropriate to require as part of the legitimacy criteria. The Agency believes the criterion is necessary because non-hazardous secondary materials that contain contaminants that are not comparable in concentration to those contained in traditional fuel products or ingredients **would suggest that these contaminants are being combusted as a means of discarding them,** and thus the non-hazardous secondary material should be classified as a solid waste. **In some cases, this can also be an indicator of sham recycling.**
>
> Refer to 75 FR 31871-72 (emphasis added).

As such, the primary purpose of the comparison on contaminants in an end product using the non-hazardous secondary material ingredient to that of traditional products made without the non-hazardous secondary material ingredient is to demonstrate that such use is not a means of discarding the non-hazardous secondary material or indicative of sham recycling.

With respect to the additional industrial uses for products produced by using fly ash feedstock as an ingredient in the STAR Reactor, a direct comparison of SEFA's end product to a traditional product which is manufactured without fly ash feedstock is not feasible for many of the end products produced in the STAR Reactor. However, based on the detailed comparison of the STAR® RP to Portland Cement and the various markets for SEFA's other STAR Reactor products as included in the above referenced submittal, it is clear that SEFA is not processing the fly ash feedstock as a means of discarding the fly ash or any of its constituents.

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[1] Email dated 5/12/2015 from Thomas Pritcher, Environmental Consulting &Technology, Inc., to Rahul Thaker, NCDAQ.

To the extent that the purpose of the contaminant comparison is to demonstrate that these products do not pose a risk to human health and the environment, SEFA has provided additional information as well as copies of the material safety data sheets for these products to demonstrate that no such risk is posed in the various industrial uses of STAR Reactor end products. For example, the material safety data sheets for Spherix® and Fortimix® included in Attachment B to the SEFA's September 2014 letter. As per SEFA, in many cases, the STAR® Reactor end products provide a safe alternative to traditional products which may pose a potential risk to human health and the environment.

Flyash Received from Landfill or Ash Pond

§241.3(b)(4) of the rule provides that NHSMs are not solid waste when "fuel or ingredient products that are used in a combustion unit, and that are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients."

As discussed above, the coal flyash disposed off in a landfill or an ash pond can be deemed as a NHSM. Prior to being used as an acceptable ingredient (feedstock) in the STAR Reactor, any flyash received from landfills or ash ponds must be "processed," as that term is defined in the rule. As discussed below, any commercial agreement between a supplier and SEFA will specify the acceptable criteria (i.e., specifications) for a feedstock that can be used in the STAR Reactor as a condition for supplying processed flyash to SEFA.

Pursuant to §241.2, "processing" means any operations that transform discarded non-hazardous secondary material into a non-waste fuel or non-waste ingredient product. Processing includes, but is not limited to, operations necessary to: remove or destroy contaminants; significantly improve fuel characteristics of the material, *e.g.* sizing or drying the material in combination with other operations; or chemically improve the as-fired energy content. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for purposes of this definition. Under the same section of the Rule, "Secondary material" is defined as any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap.

While it is recognized that coal flyash which was initially placed into a landfill may be considered to have been "previously discarded" by custom and practice, coal-fired utilities also collect this coal ash in permitted wastewater treatment ponds. This coal ash has not historically been considered "discarded" as it was merely solids settling within a permitted wastewater unit. SEFA believes that the processing of these materials as required to satisfy SEFA's specifications for its feedstock would meet the requirements for processing of "previously discarded" materials under the Solid Waste Definition Rule as applied to CISWI. As such, the requisite processing of materials to be used as feedstock in the STAR Reactor would be sufficient to transform them to an ingredient.

The Solid Waste Definition Rule provides that a previously discarded material may be processed to transform the waste to a non-waste ingredient. Specifically, §241.3(b)(4) of the Solid Waste Definition Rule provides as follows:

> Fuel or ingredient products that are used in a combustion unit, and are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients. The legitimacy criteria apply after the non-hazardous secondary material is processed to produce a fuel or ingredient product. Until the discarded nonhazardous secondary material is processed to produce a non-waste fuel or ingredient, the discarded non-hazardous secondary material is considered a solid waste and would be subject to all appropriate federal, state, and local requirements.

As per SEFA, any processing of materials from landfills or from ash ponds to meet SEFA's feedstock specifications will be undertaken under the control of the supplier prior to being received by SEFA for use an ingredient in its STAR Reactor. Accordingly, this feedstock when received by SEFA or used in the STAR Reactor would meet the legitimacy criteria for direct use as an ingredient and therefore would not be a solid waste under the Solid Waste Definition Rule. All feedstock shipped to SEFA for use as an ingredient in the STAR Reactor will first be required to undergo processing by the supplier to be:

A. Free of all, but minimal contaminants (e.g., organic debris, slag);
B. Finely-divided and free-flowing,
C. Have consistent moisture content of $\leq 25\%$; and
D. Have a consistent chemical composition, including organic content as measured by loss on ignition.

The above are SEFA specifications for acceptance of any coal flyash (discarded in landfills or ash ponds).

As per SEFA, the specific processing steps that may be needed to meet the SEFA specifications (as described above) and produce a suitable feedstock for the STAR Reactor will vary depend upon the specific characteristics of each source of coal flyash. Generally speaking, one or more of the following four processing steps will be necessary to produce a suitable feedstock for the STAR Reactor:

1) Dewatering,
2) Screening/Separation,
3) Milling, and
4) Blending.

For use as a feedstock in the STAR Reactor, coal ash from an ash pond having higher moisture content will likely need to be processed using most, if not all, of these steps. Coal ash from a landfill may not require every step. For example, it may be unnecessary to dewater coal ash from landfills if the material has consistent and acceptable moisture content.

Depending on the source of the ash, the general steps described above can require sub processes. For example, feedstock appropriate for the STAR Reactor, it may be necessary to remove larger particles or other materials found with the ash. In addition, to meet SEFA's specifications, some coal ash may require further processing through a separate loop that includes equipment (e.g., roll crusher) needed to produce a more finely-divided, free-flowing feedstock. For others, it may be necessary to utilize a magnetic separator to remove metal constituents. Also, materials such as coal, pyrites, or other more coarse materials may need to be screened. The Screening/Separation step will occur routinely to produce a free-flowing, finely-divided feedstock suitable for the STAR Reactor. Depending on the source of coal ash, milling may not be necessary to achieve a finely-divided and free-flowing material.

As emphasized by SEFA, the specific processing steps and the specific processing equipment cited above are typical examples for how these materials might be processed to produce a suitable feedstock. Those performing the actual work (i.e., suppliers) will elect to use different techniques and/or equipment. SEFA states that as long as the processed coal ash conforms to SEFA's general specifications outlined above, the coal flyash received from landfills or ash ponds will have been sufficiently "processed" and will be a suitable feedstock as an ingredient in the STAR Reactor.

It needs to be noted here that the EPA has recognized similar processing steps (similar to SEFA suggested processing steps as above to meet the SEFA specifications) are "likely to meet our definition of processing, as it appears that these processes in fact remove contaminants and improve the ingredient characteristics of these recovered CCRs **(i.e., ash from ponds and landfills)**". Refer to 76 FR 15518, March 21, 2011 (emphasis added).

With respect to the requirement for meeting the legitimacy criteria in §241.3(d)(2), pursuant to §241.3(b)(4), for flyash received from landfill or ash pond, SEFA emphasizes that after completion of "processing", it will become similar to the flyash received directly from coal-fired plant's particulate collection infrastructure (i.e., Electrostatic precipitator or Baghouse), and thus, will meet all legitimacy criteria as discussed above for it.

Finally, with respect to the particular criterion for comparable contaminants concentration of end product (traditional products) in §241.3(d)(2)(iv), SEFA analyzed each of these materials for semi-volatile organic compounds, organo-chlorine pesticides, PCBs, chlorides, metals and sulfur content, during engineering studies to assess the suitability of coal ash previously placed in water treatment ponds (pond ash) or previously placed in landfills (landfill ash). A comparison of the constituents in dry source feedstock, pond ash and landfill ash from SCE&G's[2] Wateree facility is provided in Attachment C to the SEFA's September 2014 submittal. In comparison to the dry collection feedstock, the landfill ash is comparable with slightly higher results for a few constituents. The sampling results on pond ash indicate that all constituents detected were lower

[2] www.sceg.com

than those for the dry collection feedstock and the landfill ash. Despite certain variables in the manner in which coal ash were previously placed in ponds or landfills, as per SEFA, these sampling results are sufficient to demonstrate that contaminants in coal flyash previously placed in ponds and landfills are comparable to or lower than those in dry collection coal flyash processed as feedstock (that is, flyash received directly from the coal-fired power plant's particulate emissions control) for the STAR Reactor. Furthermore, the metals and sulfur levels of the landfill ash are comparable to those of the dry collection feedstock, and the metals and sulfur levels of the pond ash are significantly lower than those of the dry collection feedstock. Finally, more recent sampling data (March-April 2015) for dry ash and pond ash, provided by SEFA, indicates that the contaminants in pond ash as are lower than the dry ash received directly from electric utility plant.[3] Therefore, SEFA concludes that there will be no increase in emissions as a result of the use of pond ash and landfill ash as a feedstock for the STAR Reactor.

Conclusions

In summary, the DAQ has determined that the fly ash received directly from the coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse) is a NHSM and an "ingredient", as defined in §241.2. DAQ has further determined that this flyash meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste and therefore, STAR Reactor is not subject to the requirements in CISWI.

Moreover, the processed flyash received from ash landfills or ash ponds meets the definition of "processing" in §241.2, and is also a NHSM and an ingredient. DAQ has further determined that this flyash also meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste and therefore, STAR Reactor is not subject to the requirements in CISWI.

It needs to be emphasized here that this letter includes only the "non-waste" determination, which is specific to the materials discussed herein. Further, the determination does not give any permission to SEFA to burn or process flyash in the STAR Reactor. SEFA will need to evaluate and submit a permit application for an air permit, as needed, for burning / processing flyash, as discussed herein, in the STAR Reactor at any location in NC.

If you have any questions regarding this determination, please contact Rahul P. Thaker, P.E., QEP, at (919) 707-8470.

[3] Email dated 5/12/2015 from Thomas Pritcher, Environmental Consulting &Technology, Inc., to Rahul Thaker, NCDAQ.

Sincerely,

William D. Willets, P.E., Chief, Permitting Section
Division of Air Quality, NCDENR

c: Central Files

Air Quality
ENVIRONMENTAL QUALITY

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

MICHAEL A. ABRACZINSKAS
Director

December 18, 2017

Mr. Jeffery D. Hines, General Manager II
Duke Energy Progress, LLC - H. F. Lee Steam Electric Plant
1199 Black Jack Church Road
Goldsboro, NC 27530

SUBJECT: Construction Permit Application No. 9600017.17A for STAR® Facility
Duke Energy Progress, LLC – H.F. Lee Steam Electric Plant
Goldsboro, North Carolina
Wayne County

Dear Mr. Hines:

The subject application, received by this office on November 13, 2017, was deemed administratively complete on that date for initial processing; however, the following additional technical information is requested in order to determine that the application is complete for further processing:

1. The application states that Duke Energy will maintain emissions from the new sources being proposed (STAR® unit and associated sources to support the STAR® system) below the existing Prevention of Significant Deterioration (PSD) avoidance limits in Section 2.1.D.5.a of Air Permit No. 01812T42 for each PSD pollutant ($PM/PM_{10}/PM_{2.5}$, SO_2, NOx, CO, VOCs, sulfuric acid and lead). Those PSD avoidance limits were placed in the permit years ago when the existing three natural gas/No. 2 fuel oil-fired simple/combined-cycle internal combustion turbines (Lee IC Unit 1A, Lee IC Unit 1B and Lee IC Unit 1C) were added. The STAR® modification emissions cannot be included under PSD avoidance limits that apply to an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD.

2. You have included a draft CAM Plan in the application. Since you are requesting a construction permit be issued initially, with the Part 70 Title V permit application to be filed within 12 months after commencing operation in accordance with 02D .0501(c)(2), a CAM Plan is not required at this time. The final CAM Plan will be required to be submitted along with the Part 70 application, for inclusion into the Title V permit at that time.

This does not preclude this agency from requesting any additional information which may be necessary to complete a review of the application and issue the permit.

If you have any questions concerning this matter, please contact Edward L. Martin, P.E., at 919-707-8739 or ed.martin@ncdenr.gov.

Sincerely,

William D. Willets, P.E., Chief, Permitting Section
Division of Air Quality, NCDEQ

c: Washington Regional Office

Martin, Ed

From: Martin, Ed
Sent: Thursday, February 01, 2018 9:00 AM
To: Wallace, Erin Elizabeth (Erin.Wallace@duke-energy.com)
Cc: Winston, Cynthia; Willets, William (william.willets@ncdenr.gov); Anderson, Tom
Subject: Lee STAR Application 1-hour Modeling

Erin:

We noticed that the application did not include 1-hour NO2 and SO2 NAAQS modeling. Whether or not this was discussed previously, it is something we will need (as was done for the Buck STAR project). Please proceed to complete such modeling.

If there are any questions, please advise.

Thanks

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

919 707 8739 office
ed.martin@ncdenr.gov

217 West Jones Street
1641 Mail Service Center
Raleigh, NC 27699-1641

Nothing Compares

H.F. Lee Energy Complex
Duke Energy Progress
1199 Black Jack Church Road
Goldsboro, N.C. 27530

February 7, 2018

Mr. William Willets, Section Chief
Division of Air Quality
North Carolina Department of Environmental Quality
1641 Mail Service Center
Raleigh, North Carolina 27699-1641

Reference: **Construction Permit Application for STAR® Facility**
Request for Additional Information
Duke Energy Progress, LLC
H. F. Lee Steam Electric Plant
Goldsboro, North Carolina; Wayne County
Air Quality Permit No. 01812T; Facility ID: 9600017

Dear Mr. Willets:

On November 6, 2017, Duke Energy Progress, LLC (Duke Energy) submitted air permit application 9600017.17A to construct an ash beneficiation facility at the H.F. Lee Steam Electric Plant. On December 18, 2018, a letter was received by Duke Energy requesting additional technical information to determine that the application is complete. A copy of the letter can be found in Attachment A.

Question 1:

The application states that Duke Energy will maintain emissions from the new sources being proposed (STAR® unit and associated sources to support the STAR® system) below the existing Prevention of Significant Deterioration (PSD) avoidance limits in Section 2.1.D.5.a of Air Permit No. 01812T42 for each PSD pollutant ($PM/PM_{10}/PM_{2.5}$, SO_2, NO_x, CO, VOCs, sulfuric acid and lead). Those PSD avoidance limits were placed in the permit years ago when the existing three natural gas/No. 2 fuel oil-fired simple/combined cycle internal combustion turbines (Lee 1C Unit 1A, Lee 1C Unit 1B and Lee 1C Unit 1C) were added. The STAR® modification emissions cannot be included under PSD avoidance limits that apply to an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD.

Response:

The permit application to repower the H.F. Lee Plant was originally submitted in December 2009 as part of the preparation for retiring the three coal-fired units. Ultimately, PSD avoidance limits were included in the permit for the three coal-fired units and three new natural gas and No. 2 fuel oil fired combustion turbines that may operate in either combined- or simple-cycle mode, along with ancillary operations to support the new turbines. Following the retirement of the coal-fired units on October 1, 2012, a request to remove the boilers and associated equipment was made as part of the renewal application, submitted on November 27, 2012. The management of coal combustion products (CCP) at the site is ultimately a part of the retirement of the coal-fired units and should be considered as part of the same project. Prior to the retirement of the coal-fired generation, Duke Energy was actively tracking potential regulations for long-term CCP management at both the state and federal level.

As a result of the December 2008 ash release that occurred at the Tennessee Valley Authority's Kingston, Tennessee facility, EPA began the process of assessing ash impoundments and determining where corrective measures may be needed to prevent failures at other facilities around the country. An information request was submitted to coal-fired electric utilities in February 2009 inquiring about the safety of surface impoundments and basins storing coal combustion residue. From that point, Duke Power and Progress Energy were actively engaged with and aware of impending measures that would be taken to manage existing ash storage locations for units that would continue to operate and units that would be nearing retirement.

On June 21, 2010, EPA published a proposed rule to regulate coal combustion residuals. The Disposal of Coal Combustion Residuals from Electric Utilities final rule was signed on December 19, 2014 and published in the Federal Register on April 17, 2015. In 2014, the North Carolina Coal Ash Management Act (CAMA) became law and required Duke Energy to begin the closure of ash basins and to evaluate beneficial reuse for a portion of the ash that was stored in the basins.

Although several years have passed since this PSD avoidance condition was placed in the H.F. Lee permit, the active permit application for the ash beneficiation plant to be located at the H.F. Lee Steam Electric Plant is ultimately a part of the retirement of the coal units at H.F. Lee and the regulations that considered as early as 2009 when EPA began collecting information from coal-fired utilities across the country, including Duke Power and Progress Energy. Although the specific disposal method proposed at H.F. Lee (i.e., beneficiation process) is required under CAMA, some type of ash management technique (i.e., removal or cap in place) would have been required for the site.

The purpose of the ash beneficiation facility is to facilitate the retirement of the coal-fired units. As anticipated, retirement of the units requires closure of the associated waste management units. The ash beneficiation facility is a necessary part of that process at HF Lee. It is a temporary facility, in the sense that it will not continue operating once the ash has been removed from the site. Accordingly, the ash beneficiation facility is not independent coal units. It is our assertion that the emissions resulting from the ash beneficiation plant should be included in the PSD avoidance limits as both the combined cycle project and ash beneficiation project are ultimately as a result of the retirement of the coal-fired units at the plant.

Question 2:

You have included a draft CAM Plan in the application. Since you are requesting a construction permit be issued initially, with the Part 70 Title V permit application to be filed within 12 months after commencing operation in accordance with 02D . 0501(c)(2), a CAM Plan is not required at this time. The final CAM Plan will be required to be submitted along with the Part 70 application, for inclusion into the Title V permit at that time.

Response:

We will submit a final CAM Plant with the Title V permit application to be submitted within 12 months of the commencement of operation of the ash beneficiation emission sources.

If you have any questions concerning the contents of this submittal, please contact Erin Wallace at (919) 546-5797.

Certification statement:
Based on information and belief formed after reasonable inquiry, the undersigned certifies under penalty of law that all information and statements provided in the enclosure are true, accurate, and complete.

Respectfully submitted,

Jeffery Hines
Station Manager

cc: Robert Fisher, Washington Regional Office
Erin Wallace, Duke Energy
Mike Graham, Duke Energy
Cynthia Winston, Duke Energy

Attachment A
Request for Additional Information from NC DAQ

Air Quality
ENVIRONMENTAL QUALITY

ROY COOPER
Governor

MICHAEL S. REGAN
Secretary

MICHAEL A. ABRACZINSKAS
Director

December 18, 2017

Mr. Jeffery D. Hines, General Manager II
Duke Energy Progress, LLC - H. F. Lee Steam Electric Plant
1199 Black Jack Church Road
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SUBJECT: Construction Permit Application No. 9600017.17A for STAR® Facility
Duke Energy Progress, LLC – H.F. Lee Steam Electric Plant
Goldsboro, North Carolina
Wayne County

Dear Mr. Hines:

The subject application, received by this office on November 13, 2017, was deemed administratively complete on that date for initial processing; however, the following additional technical information is requested in order to determine that the application is complete for further processing:

1. The application states that Duke Energy will maintain emissions from the new sources being proposed (STAR® unit and associated sources to support the STAR® system) below the existing Prevention of Significant Deterioration (PSD) avoidance limits in Section 2.1.D.5.a of Air Permit No. 01812T42 for each PSD pollutant ($PM/PM_{10}/PM_{2.5}$, SO_2, NOx, CO, VOCs, sulfuric acid and lead). Those PSD avoidance limits were placed in the permit years ago when the existing three natural gas/No. 2 fuel oil-fired simple/combined-cycle internal combustion turbines (Lee IC Unit 1A, Lee IC Unit 1B and Lee IC Unit 1C) were added. The STAR® modification emissions cannot be included under PSD avoidance limits that apply to an unrelated project, and therefore those emissions must be analyzed separately with respect to the applicability of PSD.

2. You have included a draft CAM Plan in the application. Since you are requesting a construction permit be issued initially, with the Part 70 Title V permit application to be filed within 12 months after commencing operation in accordance with 02D .0501(c)(2), a CAM Plan is not required at this time. The final CAM Plan will be required to be submitted along with the Part 70 application, for inclusion into the Title V permit at that time.

This does not preclude this agency from requesting any additional information which may be necessary to complete a review of the application and issue the permit.

If you have any questions concerning this matter, please contact Edward L. Martin, P.E., at 919-707-8739 or ed.martin@ncdenr.gov.

Sincerely,

William D. Willets, P.E., Chief, Permitting Section
Division of Air Quality, NCDEQ

c: Washington Regional Office

Martin, Ed

From: Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent: Friday, February 23, 2018 3:02 PM
To: Martin, Ed
Cc: Winston, Cynthia C; Markley, Dan
Subject: [External] RE: Lee STAR Application
Attachments: J17030596F.PDF

Ed,

Please see my responses to your inquiries regarding the HF Lee Ash Beneficiation project. Please let me know if you have any additional questions.

Thank you
Erin

1. *In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?*
The column with the lower emissions represents an hour with both gas firing and ash processing, while the column with the higher emissions represents the maximum emissions between either 100% gas or 100% ash processing.

2. On page 3-7, it says "The emissions from the existing turbines and auxiliary equipment were taken from the Toxics Modeling Analysis Appendix A Table for Potential Emissions (April 2011)." In Appendix C there are Tables 3-2, 3-3, 3-4, 4-7, 4-8, 4-9 and 4-13. In the April 2011 application, I don't see a Table 3-2, but it is included in Appendix C of the STAR application. What is Table 3-2 used for?
Upon doing some further research, Table 3-2 was pulled from the November 2010 application. This table was used because it included one additional source not included in the April 2011 modeling exercise. The purpose of this table is to show the emissions used for the existing site sources in the Toxics modeling demonstration.

3. Please provide information from the STAR vendor showing the maximum design capacity of the unit; whether that is heat input, ash process rate, or some combination, etc. to explain what the limiting factor would be for potential emissions from the STAR and associated sources so that we can understand what defines what "potential" means. Also, see 4 below.
The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition.

4. Why are annual emissions for NOx, CO and VOCs for the STAR based on a heat input of 130 mmBtu/hr and not based on the maximum design capacity (heat input) of 140 mmBtu/hr? Also, annual emissions for some sources are based on an annual ash throughput of 400,000 tpy, 430,000 tpy, etc. It doesn't appear these are potential annual rates if operated at 8760 hr/yr. For monitoring purposes, if potentials are not used in the PSD analysis, the permit will require monitoring (similar to that in the PSD avoidance condition for the turbines) of actual emissions for those sources not using potentials. That monitoring could be by using emission factors with heat inputs, operating or throughput limits, etc. Otherwise, for example, we don't know that the screener and crusher will only operate 50 hr/wk or only process 430,000 tpy. For some type of PSD avoidance condition, the permit will need to include either the additional actual or additional potential emissions from the STAR project

sources to demonstrate the existing caps are not exceeded. If potentials are recalculated based on 8760 hr/yr, then those sources can be excluded from determining actual emissions.
The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition.

5. Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?
This is an example calculation to demonstrate how the HAP/TAP emissions are calculated using the PM lb/hr emission rate. The 17.79 is a typographical error. It should be 16.61 lb/hr as on page 8 of App B which would then yield the 6.41E-04 lb/hr rate in the table above.

6. Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.
Please see attached.

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.
At the time of the application, a vendor has not been chosen for the bagfilters. The 0.025 gr/acf for HF Lee is a conservative value for a high estimate. We would expect the control efficiency of the chosen bagfilter to be 99.9% or greater.

8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.
As referenced in the Buck application, this data is provided by SEFA Group for both the Buck and HF Lee applications.

9. Are there no toxics emitted from ES-32 and ES-33?
Correct

10. How do you propose to monitor SO2 from the STAR unit?
This is to be determined and will be submitted with the CAM plan in the Part II application.

11. Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.
Per correspondence since this email was sent, the emissions will be included in the existing PSD avoidance condition.

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Thursday, January 11, 2018 12:33 PM
To: Wallace, Erin Elizabeth
Subject: Lee STAR Application

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Erin:

From our review of the application, please consider the following:

1. In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?

2. On page 3-7, it says "The emissions from the existing turbines and auxiliary equipment were taken from the Toxics Modeling Analysis Appendix A Table for Potential Emissions (April 2011)." In Appendix C there are Tables 3-2, 3-3, 3-4, 4-7, 4-8, 4-9 and 4-13. In the April 2011 application, I don't see a Table 3-2, but it is included in Appendix C of the STAR application. What is Table 3-2 used for?

3. Please provide information from the STAR vendor showing the maximum design capacity of the unit; whether that is heat input, ash process rate, or some combination, etc. to explain what the limiting factor would be for potential emissions from the STAR and associated sources so that we can understand what defines what "potential" means. Also, see 4 below.

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6. Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.

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8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.

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10. How do you propose to monitor SO2 from the STAR unit?

11. Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

919 707 8739 office
ed.martin@ncdenr.gov

217 West Jones Street
1641 Mail Service Center
Raleigh, NC 27699-1641

Nothing Compares

Martin, Ed

From: Martin, Ed
Sent: Wednesday, March 14, 2018 12:36 PM
To: 'Wallace, Erin Elizabeth'
Cc: Willets, William (william.willets@ncdenr.gov); Pullen, Booker; 'Jeffery.Hines@duke-energy.com'; Dan.Markley@duke-energy.com; Winston, Cynthia
Subject: RE: [External] RE: Lee STAR Application
Attachments: emissions summary for psd avoidance.docx

Hi Erin:

Please see my response in red below and give me any questions, or comments through (or copy) the RO.

From: Wallace, Erin Elizabeth [mailto:Erin.Wallace@duke-energy.com]
Sent: Friday, February 23, 2018 3:02 PM
To: Martin, Ed <ed.martin@ncdenr.gov>
Cc: Winston, Cynthia C <Cynthia.Winston@duke-energy.com>; Markley, Dan <Dan.Markley@duke-energy.com>
Subject: [External] RE: Lee STAR Application

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to Report Spam.

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Wouldn't the lower column emissions with both gas firing and ash processing be the worst case or is the ash processing not at 100%? And for the higher column, how could 100% gas be higher than 100% ash processing?

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Upon doing some further research, Table 3-2 was pulled from the November 2010 application. This table was used because it included one additional source not included in the April 2011 modeling exercise. The purpose of this table is to show the emissions used for the existing site sources in the Toxics modeling demonstration.
ok

3. **Please provide information from the STAR vendor showing the maximum design capacity of the unit; whether that is heat input, ash process rate, or some combination, etc. to explain what the limiting factor would be for potential emissions from the STAR and associated sources so that we can understand what defines what "potential" means. Also, see 4 below.**
   The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition. We will look at the STAR reactor design information from SEFA you sent me 3-7-18 to see if that, along with good emission factors (see 8 below), can be used to establish potential emissions for the avoidance condition.

4. **Why are annual emissions for NOx, CO and VOCs for the STAR based on a heat input of 130 mmBtu/hr and not based on the maximum design capacity (heat input) of 140 mmBtu/hr? Also, annual emissions for some sources are based on an annual ash throughput of 400,000 tpy, 430,000 tpy, etc. It doesn't appear these are potential annual rates if operated at 8760 hr/yr. For monitoring purposes, if potentials are not used in the PSD analysis, the permit will require monitoring (similar to that in the PSD avoidance condition for the turbines) of actual emissions for those sources not using potentials. That monitoring could be by using emission factors with heat inputs, operating or throughput limits, etc. Otherwise, for example, we don't know that the screener and crusher will only operate 50 hr/wk or only process 430,000 tpy. For some type of PSD avoidance condition, the permit will need to include either the additional actual or additional potential emissions from the STAR project sources to demonstrate the existing caps are not exceeded. If potentials are recalculated based on 8760 hr/yr, then those sources can be excluded from determining actual emissions.**
   The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition. The STAR reactor (ES-31) will require monitoring of actual emissions when added to the existing PSD avoidance condition to demonstrate compliance with the limits because potential emissions for the STAR project together with the turbines exceeds the current limits for some pollutants. The reactor requires monitoring because its design (heat input and flyash throughput limits) establishes the potential emissions for all STAR project sources. A summary of how we propose to modify the existing avoidance limits and which pollutants require monitoring from my draft review is attached. Monitoring will be required for PM, PM10, PM2.5, CO and VOCs. The other sources may not require monitoring as long as we have reliable emission factors (see 8 below) to verify calculated potential emissions for those sources since potentials for those sources are subtracted from the current limits to get the new limits.

   This would be similar to monitoring in the current condition for the turbines for any source for which potential emissions were not used. The lb/mmBtu emission factors for the turbines were taken from the vendor data sheets in that application and used with the measured heat inputs to calculate actual emissions and those were reported as shown in the condition. To establish the condition when the turbines were added, we subtracted off the 8760 potentials for all the ancillary turbine sources to get the avoidance limits, only leaving the turbines to monitor, so that monitoring was not needed for the small sources.

   Please let us know if this makes sense or if you disagree.

5. **Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?**
   This is an example calculation to demonstrate how the HAP/TAP emissions are calculated using the PM lb/hr emission rate. The 17.79 is a typographical error. It should be 16.61 lb/hr as on page 8 of App B which would then yield the 6.41E-04 lb/hr rate in the table above.
   ok

6. **Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.**
   Please see attached.
   How do you get from the 198 pages of lab analysis to the site-specific ash analysis emission factors used in the calculations?

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.
   At the time of the application, a vendor has not been chosen for the bagfilters. The 0.025 gr/acf for HF Lee is a conservative value for a high estimate. We would expect the control efficiency of the chosen bagfilter to be 99.9% or greater.
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   As referenced in the Buck application, this data is provided by SEFA Group for both the Buck and HF Lee applications.
   If we can get substantiated emission factors that are based on stack tests or something equivalent, we may not need to require stack testing to verify the factors to be used in the avoidance condition monitoring from:
   - the Winyah application for PM, PM10, and PM2.5 for the above sources
   - "SEFA operation experience" for NOx and CO for the reactor ES-31 as referenced in the application
   - stack tests for VOCs and sulfuric acid for ES-31 as referenced in the application
   - site specific info for Pb for ES-31 (included in 6 above) as referenced in the application

9. **Are there no toxics emitted from ES-32 and ES-33?**
   Correct
   ok

10. **How do you propose to monitor SO2 from the STAR unit?**
    This is to be determined and will be submitted with the CAM plan in the Part II application.
    As you know, the STAR unit will be subject to 02D .0516 for SO2. We need to know how you propose to monitor SO2 emissions to show compliance with the 2.3 lb/mmBtu 02D .0516 emission limit. Do you want to use a CEMs, initial performance testing, fuel (flyash) analysis for sulfur, or what?

11. **Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.**
    Per correspondence since this email was sent, the emissions will be included in the existing PSD avoidance condition.

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Thursday, January 11, 2018 12:33 PM
To: Wallace, Erin Elizabeth
Subject: Lee STAR Application

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Erin:

From our review of the application, please consider the following:

1. In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?

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5. Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?

6. Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.

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Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

919 707 8739 office
ed.martin@ncdenr.gov

217 West Jones Street
1641 Mail Service Center
Raleigh, NC 27699-1641

NC Nothing Compares

Martin, Ed

From:	Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent:	Wednesday, April 04, 2018 2:14 PM
To:	Martin, Ed
Cc:	Willets, William; Pullen, Booker; Hines, Jeffery D; Markley, Dan; Winston, Cynthia C; Graham, Mike - Env
Subject:	RE: [External] RE: Lee STAR Application
Attachments:	Ash Analysis.xls; Facility-Wide Emissions_Duke Energy_Lee_4418 EW.XLSX; PSD Limits and Silo Calcs 4-4-18.xlsx

Ed,

Good afternoon! Please see my answers to your questions below. Your most recent inquiry is in red, and our response is in green. I've also attached several files to help answer your questions. Please let me know if you have any other questions.

Thank you
Erin

1. *In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?*
The column with the lower emissions represents an hour with both gas firing and ash processing, while the column with the higher emissions represents the maximum emissions between either 100% gas or 100% ash processing.

Wouldn't the lower column emissions with both gas firing and ash processing be the worst case or is the ash processing not at 100%? And for the higher column, how could 100% gas be higher than 100% ash processing?

The STAR reactor is limited to 140 MMBtu per hour. Depending on the LOI of the ash, ash alone may require a supplemental gas/propane (See Table 3D in application). The "controlled" value is the maximum of natural gas or propane @60 MMBtu/hr plus making up the rest of the MMBtu/hr with ash processing (which can vary based on LOI of the ash). The "uncontrolled" value is the higher of the "controlled" number and ash only. I have attached the electronic version of the calculations if that is helpful. If you need more information on the way the STAR unit operates and balances fuel and ash processing, I can provide some additional explanation.

2. On page 3-7, it says "The emissions from the existing turbines and auxiliary equipment were taken from the Toxics Modeling Analysis Appendix A Table for Potential Emissions (April 2011)." In Appendix C there are Tables 3-2, 3-3, 3-4, 4-7, 4-8, 4-9 and 4-13. In the April 2011 application, I don't see a Table 3-2, but it is included in Appendix C of the STAR application. What is Table 3-2 used for?
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Ok

☑

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   The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition.

   We will look at the STAR reactor design information from SEFA you sent me 3-7-18 to see if that, along with good emission factors (see 8 below), can be used to establish potential emissions for the avoidance condition.

   ☑

4. Why are annual emissions for NOx, CO and VOCs for the STAR based on a heat input of 130 mmBtu/hr and not based on the maximum design capacity (heat input) of 140 mmBtu/hr? Also, annual emissions for some sources are based on an annual ash throughput of 400,000 tpy, 430,000 tpy, etc. It doesn't appear these are potential annual rates if operated at 8760 hr/yr. For monitoring purposes, if potentials are not used in the PSD analysis, the permit will require monitoring (similar to that in the PSD avoidance condition for the turbines) of actual emissions for those sources not using potentials. That monitoring could be by using emission factors with heat inputs, operating or throughput limits, etc. Otherwise, for example, we don't know that the screener and crusher will only operate 50 hr/wk or only process 430,000 tpy. For some type of PSD avoidance condition, the permit will need to include either the additional actual or additional potential emissions from the STAR project sources to demonstrate the existing caps are not exceeded. If potentials are recalculated based on 8760 hr/yr, then those sources can be excluded from determining actual emissions.

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   This would be similar to monitoring in the current condition for the turbines for any source for which potential emissions were not used. The lb/mmBtu emission factors for the turbines were taken from the vendor data sheets in that application and used with the measured heat inputs to calculate actual emissions and those were reported as shown in the condition. To establish the condition when the turbines were added, we subtracted off the 8760 potentials for all the ancillary turbine sources to get the avoidance limits, only leaving the turbines to monitor, so that monitoring was not needed for the small sources.

   Please let us know if this makes sense or if you disagree.

   Please see the spreadsheet where we have revised the existing limits to remove the smaller ancillary sources. We propose monitoring emissions from the STAR Reactor and the EHE (Units 1 and 2).

5. Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?

This is an example calculation to demonstrate how the HAP/TAP emissions are calculated using the PM lb/hr emission rate. The 17.79 is a typographical error. It should be 16.61 lb/hr as on page 8 of App B which would then yield the 6.41E-04 lb/hr rate in the table above.

Ok

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Please see attached.

How do you get from the 198 pages of lab analysis to the site-specific ash analysis emission factors used in the calculations?

Please see the attached spreadsheet (Ash Analysis.xls). The second calculates the average values from the multiple sample results in the lab report.

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.
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Ok

☑

8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.
As referenced in the Buck application, this data is provided by SEFA Group for both the Buck and HF Lee applications.

If we can get substantiated emission factors that are based on stack tests or something equivalent, we may not need to require stack testing to verify the factors to be used in the avoidance condition monitoring from:

- the Winyah application for PM, PM10, and PM2.5 for the above sources
- "SEFA operation experience" for NOx and CO for the reactor ES-31 as referenced in the application
- stack tests for VOCs and sulfuric acid for ES-31 as referenced in the application
- site specific info for Pb for ES-31 (included in 6 above) as referenced in the application

Please see the attached spreadsheet (PSD Limits and Silo Calcs 4-4-18.xlsx) for the revised calculations for pre-STAR and post-STAR silos. The emission factors were calculated based on the AP42 drop equation, and we have detailed in the attached.

9. Are there no toxics emitted from ES-32 and ES-33?
Correct

Ok

☑

10. How do you propose to monitor SO2 from the STAR unit?
This is to be determined and will be submitted with the CAM plan in the Part II application.

As you know, the STAR unit will be subject to 02D .0516 for SO2. We need to know how you propose to monitor SO2 emissions to show compliance with the 2.3 lb/mmBtu 02D .0516 emission limit. Do you want to use a CEMs, initial performance testing, fuel (flyash) analysis for sulfur, or what?

We would like to propose Initial performance testing.

11. Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.
Per correspondence since this email was sent, the emissions will be included in the existing PSD avoidance condition.

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Wednesday, March 14, 2018 12:36 PM
To: Wallace, Erin Elizabeth
Cc: Willets, William; Pullen, Booker; Hines, Jeffery D; Markley, Dan; Winston, Cynthia C
Subject: RE: [External] RE: Lee STAR Application

Hi Erin:

Please see my response in red below and give me any questions, or comments through (or copy) the RO.

From: Wallace, Erin Elizabeth [mailto:Erin.Wallace@duke-energy.com]
Sent: Friday, February 23, 2018 3:02 PM
To: Martin, Ed <ed.martin@ncdenr.gov>
Cc: Winston, Cynthia C <Cynthia.Winston@duke-energy.com>; Markley, Dan <Dan.Markley@duke-energy.com>
Subject: [External] RE: Lee STAR Application

Ed,

Please see my responses to your inquiries regarding the HF Lee Ash Beneficiation project. Please let me know if you have any additional questions.

Thank you
Erin

1. *In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?*

   The column with the lower emissions represents an hour with both gas firing and ash processing, while the column with the higher emissions represents the maximum emissions between either 100% gas or 100% ash processing.

   Wouldn't the lower column emissions with both gas firing and ash processing be the worst case or is the ash processing not at 100%? And for the higher column, how could 100% gas be higher than 100% ash processing?

2. On page 3-7, it says "The emissions from the existing turbines and auxiliary equipment were taken from the Toxics Modeling Analysis Appendix A Table for Potential Emissions (April 2011)." In Appendix C there are Tables 3-2, 3-3, 3-4, 4-7, 4-8, 4-9 and 4-13. In the April 2011 application, I don't see a Table 3-2, but it is included in Appendix C of the STAR application. What is Table 3-2 used for?

   Upon doing some further research, Table 3-2 was pulled from the November 2010 application. This table was used because it included one additional source not included in the April 2011 modeling exercise. The purpose of this table is to show the emissions used for the existing site sources in the Toxics modeling demonstration.

   ok

3. Please provide information from the STAR vendor showing the maximum design capacity of the unit; whether that is heat input, ash process rate, or some combination, etc. to explain what the limiting factor would be for potential emissions from the STAR and associated sources so that we can understand what defines what "potential" means. Also, see 4 below.

   The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition.

   We will look at the STAR reactor design information from SEFA you sent me 3-7-18 to see if that, along with good emission factors (see 8 below), can be used to establish potential emissions for the avoidance condition.

4. Why are annual emissions for NOx, CO and VOCs for the STAR based on a heat input of 130 mmBtu/hr and not based on the maximum design capacity (heat input) of 140 mmBtu/hr? Also, annual emissions for some sources are based on an annual ash throughput of 400,000 tpy, 430,000 tpy, etc. It doesn't appear these are potential annual rates if operated at 8760 hr/yr. For monitoring purposes, if potentials are not used in the PSD analysis, the permit will require monitoring (similar to that in the PSD avoidance condition for the turbines) of actual emissions for those sources not using potentials. That monitoring could be by using emission factors with heat inputs, operating or throughput limits, etc. Otherwise, for example, we don't know that the screener and crusher will only operate 50 hr/wk or only process 430,000 tpy. For some type of PSD avoidance condition, the permit will need to include either the additional actual or additional potential emissions from the STAR project sources to demonstrate the existing caps are not exceeded. If potentials are recalculated based on 8760 hr/yr, then those sources can be excluded from determining actual emissions.

   The emissions from the ash beneficiation sources will be included in the existing PSD avoidance condition.

   The STAR reactor (ES-31) will require monitoring of actual emissions when added to the existing PSD avoidance condition to demonstrate compliance with the limits because potential emissions for the STAR project together with the turbines exceeds the current limits for some pollutants. The reactor requires monitoring because its design (heat input and flyash throughput limits) establishes the potential emissions for all STAR project sources. A summary of how we propose to modify the existing avoidance limits and which pollutants require monitoring from my draft review is attached. Monitoring will be required for PM, PM10, PM2.5, CO and VOCs. The other sources may not require monitoring as long as we have reliable emission factors (see 8 below) to verify calculated potential emissions for those sources since potentials for those sources are subtracted from the current limits to get the new limits.

   This would be similar to monitoring in the current condition for the turbines for any source for which potential emissions were not used. The lb/mmBtu emission factors for the turbines were taken from the vendor data sheets in that application and used with the measured heat inputs to calculate actual emissions and those were reported as shown in the condition. To establish the condition when the turbines were added, we subtracted off the 8760 potentials for all the ancillary turbine sources to get the avoidance limits, only leaving the turbines to monitor, so that monitoring was not needed for the small sources.

Please let us know if this makes sense or if you disagree.

5. Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?
This is an example calculation to demonstrate how the HAP/TAP emissions are calculated using the PM lb/hr emission rate. The 17.79 is a typographical error. It should be 16.61 lb/hr as on page 8 of App B which would then yield the 6.41E-04 lb/hr rate in the table above.
ok

6. Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.
Please see attached.
How do you get from the 198 pages of lab analysis to the site-specific ash analysis emission factors used in the calculations?

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.
At the time of the application, a vendor has not been chosen for the bagfilters. The 0.025 gr/acf for HF Lee is a conservative value for a high estimate. We would expect the control efficiency of the chosen bagfilter to be 99.9% or greater.
ok

8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.
As referenced in the Buck application, this data is provided by SEFA Group for both the Buck and HF Lee applications.
If we can get substantiated emission factors that are based on stack tests or something equivalent, we may not need to require stack testing to verify the factors to be used in the avoidance condition monitoring from:
- the Winyah application for PM, PM10, and PM2.5 for the above sources
- "SEFA operation experience" for NOx and CO for the reactor ES-31 as referenced in the application
- stack tests for VOCs and sulfuric acid for ES-31 as referenced in the application
- site specific info for Pb for ES-31 (included in 6 above) as referenced in the application

9. Are there no toxics emitted from ES-32 and ES-33?
Correct
ok

10. How do you propose to monitor SO2 from the STAR unit?
This is to be determined and will be submitted with the CAM plan in the Part II application.
As you know, the STAR unit will be subject to 02D .0516 for SO2. We need to know how you propose to monitor SO2 emissions to show compliance with the 2.3 lb/mmBtu 02D .0516 emission limit. Do you want to use a CEMs, initial performance testing, fuel (flyash) analysis for sulfur, or what?

11. Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.

Per correspondence since this email was sent, the emissions will be included in the existing PSD avoidance condition.

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Thursday, January 11, 2018 12:33 PM
To: Wallace, Erin Elizabeth
Subject: Lee STAR Application

Erin:

From our review of the application, please consider the following:

1. In Table 3A (p 8), why do NOx, CO and VOCs have different numbers in the right columns – one for "Controlled Emissions" and one for "Permitted Emissions?" For example for NOx, why are the "Controlled Emissions" for ash + worst-case fuel (35.82 lb/hr) lower than from ash alone (47.60 lb/hr)?

2. On page 3-7, it says "The emissions from the existing turbines and auxiliary equipment were taken from the Toxics Modeling Analysis Appendix A Table for Potential Emissions (April 2011)." In Appendix C there are Tables 3-2, 3-3, 3-4, 4-7, 4-8, 4-9 and 4-13. In the April 2011 application, I don't see a Table 3-2, but it is included in Appendix C of the STAR application. What is Table 3-2 used for?

3. Please provide information from the STAR vendor showing the maximum design capacity of the unit; whether that is heat input, ash process rate, or some combination, etc. to explain what the limiting factor would be for potential emissions from the STAR and associated sources so that we can understand what defines what "potential" means. Also, see 4 below.

4. Why are annual emissions for NOx, CO and VOCs for the STAR based on a heat input of 130 mmBtu/hr and not based on the maximum design capacity (heat input) of 140 mmBtu/hr? Also, annual emissions for some sources are based on an annual ash throughput of 400,000 tpy, 430,000 tpy, etc. It doesn't appear these are potential annual rates if operated at 8760 hr/yr. For monitoring purposes, if potentials are not used in the PSD analysis, the permit will require monitoring (similar to that in the PSD avoidance condition for the turbines) of actual emissions for those sources not using potentials. That monitoring could be by using emission factors with heat inputs, operating or throughput limits, etc. Otherwise, for example, we don't know that the screener and crusher will only operate 50 hr/wk or only process 430,000 tpy. For some type of PSD avoidance condition, the permit will need to include either the additional actual or additional potential emissions from the STAR project sources to demonstrate the existing caps are not exceeded. If potentials are recalculated based on 8760 hr/yr, then those sources can be excluded from determining actual emissions.

5. Where does the 17.79 lb/hr come from for PM emissions on pages 7 and 11 in App B?

6. Please provide more details to verify the Lee site-specific flyash emission factors as shown in Appendix C (lab analysis, inventory, etc) as used to calculate the TAP metal emissions in view of the significantly lower factors as compared to the EPRI analysis.

7. Please provide information from the vendor showing the control guarantees for the bagfilters. Are you using different bagfilters for the STAR on Lee than for Buck? The calculations show Lee has a control of 0.025 gr/acf and Buck shows 0.01 gr/acf, but both also show the same control efficiencies of 100% and >99.9% on the C1 forms.

8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.

9. Are there no toxics emitted from ES-32 and ES-33?

10. How do you propose to monitor SO2 from the STAR unit?

11. Additional information may be needed pending the approach to PSD "netting" as we discussed in the meeting on January 5, 2018.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

919 707 8739 office
ed.martin@ncdenr.gov

217 West Jones Street
1641 Mail Service Center
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NC Nothing Compares

Martin, Ed

From: Martin, Ed
Sent: Tuesday, April 17, 2018 6:56 AM
To: Wallace, Erin Elizabeth (Erin.Wallace@duke-energy.com)
Cc: Pullen, Booker; Willets, William (william.willets@ncdenr.gov); Jeffery.Hines@duke-energy.com; Winston, Cynthia; Dan.Markley@duke-energy.com
Subject: Lee STAR Application

Hi Erin:

In your email of April 4, 2018, you responded (in green) to some of my questions. In question 8, I was looking for some additional information (in red below) for the CO and VOC emission factors for the reactor ES-31. In Table 3A (page 7 of 40) of the application, it refers to SEFA operation experience for CO and references a stack test for VOCs. Can you please give me the basis of those emission factors. If we can get substantiated emission factors that are based on stack tests or something equivalent, we may not need to require stack testing to verify the factors to be used in the avoidance condition for CO and VOCs for ES-31.

8. Pre-STAR silo and post-STAR silos and dome emissions - Please provide information from the Winyah application as referenced for the PM, PM10, and PM2.5 emission factors used for ES-30A, 30B, 36A, 36B, 38, 38A, 38B, 37A and 37B since AP-42 factors are not used.
   As referenced in the Buck application, this data is provided by SEFA Group for both the Buck and HF Lee applications.

   If we can get substantiated emission factors that are based on stack tests or something equivalent, we may not need to require stack testing to verify the factors to be used in the avoidance condition monitoring from:
   - the Winyah application for PM, PM10, and PM2.5 for the above sources
   - "SEFA operation experience" for NOx and CO for the reactor ES-31 as referenced in the application
   - stack tests for VOCs and sulfuric acid for ES-31 as referenced in the application
   - site specific info for Pb for ES-31 (included in 6 above) as referenced in the application

   Please see the attached spreadsheet (PSD Limits and Silo Calcs 4-4-18.xlsx) for the revised calculations for pre-STAR and post-STAR silos. The emission factors were calculated based on the AP42 drop equation, and we have detailed in the attached.

The other items in your April 4, 2018 response are resolved.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

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ed.martin@ncdenr.gov

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Martin, Ed

From: Martin, Ed
Sent: Wednesday, April 25, 2018 10:07 AM
To: Wallace, Erin Elizabeth (Erin.Wallace@duke-energy.com)
Subject: Lee STAR Application

Was the existing gasoline storage tank (ID No. 4) modeled?

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

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ed.martin@ncdenr.gov

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Martin, Ed

From:	Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent:	Wednesday, April 25, 2018 12:39 PM
To:	Martin, Ed
Cc:	Winston, Cynthia C
Subject:	[External] RE: Lee STAR Application

Ed,

It would appear that for Benzene, Hexane, and Toluene, the gasoline storage was inadvertently left out of the air dispersion analysis. I have looked at the potential emissions from the tank and compared to the total modeled emissions for each compound, and also to the optimization factor applied to each potential emission rate for permitting purposes.

	Benzene	Hexane	Toluene	
	lb/yr	lb/day	lb/hr	lb/day
Gasoline Tank (potential emissions from previous modeling)	1.11E+01	2.40E-02	4.77E-03	1.14E-01
Facility	1787.54	64.18	4.42	106.11
% of Modeled	0.62%	0.04%	0.11%	0.11%
Optimization Factor	285.64	2,160.29	217,541.70	109,260.60

Based on the small percentage of the total facility emissions, coupled with the large margin of compliance with each AAL, the inclusion of the gasoline storage tank in the model would have minimal effect on the model output. We propose to update the modeling prior to startup of the new sources, and include the gasoline tank in that round of modeling, when we can be sure the layout of the new sources is finalized.

Please let me know if you have any questions or concerns.

Thank you
Erin

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Wednesday, April 25, 2018 10:07 AM
To: Wallace, Erin Elizabeth
Subject: Lee STAR Application

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Was the existing gasoline storage tank (ID No. 4) modeled?

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

919 707 8739 office
ed.martin@ncdenr.gov

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Martin, Ed

From: Bright, Robert L
Sent: Tuesday, May 29, 2018 10:03 AM
To: Martin, Ed
Subject: RE: Duke Lee Draft Permit

My only comment is for the initial testing provision for 2D .0516…

15A NCAC 02D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES

a. Emissions of sulfur dioxide from this source (ID No. ES-31) shall not exceed 2.3 pounds per million Btu heat input. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard. [15A NCAC 02D .0516]

<u>**Testing**</u> [15A NCAC 02Q .0508(f)]

b. Under the provisions of NCGS 143-215.108, the Permittee shall demonstrate compliance with the emission limit in Section 2.1.J.2.a above by conducting an initial stack test for sulfur dioxide emissions, with the reactor operating within 10% of its maximum heat input rate, in accordance with a testing protocol approved by the DAQ. Details of the emissions testing and reporting requirements can be found in Section 3 - General Condition JJ. Testing shall be completed and the results submitted within 90 days of initial start-up of the reactor (ID No. ES-31). Test results shall be the average of 3 valid test runs each when the source is processing flyash with: (1) a low sulfur content, (2) a medium sulfur content, and (3) a high sulfur content; to establish a minimum lime-to-sulfur ratio for the dry scrubber (ID No. CD-31A) for each fly ash sulfur content range that demonstrates compliance with the emissions limit in paragraph a above. In addition, the Permittee shall measure the pressure drop across the baghouse (ID No. 31B) during each test.

Test results shall include the following information for each test run:
i. Sulfur dioxide emission rate (lb/mmBtu). ii. Dry scrubber lime-to-sulfur ratio. iii. Reactor heat input (mmBtu/hr).
iv. Reactor flyash raw feed rate (tons per hour). v. Flyash loss on ignition (% carbon). vi. Flyash sulfur content (%).
vii. Baghouse pressure drop (Δp).

f. <u>**Reporting**</u> [15A NCAC 02Q .0508(f)]
No later than 90 days after start-up of the reactor, **the Permittee shall submit to the DAQ Permitting Section a summary of the results of the initial stack testing** that includes the information in Section 2.1.J.2.b above for each of the three sulfur content ranges of fly ash being processed; and submit a complete permit application to revise the permit accordingly.

Is 90 days enough time from startup to do the test and submit the results? Why not give 90 days to do the testing and submit report in accordance with JJ? My 2 cents.

Robert Bright, Environmental Engineer II
NC Department of Environmental Quality
Division of Air Quality
Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
Phone: 252-946-6481
Fax: 252-975-3716
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robert.bright@ncdenr.gov

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****

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Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Martin, Ed
Sent: Friday, May 25, 2018 12:37 PM
To: Bright, Robert L <robert.bright@ncdenr.gov>; Parekh, Samir <samir.parekh@ncdenr.gov>
Subject: Duke Lee Draft Permit

Please review and submit any comments by June 4, 2018. This is to add ash beneficiation equipment.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

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Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

Martin, Ed

From: Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent: Monday, June 04, 2018 5:15 PM
To: Martin, Ed
Cc: Hines, Jeffery D; Winston, Cynthia C
Subject: [External] RE: Lee Draft STAR Permit
Attachments: Form D4 6-1-18.pdf; lee permit T43 STAR - Duke Energy Comments.docx; lee review T43 STAR - Duke Energy Comments.docx

Ed,

Attached please find the draft permit and review document for the HF Lee Ash Beneficiation Project containing comments from Duke Energy. I have also attached a D4 form for the requested revision to move some sources to the list of insignificant activities based on emissions.

Should you have any questions or concerns, please do not hesitate to let me know.
Thank you for all of your work on this permit.
Erin

Erin E. Wallace
Duke Energy | Permitting and Compliance, Carolinas
410 S. Wilmington Street | Raleigh, North Carolina 27601
Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Friday, May 25, 2018 12:32 PM
To: Wallace, Erin Elizabeth
Subject: Lee Draft STAR Permit

Hi Erin:

Here's the draft permit and review for your comments.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section

North Carolina Department of Environmental Quality

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ed.martin@ncdenr.gov

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Martin, Ed

From:	Martin, Ed
Sent:	Wednesday, August 01, 2018 1:54 PM
To:	Wallace, Erin Elizabeth (Erin.Wallace@duke-energy.com)
Cc:	Winston, Cynthia; Willets, William (william.willets@ncdenr.gov); Pullen, Booker; Davey, Brendan
Subject:	Lee STAR Draft Permit

Erin:

In order to issue the permit, we are requesting the following additional information:

1. Fugitive emissions. The draft permit identifies the ash handling equipment and ash basin as sources of fugitive emissions. At the hearing, Duke stated that they already plan to develop a dust prevention plan. Please develop and submit a fugitive dust control plan as described in rule 02D .0540(f). A requirement to have and follow the plan is intended to be added to the toxics section as the toxics emissions in the application assumed certain dust management measures will be implemented.

2. Pond test methods. How were the test methods selected that were used to determine the toxics concentrations for screening the ash pond contents as shown in the spreadsheet you sent me, and how valid are these methods for this purpose? Did these come from the Solid Waste people?

3. HCl and HF. We all know combustion of coal results in emissions of hydrogen chloride and hydrogen fluoride. Generally, these may or may not be included in toxics modeling for a facility on a case-by-case basis. For example, HCL and HF were included in toxics modeling for Belews Creek (January 6, 2009). A portion of the chlorine and fluorine in the coal may be absorbed onto the flyash. Your sampling included chlorides but no fluorides. Would not both HCl and HF be expected to be emitted from burning the flyash and therefore be included in a toxics demonstration?

4. Off-site ash processing. The CAMA does not address or prohibit off-site ash processing. First, we do not know Duke's intentions regarding off-site processing. Clearly, off-site ash could invalidate the pond sample toxic results and the PSD avoidance condition calculation emission factors to be used. Please advise whether a permit condition prohibiting off-site processing is acceptable to Duke.

5. Other permit additions. PM testing and pressure drop monitoring to be added for the reactor and two EHEs under 02D .0515. Emissions monitoring (calculations) to be added under the PSD avoidance equations for NOx and SO2 for the reactor and EHEs.

Please respond through the RO, including your previous response on PCBs and additives to Brendan on July 31, 2018.

Edward L Martin, PE
Environmental Engineer
Division of Air Quality, Permitting Section
North Carolina Department of Environmental Quality

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Martin, Ed

From: Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent: Thursday, August 09, 2018 9:22 AM
To: Martin, Ed
Cc: Winston, Cynthia C; Willets, William; Pullen, Booker; Davey, Brendan; Hines, Jeffery D
Subject: [External] RE: Lee STAR Draft Permit
Attachments: HF Lee Ash Beneficiation BDavey Response.pdf

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to Report Spam.

Ed,
Please see the Duke Energy response to your email dated August 1, regarding the HF Lee Ash Beneficiation air permit. I have also attached per your request our response to Brendan Davey regarding PCBs and additives. Should you have any additional questions or concerns, please do not hesitate to let me know.
Thank you
Erin

1. *Fugitive emissions. The draft permit identifies the ash handling equipment and ash basin as sources of fugitive emissions. At the hearing, Duke stated that they already plan to develop a dust prevention plan. Please develop and submit a fugitive dust control plan as described in rule 02D .0540(f). A requirement to have and follow the plan is intended to be added to the toxics section as the toxics emissions in the application assumed certain dust management measures will be implemented.*

   Per William Willets' email from 08/01/18, it has been requested that we explain what our plans are for the dust control plan. Per the requirements of the Coal Combustion Residuals (CCR) rule, 40 CFR 257.80, we have a fugitive dust plan that covers normal operations that generate fugitive dust from CCR facilities. This plan contains fugitive dust control measures including but not limited to watering, reducing fall distances at drop points, establishing and enforcing speed limits, covering trucks, truck washes.

2. *Pond test methods. How were the test methods selected that were used to determine the toxics concentrations for screening the ash pond contents as shown in the spreadsheet you sent me, and how valid are these methods for this purpose? Did these come from the Solid Waste people?*

   The test methods used to determine the concentrations of mercury, sulfur, and loss on ignition (LOI) in the ash were developed by the American Society for Testing and Materials (ASTM) and are the industry standard test methods for detection of these constituents in coal combustion residuals. The test method used to determine the concentrations of metals in the ash was SW-846 *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. The methods are approved by the U.S. Environmental Protection Agency for obtaining data to satisfy the requirements of 40 Code of Federal Regulations (CFR) Parts 122 through 270 promulgated under RCRA, as amended. These methods provide the concentration of metals in the ash rather than the Toxicity characteristic leaching procedure (TCLP) which is a method to simulate leaching through a landfill. The testing methods for the ash constituents utilized were not recommended by our solid waste professionals, rather they were chosen as appropriate by our engineering and certified laboratory personnel.

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Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Wednesday, August 01, 2018 1:54 PM
To: Wallace, Erin Elizabeth

Cc: Winston, Cynthia C; Willets, William; Pullen, Booker; Davey, Brendan
Subject: Lee STAR Draft Permit

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Please respond through the RO, including your previous response on PCBs and additives to Brendan on July 31, 2018.

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Sent: Tuesday, August 21, 2018 12:11 PM
To: Wallace, Erin Elizabeth (Erin.Wallace@duke-energy.com)
Cc: Davey, Brendan; Willets, William (william.willets@ncdenr.gov); Pullen, Booker; Pjetraj, Michael; Jeffery.Hines@duke-energy.com; Winston, Cynthia
Subject: RE: [External] RE: Lee STAR Draft Permit

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Please respond through the RO.

DEQ
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North Carolina Department of Environmental Quality
1641 Mail Service Center   919.707.8739 (Office)
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Sent: Thursday, August 09, 2018 9:22 AM
To: Martin, Ed <ed.martin@ncdenr.gov>
Cc: Winston, Cynthia C <Cynthia.Winston@duke-energy.com>; Willets, William <william.willets@ncdenr.gov>; Pullen, Booker <booker.pullen@ncdenr.gov>; Davey, Brendan <brendan.davey@ncdenr.gov>; Hines, Jeffery D <Jeffery.Hines@duke-energy.com>
Subject: [External] RE: Lee STAR Draft Permit

Ed,

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Thank you
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   Method SW846 3050B states:

   "This method is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment. If absolute total digestion is required use Method 3052."

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Sent: Wednesday, August 01, 2018 1:54 PM
To: Wallace, Erin Elizabeth
Cc: Winston, Cynthia C; Willets, William; Pullen, Booker; Davey, Brendan
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Martin, Ed

From:	Wallace, Erin Elizabeth <Erin.Wallace@duke-energy.com>
Sent:	Monday, August 27, 2018 7:58 AM
To:	Martin, Ed
Cc:	Hines, Jeffery D; Winston, Cynthia C
Subject:	RE: [External] RE: Lee STAR Draft Permit
Attachments:	HF and HCl Calculations and TPER Analysis - HF Lee.pdf

Good morning Ed.

The HCl and HF calculations have been completed and are attached.
For the question regarding the ash sampling methodology, we are working with our team at the labs to respond. The difference between the two methodologies is the temperature and duration of the digestion as well as the way in which the sample is heated. They are currently running a comparison of the two methods on a sample of ash and hope to have data and a response today or tomorrow.

Thank you
Erin

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Direct: (919) 546-5797
Cell: (919) 632-1634

From: Martin, Ed [mailto:ed.martin@ncdenr.gov]
Sent: Monday, August 27, 2018 6:55 AM
To: Wallace, Erin Elizabeth
Subject: FW: [External] RE: Lee STAR Draft Permit

Erin, can you please give me an update on the status of your responses?

Edward L. Martin, PE
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ed.martin@ncdenr.gov

From: Martin, Ed
Sent: Wednesday, August 22, 2018 12:18 PM
To: 'Wallace, Erin Elizabeth' <Erin.Wallace@duke-energy.com>
Cc: Willets, William (william.willets@ncdenr.gov) <william.willets@ncdenr.gov>
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From: Wallace, Erin Elizabeth [mailto:Erin.Wallace@duke-energy.com]
Sent: Wednesday, August 22, 2018 11:35 AM
To: Martin, Ed <ed.martin@ncdenr.gov>
Subject: RE: [External] RE: Lee STAR Draft Permit

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Thank you. We are working on our responses and will get them to you in a timely manner.

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2. Pond test methods. How were the test methods selected that were used to determine the toxics concentrations for screening the ash pond contents as shown in the spreadsheet you sent me, and how valid are these methods for this purpose? Did these come from the Solid Waste people?

3. HCl and HF. We all know combustion of coal results in emissions of hydrogen chloride and hydrogen fluoride. Generally, these may or may not be included in toxics modeling for a facility on a case-by-case

basis. For example, HCL and HF were included in toxics modeling for Belews Creek (January 6, 2009). A portion of the chlorine and fluorine in the coal may be absorbed onto the flyash. Your sampling included chlorides but no fluorides. Would not both HCl and HF be expected to be emitted from burning the flyash and therefore be included in a toxics demonstration?

4. Off-site ash processing. The CAMA does not address or prohibit off-site ash processing. First, we do not know Duke's intentions regarding off-site processing. Clearly, off-site ash could invalidate the pond sample toxic results and the PSD avoidance condition calculation emission factors to be used. Please advise whether a permit condition prohibiting off-site processing is acceptable to Duke.

5. Other permit additions. PM testing and pressure drop monitoring to be added for the reactor and two EHEs under 02D .0515. Emissions monitoring (calculations) to be added under the PSD avoidance equations for NOx and SO2 for the reactor and EHEs.

Please respond through the RO, including your previous response on PCBs and additives to Brendan on July 31, 2018.

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