NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: TBD

Region: Raleigh Regional Office
County: Orange
NC Facility ID: 6800043
Inspector's Name: Jeff Harris
Date of Last Inspection: 06/25/2024
Compliance Code: 3 / Compliance - inspection

Facility Data

Applicant (Facility's Name): The University of North Carolina at Chapel Hill

Facility Address:
The University of North Carolina at Chapel Hill
575 West Cameron Avenue, CB # 1858
Chapel Hill, NC 27599

SIC: 8221 / Colleges And Universities, Nec
NAICS: 611310 / Colleges, Universities, and Professional Schools

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

Permit Applicability (this application only)

SIP: 02D: .0501, .0503, .0516, .0521, .0524, .0530, .0614, .1111
02Q: .0504
NSPS: Subpart Db
NESHAP: Subpart DDDDD
PSD: n/a
PSD Avoidance: n/a
NC Toxics: n/a
112(r): no RMP required
Other: Use of projected actual emissions

Contact Data

Facility Contact	Authorized Contact	Technical Contact
J. Laurence Daw Environmental Compliance Officer (919) 883-7019 1120 Estes Drive, CB#1650 Chapel Hill, NC 27599+1650	Christi Hurt Chief of Staff, Office of the Chancellor (919) 843-0380 103 South Building, CB# 9100 Chapel Hill, NC 27599+9100	J. Laurence Daw Environmental Compliance Officer (919) 883-7019 1120 Estes Drive, CB#1650 Chapel Hill, NC 27599+1650

Application Data

Application Number: 6800043.24A
Date Received: 07/31/2024
Application Type: Modification
Application Schedule: TV-Sign-501(b)(2) Part I

Existing Permit Data

Existing Permit Number: 03069/T39
Existing Permit Issue Date: 03/07/2024
Existing Permit Expiration Date: 07/31/2026

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2023	159.35	127.26	4.42	73.12	16.91	7.17	5.55 [Hydrogen chloride (hydrochlori]
2022	160.49	125.41	4.67	69.78	17.51	7.52	5.87 [Hydrogen chloride (hydrochlori]
2021	204.03	158.57	4.43	78.73	8.29	11.78	10.06 [Hydrogen chloride (hydrochlori]
2020	191.41	205.99	4.36	76.90	7.47	12.45	10.75 [Hydrogen chloride (hydrochlori]
2019	275.32	237.63	4.00	69.74	11.90	15.89	14.37 [Hydrogen chloride (hydrochlori]

Review Engineer: Russell Braswell

Review Engineer's Signature: **Date:**

Comments / Recommendations:

Issue 03069T40
Permit Issue Date: TBD
Permit Expiration Date: July 31, 2026 (no change)

1. Purpose of Application

The University of North Carolina at Chapel Hill (UNC; the facility) currently operates a utility plant in Orange County under Title V permit 03069T39 (the existing permit). UNC's utility plant includes two boilers (Units 6 and 7) that are currently permitted to burn coal, gas, oil, and wood. The facility also operates other sources, but this application focuses on Units 6 and 7.

UNC has submitted an application to add a new fuel (so-called "engineered pelletized fuel") to the list of permitted fuels to Units 6 and 7. In the application, UNC explains that the facility plans to eventually replace the use of coal with the new pellet fuel. In subsequent correspondence, UNC also stated that "if successful, the facility plans to eventually lower the use of fossil fuels in favor of the new low-carbon pelletized fuel source" (Facility Comments on October 7 draft, received October 14, 2024). Note that UNC's application does not propose, at this time, to cease the use of natural gas or coal.

UNC submitted this application pursuant to 15A NCAC 02Q .0501(b)(2) (i.e., the first step of a two-step significant modification), which allows this application to follow the procedures of 15A NCAC 02Q .0300. Pursuant to 02Q .0504(c), UNC will submit a second application within 12 months of completing the proposed project.

Separately from the above project, UNC submitted a letter requesting to replace two permitted emergency generators with two new insignificant (*i.e.*, not permitted) emergency generators.

2. Application Chronology

Date	Event
July 31, 2024	Application received.
August 1, 2024	Phone discussion with UNC to request the following information. The following questions were asked: 1. Are there other facilities that have been permitted to use this fuel? If so, can UNC provide permits issued to those facilities? 2. The application included a summary of stack test performed by Convergen. Is the full report available? 3. Does Convergen have a more recent determination regarding their fuel and its status as non-waste?
August 15, 2024	Response received to the August 1 request: 1. UNC provided permits issued to the University of Missouri Power Plant, University of Iowa, and Manitowoc Public Utilities. 2. UNC provided the full stack test report. 3. UNC provided a letter from Convergen explaining that the fuel produced today is the same as the fuel for which Convergen (then operating as "Greenwood Fuels") received EPA concurrence regarding its status as a non-waste fuel in 2011. *With this information, DAQ deemed the application as complete.*
August 15, 2024	Letter received from the Town of Chapel Hill Planning Department confirming that UNC's application complied with zoning requirements.
August 16, 2024	Email sent to UNC requesting the following additional information. The following questions were asked: 1. Does the new fuel meet the definition of "wood" under NSPS Db? 2. Does the new fuel meet the definition of "biomass" under MACT DDDDD?
August 26, 2024	Response received to the August 16 request: 1. "we do believe that the fuel does meet the definition of 'wood' per NSPS Subpart Db." 2. "we do believe that Convergen's pellets do meet the [biomass] definition per MACT Subpart DDDDD."
September 11, 2024	DAQ AQAB issued a memo reviewing updated TAP emission rates from the boilers.
September 13, 2024	An initial draft of the permit and this application review were sent to DAQ Permits staff
September 24, 2024	Letter received from UNC requesting the replacement of two permitted emergency generators with two new emergency generators. UNC proposed that the new generators be included in the list of insignificant activities.

Date	Event
September 30, 2024	DAQ stated that the September 24 request would be incorporated into this application. DAQ also requested that UNC submit a revised Form A for this application. This new Form A should list the facility's address as the cogeneration plant, rather than the administrative building originally listed on the form. DAQ has previously received public comments on this issue, and now believes that the cogeneration plant's address should be the address of the facility because it is, by far, the largest emission point of the facility.
October 7, 2024	A draft of the permit and this application review were sent to UNC staff, DAQ SSCB staff, and DAQ RRO staff.
October 9, 2024	UNC provided the updated Form A as requested by DAQ on September 30.
October 14, 2024	UNC provided comments on the October 7 draft.
October 15, 2024	A revised draft of the permit and this application review were sent to UNC staff based on the October 14 comments. *Note: no direct response to this draft was received before the Public Notice.*
October 24, 2024	UNC requested that DAQ place this application on hold temporarily in order for DAQ to "meet the requirements for public participation in a manner to allow students, faculty, staff and other interested parties at the University" to attend a public hearing.
XXXX	Public notice published.
XXXX	Public hearing.

3. Application Discussion

3.1 Overview

Existing facility: UNC operates a cogeneration facility that produces steam and electricity for use at UNC. The cogeneration facility operates several large boilers; two of these boilers (Boiler 6 and Boiler 7) are currently heated with natural gas and coal. Note that Boilers 6 and 7 are permitted to burn oil and wood as well. In the application, UNC states: "The Cogeneration Facility is not currently combusting wood or torrefied wood within either boiler and has no plans to fire these fuels during the period of emissions projections" and "the Cogeneration Facility is not routinely combusting No. 2 fuel oil within either boiler and does not expect to fire these fuels during the period of emissions projections" (Application at 6). In this context, "period of emissions projections" means five years following the date of first firing the engineered pellets discussed below. In correspondence received after the application, UNC stated that "oil is typically used during periods of curtailments" (Facility Comments on October 7 draft, received October 14, 2024).

Boilers 6 and 7 are subject to NSPS Subpart Db as sources that were constructed, modified, or reconstructed between June 19, 1984 and February 28, 2005. Boilers 6 and 7 are subject to MACT Subpart DDDDD as existing fluidized bed units designed to burn coal/solid fossil fuel.

Proposed project: UNC "anticipates the potential to replace all heat input allocated to coal with heat input supplied by the engineered pelletized fuel" (Application at 7). The new "engineered pelletized fuel" is a biomass-based fuel produced by Convergen Energy. The application notes that at least one other state has determined this fuel to be a "100% renewable fuel source" (Application at 3), but the application does not request that DAQ evaluate that claim. It should be noted that this fuel is in-use at other facilities in the United States, and this fuel has been determined to be "renewable" and/or "biomass."[1]

After switching to the new engineered pelletized fuel, Boilers 6 and 7 will potentially be categorized as biomass-fired units under MACT Subpart DDDDD.

In correspondence received after the application, UNC clarified the plans with regards to the use of the engineered pelletized fuel:

> "UNC is testing the new engineered pelletized fuel in the hopes of reducing our dependence on fossil fuels. If tested successfully, the hope is to dramatically reduce our use of coal. It may be some time before the supplier can deliver adequate amounts of the engineered pelletized fuel to meet facility requirements. Additionally, as long as boilers at the facility operate with solid fuels, we anticipate that coal will continue to be in the mix of fuels used. For example, if there is a slowdown or delay in delivery of the engineered pelletized fuel we could cover some of the fuel needs using coal." (Facility Comments on October 7 draft, received October 14, 2024)

The application claims that the new fuel has "comparable performance" to coal (Application at 4), and UNC expects the use of this fuel will comply with NSPS Subpart Db and MACT Subpart DDDDD. Furthermore, UNC claims that this fuel is a "non-hazardous secondary material" and is not a "solid waste" as defined in 40 CFR 241.2, and therefore the boilers at UNC will continue to meet the definition of "boiler" under MACT Subpart DDDDD (as opposed to an incinerator under MACT Subpart EEE).

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[1] See Permit issued to Manitowoc Public Utilities by Wisconsin Department of Natural Resources (Construction Permit No. 23-POY-031).

UNC claims that "The Cogeneration Facility will not ramp up operation due to the use of the new fuel source; therefore, annual heat input is anticipated to remain the same" and that UNC "anticipates no change in natural gas usage" (Application at 8). Furthermore, the UNC "anticipates the potential to replace all heat input allocated to coal with heat input supplied by the engineered pelletized fuel source going forward…" (Application at 7).

3.2 Emission Calculations for Pelletized Fuel

UNC calculated the projected change in emissions as result of replacing coal with the engineered pelletized fuel by comparing emission factors between the two fuels. Convergen Energy has performed some emission testing with their new fuel. These emission factors are reasonable to initially estimate emissions, but UNC will still be required to perform site-specific emission testing to verify compliance with all applicable rules.

See Attachment 1, Sections A.1 and A.2 for UNC's emission calculations.

3.3 Emergency Generators

The existing permit includes two emergency generators (ID Nos. ES-Gen-3 and ES-Gen-58). UNC plans to replace these permitted emission sources with two new insignificant emergency generators (ID Nos. IES-GEN-3-2 and IES-GEN-58-2). In the letter received September 24, 2024, UNC explains that these new generators qualify as insignificant activities because they meet the criteria under 15A NCAC 02Q .0503(8), *i.e.*, they have potential emissions of each of the Title V pollutants less than 5 tpy, potential emissions of HAP less than 1,000 pounds per year, and they will not violate any applicable emission standard.

UNC included emission calculations for the new engines:

New Emergency Engine
I.D.: IES-Gen-3-2

Operational Parameters	
Fuel	Diesel
Maximum Output Rating, kW	80
Maximum Output Rating, hp	107
Maximum Fuel Oil Sulfur Content, %wt	0.0015
Maximum Operating Hours per Year, hr/yr	500

Potential Emissions - (1) 80 kW Emergency Generator

Pollutant(Notes)	Emission Factor (lb/hp-hr)	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (ton/yr)
NOx	0.00521	0.56	279.4	0.14
CO	0.00148	0.16	79.4	0.04
SO_2	1.21E-05	0.0013	0.7	0.0003
PM	0.000197	0.021	10.6	0.01
VOC	0.000710	0.076	38.1	0.02
Acetaldehyde	5.37E-06	5.76E-04	2.9E-01	1.44E-04
Acrolein	6.48E-07	6.95E-05	3.5E-02	1.74E-05
Benzene	6.53E-06	7.01E-04	3.5E-01	1.75E-04
Benzo(a)pyrene	1.32E-09	1.42E-07	7.1E-05	3.54E-08
Formaldehyde	8.26E-06	8.86E-04	4.4E-01	2.22E-04
PAH	1.18E-06	1.27E-04	6.3E-02	3.16E-05
Toluene	2.86E-06	3.07E-04	1.5E-01	7.67E-05
Xylene	2.00E-06	2.15E-04	1.1E-01	5.36E-05

Notes

1. NOx+NMHC, CO, and PM emission factors (nominal) provided by manufacturer for EPA Tier 3 compliant, standby engines.

2. The NOx:NMHC ratio in the Tier 3 engine exhaust is conservatively assumed to be 88:12 (88% NOx/12% VOC).

3. SO_2 emissions assume a maximum sulfur content of 15 ppm.

4. Speciated organic emission factors were obtained from the NCDAQ calculator spreadsheet.

New Emergency Engine
I.D.: IES-Gen-58-2

Operational Parameters	
Fuel	Diesel
Maximum Output Rating, kW	550
Maximum Output Rating, hp	738
Maximum Fuel Oil Sulfur Content, %wt	0.0015
Maximum Operating Hours per Year, hr/yr	500

Potential Emissions - (1) 550 kW Emergency Generator

Pollutant(Notes)	Emission Factor (lb/hp-hr)	Emissions (lb/hr)	Emissions (lb/yr)	Emissions (ton/yr)
NOx	0.01213	8.94	4,471.6	2.24
CO	0.00066	0.49	243.9	0.12
SO_2	1.21E-05	0.0090	4.5	0.0022
PM	0.000066	0.049	24.4	0.01
VOC	0.000022	0.016	8.1	0.00
Acetaldehyde	1.76E-07	1.30E-04	6.5E-02	3.25E-05
Acrolein	5.52E-08	4.07E-05	2.0E-02	1.02E-05
Benzene	5.43E-06	4.01E-03	2.0E+00	1.00E-03
Benzo(a)pyrene	1.80E-09	1.33E-06	6.6E-04	3.32E-07
Formaldehyde	5.52E-07	4.07E-04	2.0E-01	1.02E-04
PAH	1.48E-06	1.09E-03	5.5E-01	2.74E-04
Toluene	1.97E-06	1.45E-03	7.3E-01	3.63E-04
Xylene	1.35E-06	9.96E-04	5.0E-01	2.49E-04

Notes

1. NOx+NMHC, CO, and PM emission factors (nominal) provided by manufacturer for EPA Tier 2 compliant, standby engines.

2. The NOx:NMHC ratio in the Tier 2 engine exhaust is conservatively assumed to be 88:12.

3. SO_2 emissions assume a maximum sulfur content of 15 ppm.

4. Speciated organic emission factors were obtained from the NCDAQ calculator spreadsheet.

Note that the existing engines meant for replacement (ID Nos. ES-Gen-3 and ES-Gen-58) are old and not subject to NSPS Subpart IIII. The new generators will be subject to NSPS Subpart IIII.

Based on the above information, DAQ agrees that the new generators (ID Nos. IES-GEN-3-2 and IES-GEN-58-2) qualify as insignificant activities pursuant to 15A NCAC 02Q .0503(8).

3.4 Changes to the existing permit

Page No.	Section	Description of Changes
Throughout	Throughout	• Updated dates and permit numbers. • Updated the address of the facility to reflect the location of the cogeneration plant (was previously an administrative building on UNC campus).
4 - 9	1	• Added "engineered pelletized fuel (non-CISWI)" as a fuel for Boilers 6 and 7 as requested by the Permittee. • Removed references to previous minor modifications because their final effective dates have passed. • Added a footnote regarding 02Q .0501(b)(2) modifications for Boilers 6 and 7.
10 - 22	2.1 A	• Added references to "engineered pelletized fuel (non-CISWI)" where appropriate.
12	2.1 A.1	• Added requirement to perform emission testing after first firing the new engineered pelletized fuel. • Streamlined monitoring and reporting requirements for this rule by cross-referencing the COMS requirements under NSPS Subpart Db.
12 - 13	2.1 A.2	• Reformatted this condition to more clearly show the references to the CFR. • Notes that opacity, SO_2 and NOx standards apply at all times. • Included compliance periods included in the rule. • Added a NOx limit for the scenario of burning wood and coal. • Added NOx limit for burning gas and/or oil without coal. • Added a requirement to calculate the annual capacity factor for each fuel.
14	2.1 A.3	• Streamlined monitoring and reporting requirements for this rule by cross-referencing the SO_2 requirements under NSPS Subpart Db and 02D .0501(c).
14 - 20	2.1 A.4	• Added emission limits for "fluidized bed units designed to burn biomass" subcategory. • Added a notification requirement for when the Permittee actually recategorizes Boilers 6 and 7. • Added a testing requirement for when the Permittee actually recategorizes Boilers 6 and 7. • Added a requirement to keep records of fuel used, including a determination that the solid fuel is not a solid waste.
20	2.1 A.5 (new)	• Added this condition to cover the periods of time where Boilers 6 and 7 are burning only natural gas.

Page No.	Section	Description of Changes
21	2.1 A.6 (new)	• Added this condition, which requires recordkeeping and reporting for NOx emissions from Boilers 6 and 7 following the first use of the pelletized fuel.
21	2.1 A.7 (new)	• Added a requirement to submit a 2nd step permit application.
21 - 22	2.1 A.8 (new)	• Added a requirement to test the boilers and new pellet fuel for PFAS.
55 - 56	2.2 A.2.a and 2.2 A.3.a	• Removed the text "while firing coal" because the NAAQS apply at all times, not just when coal is being fired.
64	2.2 D.1 (new)	• Added this section to include an ongoing requirement to disclose the presence of PFAS-containing materials.
65	3	• Added the following new emergency generators based on the Permittee's letter received September 27, 2024: ○ IES-GEN-3-2 ○ IES-GEN-58-2
66	4	• Updated General Conditions to v8.0.

*This list is not intended to be a detailed record of every change made to the permit but a summary of those changes.

4. Rules Review

Boilers 6 and 7 at UNC are subject to the following State Implementation Plan (SIP) rules and state-enforceable only rules, in addition to the General Conditions:

- 15A NCAC 02D .0501 “Compliance with Emission Control Standards”
- 15A NCAC 02D .0503 “Particulate Emissions from Fuel Burning Indirect Heat Exchangers”
- 15A NCAC 02D .0516 “Sulfur Dioxide from Combustion Sources”
- 15A NCAC 02D .0521 “Control of Visible Emissions”
- 15A NCAC 02D .0524 “New Source Performance Standards”
- 15A NCAC 02D .0530(u) “Prevention of Significant Deterioration” (projected actual emissions)
- 15A NCAC 02D .0614 “Compliance Assurance Monitoring”
- 15A NCAC 02D .1111 “Maximum Achievable Control Technology”
- 4.9 15A NCAC 02Q .0308: “Final Action on Permit Applications” and 15A NCAC 02Q .0309: “Termination, Modification and Revocation of Permits” [state-enforceable only]
- 15A NCAC 02Q .0504 “Option for Obtaining Construction and Operation Permit”

UNC’s applicability and compliance requirements for each of these rules are discussed in detail below.

4.1 15A NCAC 02D .0501 “Compliance with Emission Control Standards”

Background: This rule applies to facilities at which DAQ determines that additional emission limits (beyond those normally required by other rules, such as NSPS) are required to ensure compliance with the ambient air quality standards found in 02D .0400.

Applicability: DAQ has previously determined that, for Boilers 6 and 7, emission limits for SO_2 that are more stringent than those already found in NSPS Subpart Db are required to ensure compliance with ambient air quality standards.

Emission limits: The existing permit includes two emission limits for SO_2 from the boilers:

- 1.2 pounds per million Btu heat input (block 24-hour average)

- 0.41 pounds per million Btu heat input (30-day rolling average)

The permit specifically states that these limits are to ensure compliance with the National Ambient Air Quality Standard (NAAQS).

Compliance: In general, SO_2 emitted by combustion sources is a function of the amount of sulfur present in the fuel. SO_2 emissions, primarily from coal, are controlled by a limestone (calcium carbonate) injection system and dry sorbent injection (DSI) system. UNC plans to burn engineered pelletized wood fuel. In general, coal has a greater sulfur content than wood, so coal is the worst-case scenario, and the SO_2 emission rate is not expected to increase as a result of this change.

Furthermore, based on testing performed at a similar facility[2], the new engineered pelletized wood fuel emitted 0.06 pounds of SO_2 per million Btu heat input, which is substantially lower than either emission limit above.

Monitoring, Recordkeeping, and Reporting: UNC is required to perform the monitoring required by NSPS Subpart Db (*i.e.*, operate an SO_2 CEMS) in order to demonstrate compliance with this rule.

Changes to the existing permit: The existing permit states that the limits and monitoring requirements under 02D .0501(c) apply only when Boilers 6 and 7 are firing coal. However, this appears to be an oversight:

- The new pelletized fuel will result in emissions of SO_2 that must be monitored.

- The NAAQS apply at all times, not just when coal is being fired. UNC must continue to operate such that the NAAQS are not exceeded, even when the new engineered pelletized fuel is combusted.

- In the past, coal has been the only fuel that could possibly result in SO_2 emissions in excess of the above limits. In other words, compliance during non-coal firing was simply assumed because the non-coal fuels did not contain enough sulfur to result in an exceedance of the above SO_2 limits. Note that continued compliance with SO_2 emission limits is still expected.

For these reasons, DAQ will remove the text “when firing coal” from paragraphs 2.2 A.2.a and 2.2 A.3.a of the existing permit. Note that NSPS Subpart Db already requires the use of an SO_2 CEMS at all times, so this change should not result in a substantial change in UNC’s compliance requirements.

4.2 15A NCAC 02D .0503 “Particulate Emissions from Fuel Burning Indirect Heat Exchangers”

Applicability: This rule applies to all indirect heat exchangers (such as boilers), except those heated with 100% wood fuel. Boilers 6 and 7 are subject to this rule. Note that this rule applies *instead* of 02D .0504, which only applies to sources that burn 100% wood. According to UNC, the new fuel should be considered wood (see discussion for NSPS Subpart Db and MACT Subpart DDDDD, below). The boilers at UNC will continue to burn some amount of natural gas, even if the use of coal is entirely replaced with the new engineered pelletized fuel. Therefore, this rule will continue to apply to UNC instead of 02D .0504.

Emission limits: The emission limit for this rule is calculated by the equation $E = 1.090 \times Q^{-0.2594}$, where E is the particulate matter (PM) emission limit (in units of pounds per million Btu; lb/MMBtu) and Q is the combined heat input of each emission source subject to this rule (in units of million Btu per hour; MMBtu/hr). Q is determined when an emission source is added to the permit, and the resulting E is not subsequently recalculated when other sources subject to this rule are added to (or removed from) the permit. As a result, different sources can have different emission limits under this rule.

Emission limits for wood-burning sources: For sources that burn wood in combination with other fuels, the rule includes an alternative limit calculated by the following equation:

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[2] Test performed on Boiler 10 at University of Missouri Power Plant. This test was performed while burning 100% fuel pellets manufactured by Convergen. During the test, emissions of SO_2 from Boiler 10 were controlled with dry sorbent injection, similar to UNC’s Units 6 and 7. Note that Boiler 10 is a stoker-type boiler, which is different than UNC’s fluidized bed boilers. However, because the emission rate of SO_2 is a function of the sulfur content of the fuel, the type of boiler should have little effect on the SO_2 emission rate.

$$E_C = \frac{[(E_W)(Q_W) + (E_O)(Q_O)]}{Q_W + Q_O}$$

Where *Ec* is the actual limit under the rule, *Ew* and *Eo* are the emission limits determined by 15A NCAC 02Q .0504 and 02Q .0503, respectively, and *Qw* and *Qo* are the hourly heat input rates from wood and non-wood fuels, respectively.

In the existing permit, *Ew* and *Eo* have been determined to be 0.276 and 0.174, respectively. Adding a new source of fuel will not change either of these values.

Compliance for boilers: UNC uses fabric filters to control PM emissions from the boilers. UNC will continue to operate these filters. Based on emission testing performed by Convergen,[3] the new engineered pelletized fuel will have a PM emission factor of 0.0079 lb/MMBtu (condensable: 0.0067, filterable: 0.0012), which is substantially lower than either *Ew* or *Eo*, and therefore is also lower than *Ec*. It should be noted that this testing was performed on a stoker-type boiler, which operates differently from UNC's fluidized bed-type boilers. Therefore, while Convergen's emission testing may be indicative of future compliance, UNC must still demonstrate compliance for these specific boilers; emission testing for PM while burning the new fuel is therefore justified and will be required.

Monitoring, Recordkeeping, and Reporting: UNC demonstrates compliance with the filterable PM emission limit under 40 CFR Part 60 Subpart Db (NSPS Subpart Db) by using a continuous opacity monitoring system (COMS). Furthermore, UNC demonstrates compliance with the filterable PM emission limit under 40 CFR Part 63 Subpart DDDDD (MACT Subpart DDDDD) by using a continuous parameter monitoring system (CPMS). Under that rule, the limit for filterable PM is 0.039 lb/MMBtu, which is substantially lower than *Ew* or *Eo*, and therefore is also lower than *Ec*. Based on the available emission testing, the condensable portion of PM is also expected to be substantially lower than the limit *Ec*. Therefore, the monitoring, recordkeeping, and requirements for NSPS Subpart Db and MACT Subpart DDDDD are expected to be sufficient to demonstrate compliance with this rule.

Testing: UNC will conduct an emission test within 180 days of first firing the engineered pelletized wood fuel (unless another date is approved by DAQ) in order to verify compliance with this rule.

4.3 15A NCAC 02D .0516 "Sulfur Dioxide from Combustion Sources"

Applicability: This rule applies to combustion sources that are not subject to an SO_2 emission limit under NSPS or MACT. Note that emission limits under other rules (such as 02D .0501(c)) do not count for exemption from 02D .0516.

NSPS Subpart Db includes an SO_2 emission limit when firing coal and/or oil. Because these boilers are subject to an SO_2 limit while firing coal and/or oil, 02D .0516 does not apply when firing coal and/or oil.

Emission limit: The emission limit for this rule is 2.3 pounds of SO_2 per million Btu of heat input.

Compliance: In general, SO_2 emitted by combustion sources is a function of the amount of sulfur present in the fuel. At this facility, sources subject to this rule can burn natural gas, wood, and the new engineered pelletized fuel (note that coal-firing and oil-firing are not subject to this rule).

[3] This is the same test referenced by Note 2.

In order to calculate SO_2 emissions from the combustion of natural gas and wood, the emission factors published by EPA in AP-42 can be applied. The published emission factors are not in units of pounds per million Btu, so the emission factor must be converted. Note that UNC operates a limestone injection system and a dry sorbent injection (DSI) system, which reduces SO_2 emissions. The factors in AP-42 are uncontrolled, which means these calculations represent a conservative upper bound.

SO_2 from natural gas combustion in a boiler
(AP-42 Chapter 1.4, Table 1.4-2; SO_2):

$$\frac{0.6 \text{ lb}}{\text{million scf}} \times \frac{1 \text{ scf}}{1{,}020 \text{ Btu}} = \frac{\mathbf{0.001\ lb}}{\textbf{million Btu}}$$

Therefore, natural gas when combusted in a boiler is expected to comply with the SO_2 limit by a wide margin.

SO_2 from wood combustion in a wood-fired boiler
(AP-42 Chapter 1.6, Table 1.6-2; SO_2):[4] **0.025 pounds per million Btu**

Therefore, wood fuel when combusted in a boiler is expected to comply with the SO_2 limit by a wide margin. The engineered pelletized fuel can be considered wood for this calculation.

Furthermore, Convergen has performed emission testing for boilers burning the engineered pelletized fuel, which showed an SO_2 emission rate of 0.06 pounds per million Btu (see Section 4.1, above). This emission factor is higher than the emission factor calculated by AP-42, but still lower than the emission limit under 02D .0516 by a wide margin.

Monitoring and recordkeeping: UNC is required to perform the monitoring required by NSPS Subpart Db (*i.e.*, keep records of fuel usage and operate an SO_2 CEMS) in order to demonstrate compliance with this rule. Given that the SO_2 CEMS will be used to demonstrate continuous compliance with this rule, no further monitoring or recordkeeping will be required.

Reporting: UNC is required to submit a semiannual summary report.

Changes to the existing permit: In order to streamline the permit, the specific condition for 02D .0516 will be updated to specifically reference the SO_2 CEMS and recordkeeping requirement under NSPS Subpart Db. This change is not intended to affect the Permittee's compliance requirements.

4.4 15A NCAC 02D .0521 "Control of Visible Emissions"

Applicability: This rule applies to sources of visible emissions (VE) that are not subject to another VE standard under 02D .0506, .0508, .0524, .1110, .1111, .1206. Generally, this rule is not applied to sources that are not expected to produce any VE (e.g., from a storage tank).

- Boilers 6 and 7 are subject to an opacity monitoring requirement as part of the CAM plan (15A NCAC 02D .0614). 02D .0614 is not a rule listed in 02D .0521(b), so the CAM plan does not provide exemption from this rule.

[4] Given that SO_2 is a function of the sulfur content of the fuel, the types of boilers listed in Table 1.6-2 should have no effect on SO_2 emissions.

- Boilers 6 and 7 are subject to NSPS Subpart Db (15A NCAC 02D .0524), which includes a VE limit during periods where coal, oil, wood, or mixtures of these fuels with any other fuels are fired. However, that rule does not include a VE limit when exclusively natural gas is fired.

Therefore, 02D .0521 applies to these boilers during periods of time when exclusively natural gas is fired.

Emission limits: The VE limit for this rule depends on the construction date of the individual source in question. At this facility, the VE limit will be 20% for each new source subject to this rule.

Continuous opacity monitoring systems (COMS): The rule includes specific requirements for sources that use COMS to demonstrate compliance. Such sources are allowed four six-minute exceedances per day, and the percent of operations that are excess emissions cannot exceed 0.8% per calendar year quarter.

Compliance: UNC will operate the COMS required by the CAM plan (see Section 5.3.2, below).

Changes to the existing permit: The existing permit does not include a specific condition for this rule. Given that UNC is permitted to operate Boilers 6 and 7 solely on natural gas (*i.e.*, the permit does not prohibit the use of 100% natural gas), the permit should include a specific condition for this rule. Note that UNC is not proposing a new operating condition wherein natural gas is fired by itself; this rule has *always* applied to these boilers during such periods. Therefore, not including a specific condition for this rule was an oversight.

A new specific condition will be added to the permit for this rule to cover the periods of time where the boilers are firing exclusively natural gas.

4.5 15A NCAC 02D .0524 "New Source Performance Standards"

This rule incorporates the requirements of 40 CFR Part 60 (the NSPS rules) into North Carolina's SIP. See Section 5.1 for a discussion of applicable NSPS rules for this facility.

4.6 15A NCAC 02D .0530 "Prevention of Significant Deterioration" ("PSD") [Projected Actual Emissions pursuant to 15A NCAC 02D .0530(u)]

Background: In general, this rule incorporates the requirements of PSD into North Carolina's SIP. For the purposes of these rules, references to the CFR are to specifically the July 1, 2019 version of the CFR (see 15A NCAC 02D .0530(v)). Pursuant to the Federal Register (FR) notice on February 23, 1982 (47 FR 7836), North Carolina has full authority from the US Environmental Protection Agency (EPA) to implement the PSD regulations in the State effective May 25, 1982.

Applicability: This facility is a major stationary source under PSD, but the existing permit does not include any specific requirements under PSD (such as a BACT limit). Note that UNC is a nonprofit educational institution, and therefore is generally exempt from PSD requirements under 40 CFR 51.166(i)(1)(i).

As discussed below, this project will not trigger PSD requirements (such as a BACT determination) because UNC has used the projected actual emissions test as allowed by 02D .0530(u) to demonstrate that the project will not constitute a major modification.

Major modifications: At a facility that is already a major stationary source, any project is a major modification if it causes both a significant emissions increase (SEI) and a significant net emissions increase (these terms are discussed further below). For major modifications, a facility must comply with 15A NCAC 02D .0530(g), *i.e.*, they must comply with PSD rules.

As discussed below, UNC has demonstrated that the proposed project will not cause a SEI, and therefore cannot constitute a major modification.

Scope of the project: UNC plans to add the new engineered pelletized fuel to the list of fuels for Boilers 6 and 7. After doing so, UNC plans to supplement the use of coal (up to total replacement) with the new engineered pelletized fuel (as discussed in Section 3.1 above) if the new engineered pelletized fuel is tested successfully.

Note that, although the emission calculations included in the application are based on the total replacement of coal with the engineered pelletized fuel, UNC has not proposed any specific operating limits that would disallow the continued use of coal in Boilers 6 and 7.

For the proposed project, UNC has submitted Step 1 PSD applicability (a.k.a. "project emissions accounting") for determination of SEI. Emissions increases that result from the use of the new fuel as compared to the baseline actual emissions of the existing units have been included.

Aggregation of substantially related projects: If a facility makes two or more modifications in a relatively short span of time, those projects should be aggregated together when determining PSD applicability if they are substantially related.[5] As a general rule, projects that are not substantially related should be considered separately when determining applicability of PSD/NSR (*i.e.*, not aggregated). In order to determine if two or more projects are substantially related, EPA has suggested looking at the different factors regarding the specific project, such as the timing of activities, technical dependence, and economic dependence.

When considering the time between projects, EPA has stated "once three years have passed, it is difficult to argue that they are *substantially* related and constitute a single project."[6] In the previous three years, UNC has been issued three Title V permits. The table below shows a brief overview of these permits and the reason for their issuance.

[5] "Substantially related" is a determination initially suggested by EPA in a memo titled *Applicability of New Source Review Circumvention Guidance to 3M—Maplewood, Minnesota* (a.k.a. "3M memo"). EPA initially used the term "intrinsic relationship," but later stated the two terms are synonymous. See *Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NNSR): Aggregation; Reconsideration* (83 FR 57324, November 15, 2018).

[6] See *Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Aggregation and Project Netting* (74 FR 2378; January 15, 2009).

Table 1: Recent permit modifications that could be aggregated with this application

Permit revision (Date)	Revision type	Discussion
T36 (August 5, 2021)	TV Renewal and TV Minor Modification	This permit revision renewed the Title V permit and made the following modifications: 1. Modified the limestone injection rate. 2. Added a DSI system to “supplement the existing hydrogen chloride (HCl) control provided by the limestone injection/baghouse systems to ensure compliance with the 15A NCAC 02D .1111.” 3. Replaced an emergency generator. None of these changes require aggregation: • Any emission increases associated with the new emergency generator are unrelated to the fuel used in the boilers. • Based on DAQ’s review of the T36 permit, modifying the limestone injection rate and including a new DSI system did not result in increased emissions of regulated NSR pollutants, and therefore there are no emissions to aggregate with this project.
T37 (August 23, 2022)	TV Minor Modification	This permit revision added a new emergency generator. This modification does not require aggregation because any emission increases associated with the new emergency generator are unrelated to the fuel used in the boilers.
T38 (March 6, 2023)	TV Minor Modification	This permit revision revised boiler operating parameters in response to recent emission testing. This modification does not require aggregation because it did not result in any changes to emissions.
T39 (March 7, 2024)	TV Minor Modification	This permit revision, again, revised boiler operating parameters in response to recent emission testing. This modification does not require aggregation because it did not result in any changes to emissions.

Based on the above analysis, no projects/modifications associated with the above cited permit revisions should be aggregated with the current project.

Contemporaneous unrelated projects: At approximately the same time as UNC is pursuing the pelletized fuel project, UNC is also planning on replacing two emergency-use generators with newer, larger emergency-use generators (as discussed in Section 3.3 above). If only the time between these projects were considered, it would appear that these two projects should be aggregated for PSD permitting.

It should be noted that EPA has qualified the three-year guideline discussed above. EPA has stated “Previous agency statements can be taken out of context or misunderstood when reviewing projects having a different set of facts. For example, while the [3M Memo] was considered by some as the EPA’s guiding policy on project aggregation, parties could certainly misconstrue portions of that statement to suggest that all projects occurring within the same timeframe should be aggregated…" (83 FR 57330). Therefore, the fact that these two projects are occurring close in time to each other is, by itself, not sufficient evidence to require project aggregation. The technical and economic dependencies of these projects must also be examined.

When determining the technical and economic dependencies of two projects, EPA has stated "activities occurring in unrelated portions of a major stationary source (e.g., a plant that makes two separate products and has no equipment shared among the two processing lines) [may] not be substantially related", and "[t]o be 'substantially related,' there should be an apparent interconnection—either technically or economically—between the physical and/or operational changes…" (74 FR 2378). Additionally, EPA has stated "Such an approach—i.e. to aggregate projects simply because they may occur close in time or may support the same overall purpose of the facility—fails to take proper account of the actual interrelationship of activities" (83 FR 57330).

The boilers are located at the cogeneration plant area of UNC, which is relatively far from the buildings on UNC's campus (where the two new generators will be located). Although both the boilers and generators produce electricity, they operate in profoundly different ways: the boilers always generate power and steam for the UNC campus, while emergency generators only supply small portions of the campus (individual buildings) with backup power during emergencies.

Therefore, DAQ concludes that the emergency generator project should not be aggregated with the pellet fuel project for PSD permitting.

Significant emissions increase: The rule defines a significant emissions increase (SEI) as, for each regulated NSR pollutant, an increase in emissions of that pollutant greater than the threshold in 40 CFR 51.166(b)(23) (see 40 CFR 51.166(b)(39)). UNC is not proposing any new emissions units, so the method for determining if an SEI is projected to occur given in 40 CFR 51.166(a)(7)(iv)(*c*) is applicable.

> "***Actual-to-projected-actual applicability test for projects that only involve existing emissions units.*** A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the projected actual emissions (as defined in paragraph (b)(40) of this section) and the baseline actual emissions (as defined in paragraphs (b)(47)(i) and (ii) of this section) for each existing emissions unit, equals or exceeds the significant amount for that pollutant (as defined in paragraph (b)(23) of this section)."

In order to apply the actual-to-projected-actual applicability test, the baseline actual emissions (BAE) and projected actual emissions (PAE) must be calculated.

Baseline actual emissions for existing sources: In the application, UNC calculated the BAE and PAE for the boilers. Furthermore, in the application, UNC notes that North Carolina's definition of BAE is slightly different than the one in 40 CFR 51.166:

> 15A NCAC 02D .0530(b)(1)(A):
>
> "For an existing emissions unit, baseline actual emissions means the average rate, in tons per year, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the five year period immediately preceding the date that a complete permit application is received by the Division for a permit required under this Rule. The Director shall allow a different time period, not to

> exceed 10 years immediately preceding the date that a complete permit application is received by the Division, if the owner or operator demonstrates that it is more representative of normal source operation."

The BAE is based on UNC's operation of Boilers 6 and 7 during the period of January 2021 to December 2022 (Application at 7). Emissions during this period were calculated using CEMS data (SO_2 and NOx), site-specific performance test data (PM, VOC, CO), and AP-42 emission factors (all others). See Attachment 1 for UNC's baseline emission calculations.

Based on DAQ's electronic database, there were no recorded emissions violations during the baseline period. Therefore, there are no emissions to be excluded during the baseline period.

Revisions to BAE required by 15A NCAC 02D .0530(b)(1)(A): Note that, for electric utility steam generating units (EGU), the average rate must be adjusted downward to reflect emission reductions resulting from compliance with N.C.G.S. 143-215.107D (a.k.a. the Clean Smokestacks Act) and for which cost recovery was sought (see 15A NCAC 02D .0530(b)(1)(A)(iv)). The boilers at UNC are not EGUs because they do not produce electricity for sale (see 40 CFR 51.166(b)(30)), so no revision pursuant to 15A NCAC 02D .0530(b)(1)(A) is required.

Projected actual emissions (PAE): In order to calculate the PAE, UNC made the following assumptions (Application at 7 and 8):

- The project will not increase the actual capacity of Boilers 6 and 7, and UNC does not predict an increase in utilization of the boilers. Therefore, the annual heat input for the PAE calculations will be the same as for the BAE.

- UNC anticipates the potential to replace 100% of coal consumption (but not natural gas) with the engineered pelletized fuel. Therefore, in order to calculate the PAE, "projected actual heat input for the engineered pelletized fuel source was set equal to that of the heat input of coal from the baseline period."

- There will be no change in natural gas consumption between the baseline and projected periods.

Emissions from the use of engineered pelletized fuel were estimated using stack test data provided by the fuel vendor. Note that UNC will continue to operate CEMS for SO_2 and NOx and will conduct site-specific emission testing to demonstrate compliance with 15A NCAC 02D .0503, NSPS Subpart Db, and MACT Subpart DDDDD. See Attachment 1 for UNC's projected emission calculations.

BAE to PAE comparison: Using the BAE and PAE calculated above, UNC concluded that this project will not constitute a major modification because, for each regulated NSR pollutant, the project will not cause a significant emissions increase.

Table 2: BAE to PAE comparison[7]

Regulated NSR Pollutant	NO_X	CO	VOC[1]	SO_2	PM[2]	PM_{10}[3]	$PM_{2.5}$[4]	SAM[5]	F[6]	Pb[7]	CO_2e[8]
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Baseline Actual Emissions	126.7	58.74	3.16	181.8	16.17	16.17	16.17	10.81	0.12	1.17E-03	189,758
Projected Actual Emissions	148.7	74.47	11.68	63.77	8.11	8.11	8.11	3.45	0.00	2.50E-02	166,886
Project Emissions Increase	**22.04**	**15.73**	**8.53**	**-118.0**	**-8.06**	**-8.06**	**-8.06**	**-7.35**	**-0.12**	**2.38E-02**	**-22,871**
PSD Significant Emissions Rates	**40**	**100**	**40**	**40**	**25**	**15**	**10**	**7**	**3**	**0.6**	**75,000**
% of SER	**55.11%**	**15.73%**	**21.31%**	**-295.0%**	**-32.26%**	**-53.76%**	**-80.6%**	**-105.0%**	**-3.94%**	**3.97%**	**-30.50%**
PSD Review Required?	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**

Footnotes
[1] VOC = Volatile organic compounds
[2] PM = PM (filterable + condensable)
[3] PM10 (total) = PM (condensable) + PM10 (filterable)
[4] PM2.5 (total) = PM (condensable) + PM2.5 (filterable)
[5] SAM = Sulfuric Acid Mist
[6] F = Fluorides
[7] Pb = Lead
[8] CO_2e = Carbon dioxide equivalents

Permit application: Pursuant to 02D .0530(u), if a facility uses the above PAE analysis to show that a project will not cause a significant emissions increase, and the difference between the PAE and BAE is greater than 50% of the threshold for a significant emissions increase, then DAQ must require a permit application for that project. Based on the calculations in Table 2, the projected increase in NOx emissions is greater than 50% of the threshold of a significant emissions increase. Therefore, UNC has submitted this permit application to satisfy 02D .0530(u).

Monitoring, recordkeeping, and reporting: Per 02D .0530(u), DAQ must add a specific condition to the permit that covers:

> "…monitoring, recordkeeping and reporting of the annual emissions related to the project in tons per year, for 10 years following resumption of regular operations after the change if the project involves increasing the emissions unit's design capacity or its potential to emit for the regulated NSR pollutant… The owner or operator shall submit a report to the Director within 60 days after the end of each year during which these records must be generated. The report shall contain the items listed in 40 CFR 51.166(r)(6)(v)(a) through (c)."

Note that this monitoring, recordkeeping, and reporting is only required for pollutants where the difference between PAE and BAE is greater than 50% of the threshold for a significant emissions increase. Therefore, based on Table 2, this will only be required for NOx emissions. The project does not involve increasing the boilers design capacity or the potential to emit NOx, so UNC will be required to keep records of emissions for five years following the first use of the pelletized fuel.

Changes to the existing permit: The permit will be updated to include a specific condition for 02D .0530(u).

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[7] This table was included in the application as Table 3-1 (Application at 9). Note that this table uses the term "CO_2e," but this term should instead be "GHG."

4.7 15A NCAC 02D .0614 "Compliance Assurance Monitoring"

This rule incorporates the CAM requirements under 40 CFR Part 64 into North Carolina's SIP. See Section 5.3.2 for a discussion of UNC's requirements under CAM. UNC is not proposing changes to the existing CAM plan as part of this application.

4.8 15A NCAC 02D .1111 "Maximum Achievable Control Technology"

This rule incorporates the MACT rules (40 CFR Part 63) into North Carolina's SIP. See Section 5.3 for a discussion of MACT rules that apply to this facility.

4.9 15A NCAC 02Q .0308: "Final Action on Permit Applications" and 15A NCAC 02Q .0309: "Termination, Modification and Revocation of Permits" [state-enforceable only]

The North Carolina Department of Environmental Quality (DEQ, the parent agency of DAQ) is working to address the environmental impacts of per- and poly-fluoroalkyl substances (a.k.a. PFAS).[8] DEQ is advancing science-based, standards-setting approaches regarding the permitting of PFAS releases into the environment. Accordingly, to undertake any future standards-setting for PFAS emissions, the DEQ is currently collecting information on PFAS uses, creation (product or byproduct), and its environmental releases.

According to UNC, the new pelletized fuel will contain a trace, but measurable, amount of PFAS. Based on a laboratory test performed for Convergen, the concentration of PFAS in the pellets is approximately 8.265 nanograms per gram (ng/g).[9]

It is unclear if combustion in the boilers would destroy any PFAS compounds contained in the pellet fuel, and it is unlikely that the post-combustion control devices present at UNC would reduce any PFAS emissions. Natural gas is not expected to contribute to PFAS emissions.

Therefore, a conservative estimate of PFAS emissions from the boilers using the new pellet fuel is 100% of the PFAS content of the fuel. This can be calculated using the predicted amount of pellet fuel usage in both boilers:

$$\left[(22{,}827+22{,}006)\frac{\text{ton}_{\text{pellet}}}{\text{year}}\right]\times\left(907{,}185\frac{\text{g}_{\text{pellet}}}{\text{ton}_{\text{pellet}}}\right)\times\left(8.265\frac{\text{ng}_{\text{PFAS}}}{\text{g}_{\text{pellet}}}\right)\times\left(\frac{1\text{ g}}{10^{9}\text{ng}}\right)=507.3\frac{\text{g}_{\text{PFAS}}}{\text{year}}=\mathbf{1.118}\frac{\mathbf{lb}_{\mathbf{PFAS}}}{\mathbf{year}}$$

DAQ will require site-specific emission testing to determine the actual PFAS emission rate from the boilers while using the pellet fuel. UNC will be required to test at the maximum predicted load of the boilers and using the maximum predicted ratio of pellets to natural gas. For example, if UNC plans to burn at most an 80% mixture of pellets to natural gas, then the test must be conducted while burning a mixture of at least 80% pellets.

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[8] See NC's "Action Strategy for PFAS" available at https://www.deq.nc.gov/news/key-issues/emerging-compounds/action-strategy-pfas.

[9] See Application at Appendix E. The sum of all PFAS compounds in the test that were above the limit of detection (LOD) and limit of quantification (LOQ) was 7.187. The sum of all PFAS compounds that were between the LOD and LOQ was 0.487. For a more conservative estimation, for compounds between the LOD and LOQ, the LOQ was used instead. In this case, the sum of all detected compounds was 8.265 ng/g.

In addition, UNC will be required to perform annual fuel sampling of the pellets. If future samples show a higher PFAS content than what has been previously recorded, DAQ may require UNC to perform additional emission testing.

Note that there is, as of now, no specific emission limits or requirements regarding PFAS emissions in North Carolina's State Implementation Plan, NC state laws and rules, or the Federal Clean Air Act. The above information is being collected to assist DEQ in potentially crafting future PFAS emission requirements.

Finally, UNC will be required to notify DAQ if UNC discovers that PFAS-containing materials are used elsewhere and that have the potential to result in air emissions of PFAS.

4.10 15A NCAC 02Q .0504: "Option for Obtaining Construction and Operation Permit"

Applicability: As allowed by 15A NCAC 02Q .0501(b)(2), a facility may choose to apply for a significant modification to a Title V permit using a two-step process. If a facility chooses this option, the first application is submitted pursuant to 15A NCAC 02Q .0300. UNC submitted this application using this two-step process.

Requirements: UNC is not physically modifying any emission sources. Therefore, UNC will be required to submit the 2nd-step application within 12 months of the issuance of this permit.

Changes to the existing permit: A specific condition will be added to the permit that requires UNC to submit an application pursuant to 02Q .0500 within 12 months.

5. NSPS, NESHAP, MACT, CAM, PSD, CSAPR, and §112(r)

5.1 New Source Performance Standards (NSPS; 40 CFR Part 60)

5.1.1 NSPS Subpart Db "Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units"

Applicability: This rule applies to fossil fuel-fired boilers with capacity greater than 100 million Btu per hour and that were constructed, modified, or reconstructed after June 19, 1984. Boilers 6 and 7 are subject to this rule.

Construction, modification, and reconstruction: The rule has different limits based on the age of the boiler in question. Specifically, there are separate, more stringent limits for boilers constructed, modified, or reconstructed after February 28, 2005. Boilers 6 and 7 are not subject to those limits because they were constructed before February 28, 2005 and were not modified or reconstructed after that date.

Modifications: Any change to the boilers may meet the definition of "modification" under the NSPS rule and therefore make these boilers subject to the more stringent post-February 28, 2005 limits. NSPS defines "modification" as "any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act" (see 40 CFR 60.14(a)).

- In the application, UNC explains that burning the new engineered pelletized fuel does not require any physical modification of Boilers 6 and 7 (Application at 12). Therefore, there will be no physical change to Boilers 6 and 7.

- Boilers 6 and 7 are currently permitted to burn wood fuels. As discussed below, UNC and DAQ believe that the new engineered pelletized fuel meets the definition of "wood" under this rule. Therefore, there will be no operational change under NSPS because the engineered pelletized fuel does not represent a new, previously unpermitted fuel.

Therefore, the proposed project does not constitute a modification for NSPS Subpart Db.

Wood fuel: In correspondence received following the initial application, UNC stated that "Based on Convergen's characterization of the fuel, although the material isn't 100% wood we do believe that the fuel does meet the definition of "wood" per NSPS Subpart Db."[10]

NSPS Subpart Db defines "wood" as:

> wood, wood residue, bark, or any derivative fuel or residue thereof, in any form, including, but not limited to, sawdust, sanderdust, wood chips, scraps, slabs, millings, shavings, and processed pellets made from wood or other forest residues.

Notably, NSPS Db considers "any derivative fuel or residue" of wood in any form, and "processed pellets" are also considered wood. Given that the definition of wood does not exclude non-wood additives (such as binding plastic), and the engineered pelletized fuel is primarily made from wood and paper byproducts,

[10] Email from Thomas Timms (representing UNC) to Russell Braswell (Engineer, DAQ) received August 26, 2024.

ultimately making it a residue of wood, it appears that the engineered pelletized fuel meets the definition of "wood" under NSPS Subpart Db.

Annual capacity factor: Under NSPS Subpart Db, there are several emission limits that only apply to boilers that are subject to an enforceable annual capacity factor for a certain fuel. Although UNC plans to typically co-fire 50% natural gas and 50% engineered pelletized fuel, UNC has not requested any enforceable limit on the annual capacity factor for any fuel.

Emission limits: This rule includes specific emission limits for NOx (expressed as NO_2), SO_2, and PM (including opacity).

- SO_2: Boilers 6 and 7 are permitted to burn oil and coal (alone and in combination with other fuels), therefore, the SO_2 emission limit under §60.42b(a) applies. The limit is either 0.2 pounds per million Btu, or a 90% reduction in SO_2 emissions as calculated by the formula in §60.42b(a). No other SO_2 limit under §60.42b applies to these boilers. Note that the SO_2 limit is measured on a 30-day rolling average basis (see §60.45b(g)).

  Note that this limit only applies when oil and/or coal are being fired. If UNC removes coal and oil from these boilers, the above SO_2 limit will no longer apply.

- PM: Boilers 6 and 7 are permitted to burn natural gas, oil, coal, and wood.

  - When burning coal alone or in combination with any other fuel, the applicable PM limit is 0.051 pounds per million Btu (see §60.43b(a)(1)).

  - When burning wood alone or in combination with any other fuel (except coal), the applicable PM limit is 0.10 pounds per million Btu, if the boiler has an annual capacity factor for wood burning greater than 30% (see §60.43b(c)(1)). Note that the rule does not include a PM limit if the boiler has an annual capacity factor for wood less than 30%.

  - Opacity: In addition to specific PM standards, the rule includes limits for opacity from the boilers. When burning coal, oil, wood (including the pelletized fuel), or mixtures of those fuels with any other fuel, the opacity limit is 20% (with one 27% exception per hour). Note that the rule does not include an opacity limit when firing only natural gas.

- NOx: Boilers 6 and 7 are fluidized bed-type boilers permitted to burn natural gas, oil, coal, and wood.

  - When burning only coal, oil, or natural gas, the NOx limit is

    - 0.10 pounds per million Btu when burning only oil and/or natural gas. See §60.44b(a)(1)(ii).

    - 0.60 pounds per million Btu when burning coal. See §60.44b(a)(3)(ii).

    - Determined by the equation in §60.44b(b) when burning a combination of these fuels.

  - When burning coal and wood, the NOx limit is also determined by §60.44b(b). See §60.44b(c)

- When burning wood with natural gas and/or fuel oil (and not coal), the NOx limit is 0.30 pounds per million Btu. See §60.44b(d)

Monitoring: The rule requires a continuous emission monitoring system for SO_2, CO_2 or O_2, NOx, and opacity. UNC will continue to use these systems after beginning to burn the new engineered pelletized fuel, and therefore continue to demonstrate compliance with the emission limits under this rule.

Recordkeeping: UNC must keep records of fuel usage and calculate the annual capacity factor on a monthly basis (see §60.49(d) and (p)). Records must be kept for at least two years (see §60.49(o)).

Reporting: UNC must submit the applicable notifications per 40 CFR 60.49b and a quarterly notification of excess CEMS/COMS emissions (or a semiannual report stating no excess CEMS/COMS emission).

Changes to the existing permit:

- Some formatting has been changed in the existing permit for clarity.

- Some sections of NSPS Subpart Db that were included in the existing permit as a reference are now included as a paragraph. This change is made for clarity and ease of understanding the Title V permit.

5.2 National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR Part 61)

There are no specific rules under 40 CFR Part 61, as incorporated into North Carolina's SIP under 15A NCAC 02D .1110, that apply to Boilers 6 and 7 at UNC.

5.3 National Emission Standards for Hazardous Air Pollutants for Source Categories (a.k.a. Maximum Achievable Control Technology, MACT; 40 CFR Part 63)

5.3.1 Major Source Status

UNC is a major source of hazardous air pollutants (HAP) because the facility has potential emissions of HAP greater than the thresholds listed in the definition of "major source" in 40 CFR 63.2. Because this facility is a major source of HAP, rules that apply exclusively to area sources of HAP (*e.g.,* Subpart JJJJJJ) categorically do not apply to this facility.

5.3.2 MACT Subpart DDDDD "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters"

Applicability: This rule applies to boilers and process heaters (defined by 40 CFR 63.7575) located at major sources of HAP. This rule was most recently revised on October 6, 2022 (see 87 FR 60842). Boilers 6 and 7 are subject to this rule.

Reconstruction: Under this rule, a boiler is "existing" if it is not "new" or "reconstructed" (see 40 CFR 63.7490(d)). These boilers are not "new" because they were constructed before June 4, 2010 (see 40 CFR 40 CFR 63.7490(b)). The use of the new engineered pelletized fuel will not cause the boilers to be "reconstructed" based on the definition within the MACT rule (see 40 CFR 63.2):

> "*Reconstruction*, unless otherwise defined in a relevant standard, means the replacement of components of an affected or a previously nonaffected source."

UNC is not proposing any replacement of components (Application at 12), so using the new engineered pelletized fuel will not cause the boilers to be "reconstructed." Therefore, the boilers will continue to be "existing" under this rule.

Solid waste: Under this rule, a device that combusts solid waste, as defined in 40 CFR 241.3, is not a boiler (see 40 CFR 63.7575 "Boiler"). The engineered pelletized fuel is created by Convergen using "by-products from the packaging and label industries" (Application at Appendix D, 7); this could possibly be considered as solid waste. However, Convergen claims that the engineered pelletized fuel is not solid waste based on correspondence with the US EPA:

> "Overall, based on the information provided in your letter, and given the assumptions and data limitations outlined in this letter, the fuel pellets meet both the processing definition and the legitimacy criteria outlined above. Accordingly, [the US EPA] would consider this NHSM *[non-hazardous secondary material]* a non-waste fuel under 40 C.F.R. Part 241 regulations." (Application at Appendix C, 4)[11]

Convergen also claims that "Convergen's fuel still adheres to the requirements of the alternative fuel program under RCRA *[Resource Conservation and Recovery Act]* and remains a 'Non-Hazardous, Non-Waste' fuel. In fact, Convergen's fuel has remained consistent since its start-up in 2009."[12]

For facilities that intend to burn NHSM as fuel, the facility must determine that such materials are not solid waste pursuant to 40 CFR 241.3(b), the facility must keep records that show how the NHSM meets the legitimacy criteria under 40 CFR 241.3(d)(1) (see 40 CFR 63.7555(d)(2)). Given that Convergen has already obtained concurrence from US EPA that their fuel meets the legitimacy criteria, DAQ anticipates that UNC will comply with this requirement.

Therefore, because UNC has shown that the engineered pelletized fuel supplied by Convergen is not a solid waste, Boilers 6 and 7 can burn this fuel and still meet the definition of "boiler" under MACT Subpart DDDDD.

Biomass or bio-based solid fuel: This rule defines a biomass fuel as "any biomass-based solid fuel that is not a solid waste." The rule includes a long, but not exclusive, list of examples that range from tree stumps to animal manure to coffee grounds. UNC states that they "believe that Convergen's pellets do meet the definition per MACT Subpart DDDDD."[13] Note that Convergen's pellets also appear to meet the definition of "wood" under NSPS Subpart Db (see Section 5.1.1).

Subcategories: For each boiler, the requirements of this rule are based on the specific subcategory of boiler. The subcategories are broadly based on the fuel type in the boiler. For example:

> *Unit designed to burn biomass/bio-based solid subcategory* includes any boiler or process heater that burns at least 10 percent biomass or bio-based solids on an annual heat input basis in combination with solid fossil fuels, liquid fuels, or gaseous fuels.

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[11] Letter from Margaret M. Guerriero (Director, Land and Chemicals Division, US EPA Region 5) to James S. Rickun (James S. Rickun Environmental Consulting), representing Greenwood Fuels LLC, sent November 14, 2011. Greenwood Fuels LLC subsequently changed their corporate name to "Convergen Energy." Included in this review as Attachment 2.
[12] Letter from Steven J. Brooks (CFO, Convergen Energy) to UNC, sent August 5, 2024.
[13] See Note 10.

> *Unit designed to burn coal/solid fossil fuel subcategory* includes any boiler or process heater that burns any coal or other solid fossil fuel alone or at least 10 percent coal or other solid fossil fuel on an annual heat input basis in combination with liquid fuels, gaseous fuels, or less than 10 percent biomass and bio-based solids on an annual heat input basis.
>
> *Unit designed to burn solid fuel subcategory* means any boiler or process heater that burns only solid fuels or at least 10 percent solid fuel on an annual heat input basis in combination with liquid fuels or gaseous fuels.

For the purposes of this rule, Boilers 6 and 7 are in the "Unit designed to burn coal/solid fossil fuel subcategory." After beginning to burn the new engineered pellets, the boilers may be categorized as "Unit designed to burn biomass/bio-based solid subcategory" depending on the annual heat inputs from coal, gas, pellets, or other fuels. Furthermore, these boilers are also fluidized bed units (this status will not change based on fuel types). The new permit will include the relevant emission limits for both subcategories because UNC will still be permitted to burn coal.

Note that although these boilers can burn natural gas, they are still categorized as solid fuel boilers. Limits for the "Unit designed to burn solid fuel subcategory" will also be included in the permit where appropriate.

Emission limits: In general, these boilers are subject to emission limits based on the subcategory of the boiler. Currently, Boilers 6 and 7 are "Fluidized bed units designed to burn coal/solid fossil fuel." As discussed above, after switching from coal to the engineered pelletized fuel, they may be "Fluidized bed units designed to burn biomass/bio-based solid fuel" depending on the annual heat inputs from coal, gas, pellets, or other fuels. See below for a comparison of emission limits for these subcategories.

Table 3: Excerpt from Table 2 to 40 CFR Part 63 Subpart DDDDD

Boiler subcategory	Pollutant	Emission limit
Units in all subcategories designed to burn solid fuel	HCl	2.0E-02 lb per million Btu of heat input
	Mercury	5.4E-06 lb per million Btu of heat input
Units design to burn coal/solid fossil fuel	Filterable Particulate Matter (PM) -or- Total Suspended Metals (TSM)	3.9E-02 lb per million Btu of heat input -or- 5.3E-05 lb per million Btu of heat input
Fluidized bed units designed to burn coal/solid fossil fuel	Carbon Monoxide (CO) -or- CO (with CEMS)	130 ppm by volume on a dry basis corrected to 3 percent oxygen, 3 run average -or- 230 ppm by volume on a dry basis corrected to 3 percent oxygen, 30-day rolling average
Fluidized bed units designed to burn biomass/bio-based solid	CO -or- CO (with CEMS)	210 ppm by volume on a dry basis corrected to 3-percent oxygen, 3-run average -or- 310 ppm by volume on a dry basis corrected to 3-percent oxygen, 30-day rolling average)
	Filterable PM -or- TSM	7.4E-03 lb per MMBtu of heat input -or- 6.4E-05 lb per MMBtu of heat input

Demonstrating compliance: UNC currently demonstrates compliance with the above limits by:

- Operating fabric filters for control of PM, and operating a continuous parameter monitoring system (CPMS) to demonstrate compliance with the PM limit.

- Operating injection systems for control of HCl and mercury, and operating a continuous monitoring for injection rates to demonstrate compliance with the limits.

- Operating an automatic O_2 trim system to demonstrate compliance with the CO limit.

In addition to the above, UNC must conduct regular fuel analysis, emission testing, and boiler tune-ups.

These compliance methods will not change if UNC begins burning the new engineered pelletized fuel. UNC will continue to operate these control devices and monitors in the future.

In addition to the above, UNC must now also keep a record that shows that the new engineered pelletized fuel is not solid waste (see 40 CFR 63.7555(d)(2)). Furthermore, UNC must submit a notification of compliance status upon actually recategorizing the boilers as "Unit designed to burn biomass/bio-based solid" (see 40 CFR 63.7545(h)), and again demonstrate initial compliance with the rule after recategorizing the boilers (see 40 CFR 63.7510(k)).

Changes to the existing permit: The permit will be updated to include the following new requirements based on the addition of the new engineered pelletized fuel to the boilers:

- Emission limits specific to the "Fluidized bed units designed to burn biomass/bio-based solid fuel" subcategory.

- A notification requirement for if/when the boilers are recategorized.

- A requirement to again demonstrate initial compliance after the boilers are recategorized.

- A specific requirement to keep records of monthly fuel use and a determination that the new engineered pelletized fuel is not a solid waste. Note that this requirement was previously included in the permit by reference. For clarity, the new permit will include this requirement as a specific condition.

5.4 Compliance Assurance Monitoring (CAM; 15A NCAC 02D .0614)

Background: Under 02D .0614, most of the compliance assurance monitoring (CAM) rule in 40 CFR Part 64 are incorporated into North Carolina's SIP. The CAM rule requires owners and operators to conduct monitoring to provide a reasonable assurance of compliance with applicable requirements under the act. Per 02D .0614(a), this rule potentially applies to any facility required to obtain a permit under 02Q .0500 (i.e., a Title V permit).

CAM plan submittal requirements: Per 40 CFR 64.5(a)(2), for large PSEUs (defined in the rule), a CAM plan must be submitted with a Title V permit application. Boilers 6 and 7 are large PSEUs, so any necessary changes to the CAM plan must be addressed when UNC submits the permit application required by 15A NCAC 02Q .0504 (see Section 4.10).

Note that, according to the application, UNC's approach to demonstrating compliance with PM emission limits will not change as a result of the new engineered pelletized fuel (Application at 14).

5.5 Prevention of Significant Deterioration (PSD; 15A NCAC 02D .0530 and 40 CFR 51.166)

Background: The Federal rules for PSD are implemented into North Carolina's SIP under 15A NCAC 02D .0530. In general, a facility is a major stationary source for PSD if the facility has actual or potential emissions of a regulated NSR pollutant greater than the threshold listed in 40 CFR 51.166(b)(1). For facilities that fall under the specific categories listed in 40 CFR 51.166(b)(1)(i)(*a*), the threshold is 100 tpy. UNC is an educational institution (SIC 8221), which is not a listed category. However, collections of fossil-fuel-fired boilers with combined capacity greater than 250 million Btu per hour is such a listed category. Therefore, the boilers are considered a "nested" source that are ultimately subject to the 100 tpy threshold.

Major stationary source: UNC is a major stationary source for PSD because it has actual emissions of a regulated NSR pollutant greater than the threshold discussed above. Note that the existing permit lists several sources as subject to PSD and does not include any BACT limits for any sources.

Projected actual emissions: UNC has demonstrated that this proposed project will not be a major modification for PSD using the projected actual emissions method as allowed by 15A NCAC 02D .0530. See Section 4.6 for a discussion of UNC's projected actual emissions.

5.6 Section 112(r) of the Clean Air Act (and 15A NCAC 02D .2100 "Risk Management Program")

Background: This rule requires facilities that store materials above the threshold quantities in 40 CFR 68.130 above their respective thresholds to prepare and submit a risk management plan (RMP).

Applicability: In the application on Form A3, UNC states that an RMP is not required for this facility because "No 112(r) hazardous or flammable materials [are] stored in quantities above applicable thresholds." Therefore, UNC is not required to submit an RMP and has no specific requirements under 02D .2100. Note that other parts of that rule, such as the General Duty clause, may still apply to this facility; those portions of §112(r) are beyond the scope of the Title V permit.

6. Toxic Air Pollutants

Background: In general, a facility that emits toxic air pollutants (TAP) at rates greater than the TAP permitting emission rate (TPER) listed in 15A NCAC 02Q .0711 must perform air dispersion modeling following the procedures in 15A NCAC 02D .1106. The results of this modeling must be less than the acceptable ambient limits (AAL) listed in 15A NCAC 02D .1104.

TAPs from MACT sources: Per 15A NCAC 02Q .0702(a)(27)(B), a permit for TAP emission is not required for any source that is subject to a rule under 40 CFR Part 63 (*i.e.*, a MACT-affected source). As part of the T32 permit revision, DAQ determined that all sources of TAPs at this facility were MACT-affected sources, and therefore were exempt from TAP emission requirements.[14] The existing permit therefore does not include any TAP emission limits.

Modifications: Per 02Q .0706(a)(2), a modification at a facility subject to 02Q .0500 (*i.e.*, a Title V facility) is subject to the TAP rules if that modification is not exempt pursuant to 15A NCAC 02Q .0702. UNC proposes to add a new fuel to the list of permitted fuels in Boilers 6 and 7. Based on the emission calculations submitted by UNC, this could potentially increase the emission rate of TAPs. However, Boilers 6 and 7 are subject to a MACT standard and are therefore exempt pursuant to 15A NCAC 02Q .0702. Therefore, UNC's proposed change will not be a modification under 02Q .0706.

Unacceptable risk: For sources that meet the exemption set forth in 15A NCAC 02Q .0702(a)(27) (*i.e.*, MACT affected sources), DAQ is required to review TAP emissions from those sources pursuant to NCGS 143-215.107(a)(5)b, which requires DAQ "to determine if the emission of toxic air pollutants from the source or facility would present an unacceptable risk to human health."

In order to determine if the proposed project presents an unacceptable risk to human health, DAQ modeled TAP emissions from the facility based on the new potential TAP emission rates included in the application.

UNC has previously submitted air dispersion modeling on January 7, 2020 in order to assist DAQ with a review for unacceptable risk for a project not related to the use of the pellet fuel. DAQ approved the modeling result and concluded at that time that there was no unacceptable risk at that time.[15] The modeling demonstration covered emissions of the following nine TAPs: acrolein, arsenic, benzene, beryllium, cadmium, chromium, formaldehyde, mercury, and nickel.

The emission sources and their parameters have not meaningfully changed since the January 7, 2020 modeling was submitted. Therefore, in order to review UNC's proposed project, DAQ can revise that model with the maximum potential emission rate for each above TAP from Boilers 6 and 7.

Potential TAP emissions: In order to calculate TAP emissions from Boilers 6 and 7 while using the new pelletized fuel, DAQ made the following assumptions:

- 100% pellet firing
- Maximum heat input rate
- Emission factors from AP-42 Chapter 1.6, Tables 1.6-3 and 1.6-4

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[14] See DAQ's review for air permit 03069T32 and application 6800043.14A, issued September 10, 2014.
[15] See DAQ's review for air permit 03069T36, issued August 5, 2021. See also the memo *Review of Dispersion Modeling Air Toxics Analysis for University of North Carolina Chapel Hill*, issued July 10, 2020.

These assumptions represent the worst-case (*i.e.*, most conservative) scenario because the boilers do not normally operate at maximum capacity and the AP-42 emission factors include data from some uncontrolled boilers.[16] Using these assumptions, TAP emissions from the boilers and the new fuel are calculated in Table 4.

Table 4: TAP emissions from Boilers 6 and 7

TAP	Emission factor (lb/MMBtu)	Hourly emission rate (lb/hr)
acrolein	4.00E-03	2.59E+00
arsenic	2.20E-05	1.42E-02
benzene	4.20E-03	2.71E+00
beryllium	1.10E-06	7.11E-04
cadmium	4.10E-06	2.65E-03
chromium (hex)	3.50E-06	2.26E-03
formaldehyde	4.40E-03	2.84E+00
mercury	3.50E-06	2.26E-03
nickel	3.30E-05	2.13E-02
Capacity	646.34	MMBtu/hr, total

Note that Boilers 6 and 7 share the same emission release point, so emissions from both boilers must be summed for the model.

Modeling results: The above emission rates were inserted into the January 7, 2020 modeling data by replacing the data previously used for Boilers 6 and 7. DAQ Air Quality Analysis Branch (AQAB) then re-ran model using AERMOD. Based on the results of the model, AQAB issued a memo concluding that no AAL would be exceeded.

Table 5: Modeling results[17]

Pollutant	Averaging Period	Max. Conc. (µg/m³)	AAL (µg/m³)	% of AAL
Acrolein	1-hour	1.12	80	1.4%
Arsenic	Annual	0.0003	0.0021	14.3%
Benzene	Annual	0.045	0.12	37.5%
Beryllium	Annual	0.00006	0.0041	1.5%
Cadmium	Annual	0.00008	0.0055	1.5%
Chromic acid (VI)	24-hour	0.0023	0.62	0.4%
Formaldehyde	1-hour	5.43	150	3.6%
Mercury	24-hour	0.0023	0.6	0.4%
Nickel	24-hour	0.0051	6	0.1%

[16] AP-42 is a document published by US EPA. The emission factors in AP-42 are generally determined by testing a wide range of sources and analyzing the results. In footnote b to Table 1.6-4, EPA noted that "Factors are for boilers with no controls or with particulate matter controls." Given that Boilers 6 and 7 are equipped with control devices, it is reasonable to expect the values in AP-42 to be a conservative estimation.

[17] Data taken from the memo *Toxics Air Dispersion Modeling Analysis – The University of North Carolina at Chapel Hill*, issued September 9, 2024.

Note that the highest impact relative to an AAL is 37.5%. Based on this result, DAQ concludes that this proposed project does not present an unacceptable risk to human health consistent with 15A NCAC 02Q .0706(d).

Therefore, this proposed project is not a modification per 02Q .0706, and UNC has no additional requirements under 02Q .0706 or 02D .1100.

TAP emissions from new emergency generators: As discussed in Section 3.3, UNC plans to replace two existing emergency generators with two new emergency generators. The new generators will be insignificant and will have a total capacity slightly greater than the generators they are replacing. The new generators will be subject to MACT Subpart ZZZZ, and therefore, for the reasons discussed above, are exempt from TAP requirements pursuant to 15A NCAC 02Q .0702. Therefore, UNC's proposed change will not be a modification under 02Q .0706.

Furthermore, as discussed above, DAQ is required to review TAP emissions from the generators pursuant to NCGS 143-215.107(a)(5)b. In order to determine if the proposed generator replacement presents an unacceptable risk to human health, the change in emissions of previously-modeled TAPs can be examined. DAQ has published emission calculation spreadsheets[18] for large and small internal combustion engines, and the emission factors in those spreadsheets can be used to calculate emissions of TAPs.

The emission factors for small engines (less than 600 horsepower capacity) are in units of pounds emitted per horsepower-hour (lb/hp-hr). UNC plans to replace the existing generators, so the new generators and existing generators will never operate simultaneously. Therefore, the potential change in emissions can be calculated based on the difference in horsepower rating of the engines.

Table 6: Generator capacity

Existing small generators:	Capacity (hp)
ES-Gen-3	40
ES-Gen-58	308

New small generators:	Capacity (hp)
IES-Gen-3-2	107

Change in small generator capacity:	**-241 hp**

The emission factors for large engines (greater than 600 horsepower capacity) are also in units of lb/hp-hr. The new IES-Gen-58-2 will be rated at 738 horsepower.

Comparing the change in generator capacity (measured in horsepower) and the emission factors included in DAQ's emission calculation spreadsheets, the expected change in TAP emissions can be calculated:

[18] Available at https://www.deq.nc.gov/about/divisions/air-quality/air-quality-permitting/emission-estimation-spreadsheets

Table 7: Small engines, large engines, and emission changes

Small Engines			
TAP	Emission Factor	Potential emissions	
	(lb/hp-hr)	(lb/hr)	(lb/yr)
Acrolein	6.48E-07	-1.56E-04	-7.81E-02
Arsenic	2.80E-08	-6.75E-06	-3.37E-03
Benzene	6.53E-06	-1.57E-03	-7.87E-01
Beryllium	2.10E-08	-5.06E-06	-2.53E-03
Cadmium metal	2.10E-08	-5.06E-06	-2.53E-03
Chromic Acid (VI)	2.10E-08	-5.06E-06	-2.53E-03
Formaldehyde	8.26E-06	-1.99E-03	-9.95E-01
Mercury vapor	2.10E-08	-5.06E-06	-2.53E-03
Nickel metal	2.10E-08	-5.06E-06	-2.53E-03

Small Engine Capacity change: -241 hp
Annual operations: 500 hr/yr

Large Engines			
TAP	Emission Factor	Potential emissions	
	(lb/hp-hr)	(lb/hr)	(lb/yr)
Acrolein	5.52E-08	4.07E-05	2.04E-02
Arsenic	2.80E-08	2.07E-05	1.03E-02
Benzene	5.43E-06	4.01E-03	2.00E+00
Beryllium	2.10E-08	1.55E-05	7.75E-03
Cadmium metal	2.10E-08	1.55E-05	7.75E-03
Chromic Acid (VI)	2.10E-08	1.55E-05	7.75E-03
Formaldehyde	5.52E-07	4.07E-04	2.04E-01
Mercury vapor	2.10E-08	1.55E-05	7.75E-03
Nickel metal	2.10E-08	1.55E-05	7.75E-03

Large Engine Capacity change: +748 hp
Annual operations: 500 hr/yr

Total Change		
TAP	Potential emissions	
	(lb/hr)	(lb/yr)
Acrolein	-1.15E-04	-0.06
Arsenic	1.39E-05	0.01
Benzene	2.43E-03	1.22
Beryllium	1.04E-05	0.01
Cadmium metal	1.04E-05	0.01
Chromic Acid (VI)	1.04E-05	0.01
Formaldehyde	-1.58E-03	-0.79

Total Change		
TAP	Potential emissions	
	(lb/hr)	(lb/yr)
Mercury vapor	1.04E-05	0.01
Nickel metal	1.04E-05	0.01

The change in hourly and annual emission rates of the previously modeled TAPs are small relative to the TAP emissions previously modeled, and the results of DAQ's most recent model show relatively large margins with respect to the AALs (see Table 5), DAQ concludes that the replacement generator project does not present an unacceptable risk to human health.

Therefore, this proposed project is not a modification per 02Q .0706, and UNC has no additional requirements under 02Q .0706 or 02D .1100.

7. Compliance Status and Other Regulatory Concerns

Compliance status:

- DAQ most recently inspected this facility on June 25, 2024. UNC appeared to be in compliance with the Title V permit at that time.

- In the previous five years, DAQ has issued one Notice of Violation (NOV) to UNC. On February 7, 2020, DAQ sent an NOV to UNC for not performing required monitoring under 40 CFR Part 63, Subpart ZZZZ (a.k.a. "RICE MACT" or "engine MACT"). DAQ considers this matter resolved as of March 2, 2020.

- This application was submitted pursuant to 15A NCAC 02Q .0300 rules (as allowed by 15A NCAC 02Q .0501(b)(2) and 02Q .0504). No Form E5 is required for applications submitted pursuant to 02Q .0300.

Application fee: Some applications require an application fee. UNC submitted the appropriate fee with the application.

PE Seal: Pursuant to 15A NCAC 02Q .0112 "Application requiring a Professional Engineering Seal," a professional engineer's seal (PE Seal) is required to seal technical portions of air permit applications for new sources and modifications of existing sources as defined in 15A NCAC 02Q .0103 that involve the criteria in 02Q .0112(a)(1)-(3):

- Design:
  The design of boilers 6 and 7 is not changing

- Determination of applicability and appropriateness:
  There will be no new rules that apply to Boilers 6 and 7 (note that the PFAS testing requirement is state-enforceable only and not associated with any specific emission limit)

- Determination and interpretation of performance of air pollution capture and control systems:

Therefore, UNC's use of the pelletized engineered fuel does not meet the criteria in 02Q .0112(a)(1)-(3), so no PE Seal was required.

Zoning Consistency Determination: In the application, UNC included a request to the Town of Chapel Hill requesting a zoning consistency determination for the proposed project. The Town of Chapel Hill approved the zoning request in a letter sent to DAQ on August 15, 2024.

8. Facility Emissions Review

Emission changes based on modified sources: In the application, UNC submitted emission calculations for the replacement of coal with the new engineered pelletized fuel in Boilers 6 and 7. It should be noted that UNC will retain the ability to burn coal in the future. UNC is not planning on increasing the nominal heat input or changing the overall ratio of natural gas to non-natural gas fuel in Boilers 6 and 7, although UNC notes that the ratio of natural gas to non-natural gas fuels is variable year-to-year (Facility Comments on October 7 draft, received October 14, 2024).

UNC has calculated expected actual emissions based on emission testing at other facilities using this fuel, and where data was unavailable, the AP-42 emission factor for wood combustion. UNC will be required to perform emission testing for PM, CO, and HCl emissions (see MACT Subpart DDDDD), and will continue to continuously monitor SO_2 and NOx emissions using CEMS.

Overall, actual emissions are expected to change by the "Project Emissions Increase" line in Table 2, above. Furthermore, see Attachment A.2 for the summary of UNC's emission calculations.

Title V: UNC is a major source for Title V because it has actual emissions of criteria pollutants greater than the major source threshold in 40 CFR 70.2. UNC will continue to be a major source for Title V.

HAP: UNC is a major source of hazardous air pollutants (HAP) because it has potential emissions of HAP greater than the major source threshold in 40 CFR 63.2. UNC will continue to be a major source of HAP.

PSD: UNC is a major stationary source for PSD (see 40 CFR 51.166(b)(1)(i)) because the facility has had actual emissions of a regulated NSR pollutant greater than the threshold. UNC will continue to be a major stationary source for PSD.

PSD Increment Tracking: The Orange County airshed has been triggered for PSD Increment Tracking for NOx, SO_2, and PM_{10}. The change in hourly emissions of these pollutants can be calculated by averaging the projected emission changes over the year (*i.e.,* divide by 8,760 hr/yr):

- NOx: +5.03 lb/hr
- SO_2: -26.94 lb/hr
- PM_{10}: -1.84 lb/hr

9. Draft Permit Review Summary, Public Notice, and EPA Review

9.1 Initial draft:

An initial draft of the permit and this application review were sent to DAQ Permits staff on September 13, 2024. Comments were received in-person on September 30, 2024.

DAQ Permits Comment 1: Typos in the draft permit and application review.

Response: These issues were corrected.

DAQ Permits Comment 2: The draft permit treats opacity under NSPS Subpart Db as a separate regulated pollutant. NSPS Subpart Db uses opacity as a compliance method for PM. The permit should make this clear.

Response: Opacity requirements under NSPS Subpart Db will be grouped under the PM requirements.

DAQ Permits Comment 3: The permit and review should address PFAS emissions.

Response: The permit will include a testing requirement for PFAS and a notification for PFAS-containing materials. The review will include a calculation of PFAS emissions and discussion of PFAS-related requirements.

DAQ Permits Comment 4: Why do the specific conditions regarding the SO_2 NAAQS (specific conditions 2.2 A.2 and 2.2 A.3) specify that monitoring is only required when coal is being burned?

Response: This appears to be a mistake. The NAAQS apply at all times, and therefore UNC must demonstrate compliance at all times. The text “when firing coal” will be removed from specific conditions 2.2 A.2 and 2.2 A.3.

DAQ Permits Comment 5: In discussion about PSD, the review should be clear that UNC is a nonprofit educational institution, and therefore is generally exempt from PSD requirements under 40 CFR 51.166(i)(1)(i).

Response: This will be added to the review.

DAQ Permits Comment 6: In discussion about PSD, the review should be clear that there were not any periods of violation during the baseline period that would require reevaluation of the baseline emissions.

Response: This will be added to the review.

DAQ Permits Comment 7: The review should include a copy of the EPA’s letter regarding the 40 CFR 241.2 status of the pellets.

Response: This will be added to the review as Attachment 2.

9.2 Subsequent draft:

A revised draft of the permit and this application review were sent to UNC staff, DAQ SSCB staff, and DAQ RRO staff on October 7, 2024.

No comments were received from DAQ SSCB or DAQ RRO staff.

Comments were received from UNC staff on October 14, 2024. The comments were in the form of emailed questions, tracked changes in the draft versions of the permit and review, and questions embedded in the draft versions. A summary of the comments, and DAQ's responses, are below.

UNC Comment 1: If there is any possibility of the final permit being issued in 2024, we would like to request the effective date of the permit to be January 1, 2025.

Response: January 1, 2025 will be listed tentatively as the effective date of the permit. *Further note: January 1 is no longer a possible issue date, so this date will be replaced with "TBD."*

UNC Comment 2: Is there a possibility of extending the 12-month deadline to submit the Part 2 application?

Response: No. The 12-month deadline is written into 02Q .0504.

UNC Comment 3: With respect to condition 2.1.A.2.c.iii, we request NCDAQ's concurrence that the "performance test" referenced within the condition is the typical 30-day average that we calculate for compliance with the NSPS Subpart Db SO2 standard.

Response: This specific condition is the text of 60.45b(g), which already applies to this facility. Therefore, this should not represent a change in UNC's compliance requirements.

UNC Comment 4: For compliance with 2.1.A.4.iii(A) and (B). Does a notification need to take place each time the fuel feed is changed (e.g., coal combustion is taking place, switched to test the engineered fuel pellet, then changed back to an all-coal feed)? Does performance testing need to take place with this notification?

Response: There does not need to be a notification each time the fuel feed is changed, only when the subcategory under MACT Subpart DDDDD is changed.

Performance testing will be required when the subcategory is changed, but only if the facility has not performed a compliance test within the previous year.

UNC Comment 5: It is our understanding that consideration regarding recategorization of each boiler to a "Unit designed to burn biomass/bio-based solid" (for Boiler MACT purposes) does not need to take place until combustion of the engineered pelletized fuel exceeds 10% of the annual heat input for Boilers 6 and 7 (individually). Based on this understanding, initial testing and notifications for Boiler MACT compliance would not take place until the heat input attributed to this fuel would exceed the 10% threshold. We would like to request your concurrence regarding our understanding of these requirements.

Response: This appears to be correct.

UNC Comment 6: We are expecting to not be able to comply with the timeline for both initial Boiler MACT and PFAS testing (60-day and 90-day window), as the availability of the fuel is limited and we will not have enough fuel to test properly considering that testing is done at high load on 100% of the fuel. We believe that this compliance testing can be completed within the first 12-months and request an extension of these compliance testing windows.

Response: The draft condition for PFAS testing allows UNC to request an alternative date for testing. If necessary, UNC can request an alternative date.

UNC Comment 7: Additionally, I would like to elaborate on some thoughts that may not have been adequately conveyed in either our in-person meeting or in the application package.

UNC is testing the new engineered pelletized fuel in the hopes of reducing our dependence on fossil fuels. If tested successfully, the hope is to dramatically reduce our use of coal. It may be some time before the supplier can deliver adequate amounts of the engineered pelletized fuel to meet facility requirements. Additionally, as long as boilers at the facility operate with solid fuels, we anticipate that coal will continue to be in the mix of fuels used. For example, if there is a slowdown or delay in delivery of the engineered pelletized fuel we could cover some of the fuel needs using coal.

Response: DAQ will add this clarification throughout the application review. However, it must be noted that the emission calculations included in the application are based on 100% replacement of coal with pellets. When discussing the emission calculations in the application, it must be made clear that UNC has not provided calculations for an intermediate period where coal is being mixed with pellets.

UNC Comment 8: The two permitted emergency generators (ES-GEN-3 and ES-GEN-28) should not be removed from the permit.

Response: These will be readded to the permit.

UNC Comment 9: Could there possibly be a bound that triggers a retest for PFAS emission testing?

Response: Not at this time. Given that there are no specific limits, and that DAQ is still gathering data regarding PFAS emissions, DAQ is not willing to include a hard number here at this time. DAQ will reserve the right to require re-testing based on any site-specific samples.

UNC Comment 10: Add the statement "Notwithstanding that the overall campus load may increase due to campus growth, which would require more fuel regardless of type" to Application Review Section 4.6 "Projected actual emission."

Response: This will not be added to the application review. This appears to be a reference to the "could have accommodated" (aka "demand growth") exclusion in 40 CFR 51.166(b)(40)(ii)(*c*). In order to claim any excludable emissions under this paragraph, an applicant must explain and calculate them. See 15A NCAC 02D .0530(u)(3).

The application does not include any such discussion of demand growth, so it cannot be included here.

UNC Comment 11: We do not want to recategorize the boiler [with regards to MACT Subpart DDDDD] and want to keep it as a coal boiler that is able to combust the engineered pelletized fuel (biomass derived fuel).

Response: The subcategory of the boilers will be determined by the actual use of fuel going forward. The application review will be updated to make this clearer.

UNC Comment 12: Natural gas combustion varies year to year due to the availability of solid fuel (whether that be coal or the new engineered pelletized fuel) and can fluctuate either higher or lower than 50% of Boilers 6 and 7's total heat input.

Response: The draft application review incorrectly states in multiple places that the fuel mix is exactly 50% coal and 50% natural gas. This will be corrected as UNC has requested.

UNC Comment 13: Throughout the permit and application review, UNC indicated typos and corrections.

Response: These issues will be corrected as needed.

9.3 Public Notice and EPA Review:

As allowed by 15A NCAC 02Q .0501(b)(2) and 02Q .0504(a), this application was submitted pursuant to 15A NCAC 02Q .0300. Pursuant to 15A NCAC 02Q .0306, no public notice is required for this draft air quality permit because it does not meet any of the specific criteria in that rule. However, as allowed by 02Q .0306(a)(1), the Director of DAQ has determined that both a public notice period and public hearing shall be held for this draft air quality permit.

Therefore, pursuant to 15A NCAC 02Q .0307(b), a notice of the draft air permit shall be made in a local newspaper (XXXXXXXXXXX). Furthermore, copies of the public notice shall be published on DAQ's website, sent to persons on the Title V mailing list, sent to US EPA (note that this is not the 45-day EPA review period), and each neighboring State. The notice will provide for a 30-day comment period (from XXXX to XXXXXX), followed by a public hearing scheduled for XXXXX and held at YYYYYYY.

Pursuant to 15A NCAC 02Q .0307(f), all documents will be kept for public review at the DAQ's Raleigh Regional Office for the entire public notice period (30 days).

10. Recommendations

This permit application has been reviewed by NC DAQ to determine compliance with all procedures and requirements. NC DAQ has determined that this facility appears to be complying with all applicable requirements.

DAQ recommends issuance of Permit No. 03069T40. RRO, SSCB, and UNC staff have received a copy of this permit and submitted comments that were incorporated as described in Section 9.

Attachment 1: Emission Calculations

The following calculations were performed by UNC and included in the application as “APPENDIX B”

A.1 Baseline Actual Emissions

Baseline Actual Emissions - Boiler 6 and Boiler 7
The University of North Carolina at Chapel Hill - Chapel Hill, NC

Baseline Actual Annual Throughput			Units
Boiler 6	Bituminous Coal	525,016	MMBtu
		21,115	tons
	Natural Gas	551,814	MMBtu
		535.0	MMscf
Boiler 7	Bituminous Coal	506,137	MMBtu
		20,452	tons
	Natural Gas	542,677	MMBtu
		526.1	MMscf

Regulated NSR Pollutant	CAS No./Code	Unit 6 Emissions Factor (Bituminous Coal)		Footnote	Unit 7 Emissions Factor (Bituminous Coal)		Footnote	Emissions Factor (Natural Gas)		Footnote	Baseline Emissions - Boiler 6 (Bituminous Coal)		Baseline Emissions - Boiler 6 (Natural Gas)		Baseline Emissions - Boiler 7 (Bituminous Coal)		Baseline Emissions - Boiler 7 (Natural Gas)		Total Baseline Emissions	
		Value	Units		Value	Units		Value	Units		lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Volatile Organic Compounds (VOC)	VOC	1.15E-02	lb/ton of coal	1	1.15E-02	lb/ton of coal	1	5.50	lb/MMscf	7	243.0	0.12	2,942	1.47	235.3	0.12	2,894	1.45	**6,314**	**3.16**
Total Particulate Matter (PM)	PM	0.61	lb/ton of coal	6	0.56	lb/ton of coal	6	7.60	lb/MMscf	6	12,776	6.39	4,066	2.03	11,500	5.75	3,998	2.00	**32,340**	**16.17**
Total Particulate Matter less than 10 microns (PM_{10})	PM_{10}	0.61	lb/ton of coal	6	0.56	lb/ton of coal	6	7.60	lb/MMscf	6	12,776	6.39	4,066	2.03	11,500	5.75	3,998	2.00	**32,340**	**16.17**
Total Particulate Matter less than 2.5 microns ($PM_{2.5}$)	$PM_{2.5}$	0.61	lb/ton of coal	6	0.56	lb/ton of coal	6	7.60	lb/MMscf	6	12,776	6.39	4,066	2.03	11,500	5.75	3,998	2.00	**32,340**	**16.17**
Filterable Particulate Matter (FPM)	FPM	0.09	lb/ton of coal	2	0.04	lb/ton of coal	2	1.90	lb/MMscf	7	1,796	0.90	1,016	0.51	865.2	0.43	999.6	0.50	**4,677**	**2.34**
Filterable Particulate Matter less than 10 microns (FPM_{10})	FPM_{10}	0.09	lb/ton of coal	3	0.04	lb/ton of coal	3	1.90	lb/MMscf	7	1,796	0.90	1,016	0.51	865.2	0.43	999.6	0.50	**4,677**	**2.34**
Filterable Particulate Matter less than 2.5 microns ($FPM_{2.5}$)	$FPM_{2.5}$	0.09	lb/ton of coal	3	0.04	lb/ton of coal	3	1.90	lb/MMscf	7	1,796	0.90	1,016	0.51	865.2	0.43	999.6	0.50	**4,677**	**2.34**
Particulate Matter Condensable (CPM)	CPM	0.52	lb/ton of coal	5	0.52	lb/yr	5	5.70	lb/MMscf	7	10,980	5.49	3,049	1.52	10,635	5.32	2,999	1.50	**27,663**	**13.83**
Sulfur Dioxide (SO_2)	SO_2	0.17	lb/MMBtu	4	0.17	lb/MMBtu	4				180,206	90.10	0.00	0.00	183,345	91.67	0.00	0.00	**363,551**	**181.8**
Nitrogen Oxides (NO_x)	NO_x	0.11	lb/MMBtu	4	0.13	lb/MMBtu	4	0.12	lb/MMBtu	4	59,589	29.79	62,631	31.32	63,267	31.63	67,835	33.92	**253,322**	**126.7**
Carbon Monoxide (CO)	CO	0.68	lb/ton of coal	2	0.68	lb/ton of coal	2	84.00	lb/MMscf	8	14,398	7.20	44,937	22.47	13,946	6.97	44,193	22.10	**117,473**	**58.74**
Sulfuric Acid (aerosol forms only)	7664939	0.52	lb/ton of coal	9	0.52	lb/yr	9				10,980	5.49	0.00	0.00	10,635	5.32	0.00	0.00	**21,614**	**10.81**
Hydrofluoric Acid	7664393	5.68E-03	lb/ton of coal	1	5.68E-03	lb/ton of coal	1				120.0	0.06	0.00	0.00	116.3	0.06	0.00	0.00	**236.3**	**0.12**
Lead	7439921	4.35E-05	lb/ton of coal	1	4.35E-05	lb/ton of coal	1	5.00E-04	lb/MMscf	7	0.92	4.59E-04	0.27	1.34E-04	0.89	4.45E-04	0.26	1.32E-04	**2.34**	**1.17E-03**
Carbon Dioxide Equivalent (CO_2e)	CO_2e	See Footnote 15									See Footnote 15				See Footnote 15				**379,515,239**	**189,758**
Carbon Dioxide	CO_2	See Footnote 13									See Footnote 13				See Footnote 13				**377,673,959**	**188,837**
Methane	CH_4	0.60	lb/ton of coal	14	0.60	lb/ton of coal	14	2.20E-03	lb/MMBtu	14	12,732	6.37	1,217	0.61	12,274	6.14	1,196	0.60	**27,419**	**13.71**
Nitrous oxide	N_2O	0.09	lb/ton of coal	14	0.09	lb/ton of coal	14	2.20E-04	lb/Mmbtu	14	1,852	0.93	121.7	0.06	1,785	0.89	119.6	0.06	**3,879**	**1.94**

Footnotes
[1] August 2009 Section 114 Compliance Testing on Boiler 6.
[2] Average emissions factor from 2021 and 2022 Boiler MACT performance test.
[3] Filterable PM_{10} and $PM_{2.5}$ set equal to Filterable PM.
[4] Average emissions rate over baseline period derived from CEMS data.
[5] AP-42 Section 1.1, Table 1.1-5
[6] Summation of filterable and condensable portions of particulate matter.
[7] AP-42 Section 1.4, Table 1.4-2
[8] AP-42 Section 1.4, Table 1.4-1
[9] Emissions of sulfuric acid conservatively estimated to equal the emissions of condensable particulate matter.
[10] August 2020 stack test performed by Convergen Energy on a Riley Traveling Grate Stoker Boiler
[11] AP-42 Section 1.6, Table 1.6-4
[12] Average NO_X emissions rate measured during the 2021 and 2022 Boiler MACT test
[13] Both Boiler 6 and Boiler 7 are outfit with a CO_2 CEMS. Total emissions shown are the average of calendar year 2021 and 2022 CO_2 emissions.
[14] 40 CFR Part 98, Table C-2 converted from kg/MMBtu via fuel specific heating value.
[15] Summation of greenhouse gas emissions converted to CO_2e via the Global Warming Potentialsfrom in Table A-1 of 40 CFR Part 98.

Greenhouse Gas	Global Warming Potential
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

[16] Calculations performed utilizing the parameters below:

Parameter	Value	Units
Boiler 6 Bituminous Coal Heating Value	12,433	Btu/lb
Boiler 7 Bituminous Coal Heating Value	12,374	Btu/lb
Natural Gas Heating Value	1,032	Btu/scf
Btu to MMBtu Conversion	1,000,000	Btu/MMBtu
Pound to Ton Conversion	2,000	lb/ton
Hours to Year Conversion	8,760	hrs/yr

A.2 Projected Actual Emissions

Projected Actual Emissions - Boiler 6 and Boiler 7
The University of North Carolina at Chapel Hill - Chapel Hill, NC

Projected Actual Annual Throughput			Units
Boiler 6	Engineered Pelletized Fuel	525,016	MMBtu
		22,827	tons
	Natural Gas	551,814	MMBtu
		535.0	MMscf
Boiler 7	Engineered Pelletized Fuel	506,137	MMBtu
		22,006	tons
	Natural Gas	542,677	MMBtu
		526.1	MMscf

Regulated NSR Pollutant	CAS No./Code	Unit 6 Emissions Factor (Engineered Pelletized Fuel)		Footnote	Unit 7 Emissions Factor (Engineered Pelletized Fuel)		Footnote	Emissions Factor (Natural Gas)		Footnote	Projected Actual Emissions - Boiler 6 (Engineered Pelletized Fuel)		Projected Actual Emissions - Boiler 6 (Natural Gas)		Projected Actual Emissions - Boiler 7 (Engineered Pelletized Fuel)		Projected Actual Emissions - Boiler 7 (Natural Gas)		Total Projected Actual Emissions	
		Value	Units		Value	Units		Value	Units		lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Volatile Organic Compounds (VOC)	VOC	1.70E-02	lb/MMBtu	13	1.70E-02	lb/MMBtu	13	5.50	lb/MMscf	7	8,925	4.46	2,942	1.47	8,604	4.30	2,894	1.45	**23,365**	**11.68**
Total Particulate Matter (PM)	PM	7.90E-03	lb/MMBtu	6	7.90E-03	lb/MMBtu	6	7.60	lb/MMscf	6	4,148	2.07	4,066	2.03	3,998	2.00	3,998	2.00	**16,210**	**8.11**
Total Particulate Matter less than 10 microns (PM_{10})	PM_{10}	7.90E-03	lb/MMBtu	6	7.90E-03	lb/MMBtu	6	7.60	lb/MMscf	6	4,148	2.07	4,066	2.03	3,998	2.00	3,998	2.00	**16,210**	**8.11**
Total Particulate Matter less than 2.5 microns ($PM_{2.5}$)	$PM_{2.5}$	7.90E-03	lb/MMBtu	6	7.90E-03	lb/MMBtu	6	7.60	lb/MMscf	6	4,148	2.07	4,066	2.03	3,998	2.00	3,998	2.00	**16,210**	**8.11**
Filterable Particulate Matter (FPM)	FPM	1.20E-03	lb/MMBtu	10	1.20E-03	lb/MMBtu	10	1.90	lb/MMscf	7	630.0	0.32	1,016	0.51	607.4	0.30	999.6	0.50	**3,253**	**1.63**
Filterable Particulate Matter less than 10 microns (FPM_{10})	FPM_{10}	1.20E-03	lb/MMBtu	3	1.20E-03	lb/MMBtu	3	1.90	lb/MMscf	7	630.0	0.32	1,016	0.51	607.4	0.30	999.6	0.50	**3,253**	**1.63**
Filterable Particulate Matter less than 2.5 microns ($FPM_{2.5}$)	$FPM_{2.5}$	1.20E-03	lb/MMBtu	3	1.20E-03	lb/MMBtu	3	1.90	lb/MMscf	7	630.0	0.32	1,016	0.51	607.4	0.30	999.6	0.50	**3,253**	**1.63**
Particulate Matter Condensable (CPM)	CPM	6.70E-03	lb/MMBtu	10	6.70E-03	lb/MMBtu	10	5.70	lb/MMscf	7	3,518	1.76	3,049	1.52	3,391	1.70	2,999	1.50	**12,957**	**6.48**
Sulfur Dioxide (SO_2)	SO_2	0.06	lb/MMBtu	10	0.06	lb/MMBtu	10				64,610	32.30	0.00	0.00	62,929	31.46	0.00	0.00	**127,539**	**63.77**
Nitrogen Oxides (NO_x)	NO_x	0.14	lb/MMBtu	12	0.18	lb/MMBtu	12	123.0	lb/MMscf	12	75,634	37.82	65,804	32.90	91,256	45.63	64,714	32.36	**297,407**	**148.7**
Carbon Monoxide (CO)	CO	0.06	lb/MMBtu	10	0.06	lb/MMBtu	10	84.00	lb/MMscf	8	30,451	15.23	44,937	22.47	29,356	14.68	44,193	22.10	**148,936**	**74.47**
Sulfuric Acid (aerosol forms only)	7664939	6.70E-03	lb/MMBtu	9	6.70E-03	lb/MMBtu	9				3,518	1.76	0.00	0.00	3,391	1.70	0.00	0.00	**6,909**	**3.45**
Hydrofluoric Acid	7664393										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
Lead	7439921	4.80E-05	lb/MMBtu	11	4.80E-05	lb/MMBtu	11	5.00E-04	lb/MMscf	7	25.20	1.26E-02	0.27	1.34E-04	24.29	1.21E-02	0.26	1.32E-04	**50.03**	**2.50E-02**
Carbon Dioxide Equivalent (CO_2e)	CO_2e	See Footnote 16									See Footnote 16				See Footnote 16				**333,772,304**	**166,886**
Carbon Dioxide	CO_2	195.0	lb/MMBtu	13	195.0	lb/MMBtu	13	117.0	lb/MMBtu	15	102,378,143	51,189	64,548,982	32,274	98,696,727	49,348	63,480,181	31,740	**329,104,034**	**164,552**
Methane	CH_4	2.10E-02	lb/MMBtu	13	2.10E-02	lb/MMBtu	13	2.20E-03	lb/MMBtu	14	11,025	5.51	1,217	0.61	10,629	5.31	1,196	0.60	**24,067**	**12.03**
Nitrous oxide	N_2O	1.30E-02	lb/MMBtu	13	1.30E-02	lb/MMBtu	13	2.20E-04	lb/Mmbtu	14	6,825	3.41	121.7	0.06	6,580	3.29	119.6	0.06	**13,646**	**6.82**

Footnotes

[1] August 2009 Section 114 Compliance Testing on Boiler 6 and Boiler 7.
[2] Average emissions factor from 2021 and 2022 Boiler MACT performance test.
[3] Filterable PM_{10} and $PM_{2.5}$ set equal to Filterable PM.
[4] Average emissions rate over baseline period derived from CEMS data.
[5] AP-42 Section 1.1, Table 1.1-5
[6] Summation of filterable and condensable portions of particulate matter.
[7] AP-42 Section 1.4, Table 1.4-2
[8] AP-42 Section 1.4, Table 1.4-1
[9] Emissions of sulfuric acid conservatively estimated to equal the emissions of condensable particulate matter.
[10] August 2020 stack test performed by Convergen Energy on a Riley Traveling Grate Stoker Boiler
[11] AP-42 Section 1.6, Table 1.6-4
[12] Representative Convergen Energy Data is unavailable for NOx. Average NO_x emissions rate measured during the 2021 and 2022 Boiler MACT test. Basis is conservative because coal was maximized during stack test. Natural gas emissions factor is equal to the baseline.

[13] AP-42 Section 1.6, Table 1.6-3
[14] 40 CFR Part 98, Table C-2 converted from kg/MMBtu via fuel specific heating value.
[15] 40 CFR Part 98, Table C-1 converted from kg/MMBtu via fuel specific heating value.
[16] Summation of greenhouse gas emissions converted to CO_2e via the Global Warming Potentials from in Table A-1 of 40 CFR Part 98.

Greenhouse Gas	Global Warming Potential
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

[17] Calculations performed utilizing the parameters below:

Parameter	Value	Units
Boiler 6 Pelletized Fuel Heating Value	11,500	Btu/lb
Boiler 7 Pelletized Fuel Heating Value	11,500	Btu/lb
Natural Gas Heating Value	1,032	Btu/scf
Btu to MMBtu Conversion	1,000,000	Btu/MMBtu
Pound to Ton Conversion	2,000	lb/ton
Hours to Year Conversion	8,760	hrs/yr

Attachment 2: EPA Letter to Greenwood Fuels LLC

The letter from EPA regarding Greenwood Fuels LLCs (subsequently renamed to Convergen)'s discussing the NHSM status for their pelletized fuel.

This letter was included in the application as "APPENDIX C"

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:
L-8J

NOV 14 2011

Mr. James S. Rickun
James S. Rickun Environmental Consulting
4933 Black Oak Drive
Madison, Wisconsin 53711-4373

Dear Mr. Rickun:

In your letter of June 11, 2011, and follow-up letter of June 22, 2011, you requested confirmation from the U.S. Environmental Protection Agency Region 5 that Greenwood Fuels LLCs' fuel pellets would not be considered a solid waste when burned in a combustion unit in accordance with the requirements in 40 C.F.R. § 241.3(b)(4). To be designated as a non-waste fuel under that section, the rule requires that processing of the non-hazardous secondary material (NHSM) meets the definition of processing in 40 C.F.R. § 241.2. Also, after processing, the NHSM must meet the legitimacy criteria in 40 C.F.R. § 241.3(d)(1) to be designated a non-waste fuel. Based on the information provided in your letter and supporting materials, we believe the 40 C.F.R. Part 241 regulations would identify the fuel pellets generated by Greenwood Fuels, LLC and burned in combustion units as a non-waste fuel.[1] The remainder of this letter provides the basis for our position. *If there is a discrepancy in the information provided to us, it could result in a different interpretation.*

Processing

Processing is defined in 40 C.F.R. § 241.2 as operations that transform discarded NHSMs into a non-waste fuel or non-waste ingredient, including operations necessary to: remove or destroy contaminants; significantly improve the fuel characteristics, e.g. sizing or drying of the material in combination with other operations; chemically improve the as-fired energy content; or

[1] Note that a non-waste determination under 40 C.F.R. Part 241 does not preempt a state's authority to regulate a non-hazardous secondary material as a solid waste. Non-hazardous secondary materials may be regulated simultaneously as a solid waste by the state, but as a non-waste fuel under 40 C.F.R. Part 241 for the purposes of determining appropriate emissions standards under the Clean Air Act for the combustion unit in which it is used.

improve the ingredient characteristics. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for purposes of the definition.

In your letters, you state that the feedstock materials accepted by Greenwood Fuels include a variety of industrial off-spec materials, misprints, excess ends, etc., from a variety of paper, packaging, non-woven, and wood working industries. As you note in your letters, the fact that no post-consumer material is used limits the contamination present in the material. These fiber and polymer-based materials are separated by type, shredded, mixed, cleared of metals, mixed and shredded again, and then densified and shaped into pellets of uniform shape and consistency. The fuel pellets are one and one-half (1 ½) to two (2) inches in size, which makes them suitable for use in existing coal-fired stoker boilers as a substitute for coal.

Based on this description---that is, pre-shredding and pre-mixing to improve the fuel characteristics, removing metal to reduce contaminants, further mixing and re-shredding the feedstock materials to improve the fuel characteristics of the finished material thereby achieving a specified BTU range, and pelletizing the finished material into a homogenous fuel product for use in coal-fired stoker boilers as a replacement for coal, we believe the definition of processing in 40 C.F.R. § 241.2 has been met.

Legitimacy Criteria

Under 40 C.F.R. § 241.3(d)(1), the legitimacy criteria for fuels includes: 1) management of the material as a valuable commodity based on the following factors – storage prior to use must not exceed reasonable time frames and management of the material must be in a manner consistent with an analogous fuel, or where there is no analogous fuel, adequately contained to prevent releases to the environment; 2) the material must have meaningful heating value and be used as a fuel in a combustion unit that recovers energy; and 3) the material must contain contaminants at levels comparable to or less than those in traditional fuels which the combustion unit is designed to burn.[2] The term contaminants is defined in 40 C.F.R. § 241.2 as constituents in the NHSM that will result in emissions of air pollutants under Clean Air Act Section 112(b) or the nine pollutants listed under Clean Air Act Section 129, including those constituents that could generate products of incomplete combustion.

Manage As A Valuable Commodity

Regarding the first legitimacy criterion, you state that the fuel pellets are stored at Greenwood's facility in either silos or bunkers, which are covered and have sidewall containment, for up to three (3) days prior to being shipped off-site. The facility has a Storm Water Pollution Prevention Plan to prevent storm water run-off. Furthermore, you indicate that the one and one-

[2] The legitimacy criteria would apply once the pelletized fuel is produced; it would not apply to the input material to the processing operation.

half (1 ½) to two (2) inch fuel pellets contain few fines, such that wind-blown dust is not an issue. You also state that the storage and transportation requirements for Greenwood's fuel pellets are almost identical to coal storage and handling. The pellets are shipped to the customer within one (1) to three (3) days of production via coal dump trailers, walking floor trailers, or rail, as is typical for coal. Combustion facilities receiving the pellets either store the pellets in dedicated storage areas or mix the pellets with coal upon their receipt at the facility. Storage locations may be inside or outside. You indicate that although the majority of pellets are consumed within twenty-four (24) hours of delivery, some customers mix the pellets with coal, and most of those customers store pellets for no more than one (1) week, which is typical for coal storage.

Based on this information, we believe the material is managed as a valuable commodity: storage does not exceed a reasonable time frame and storage in silos or bunkers is adequate to prevent releases. Also, management of the pellets by the combustion unit appears to be analogous to the management of coal that is burned as a fuel.

Meaningful Heating Value and Use As A Fuel In A Combustion Unit That Recovers Energy

Regarding the second legitimacy criterion, you state that the fuel pellets contain an average of 10,470 Btu/pound, which is derived from weekly analyses (occurring between January and May of 2011) provided by an independent, certified lab. As discussed in the final rule, 5,000 Btu/pound was established as a general guideline for meaningful heating value. In addition, coal-fired stoker boilers would recover energy from the use of this material as a non-waste fuel. Thus, the material meets this criterion.

Comparability of Contaminant Levels

Regarding the third criterion, you provided data on the average concentration of specified contaminants in Greenwood's pellets from weekly lab tests occurring between January and May of 2011, and you compared those levels to the contaminant data for coal as outlined in the materials characterization paper (MCP) "Traditional Fuels and Key Derivatives."[3,4,5] (See

[3] The Materials Characterization Paper on *Traditional Fuels and Key Derivatives* can be found at www.epa.gov/epawaste/nonhaz/define/index.htm.

[4] EPA notes that the contaminant values listed in the *Traditional Fuels and Key Derivatives* MCP for coal (and other traditional fuels) may be revised in the future based on the availability of new or additional data. Any future revisions to the values will not impact the conclusions made in this letter; the values are based upon the data that is available at the time EPA responds to a request.

[5] You may use other data on the contaminant levels in traditional fuels in determining whether the levels are comparable to Greenwood's pellets. That is, other data on the level of contaminants in traditional fuels that your company has or may become aware of may also be considered in determining whether the level of contaminants

attached Table.) Please note that only those constituents identified in the contaminant definition under § 241.2 are relevant with respect to meeting the contaminants legitimacy criterion.

As indicated in your attached Table, the fuel pellets meet the legitimacy criterion for these contaminant levels when compared to coal, the traditional fuel that the combustion unit is designed to burn.[6] This conclusion is based only on the constituents you identified in your laboratory analysis. We presume that additional contaminants are present at levels comparable to or less than those in coal, based on your knowledge of the NHSM.

Overall, based on the information provided in your letter, and given the assumptions and data limitations outlined in this letter, the fuel pellets meet both the processing definition and the legitimacy criteria outlined above. Accordingly, we would consider this NHSM a non-waste fuel under the 40 C.F.R. Part 241 regulations.

If you have any other questions, please contact Julie Gevrenov of my staff at 312-886-6832.

Sincerely,

Margaret M. Guerriero
Director
Land and Chemicals Division

Enclosure

cc: George Faison, EPA/ORCR
Ethan Chatfield, EPA R5/ARD
Stuart Hersh, EPA R5/ORC
Dan Harris, Ohio EPA

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in Greenwood's pellets are comparable to those in the traditional fuel that the combustion unit is designed to burn.

[6] The term "volatiles" is not related to the term "volatile organic compound (VOC)" and is not pertinent to the definition of "contaminants" specified in §241.2. Instead, the term "volatiles" comes from a proximate analysis of fuels, a common test performed to characterize fuels by determining percentages for moisture, volatiles, ash, and fixed carbon that add up to 100 percent. In such an analysis, a sample is weighed, burned at a specified temperature, and weighed again. The percent weight difference is called "volatiles" and includes any gases or vapors driven off at the specified temperature, a large portion of which is likely to be non-contaminants.

EPA Material Characterization Sheet, Feb. 07,2011 Component	As-received basis Units	Coal-Int'l Avg (Range)[1,2,3]	Anthracite (Lackawanna, PA)[5,6]	Bituminous (Marion, WV)[5,6,7]	Sub-bituminous (Sheridan, WY)[5,6,8]	Lignite (McLean, ND)[5,6]	GWF Pellets Avg.	Coal Bituminous Avg.[4,10]	Coal Bituminous Range[4]	Coal Sub-bituminous Avg.[4,10]	Coal Sub-bituminous Range[4]
Moisture	wt%	5.2 (1.7-17)	5.3	2.3	22.2	36.8	6.0	-	-	-	-
Volatiles	wt%	37.8 (7.9-55.4)	4.1	36.5	33.2	27.8	80.9	2.3	-	22.2	-
Ash	wt%	9.4 (2.9-17.7)	9.6	5.2	4.3	5.9	6.5	5.2	-	4.3	-
Calorific Value, HHV	Btu/lb	13,925 (11,277-15,342)						-	-	-	-
Calorific Value, LHV	Btu/lb	13,466 (10,826-14,991)	12,880	14,040	9,600	7,000	10,470	-	-	-	-
Elemental Analysis											
Carbon	%	78.3 (60.5-91.6)	79.7	78.4	53.9	40.6	6.4	-	-	-	-
Hydrogen	%	4.92 (3.5-5.83)	2.9	5.5	6.9	6.9	7.5	-	-	-	-
Oxygen	%	13.2 (2.3-33.7)	6.1	8.5	33.4	45.1	25.0	-	-	-	-
Nitrogen	%	1.41 (0.76-1.9)	0.9	1.6	1.0	0.6	0.2	1.27	0.98-1.54	0.78	0.70-0.91
Sulfur	%	1.39 (0.31-5.79)	0.8	0.8	0.5	0.9	0.1	1.97	0.58-4.36	0.77	0.21-1.84
Chemical Composition											
Chlorine	ppm	1,440 (30-7380)	-	-	-	-	601	1,240	100-3,500	140	10-398
Fluorine	ppm	160 (130-180)				-	-	66.8	5-158	52	44-65
Bromine	ppm	-				-	-				
Aluminum	ppm	8,882 (146-15,800)				-	-	-	-	-	-
Arsenic	ppm	8 (5-11)	0.5-60				0.79	4.419	0.49-17	0.913	0.4-1.7
Boron	ppm	47				-	-	-	-	-	-
Barium	ppm	290				-	-	-	-	-	-
Beryllium	ppm	-				-	0.05	1.353	0.013-4.0	0.377	0.1-0.9
Calcium	ppm	3,750 (1,800-5,700)				-	-	-	-	-	-
Cadmium	ppm	0.8 (0.6-1.0)	0.1-3.0				0.040	1.131	0.011-5.47	0.147	0.1-0.4
Cobalt	ppm	3.3 (2.0-4.5)	0.5-30.0				-	6.512	0.056-40.9	1.703	1.2-2.3
Chromium	ppm	10 (2.0-18.0)	0.5-60.0				-	15.669	2.5-121.3	5.597	1.6-11.3
Copper	ppm	20 (17-23)				-	-	-	-	-	-
Iron	ppm	4,313 (2,940-6,900)				-	-	-	-	-	-
Mercury	ppm	2	0.1-1.8				<0.01	0.101	0.02-0.75	0.058	0.04-0.07
Potassium	ppm	1,686 (140-3,610)				-	-	-	-	-	-
Magnesium	ppm	1,150 (800-1,500)				-	-	-	-	-	-
Manganese	ppm	132 (53-210)	5-300				-	25.977	7-223	10.926	3.9-25.3
Molybdenum	ppm	1.8 (1.5-2.0)				-	-	-	-	-	-
Sodium	ppm	723 (300-1,420)				-	-	-	-	-	-
Nickel	ppm	10 (3-17)	0.5-50				0.63	15.363	2.26-34	4.659	2.1-15.6
Phosphorus	ppm	245 (160-330)				-	-	161.921	0.069-1,400	213.051	151-332
Lead	ppm	14 (7.4-20)	2.0-80.0				0.36	8.398	1.34-32	1.518	0.9-2.4
Antimony	ppm	3	0.05-10				4.21	11.070	0.027-235	0.146	0.1-0.2
Selenium	ppm	2	.2-10				0.430	2.162	0.42-6.49	1.197	0.5-2.2
Silicon	ppm	18,950 (17,900-20,000)				-	-	-	-	-	-
Tin	ppm	1.2				-	-	-	-	-	-
Strontium	ppm	95				-	-	-	-	-	-
Tellurium	ppm	450				-	-	-	-	-	-
Titanium	ppm	-				-	-	-	-	-	-
Vanadium	ppm	17 (7-27)				-	-	-	-	-	-
Zinc	ppm	15 (14-15)				-	-	-	-	-	-
Notes:	1. See EPA Material Characterization Paper for description of footnotes and other general information, Feb, 2011 2. Greenwood Fuels pellet analysis data based on weekly samples/analysis, Jan., 2011 to May, 2011										