

**NORTH CAROLINA DIVISION OF
AIR QUALITY**

Air Permit Review

Permit Issue Date:

Region: Raleigh Regional Office
County: Orange
NC Facility ID: 6800043
Inspector's Name: Brian Bland
Date of Last Inspection: 04/27/2010
Compliance Code: B / Violation - emissions

Facility Data			Permit Applicability (this application only)	
Applicant (Facility's Name): University of North Carolina at Chapel Hill Facility Address: University of North Carolina at Chapel Hill 1120 Estes Drive Extension, CB# 1650 Chapel Hill, NC 27599 SIC: 8221 / Colleges And Universities, Nec NAICS: 61131 / Colleges, Universities, and Professional Schools Facility Classification: Before: Title V After: Title V Fee Classification: Before: Title V After: Title V			SIP: NSPS: NESHAP: 2D .1109 Revised PSD: PSD Avoidance: NC Toxics: 112(r): Other:	
Contact Data			Application Data	
Facility Contact	Authorized Contact	Technical Contact	Application Number: 6800043.11A Date Received: 12/28/2010 Application Type: Renewal Application Schedule: TV-Renewal Existing Permit Data Existing Permit Number: 03069/T27 Existing Permit Issue Date: 11/18/2010 Existing Permit Expiration Date: 09/30/2011	
Timothy Aucoin Regulatory Compliance Coord. (919) 962-1309 501 Cameron Ave Chapel Hill, NC 27599	Richard Mann Vice Chancellor Finance & Administration (919) 962-3798 302 South Building- CB#1000 Chapel Hill, NC 27599- 1000	Dr. Dan Elliot Env. Affairs Manager (919) 962-5718 1120 Estes Drive Extension Chapel Hill, NC 27599		
Review Engineer: Jenny Kelvington Review Engineer's Signature: _____ Date: _____			Comments / Recommendations: Issue 03069/T28 Permit Issue Date: Permit Expiration Date:	

I. Introduction and Purpose of Application

The University of North Carolina (UNC) located in Chapel Hill, N.C., is a nonprofit educational institution. The University currently operates a cogeneration facility that supplies all of the steam and some of the electrical requirements for the University and the UNC hospitals. The facility also operates numerous emergency and non-emergency generators. Application No. 6800043.11A was received December 28, 2010, at least nine months prior to the expiration date, and requests the renewal of the Title V permit.

In addition to this renewal, the permittee requested some changes to the 112(j) case-by-case MACT that was issued with T25 in February 2010. The changes will be discussed herein.

II. Changes to existing permit (0369T27) per application Nos. 6800043.11A

Page(s)	Section	Description of Change(s)
N/A	Insignificant Activities List	Remove four emergency generators (IES-Gen-7, IES-Gen-43, IES-Gen-48, and IES-Gen82); Add one 35 kW diesel-fired emergency generator (IES-Gen-7); Add two 110 HP diesel-fired fire pumps (IES-FP-2 and IES-FB-3); Add fifteen water heaters (IES-SB-1 to IES-SB17, except SB6 and SB15); Add NSPS III designation for IES-Gen-2; Add MACT ZZZZ designation for all emergency generators; Remove footnote showing when MACT ZZZZ became effective; Correct Emission Source ID Numbers for IES-Gen-24 to IES-Gen-33; Change the location name for IES-Gen-28 from Kenan Field House to Kenan Football Center; and Correct the size listing for IES-Gen-10 from 200 kW to 25 kW.
1	Permit Cover Page	Amend permit revision numbers and issuance/effective dates.
3	Emission Source Table	Change 112(j) description to 2D .1100 CASE BY CASE MACT.
5	Table Footnote	Removed the requirement to submit a permit application within 12 months of firing wood in boilers #1 and 2.
10	2.1.A.4.a	Revise carbon monoxide limit for wood-firing from 508 to 834 ppmvd, at 7% O ₂
10	2.1.A.4.b	Specify when the limit for a particular fuel applies.
11	2.1.A.4.f	Delete detailed testing requirements.
11	2.1.A.4.h	Change annual testing every 10 to 12 months to every 11 to 13 months. Requirement for testing reduction changed from compliance to less than or equal to 80% of the emission limitation.
11, 12	2.1.A.4.i.	Delete detailed requirement in Site Specific Monitoring Plan.
13	2.1.A.4.l and m	Added boiler inspection and maintenance for boilers firing natural gas and No. 2 fuel oil only.
14	2.1.A.4.r	Add fuel recordkeeping.
18	2.1.B.4.b and c.	Add boiler inspection and maintenance requirements.
21	2.1.C.4.b and c.	Add boiler inspection and maintenance requirements.
22	2.1.D.1.a.	Add the allowable particulate emission rate for processes less than 30 tons per hour.
24	2.1.E.1.a.	Add the allowable particulate emission rate for processes less than 30 tons per hour.
34, 35	2.1.I	Add 112(j) requirements for emission sources (ID Nos. ES-SB6 and ES-SB15)
36	2.2.C.1	Specify CAM for particulate emissions for Boilers #6 and #7 applies only until February 3, 2013.
41-49	3.0	Update General Conditions to the latest version 3.3.

III Permit History

UNC's permit was last renewed on October 3, 2006 as revision T19. Since that time, the permit has been modified eight times. A summary of the permit changes are listed below:

Date	Revision	Description of Change(s)
12/13/06	Modification T20	Added 3diesel-fired emergency generators (IES-GEN32, -GEN76, -GEN77); Added 1 natural gas-fired emergency generator (IES-GEN21); Removed 2 diesel-fired emergency generators (former IES-GEN32, IS-21); Corrected rating for 3 existing emergency generators (ES-EG#8, EG#11, EG#14); and Added 3 temporary NSPS NG/No. 2 fuel oil-fired boilers (ES-011, 012, 013)

Date	Revision	Description of Change(s)
4/7/08	Modification T21	Removed all Boiler MACT limitations; Added 6 emergency generators (ES-EG#17, EG#18, IES-Gen-79, IES-Gen-80, IES-Gen-81, IES-Gen-83); Relisted emergency generator (IES-Gen-82) on the insignificant activities list; Deleted diesel-fired emergency generator (IES-Gen-5); Removed 3 temporary boilers (ID Nos. ES-011, 012, and 013); and Renamed 4 building locations.
6/17/08	Modification T22	Completed the 2 nd step of significant modification for sources added with T21; and Reclassified boilers ES-004-Boiler#9 and ES-004-Boiler#10 as NSPS.
9/24/09	Modification T23	Added 2 emergency generators (ES-EG#19, ES-EG#20, IES-Gen-84); Added 1 emergency fire water pump (IES-FP-1); Replaced 1 emergency generator (IES-Gen-2); Removed 2 non-emergency generators (ES-006 and 009); Re-identified existing source ES-008 as ES-006; and Updated the associated facility-wide NAAQs modeling associated both with these changes as well as additional updated emissions limits and emission point configurations for existing permitted sources.
10/29/09	Administrative T24	Made the following corrections: -showed IES-Gen32 and -Gen82 not subject to MACT; -showed IES-Gen71, -Gen72, and ES-EG#13 subject to CI NSPS, Subpart IIII; -corrected NSPS emission limits for ES-EG#19
2/3/10	Modification T25	Added 112(j) requirements for 5 boilers; and Completed the 2 nd step of significant modification for sources added with T23.
7/1/10	Modification T26	Allowed the combustion of wood in 2 boilers (ES-001-Boiler#6; ES-002-Boiler#7)
11/18/10	Administrative T27	Amended the PSD avoidance condition regarding the combustion of wood in 2 boilers (ES-001-Boiler#6; ES-002-Boiler#7)

IV. Compliance Status

The DAQ has reviewed the compliance status of this facility. Mr. Brian Bland of the Raleigh Regional Office (RRO) inspected the facility on April 27, 2010. The facility appeared to be in compliance with all permitting requirements at the time of inspection. However, during the past five years the facility has received three notices of violation (NOVs) including two received last year as detailed below:

11/23/10: NOV letter sent for late report. UNC responded 12/14/10 and the violation was resolved.

02/26/10 : NOV/NRE letter sent for non-compliance with the 30-day rolling average SO2 limit for boiler ES-001-Boiler#6 during the 31 day period from 10/10/09 through 11/9/09. The facility responded on 3/8/10. UNC was assessed a fine on 4/22/10 for the violation.

08/15/07: NOV letter sent for late report. UNC responded and the violation was resolved.

V. Stack Testing History

Since the permit was last renewed, UNC has conducted the following stack test:

Date	Emission Source	Fuel Fired	Pollutant	Test Result(s)
1/20/10	No. 2 fuel oil-fired, compression ignition, generator (2,000 kW; ID No. ES-006)	No. 2 fuel oil	CO	4.5 ppm @ 15% O ₂ 94% reduction
1/20/10	No. 2 fuel oil-fired, compression ignition, generator (2,000 kW; ID No. ES-007)	No. 2 fuel oil	CO	12.2 ppm @ 15% O ₂ 86% reduction
8/10/09	Coal/natural gas/No. 2 fuel oil/wood/torried wood -fired, circulating fluidized combustion	Coal	CO	0.0341 lb/MMBtu
			PM _{2.5}	0.0921lb/MMBtu

Date	Emission Source	Fuel Fired	Pollutant	Test Result(s)
	boiler, (323.17 million Btu per hour heat input capacity; ID No. ES-001-Boiler#6)		HCl	0.0128 lb/MMBtu
7/15/08	Natural gas/No. 2 fuel oil-fired boiler (249 million Btu per hour heat input capacity; ID No. ES-004-Boiler#9)	Natural gas	NOx	0.06 lb/MMBtu
7/16/08	Natural gas/No. 2 fuel oil-fired boiler (249 million Btu per hour heat input capacity; ID No. ES-005-Boiler#10)	Natural gas	NOx	0.06 lb/MMBtu
8/8/07	No. 2 fuel oil-fired, compression ignition, generator (2,000 kW; ID No. ES-006)	No. 2 fuel oil	CO	3.8 ppm @ 15% O ₂ 98.7% reduction
8/8/07	No. 2 fuel oil-fired, compression ignition, generator (2,000 kW; ID No. ES-007)	No. 2 fuel oil	CO	5.3 ppm @ 15% O ₂ 98.8% reduction

VI. Ambient Modeling History

Due to the numerous combustion sources at the UNC campus, DAQ has required UNC to demonstrate campus-wide sulfur dioxide and nitrogen dioxide ambient levels are in compliance with National Ambient Air Quality Standards (NAAQS) prior to adding any non-emergency combustion sources to their permit. The primary sulfur dioxide and nitrogen dioxide emission sources at the University are the boilers located at the Cogeneration Facility near the intersection of Merritt Mill Road and West Cameron Avenue and the boilers at the Manning Drive Steam Plant. Other combustion sources are emergency and non-emergency generators.

UNC last demonstrated compliance with NAAQS in June 2008 during permit modification T22. The modeling was based on the revised DAQ modeling policy using the AERMOD analysis. Potential NOx and SO₂ emissions from all on-site sources, including Boiler Nos. 6, 7, & 8, the three 2,000 kW generators at the Cogeneration Facility; Boiler Nos. 9 & 10 and the 2,000 kW generator at the Manning Drive Steam Plant; the three former temporary boilers near the Manning Drive plant; and previously permitted on-campus emergency generators, were evaluated for the compliance demonstration. The modeling reflected the replaced, removed and new emissions units as well as regulatory emissions reductions not previously taken into account. Mr. Jerry Freeman, Meteorologist, DAQ Air Quality Air Analysis Branch, reviewed the modeling analysis and summarized the compliance demonstration as follows:

UNC used AERMOD with full terrain and normal regulatory defaults...Appropriate receptors, background, and off-site sources were again used. Although five years of DAQ-processed meteorology (from Raleigh/Greensboro, '88-'92) were utilized, the meteorology wasn't the latest available from NCDAQ. I reran one year of the NOx modeling using the latest meteorology and obtained a 10% increase in impact. This being the case, the increase in impacts caused from updated meteorology, would not jeopardize NAAQS, and in my judgment does not warrant requiring a full remodeling. I notified the facility's modeling representative about this issue, and advised them to correct this for future submissions.

The impacts for short-term SO₂ are actually smaller than in the 2008 modeling. This was because the replaced generator (EG2) was close to the maximum impact receptor, while all the other new sources were far away on the vast premises. Further, the SO₂ emission rate of the upgraded EG2 was much smaller than its predecessor, due to a fuel type restriction.

The Maximum impacts occurred on the property lines and reached the percentages of the NAAQS shown in the table below....

Pollutant	Background (ug/m ³)	Modeled Impact plus Background (ug/m ³)	Percent of NAAQS
SO ₂ annual	5	21.9	27
SO ₂ 24hr	16	196.3	54
SO ₂ 3hr	34	505.6	39
NOx	21	81.9	82

Compliance with NAAQS for SO₂ and NO_x is demonstrated.

VII. Regulatory Review

- A. **Two coal/natural gas/No. 2 fuel oil/wood (non-CISWI)/torrified wood (non-CISWI)-fired, circulating fluidized combustion boilers (323.17 million Btu per hour heat input capacity each, ID Nos. ES-001-Boiler #6 and ES-002-Boiler #7, NSPS-Subpart Db) with associated bagfilters (ID Nos. CD-004 and 005)**

1. **15A NCAC 2D .0503: PARTICULATE EMISSIONS FROM FUEL BURNING INDIRECT HEAT EXCHANGERS**

Emissions of particulate matter shall not exceed an allowable emission rate as calculated by the following equation:

$$E_c = [(0.276)(Q_w) + (0.174)(Q_o)]/Q_t$$

Where;

E_c = emission limit for combined firing (pound per mmBtu);

Q_w = actual wood heat input (including torrified wood);

Q_o = actual heat input other than wood heat input; and

Q_t = Q_w + Q_o

Compliance with NSPS, Subpart Db assures compliance. Compliance for natural gas combustion is expected as natural gas is inherently low in particulate emissions.

2. **15A NCAC 2D .0524: NSPS 40 CFR PART 60 SUBPART Db**

Particulate emissions shall not exceed:

- **0.051 pounds per million Btu heat input** when firing of coal alone or in combination with other fuels
- **0.10 pounds per million Btu heat input** when firing wood alone or in combination with No. 2 fuel oil and/or natural gas

Compliance with the particulate limit is achieved through the use of the bagfilters coupled with the monitoring of opacity. During the stack testing of Boiler #6 while firing coal on 8/10/09, particulate emissions were measured at 0.00846 lb/MMBtu and in compliance with the NSPS limit.

Sulfur Dioxide emissions from the firing of coal and fuel oil, alone or in combination with wood shall not exceed **0.2 pounds per million Btu heat input** or ten percent of the potential sulfur dioxide emission rate (ninety percent reduction) and shall not contain sulfur dioxide in excess of the rate calculated by the following formula:

$$E_s = \frac{(K_a H_a + K_b H_b)}{(H_a + H_b)}$$

E_s = sulfur dioxide emission limit (lbs/million Btu heat input)

K_a = 1.20 lbs/million Btu heat input

K_b = 0.80 lbs/million Btu heat input

H_a = heat input from the combustion of coal in million Btu

H_b = heat input from the combustion of oil in million Btu

Continuous SO₂ monitors have demonstrated compliance for both boilers except for one 31-day period from October 10, 2009 to November 9, 2009 for Boiler #6. Since that time, continuous compliance has been achieved. Continued compliance is expected.

Nitrogen Dioxide emissions shall not exceed:

- **0.60 pounds per million Btu heat input** when firing of coal in boilers with a low heat release rate

- **0.10 pounds per million Btu heat input** when firing natural gas or No. 2 fuel oil in boilers with a low heat release rate, or
- the limit determined by the formula listed in 40 CFR 60.44b (b).

Continuous NO₂ monitors have consistently demonstrated compliance for both boilers. Continued compliance is expected.

Visible emissions shall not be greater than 20 percent opacity (six-minute average), except for one six-minute period per hour of not more than 27 percent opacity, when firing coal, No. 2 fuel oil, and/or natural gas. A continuous opacity monitor for each affected

Continuous opacity monitors have consistently demonstrated compliance for both boilers. Continued compliance is expected.

The most recent CEM reports shows the facility is in compliance with applicable NO_x, SO₂, and opacity emission standards set forth in 40 CFR Part 60 Subpart Db, the general provisions of 40 CFR 60.11(d), 40CFR 60.13 and NC CEM Enforcement Plan.

3. 15A NCAC 2D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES
Sulfur dioxide emissions shall not exceed **2.3 pounds per million Btu heat input**.

Compliance with NSPS, Subpart Db assures compliance. Compliance for natural gas combustion is expected as natural gas is inherently low in SO₂ emissions.

4. 15A NCAC 2D .1109: CAA § 112(j); Case-by-Case MACT for Boilers & Process Heaters

Emissions of the following regulated pollutants shall not exceed the emissions limits listed below for the affected boilers (**ID Nos. ES-001-Boiler #6 and ES-002-Boiler #7**):

- i. From coal firing:
 - (A) Filterable PM: 0.08 lbs/MMBtu
 - (B) Mercury (Hg): 3.0e-06 lbs/MMBtu
 - (C) Hydrogen Chloride-equivalent (HCl): 435.5 lbs/hr
 - (D) Carbon Monoxide (CO): 133 ppmvd, corrected to 7% oxygen
- ii. From No. 2 fuel oil firing:
 - (A) Filterable PM: 0.014 lbs/MMBtu
 - (B) Mercury (Hg): 3.0e-06 lbs/MMBtu
 - (C) Carbon Monoxide (CO): 30 ppmvd, corrected to 7% oxygen
- iii. From natural gas firing:
 - (A) Carbon Monoxide (CO): 66 ppmvd, corrected to 7% oxygen
- iv. From wood/torried wood firing:
 - (A) Filterable PM: 0.39 lbs/MMBtu
 - (B) Mercury (Hg): 5.0e-06 lbs/MMBtu
 - (C) Hydrogen Chloride-equivalent (HCl): 435.5 lbs/hr
 - (D) Carbon Monoxide (CO): 834 ppmvd, corrected to 7% oxygen

Several changes have been made to this permit condition for consistency with other permitted coal/wood-fired boilers. The CO limit for wood-firing for boilers with heat inputs greater than 100 MMBtu/hr has increased from 508 ppm to 834 ppm. The 834 ppm is the upper 90% confidence level for stack test data from the five least CO emitting wood-fired boilers in NC.

The initial compliance date for these emission limitations and associated monitoring, recordkeeping, and reporting requirements is February 3, 2013. Compliance is expected and will be evaluated after that date.

**5. 15A NCAC 02Q. 0317: AVOIDANCE CONDITION for
15A NCAC 02D .0530: PREVENTION OF SIGNIFICANT DETERIORATION
THIS CONDITION IS NOT SHIELDED PURSUANT TO 15A NCAC 02Q .0512(a).**

Upon firing wood and/or terrified wood in either boiler, NO_x emissions from the two boilers combined are limited to less than 599.1 tons per consecutive 12-month period. Compliance is expected.

6. 15A NCAC 2Q .0501 (c)(2)

The permit currently lists wood-firing in emission sources (**ID Nos. ES-001 and 002**) as a 15A NCAC 2Q .0501(c)(2) modification and requires UNC to file a Title V Air Quality Permit Application on or before 12 months after commencing operation in accordance with General Condition NN.1. As such for wood-firing, the permit shield described in General Condition R does not apply and the compliance certification as described in General Condition P is not required for these sources. On February 23, 2011, Mr. Timothy Aucoin, UNC Regulatory Compliance Coordinator requested that the second step of the significant modification be included with this permit renewal. Since the renewal process requires public notice, DAQ will incorporate the second step of the permit modification at this time. Following renewal, wood-firing in these boilers will be under the permit shield and the compliance certification.

B. One natural gas/No. 2 fuel oil-fired boiler (338 million Btu per hour heat input capacity, ID No. ES-003 Boiler #8, NSPS-Subpart Db)

1. 15A NCAC 2D .0503: PARTICULATE EMISSIONS FROM FUEL BURNING INDIRECT HEAT EXCHANGERS - NATURAL GAS OR NO. 2 FUEL OIL FIRING

Particulate emissions shall not exceed **0.174 pounds per million Btu heat input**.

Compliance for No. 2 fuel oil combustion is demonstrated with NSPS, Subpart Db compliance. Compliance for natural gas combustion is expected as natural gas is inherently low in particulate emissions.

**2. 15A NCAC 2D .0524: NSPS 40 CFR PART 60 SUBPART Db - WHEN FIRING NO. 2 FUEL OIL
Emission Limitations**

- **Sulfur Dioxide** - The maximum sulfur content of No. 2 fuel oil fired shall not exceed **0.5 sulfur percent by weight**.
- **Nitrogen Dioxide** - The maximum nitrogen dioxide emissions when firing natural gas or No. 2 fuel oil shall not exceed **0.20 pounds per million Btu heat input** during a high heat release rate.
- **Opacity** – Visible emissions are limited to **20 percent opacity** (six-minute average), except for one six-minute period per hour of not more than 27 percent opacity.

UNC limits the maximum sulfur content of No. 2 fuel oil to 0.5 percent and has consistently demonstrated compliance with the NO₂ and opacity limitations through continuous emission monitoring systems. Continue compliance is expected.

3. 15A NCAC 2D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES

Sulfur dioxide emissions shall not exceed **2.3 pounds per million Btu heat input**.

Compliance with NSPS, Subpart Db assures compliance. Compliance for natural gas combustion is expected as natural gas is inherently low in SO₂ emissions.

4. 15A NCAC 2D .1109: CAA § 112(j); Case-by-Case MACT for Boilers & Process Heaters

Emissions of the following regulated pollutants shall not exceed the emissions limits listed below for the affected boiler (**ID No. ES-003-Boiler #8**):

- i. From No. 2 fuel oil firing:
 - (A) Filterable PM: 0.014 lbs/MMBtu
 - (B) Mercury (Hg): 3.0e-06 lbs/MMBtu
 - (C) Carbon Monoxide (CO): 30 ppmvd, corrected to 7% oxygen
- ii. From natural gas firing:
 - (A) Carbon Monoxide (CO): 66 ppmvd, corrected to 7% oxygen

For consistency with other No. 2 fuel oil/natural gas-fired boilers permitted in NC, boiler inspection and maintenance requirements have been added. **The initial compliance date for these emission limitations and associated monitoring, recordkeeping, and reporting requirements is February 3, 2013.** Compliance is expected and will be evaluated after that date.

C. Two natural gas/No. 2 fuel oil-fired boilers (249 million Btu per hour heat input capacity each, ID Nos. ES-004-Boiler#9 and ES-005-Boiler#10, NSPS-Subpart Db) located at the Manning Drive Steam Plant

Boiler #9 and Boiler #10 were placed into operation on March 25, 2008 and March 19, 2008, respectively. UNC submitted the notification of startup in a letter dated March 31, 2008.

1. 15A NCAC 2D .0503: PARTICULATE EMISSIONS FROM FUEL BURNING INDIRECT HEAT EXCHANGERS - NATURAL GAS OR NO. 2 FUEL OIL FIRING

Particulate emissions shall not exceed **0.164 pounds per million Btu heat input.**

Compliance for No. 2 fuel oil combustion is demonstrated with NSPS, Subpart Db compliance. Compliance for natural gas combustion is expected as natural gas is inherently low in particulate emissions.

2. 15A NCAC 2D .0524: NSPS 40 CFR PART 60 SUBPART Db - WHEN FIRING NO. 2 FUEL OIL (For boilers installed after February 28, 2005)

Emission Limitations

- **Sulfur Dioxide** - The maximum sulfur content of No. 2 fuel oil fired shall not exceed **0.3 sulfur percent by weight.**
- **Nitrogen Dioxide** - The maximum nitrogen dioxide emissions when firing natural gas or No. 2 fuel oil shall not exceed **0.20 pounds per million Btu heat input** during a high heat release rate.
- **Opacity** – Visible emissions are limited to **20 percent opacity** (six-minute average), except for one six-minute period per hour of not more than 27 percent opacity.

UNC limits the maximum sulfur content of No. 2 fuel oil to 0.3 percent and has consistently demonstrated compliance with the NO₂ and opacity limitations through continuous emission monitoring systems. During the most recent inspection, the following instantaneous readings were observed for Boiler #9: (Boiler #10 was not operating at the time of the inspection.)

- NO_x: 0.039 lb/MMBtu for 10 second average
- Opacity: 3.1% for 6 minute average

UNC has reported visible emissions from Boiler #9 in excess of the opacity limitation occurring on 7/7/09 (due to manufacturer tuning fuel oil burner management system) and 2/24/10 (due to a malfunction of the fuel oil control valve during startup) In response, UNC adjusted the air flow curve and replaced the faulty valve. Compliance is expected.

3. 15A NCAC 2D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES -When firing Natural Gas-

Sulfur dioxide emissions shall not exceed **2.3 pounds per million Btu heat input.**

Compliance for natural gas combustion is expected as natural gas is inherently low in SO₂ emissions.

4. 15A NCAC 2D .1109: CAA § 112(j); Case-by-Case MACT for Boilers & Process Heaters

Emissions of the following regulated pollutants shall not exceed the emissions limits listed below for the affected boilers (**ID Nos. ES-004-Boiler#9 and ES-005-Boiler#10**):

- i. From No. 2 fuel oil firing:
 - (A) Filterable PM: 0.014 lbs/MMBtu
 - (B) Mercury (Hg): 3.0e-06 lbs/MMBtu
 - (C) Carbon Monoxide (CO): 30 ppmvd, corrected to 7% oxygen
- ii. From natural gas firing:

(A) Carbon Monoxide (CO): 66 ppmvd, corrected to 7% oxygen

For consistency with other No. 2 fuel oil/natural gas-fired boilers permitted in NC, boiler inspection and maintenance requirements have been added. **The initial compliance date for these emission limitations and associated monitoring, recordkeeping, and reporting requirements is February 3, 2013.** Compliance is expected and will be evaluated after that date.

D. One coal handling, conveying, crushing, and storage system [NSPS] consisting of:

- * **Three enclosed railcar dump pits (ID Nos. ES-010.1, 010.2, & 010.3) with associated wet dust suppression systems (100 gallons per minute water injection rate in each hopper, ID No. CD-018),**
- * **One coal silo (ID No. ES-1) with associated bagfilter (533 square feet of filter surface area, ID No. CD-011),**
- * **One coal silo (ID No. ES-2) with associated bagfilter (533 square feet of filter surface area, ID No. CD-012),**
- * **One coal crusher building (ID No. ES-010A) with associated bagfilter (1330 square feet of filter surface area, ID No. CD-013), and**
- * **Five silo feed conveyors (ID Nos. ES-3.1, 3.2, 3.3, 3.4, & 3.5) with associated bagfilter (1598 square feet of filter surface area, ID No. CD-019)**

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

Emissions of particulate matter from the coal handling, conveying, crushing, and storage system shall not exceed an allowable emission rate as calculated by the following equation:

$$E = 4.10 \times P^{0.67} \quad P < 30 \text{ tpy}$$

$$E = 55.0 \times P^{0.11} - 40 \quad P \geq 30 \text{ tpy}$$

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

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

Bagfilters (ID Nos. CD-011, 012, 013 and 019) are designed to capture 99.8% of the particulate emissions from the handling of coal. The most recent emissions inventory demonstrates compliance for the sources these bagfilters control.

Emission Source	Average 2009 Process Rate (tph)	Allowable Particulate Emission Rate (lb/hr)	Average 2009 Particulate Emission Rate (lb/hr)
Coal silo ES-1	201	58.6	0.04
Coal silo ES-2			
Coal crusher building ES-010A	12.0	21.7	0.17
Silo feed conveyors ES-3	12.0	21.7	0.002

Because the average process rates for emission sources (ES-010A and ES-3) are below 30 tph, the allowable particulate emission rate for these smaller processes has been added to this permit condition.

Wet dust suppression systems control particulate emissions from the three enclosed railcar dump pits when dry coal is handled. In 2009, the dump rate averaged 187 tph during operation and emissions were estimated at 0.04 lb/hr. Allowable emissions at this process rate are 57.8 lb/hr. Compliance is indicated.

2. 15A NCAC 2D .0524: 40 CFR PART 60, SUBPART Y - CONTROL OF VISIBLE EMISSIONS

Visible emissions from the coal handling, conveying, crushing, and storage system shall not be more than **20 percent opacity** when in operation. Wet suppression is used to keep VE below the opacity limit when coal is

dumped from railcars. Bagfilters are used to ensure compliance for all other coal handling sources. Compliance is expected as 2009 hourly particulate emissions were very low.

E. One ash handling, storage, and loading system consisting of:

- * **One ash storage silo equipped with dry loadout system (ID No. ES-030) and associated bagfilter (ID No. CD-031)**
- * **One wet loadout system (ID No. ES-030A) with water injection system (ID No. CD-032)**

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

Emissions of particulate matter from the coal handling, conveying, crushing, and storage system shall not exceed an allowable emission rate as calculated by the following equation:

$$E = 4.10 \times P^{0.67} \quad P < 30 \text{ tpy}$$

$$E = 55.0 \times P^{0.11} - 40 \quad P \geq 30 \text{ tpy}$$

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

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

Bagfilter (ID No. CD-031) is designed to capture 99.8% of the particulate emissions from the handling of ash. The most recent emissions inventory demonstrates compliance for the ash storage silo:

Emission Source	Average 2009 Process Rate (tph)	Allowable Particulate Emission Rate (lb/hr)	Average 2009 Particulate Emission Rate (lb/hr)
Ash silo ES-030	7.03	15.1	0.95

A water injection system controls particulate emissions from the wet loadout system. No process or emission data is provided for this source in the 2009 emissions inventory. Compliance is expected.

Because the average process rate for emission source (ES-030) is below 30 tph, the allowable particulate emission rate for these smaller processes has been added to this permit condition.

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

Visible emissions from the ash handling, conveying, crushing, and storage system shall not be more than **20 percent opacity** when in operation. All visible observations have indicated compliance. Continued compliance is expected.

F. Four No. 2 fuel oil storage tanks (two with 500,000 gallon capacity each, ID Nos. ES-T-001 & T-002, and two with 184,200 gallon capacity each, ID Nos. ES-T-003 & T-004)

No applicable requirements.

G. Diesel-fired emergency generators located in various buildings

ID Number	Source Description	Size of Generator (Maximum Output)	Location
ES-EG#1	Diesel-fired	900 kW	EPA Building
ES-EG#2	Diesel-fired	1600 kW	Thurston Bowles Building
ES-EG#3	Diesel-fired	728 kW	Lineberger Cancer Research Building
ES-EG#4	Diesel-fired	1000 kW	Taylor Hall
ES-EG#5	Diesel-fired	910 kW	Neuroscience Research Building

ID Number	Source Description	Size of Generator (Maximum Output)	Location
ES-EG#6	Diesel-fired	1500 kW	Medical Biomolecular Research Building
ES-EG#7*	Diesel-fired	1250 kW	Michael Hooker Research Center
ES-EG#8*	Diesel-fired	800 kW	Chapman Hall
ES-EG#9*	Diesel-fired	1000 kW	Caudill Labs
ES-EG#10*	Diesel-fired	800 kW	Bondurant Hall
ES-EG#11*	Diesel-fired	1750 kW	Burnett-Womack Building
ES-EG#12*	Diesel-fired	1250 kW	Mary Ellen Jones Building
ES-EG#13* NSPS	Diesel-fired	2000 kW	Genetic Medicine Building
ES-EG#14*	Diesel-fired	900 kW	440 West Franklin Building
ES-EG#15*	Diesel-fired	2000 kW	Rams Head Center
ES-EG#16*	Diesel-fired	2000 kW	ITS Building
ES-EG#17* NSPS	Diesel-fired	1000 kW	Brinkhous-Bullitt Building
ES-EG#18* NSPS	Diesel-fired	1000 kW	Venable Hall
ES-EG#19* NSPS	Diesel-fired	2500 kW	Imaging Research Building
ES-EG#20* NSPS	Diesel-fired	2000 kW	Genomic Science Building

* Classified as “new” emergency generators in R.I.C.E. MACT, in accordance with 40 CFR Part 63, Subpart ZZZZ

1. 15A NCAC 2D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES
Sulfur dioxide emissions shall not exceed **2.3 pounds per million Btu heat input**.

Compliance is expected as diesel fuel combustion is inherently low in SO₂ emissions.

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

Visible emissions from these emergency generators shall not be more than **20 percent opacity** each when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

Compliance is expected as diesel fuel combustion is inherently low in visible emissions.

3. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart ZZZZ “National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ applies to emergency generators (ES-EG#7 through ES-EG#20). Since each of these generators is used for emergency purposes only, only the initial notification and recordkeeping requirements for the RICE MACT apply. The initial notification for ES-EG#17 was received February 16, 2009 for the December 1, 2008 start-up. ES-EG#18 was under construction at the time of the last facility inspection. Compliance is expected.

4. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart ZZZZ “National Emission Standards for Hazardous Air Pollutants for “Existing” Emergency Stationary Reciprocating Internal Combustion Engines

The six existing RICE units (ES-EG#1 through ES-EG#6) were onsite prior to December 19, 2002 and as such, do not have meet the requirements of 40 CFR Part 63, Subpart ZZZZ or the General Provision located in 40 CFR Part 63, Subpart A. The applicability determination for exclusion of these emergency generators from the requirements of 40 CFR Part 63, Subpart ZZZZ and Subpart A of this part, shall be maintained on site for a period of 5 years after the determination, or until the source changes its operations to become an affected source, whichever comes first. Facility inspections show UNC complies with the recordkeeping requirements. Continued compliance is expected.

H. Two No. 2 fuel oil-fired, compression ignition, non-emergency generators

ID Number	Source Description	Size of Generator	Location
ES-006 - MACT	No. 2 fuel oil	2000 kW maximum output	Cogeneration Facility
ES-007- MACT	No. 2 fuel oil	2000 kW maximum output	Cogeneration Facility

The following table provides a summary of limits and standards for the emission source(s) described above:

Regulated Pollutant	Limits/Standards	Applicable Regulation
Sulfur dioxide	2.3 pounds per million Btu heat input	15A NCAC 2D .0516
Visible emissions	20 percent opacity each	15A NCAC 2D .0521
Hazardous air pollutants	Work practice standards, emission limits, performance testing	15A NCAC 2D .1111 40 CFR Part 63, Subpart ZZZZ

1. 15A NCAC 2D .0516: SULFUR DIOXIDE EMISSIONS FROM COMBUSTION SOURCES
Sulfur dioxide emissions shall not exceed **2.3 pounds per million Btu heat input**.

Compliance is expected as diesel fuel combustion is inherently low in SO₂ emissions.

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

Visible emissions from these emergency generators shall not be more than **20 percent opacity** each when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

Compliance is expected as diesel fuel combustion is inherently low in visible emissions.

3. 15A NCAC 2D .1111, 40 CFR Part 63, Subpart ZZZZ “National Emission Standards for Hazardous Air Pollutants for “New” Non-emergency, Compression Ignition, Stationary Reciprocating Internal Combustion Engines

Carbon monoxide emissions shall be reduced by 70% or more at 100% load +/- 10%; or formaldehyde emissions shall be limited to 580 parts per billion by volume (ppbv) or less @ 15% O₂ in the RICE exhaust.

UNC is also required to maintain the oxidation catalyst so that the pressure drop across the catalyst does not change by more than 2 inches H₂O at 100% load +/- 10% from the pressure drop across the catalyst that was measured during the initial performance test; and maintain the catalyst inlet temperature between 450 and 1350 degrees Fahrenheit. The generator startup date was February 26, 2007 and the initial performance test was completed August 8, 2007. The pressure differentials in the initial performance tests were 7.8 inches H₂O and 7.4 inches H₂O for the ES-006 and the ES-007 catalysts, respectively.

The two No. 2 fuel oil-fired, compression ignition, non-emergency generators (ID Nos. ES-006 and ES-007) were last tested on January 10, 2010. The generators have a maximum output of 2,000 kilowatts (kW), an 8-hour output of 1,825 kW, and a long term output of 1,600 kW. During the most recent stack test, ES-006 was operating at 1,712 kW which is 86% of the maximum permitted operating load and ES-007 was operating at 1,697 kW which is 85% of the maximum permitted operating load. The test results indicate compliance with the minimum CO removal efficiency requirement of 70% during the testing period. Additionally, the catalysts were operating in the proper temperature range with pressure differentials were less than 2 inches H₂O different from the initial performance test. Continued compliance is expected. The test results for CO and the operating parameters associated with the oxidation catalyst are summarized in the tables given below.

Source	Catalyst Inlet Temperature	Catalyst Pressure Differential	Ave. Inlet CO ppmvd @ 15% O ₂	Ave. Outlet CO ppmvd @ 15% O ₂	Removal Efficiency
ES-006	823 °F	7.9 in. H ₂ O	82	4.5	94%
ES-007	830 °F	8.5 in. H ₂ O	87	12.2	86 %

I. One natural gas-fired boiler (2.52 million Btu per hour heat input capacity, ID No. ES-SB-6) and One natural gas-fired water heater (0.95 million Btu per hour heat input capacity, ID No. ES-SB-15)

1. 15A NCAC 2D .1109: CAA § 112(j); Case-by-Case MACT for Boilers & Process Heaters

The existing boiler and heater are affected sources which were previously considered insignificant activities under 15A NCAC 2Q .0503(8) with criteria pollutant emissions less than 5 tpy and HAP emissions less than 1000 lbs/year. Because they will be subject to the Boiler MACT beginning February 3, 2013, the initial permit compliance date, the small boiler and water heater have been added to the list of permitted sources. NC DAQ has determined that major HAP facilities with small natural-gas fired boilers and heaters must follow 112 (j) work practices which consist of:

- Inspecting the burner, and cleaning or replacing any components of the burner as necessary,
- Inspecting the flame pattern and making any adjustments to the burner necessary to optimize the flame pattern consistent with the manufacturer's specifications, and
- Inspecting the system controlling the air-to-fuel ratio, and ensuring that it is correctly calibrated and functioning properly,

The Permittee shall conduct at least one tune-up per calendar year to demonstrate compliance with this requirement. Compliance is expected and will be evaluated after the initial compliance date.

J. Multiple Emission Sources

1. 15A NCAC 2D .0501(e): COMPLIANCE WITH EMISSION CONTROL STANDARDS

In order to ensure that the twenty-four hour SO₂ National Ambient Air Quality Standard (NAAQS) is not exceeded, boilers (ID Nos. ES-001-Boiler #6 and ES-002-Boiler #7) are required to monitor and keep records of SO₂ emissions using a 24-hour block average **when firing coal**.

The following table provides a summary of limits and standards for the emission source(s) described above:

Regulated Pollutant	Limits/Standards	Applicable Regulation
Sulfur dioxide	1.2 lbs/million Btu heat input per 24-hour block average	15A NCAC 2D .0501(e) 40 CFR Part 60, Subpart Db, 60.42b (a)

2. 15A NCAC 2D .0614: COMPLIANCE ASSURANCE MONITORING (CAM) for Sulfur Dioxide

NSPS, Subpart Db, 40 CFR §60.42b(a), amended 2/27/06, requires that a Continuous Emissions Monitoring System (CEMs) be installed to monitor the SO₂ emissions from boilers, ID Nos. ES-001-Boiler #6 and ES-002-Boiler #7. This monitoring system satisfies the requirements of CAM in accordance with 40 CFR Part 64, §64.3(d)(1).

3. 15A NCAC 2D .0614: COMPLIANCE ASSURANCE MONITORING (CAM) for Particulate

Particulate emissions from the two coal/natural gas/No. 2 fuel oil/wood/torried wood-fired, circulating fluidized combustion boilers, 323.17 million Btu per hour heat input each, ID Nos. ES-001-Boiler #6 and ES-002-Boiler #7, are subject to CAM. The key elements of the monitoring approach for particulate matter, including parameters to be monitored, parameter ranges and performance criteria are presented in the following table:

1	
I. Indicator	Visible emissions
Measurement Approach	Visible emissions from the fabric filter will be monitored continuously using COM system on each boiler

1	
II. Indicator Range	An excursion is defined as visible emissions in amounts greater than or equal to 15%. Excursions trigger an inspection, corrective action, and a reporting requirement.
QIP Threshold	The QIP threshold is six excursions in a 6-month reporting period.
III. Performance Criteria	
A. Data Representativeness	Measurements are being made at the emission point (fabric filter outlet) of each boiler
B. Verification of Operational Status	DAHS
C. QA/QC Practices	The COM systems shall be calibrated, maintained and operated according to 40 CFR 60, Appendix B, PS1. Data is collected continuously with COM systems.
D. Monitoring Frequency	
Data Collection Procedures	Data from the COM system is collected electronically and maintained on the Data Acquisition and Handling System computer along with information on the operating status of the boilers.
Averaging Periods	6-minutes

UNC provides monitoring reports every six months and has consistently complied with the CAM requirements. Continued compliance is expected.

Beginning February 3, 2013, particulate emissions from boilers #6 and #7 (ID No. ES-001 and ES-002) are subject to 15A NCAC 2D .1109: CAA § 112(j); “Case-by-Case MACT for Boilers & Process Heaters” and no longer subject to CAM.

4. 15A NCAC 2D .0524: NSPS, STANDARDS OF PERFORMANCE FOR STATIONARY COMPRESSION IGNITION INTERNAL COMBUSTION ENGINES [40 CFR 60 SUBPART III], (For units manufactured after April 1, 2006)

ID Number	Source Description	Size of Generator	Location
ES-EG#13 * NSPS	Diesel-fired	2000 kW maximum output	Genetic Medicine Building
ES-EG#17 * NSPS	Diesel-fired	1000 kW maximum output	Brinkhous-Bullitt Building
ES-EG#18 * NSPS	Diesel-fired	1000 kW maximum output	Venable Hall
ES-EG#19 * NSPS	Diesel-fired	2500 kW maximum output	Imaging Research Building
ES-EG#20 * NSPS	Diesel-fired	2000 kW maximum output	Genomic Science Building

Exhaust emission standards for 1000 to 2000 kW diesel-fired emergency generators: (ES-EG#13, #17, #18, and #20)

NMHC and NO_x (combined): 6.4 g/kW-hr

CO: 3.5 g/kW-hr

PM: 0.20 g/kW-hr

Exhaust emission standards for 2500 kW diesel-fired emergency generator (ES-EG#19)

NOx: 9.2 g/kW-hr

CO: 11.4 g/kW-hr

PM: 0.54 g/kW-hr

HC: 1.3 g/kW-hr

Fuel Specification

As of October 2, 2010, each emergency generator must use diesel fuel with a sulfur content of less than 15 ppm.

The generators are manufactured to comply with the exhaust emission standards. UNC maintains records which show the fuel meets the required sulfur content specifications. Continued compliance is expected.

5. 15A NCAC 2D .2400 “Clean Air Interstate Rule” (CAIR)

The ozone season allocations of nitrogen oxide allowances are determined by the US EPA. The emissions of nitrogen oxides of a source shall not exceed the number of allowances that it has in its compliance account established and administered in accordance with 15A NCAC 2D .2408. In 2010, the NOx Allocations were 128 tons for Boilers#6 and #7 and 113 tons for Boiler #8.

Compliance is expected.

IX. NSPS, NESHAPS/MACT, PSD, 112(r), Facility Wide Toxics, and CAM

NSPS – The facility is subject to New Source Performance Standards (NSPS) including Subpart Db, Y, IIII and JJJJ. Compliance is indicated.

NESHAPS/MACT - The facility is subject to 40 CFR 63 Subparts DDDDD (Boiler MACT) and ZZZZ (RICE MACT). Compliance is indicated.

PSD – The facility is a major source located in Orange County, which is in attainment for ozone.

112(r) – The facility is not subject to Section 112(r) of the Clean Air Act requirements because it does not store regulated substances in quantities above the thresholds in the Rule. The permit renewal does not affect this status.

Facility Wide Air Toxics – The facility is not currently subject to facility-wide air toxics limitations under 2D .1100 or 2Q .0711. All of their combustion sources were permitted prior to July 1, 2010.

CAM – Compliance Assurance Monitoring (CAM) (40 CFR Part 64) applies only to boilers (ID Nos. ES-006 and ES-007). The CAM requirements were added to the permit at the time of the last renewal (T19). Beginning February 3, 2013, particulate emissions from boilers #6 and #7 (ID No. ES-001 and ES-002) are subject to 15A NCAC 2D .1109: CAA § 112(j); Case-by-Case MACT for Boilers & Process Heaters” and no longer subject to CAM.

X. FACILITY WIDE EMISSIONS

Pollutant	2009 Actual Emissions (from Emissions Inventory) (Tons)
PM	15.3
CO	58.7
NOx	461.5
SO ₂	245.4

Pollutant	2009 Actual Emissions <i>(from Emissions Inventory)</i> (Tons)
VOC	2.0
Single largest HAP [HCl]	9.6
Total HAPs	10.9

XI. Review of Permit Changes Recommended by Facility and Region

The RRO was provided the initial draft permit to review on February 14, 2011 and draft revisions on March 2, 2011 and March 14, 2011. Mr. Charles McEachern, RRO, recommends permit issuance.

Mr. Timothy Aucoin, UNC Regulatory Compliance Coordinator, was provided a draft permit to review on February 14, 2011 and draft revisions on March 2, 2011 and March 14, 2011. UNC's consultant, Mr. Butch Smith provided comments on each draft on behalf of UNC. The recommended changes have been incorporated into the permit and review.

XII. Public Notice/EPA and Affected State(s) Review

Public notice will be provided consistent with the requirements of 15A NCAC 2Q .0521. The notice will provide for a 30-day comment period, with an opportunity for a public hearing. Copies of the public notice will be sent to persons on the Title V mailing list and EPA.

XII. Recommendations

This permit renewal application for the UNC facility located in Chapel Hill, Orange County, North Carolina 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.

Issue permit No. 03069T28.