

NORTH CAROLINA DIVISION OF AIR QUALITY

Air Permit Review - Renewal Consolidated with Significant Modification (Step 2)

Region: Raleigh Regional Office
County: Orange
NC Facility ID: 6800043
Inspector's Name: Brian Bland
Date of Last Inspection: 12/21/2004
Compliance Code: 3/In Compliance - Inspection

Permit Issue Date:

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 Chapel Hill, North Carolina 27599-1650 SIC: 8221 / Colleges And Universities, Nec NAICS: 221112 / Fossil Fuel Electric Power Generation Facility Classification: Before: Title V After: Title V Fee Classification: Before: Title V After: Title V			SIP: 15A NCAC 2D .0503, 2D .0516, 2D .0521, 2D .0524, 2D .0614, 2D .1111; 15A NCAC 2Q .0516, 2Q. 0513 (Renewal) NSPS: 40 CFR Part 60, Subpart Db NESHAP: 40 CFR Part 63, Subparts ZZZZ (RICE) DDDDD (Boiler MACT) PSD: N/A PSD Avoidance: N/A NC Toxics: N/A 112(r): N/A Other: N/A		
Contact Data			Application Data		
Facility Contact	Authorized Contact	Technical Contact	Application Number: 6800043.04A (significant mod., 2 nd step) consolidated with 6800043.04C (renewal) Date Received: 05/28/2004 & 12/15/2004 respectively Application Type: Significant Mod. & Renewal Application Schedule: Significant Mod. & Title V Renewal Existing Permit Data Existing Permit Number: 03069T18 Existing Permit Issue Date: 06/01/2005 Existing Permit Expiration Date: XXX 2011		
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Review Engineer: Booker Pullen Regional contact: Charles McEachern Review Engineer's Signature:			Comments / Recommendations:		
			Issue: 03069T19 Permit Issue Date: XXXXX, 2006 Permit Expiration Date: XXXXXX, 2011		
			Begin Date: 05/27/2005 End Date: XX/XX/2006		

I. Introduction

The University of North Carolina 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.

II. Purpose of this application: The purpose of these applications {(APP# 6800043.04A, 2nd step of a significant modification) and (6800043.04C, renewal)}, received on May 28, 2004 and December 15, 2004 respectively, is to apply for Renewal of the permit and to submit the second step of a two-step significant modification in accordance with 15A NCAC 2Q .0516. This permit will be sent to a 30-day public notice period and a 45-day EPA review period. The modifications from Permit revisions 03069T15 through 03069T18 will be included in the public notice submittal and the 45 day EPA review, because they were processed through the 15A NCAC 2Q .0501(c)(2) (two step) procedure or as 15A NCAC 2Q .0515 (minor modification) and have not gone through the Title V public comment periods (public notice and EPA review).

II. Purpose of this application (continued):

Changes per Permit Revision T15 – issued 8/21/02 as a PSD permit for a nonprofit organization

- **Add three new** diesel-fired emergency generator units (ID Nos. ES-EG#7, EG#8, and EG#9) located at the School of Public Health, the Phillips Addition, and the Wilson-Dey Building, respectively.
- **Add one new** larger diesel-fired emergency generator unit (800 kW, ID No. ES-EG#10) to replace a smaller existing unit (125 kW) located at the Medical Sciences Research Building.
- **Add one new** larger diesel-fired emergency generator unit (1,500 kW, ID No. ES-EG#11) to replace a smaller existing unit (350 kW) located at the Burnett-Womack Building.
- **Add one new** diesel-fired emergency generator unit (125 kW) located at Memorial Hall to be placed on the insignificant activities list in accordance with 15A NCAC 2D .0503 (8).
- **Add one new** natural gas-fired emergency generator unit (30kW) located at Morehead Planetarium to replace the existing smaller diesel-fired unit (15kW) and will remain on the insignificant activities list in accordance with 15A NCAC 2D .0503 (8).
- **Add one existing** natural gas-fired emergency generator unit (20 kW) located at the New East Building to be placed on the insignificant activities list in accordance with 15A NCAC 2D .0503 (8).
- **Add one existing** diesel fired emergency generator unit (105 kW) located at the Dogwood Deck to be placed on the insignificant activities list in accordance with 15A NCAC 2D .0503 (8).
- Correct and clarify the identification names/building names for several of the emergency generators currently listed on the insignificant activities list in the Title V permit.

Changes per Permit Revision T16 – issued 2/10/04

- **Two** natural gas/No. 2 fuel oil-fired boilers (ID Nos. ES-0040Boiler #9, and ES-005-Boiler #10) located at the Manning Drive Steam Plant
- **One** diesel-fired non emergency generator (ES-006) located at the Manning Drive Steam Plant
- **Two** fuel oil storage tanks (ID Nos. ES-T-003 and ES-T-004) located at the Manning Steam Drive Plant
- Existing boiler (ID No. ES-Boiler #5) will be decommissioned and removed as part of the overall modification to the facility.
- **Three** No. 2 fuel oil-fired non emergency generators (ID Nos. ES-007, 008, and 009, 2000kW each) located at the Cogeneration Facility
- **Two** diesel-fired emergency generators (ID Nos. ES-EG#13 and EG#14, 1000 kW each) located at the Genetic Medicine Building
- **One** diesel-fired emergency generator (ID No. ES-EG#12, 1350 kW) located at the Mary Ellen Jones Building
- The emergency generators (ID Nos. ES-EG-16 & 17) located at the Mary Ellen Jones Building, currently listed in the permit as insignificant, will be replaced with one larger emergency generator (ID No. ES-EG#12, 1350 kW capacity).

Changes per Permit Revision T17 – 1/26/05 as a Significant modification per 15A NCAC 2Q. 0501(c)(2) –step one

- Change generator size (ID No. 58, located at the Carrington Building) from 165 kW to 154 kW.
- Change generator size (ID No. 60, located at the Health Sciences Library) from 135 kW to 148 kW.
- Remove generator (ID No. 4, 20 kW, located at the Bennett Building) and the printing operation (ID No. MCS-5) from the insignificant activities list because these sources have been removed from the facility.
- Change Generator size (ID No. ES-EG#7, located at the School of Public health) from 1,200 kW to 1,250 kW.
- Replace the currently listed insignificant source diesel-fired emergency generator (250 kW, ID No. 63, located at the Rams Head Center) with a 2000 kW diesel-fired emergency generator unit (ID No. ES-EG#15 at the same location).
- Remove boiler (ID No. ES-Boiler #5) from the permit because this boiler has been removed from the facility.

**Changes per Permit Revision T18 – issued 6/1/05 as a Minor modification per
15A NCAC 2Q .0515**

- Install six new emergency generators {two significant sources (ID Nos. EG#16 and EG#14) and four insignificant sources}.
- Modify the permit-listed sizes of two existing emergency generators {ID Nos. EG#12 (was 1350 kW, now 1250), and EG#13 (was 1000 kW, now 2000 kW)}.
- The two 1000 kW emergency generators (ID Nos. EG#13 and EG#14) located at the Genetic Medicine Building, will be replaced with one 2000 kW emergency generator. The new larger generator will keep ID Number (EG#13).
- The 1000 kW emergency generator (ID No. EG#14) that will be replaced by the larger emergency generator (2000 kW) located at the Genetic Medicine Building will be relocated to the 440 West Franklin building and keep the ID Number (EG#14).
- Add relocated emergency generator (ID No. GEN-4, 20 kW) to the insignificant activities list to be located at the Cheek/Clark Building. This generator was removed from the Bennett Building on the last permit revision.

Changes per Permit Revision T19 issued as a second step Significant Modification and Renewal

- Add MACT language to the permit for boilers (ES-004-Boiler #9 and ES-005-Boiler #10) classified as “new”(built after January 13, 2003) under the MACT.
- Add MACT language to the permit for reciprocating internal combustion engines (RICE, generators), ID Nos. ES-EG#7, #8, #9, #10, #11, #12, #13, #14, #15, #16, ES-006, ES-007, ES-008, ES-009, Gen 57, and Gen 59 classified as “new”(installed onsite after December 19, 2002) under the MACT.
- Add CAM for PM control of boilers, ID Nos. ES-001-Boiler #6, and ES-002-Boiler 7. CAM will be applicable until the existing boilers have to be in compliance with the boiler MACT in 2007.
- Remove the Kb requirements from tanks T001, T002, T003, and T004 because these tanks store No. 2 fuel oil which has a vapor pressure less than 3.5 kilopascals (0.5 psia).

III. Applicability Explanation:

The University of North Carolina at Chapel Hill currently operates a Cogeneration Facility near the intersection of Merritt Mill Road and West Cameron Avenue consisting of two-coal, No. 2 fuel oil, and natural gas-fired boilers (ID Nos. 6 and 7); one natural gas and No. 2 fuel oil-fired boiler (Boiler No. 8); and multiple coal handling activities.

On February 10, 2004, the NC DAQ issued a revised permit for the construction of a new Manning Drive Steam Plant on the campus. Emission sources at the new steam plant included two 249 million Btu per hour natural gas and No. 2 fuel oil-fired boilers (ID Nos. ES-004-Boiler #9 and #10), one 2,000 kW, No. 2 fuel oil-fired unrestricted-use generator (ID No. ES-006, located at the Manning Drive Steam Plant), and two 175,000 gallon No. 2 fuel oil storage tanks. The revised permit also permitted the installation of three 2,000 kW, No. 2 fuel oil-fired unrestricted-use generators (ID Nos. ES-007, 008, and 009) to be located at the Cogeneration Facility with exhaust to a common stack (No. 4 stack, 208 feet high). In addition to combustion sources at the Cogeneration Facility and Manning Drive Steam Plant, the University is currently permitted to operate over 70 emergency generators located across the campus. With the exception of two propane and two natural gas-fired units, all of the permitted emergency generators are diesel-fired units.

Due to the large number of combustion sources at the UNC campus, the DAQ requires that an updated campus-wide sulfur dioxide and nitrogen dioxide ambient impact modeling analysis be submitted with each modification application with combustion sources to demonstrate compliance with National Ambient Air Quality Standards (NAAQS). This was done in each of the previous application submittals.

IV. Ambient Modeling History:

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.

- December 11, 1998 – Application for a new boiler (Boiler #8) at the Cogeneration Facility. Modeling for sulfur dioxide emissions submitted in August 1999.
- October 1999 – Application for a new 1,000 kW diesel-fired emergency generator (ID No. EG#4). Modeling for sulfur dioxide emissions submitted.
- November 1999 – Application for two new emergency generators (ID Nos. EG#5, #6). Modeling for sulfur dioxide emissions submitted.
- May 2000 – Additional dispersion modeling was performed to support the permitting of the new emergency generator located at Beard Hall as an insignificant source. Consistent with the analysis for EG#5 and EG#6, the analysis evaluated the short-term sulfur dioxide impacts from the Cogeneration Facility, EG#4, EG#5, EG#6, the Beard Hall emergency generator, and off-site sources identified for the boiler No. 8 application.
- April 2002 – Application for the addition of twelve new emergency generators, all of which were classified as insignificant sources. Modeling for sulfur dioxide emissions submitted which included all of the generators (significant and insignificant) that had never been modeled previously.
- December 2002 - Application for nine new emergency generators. Modeling for sulfur dioxide emissions submitted.
- April 2003 – The DAQ sent UNC chapel Hill a letter requesting nitrogen dioxide dispersion modeling update to include the nine new emergency generators. The modeling analysis was submitted to the DAQ on May 5, 2003. The modeling analysis was submitted with the application.
- July 15, 2003 – Application for two new boilers at the new Manning Drive Steam Plant along with a new unrestricted-use generator. The modeling analysis was submitted with the application.
- November 2003 – Addendum to the Manning Drive Steam Plants application for the installation of three unrestricted-use generators at the Cogeneration Facility and three new emergency generators to be installed on the campus. The modeling analysis was submitted with the application.
- November 2, 2004 – Application to change the size of four diesel-fire emergency generators (ID Nos. 58, 60, 63, and ES-EG#7). The modeling analysis was submitted with the application.

In support of application No. 6800043.05A to install six new emergency generators, to modify the permit-listed sizes of two emergency generators, and to relocate one existing emergency generator in the Title V permit, the November 2004 facility wide modeling analysis has been updated. The only change to the previous November 2004 modeling update is an adjustment in the exit gas parameters for the modified emergency generators and addition of the seven new installations. Incorporation of the new installations into the modeling files included both the input of the generator emission source locations and exhaust stack parameters, and the input of adjacent buildings for those new locations files.

With these changes and additions, the existing modeling files, the ISCST3 model, was run to evaluate the impacts of simultaneous operation of: (1) the three Cogeneration Facility boilers, (2) the three generators at the cogeneration Facility, (3) the new boilers and the generator at the Manning Drive Steam Plant, (4) all emergency generators on the University's campus (including the new units), and (5) all significant off-site SO₂ and NO_x sources (within 75 km of the Manning Drive Steam Plant) as defined in the DAQ's "20D" rule.

V. Changes to existing permit (0369T18) per application Nos. 6800043.04A & 6800043.04C

Old Page No.	New Page No.	Condition No.	Changes
Cover Letter			
Page 1	Page 1	General, descriptive information	Changed: date of permit, revision number of permit, added "Renewal of a Title V Permit" to first sentence, changed the complete application received date, added revised cover page language
Page 2	Page 2	Descriptive information	Changed: date of letter, effective date of permit, revised PSD increment language, added revised cover letter language
Insignificant Activities List			
Page 1 of 5	Page 1 of 4	Table of Insignificant Activities	Changed revision No. to T19, removed existing emergency generator (ID No. GEN-5) from insignificant activities list because it is subject to the RICE MACT, placed GEN-4 on page 1 of 4 from page 5 of 5
Page 2 of 5	Page 2 of 4	Table of Insignificant Activities	Changed revision No. to T19, removed existing emergency generator (ID No. GEN-30) from insignificant activities list because it is subject to the RICE MACT
Page 3 of 5	Page 3 of 4	Table of Insignificant Activities	Changed revision No. to T19, removed existing emergency generators (ID Nos. GEN-38 and 40) from insignificant activities list because they are subject to the RICE MACT
Page 4 of 5	Page 4 of 4	Table of Insignificant Activities	Removed existing emergency generator (ID No. GEN-50) and new emergency generators (GEN-57 and 59) from the insignificant activities list because they are subject to the RICE MACT
Page 5 of 5	N/A	Table of Insignificant Activities	Removed the note from the bottom of table, and moved emergency generators (GEN-71, 72, 74, and 75) from page 5 of 5 to page 4 of 4 Revised the "Changes To Existing Permit" table to reflect this modification
Part I Operating Permit			
Page 1	Page 1	Cover page	Changed: Permit No., "Replaces Permit No.", effective date of permit, expiration date, application No., renewal application due date, permit issue date
All pages	All pages	Heading of page	Changed the permit revision number to T19
Page 2	Page 2	Table of Contents	Removed: "Air Quality Title V and State Operation Permit" from the title of the Part I Section, the Part II "Construction Section" at page bottom
Page 3	Page 3	Permitted Emissions Sources Table	Added "MACT" description to Boilers ES-001-Boiler #6, 002-Boiler #7, 003-Boiler #8,004-Boiler #9, and 005-Boiler #10
Page 4	Page 4	Permitted Emissions Sources Table	Removed "*" from storage tank ID nos., removed "NSPS, Subpart Kb from storage tank descriptions" (exempted from requirements)

-Table continued on the next page-

V. Changes to existing permit (0369T18) per applications 6800043.04A & 6800043.04C - continued

Old Page No.	New Page No.	Condition No.	Changes
Part I Operating Permit- continued			
N/A	Page 5	Permitted Emissions Sources Table	Added emergency generators (ID Nos ES-GEN-5, Gen-30, GEN-38, GEN-40, GEN-50, GEN-57, and GEN-59) to the Permitted Sources Table because they are subject to the RICE MACT
Page 4 & 5	Page 4 & 5	Permitted Emissions Sources Table	Added "MACT" description to emergency generators EG#1 through EG#16, and ES-006 through 009
Page 6	Page 6	Specific Limitations and Conditions	Added "MACT" description to boilers ES-001-Boiler #6 and 002-Boiler #7 Added the revised sulfur dioxide emission limit (0.2 lbs SO ₂ per million Btu heat input) as a compliance option for coal fired boilers per the most recent NSPS, Subpart Db revision
Page 7	Page 7	Specific Limitations and Conditions	Added regulation 15A NCAC 2D .1111 to table of applicable regulations
Page 8	Page 8	Specific Limitations and Conditions	Added the revised sulfur dioxide emission limit (0.2 lbs SO ₂ per million Btu heat input) for coal/fuel oil-fired boilers per the most recent NSPS, Subpart Db revision
Page 9	Page 9	Specific Limitations and Conditions	Added "MACT" description to boilers ES-003-Boiler #8
Page 10	Page 10	Specific Limitations and Conditions	Added regulation 15A NCAC 2D .1111 to table of applicable regulations
Page 14	Pages 14 - 16	Specific Limitations and Conditions	Added regulation language for 2D .1111, Subpart DDDDD to the permit
Page 17-18	Page 21	Specific Limitations and Conditions	Removed "NSPS, Subpart Kb from storage tank descriptions" (Subpart Kb was revised and these tanks are now exempted from the recordkeeping requirements) Added previously insignificant emergency generators (GEN-5, 30, 38, 40, 50, 57 and 59) to significant list Added RICE MACT note at the bottom of emergency generator table
N/A	Page 22	Specific Limitations and Conditions	Added RICE MACT to the table of regulated pollutants
N/A	Page 23	Specific Limitations and Conditions	Added RICE MACT language to the permit for generators classified as "new" under MACT
Page 19	Page 24	Specific Limitations and Conditions	Added RICE MACT language to table of regulated pollutants for non-emergency generators Added RICE MACT language to the permit for generators classified as "existing" under MACT
Page 22	N/A	Specific Limitations and Conditions	Removed Condition 2.2 C. because it is included in Section 2.1 of the Permit
N/A	Pages 25-29	Specific Limitations and Conditions	Added RICE MACT language to the permit for non-emergency generators classified as "new" under MACT
N/A	Pages 31-33		Added CAM Plan for boilers ES-001-Boiler #6 and #7
Page 24-33	Pages 34-43	General Conditions	Added the most recent version of the General Conditions to the permit
Page 33	N/A	Part II Construction Permit	Removed sources from the permit. They are included in Section 2.1, and should already be constructed

VI. Summary of Emission Sources added/changed in modification for permit revision T15, Application No. 6800043.02D

A. Emergency generators located in various buildings as listed below in the table:

ID Number	Source Description	Size of Generator	Building Location
ES-EG#7	Diesel -fired	1,200 kW maximum output	School of Public Health
ES-EG#8	Diesel -fired	1,500 kW maximum output	Phillips Addition
ES-EG#9	Diesel -fired	1,000 kW maximum output	Wilson – Dey Building
ES-EG#10	Diesel -fired	800 kW maximum output	Medical Sciences Research Building
ES-EG#11	Diesel -fired	1,500 kW maximum output	Burnett-Womack Building
Generator #36	Natural gas-fired	30 kW maximum output	Morehead Planetarium (<i>insignificant activity</i>)
Generator #67	Diesel-fired	125 kW maximum output	Memorial Hall (<i>insignificant activity</i>)

- Description:** Six of the emergency generators listed above are fired by diesel fuel and one is fired by natural gas. The maximum operation of each emergency generator shall not exceed 500 hours per the 1995 EPA guidance from John S. Seitz, Director of the Office of Air Quality Planning and Standards. Emissions from the generators are uncontrolled.
- Applicable Regulatory Requirements:** All the generators will be installed after July 1, 1971. NSPS does not apply to any of these emergency generators.

The following provides a summary of limits and/or 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	15A NCAC 2D .0521
Nitrogen dioxide	Less than 500 hours of operation	15A NCAC 2D .0530 (PSD)
	Less than 49.58 tons per consecutive 12 month period	15A NCAC 2D .0501(e)

a. 15A NCAC 2D .0516 “Sulfur Dioxide Emissions from Combustion Sources”

Regulation Analysis:

- Emissions of sulfur dioxide from each source shall not exceed **2.3 pounds per million Btu heat input**. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard.

Six of the of the emergency generators fire diesel fuel. One emergency generator fires natural gas. The diesel fuel that is sold in North Carolina contains 0.5% sulfur content by weight. Natural gas is inherently low in sulfur content.

Compliance is indicated since the actual of sulfur dioxide from diesel fuel with $\leq 0.5\%$ sulfur by weight will be less than the allowable emissions (**2.3 pounds SO₂ per million Btu heat input**).

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- No monitoring, recordkeeping, or reporting is required for sulfur dioxide emissions from the firing of diesel fuel or natural gas in any emergency generator.

b. 15A NCAC 2D .0521 "Control Of Visible Emissions"

Regulation Analysis:

- i. These generators will be installed after July 1, 1971, and each is therefore subject to the State regulation 15A NCAC 2D .0521(d). Per this regulation visible emissions shall not be more than **20 percent opacity** when averaged over a six-minute period except that six-minute periods averaging more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period for each boiler.

Compliance is expected with this regulation because all of the generators will be firing diesel fuel or natural gas.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for visible emissions from the firing of diesel fuel or natural gas in any generator because it should always be in compliance with the opacity standard during normal operation.

c. 15A NCAC 2D .0530 "Prevention Significant Deterioration (PSD)"

Because of the large boilers at UNC Chapel Hill's Cogeneration Facility, the University is an existing PSD major source. The addition of the seven emergency generators requested in this application will increase the emissions of sulfur dioxide, particulate emissions, and nitrogen dioxide from the facility. **Prevention of Significant Deterioration (PSD) does apply** because the installation of these diesel-fired emergency generators (ID Nos. ES-EG#7 through EG#11), even operating at no more than 500 hours per year each, will produce nitrogen dioxide emissions greater than the 40 ton per year NO_x significance level.

However, since this is a major modification at a nonprofit educational institution, the modification **is only subject to a portion** of the PSD program {40 CFR 51.166 (a) through (i) and (s)} listed below. The PSD regulations 40 CFR 51.166 (a) through (s), spell out the requirements of each State for assuring air quality within the entire geographic area comprising such State. By submitting an implementation plan, each State will specify the manner in which national primary and secondary ambient air quality standards will be achieved and maintained with each air quality control region in such State (Section 107 of the Clean Air Act). The State of North Carolina has an approved PSD Program.

- i. **40 CFR 51.166 (a)** - Plan requirements: (1) a major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the significance levels at any locality that does not or would not meet the applicable national standard; (2) state implementation plan revisions; (3) assessments, (4) public participation, and (5) amendments.

40 CFR 51.166 (b) - Definitions: state implementation plans should use the definitions listed in this section for PSD permitting.

40 CFR 51.166 (c) - Ambient air increments: each state implementation plan shall contain emission limitations and such other measures as may be necessary to assure that in areas designated as Class I, II, or III, increases in pollutant concentration over baseline concentration shall be limited to the maximum allowable increases (in micrograms per cubic meter) listed in this section of the PSD regulation.

40 CFR 51.166 (d) - Ambient air ceilings: no concentration of pollutant shall exceed the secondary or primary ambient air quality standard.

40 CFR 51.166 (e) - Restrictions on area classifications: restrictions on designated/redesignated Class I and Class II areas.

- c. **15A NCAC 2D .0530 "Prevention Significant Deterioration (PSD)"---Continued----**
- 40 CFR 51.166 (f)** - Exclusions from increment consumption: circumstances where concentrations attributable to an emissions increase should not be used in determining compliance with a maximum allowable increases.
- 40 CFR 51.166 (g)** - Redesignation: procedures for the designation/redesignation of Class I, Class II, and Class III areas.
- 40 CFR 51.166 (h)** - Stack heights: good engineering practices.
- 40 CFR 51.166 (i)** - Review of major stationary sources and major modifications: source applicability and exemptions (nonprofit educational institution exemption from paragraphs (r) through (i) of 40CFR 51.166).
- 40 CFR 51.166 (s)** - Innovative control technology: the owner or operator of a major source can request that the reviewing authority approve a system of innovative control technology.
- ii. In accordance with 40 CFR 51.166 (i) {review of major stationary sources and major modifications-source applicability and exemptions}, these emergency generators (ID No. ES-EG#7 through EG#11, Generator Nos. 36 & 67) **are not subject to the sections in 40 CFR 51.166 (j) through (r) of the PSD program.**
- 40 CFR 51.166 (j)** - Control technology review: best available control technology (BACT). **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (k)** -Source impact analysis: The allowable emissions from the proposed modification, in conjunction with all other applicable emissions increases or reduction (including secondary emissions) would not cause or contribute to air pollution in violation of the NAAQS or the applicable maximum allowable increase over the baseline concentration in any area. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (l)** - Air quality models: all applications of air quality modeling involved in this subpart shall be based on the applicable models, data bases, and other requirements specified in appendix W (guideline on Air Quality Models) of 40 CFR 51. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (m)** - Air quality analysis: (i) pre-application analysis, (ii) post-construction monitoring, and (iii) operation of monitoring stations. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (n)** - Source information: The owner or operator of a proposed source or modification shall submit all information necessary to perform any analysis or make any determination required under procedures established in accordance with this section. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (o)** - Provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**
- 40 CFR 51.166 (p)** - The reviewing authority shall transmit to the EPA a copy of each permit application relating to a major stationary source or major modification and provide notice to the EPA of every action related to the consideration of such permit. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**

- c. **15A NCAC 2D .0530 "Prevention Significant Deterioration (PSD)"---Continued---**
40 CFR 51.166 (q) - Public participation: notify the public, by advertisement in a newspaper of general circulation in each region in which the proposed source would be constructed, of the application, the preliminary determination, the degree of increment consumption that is expected from the source or modification, and of the opportunity for comment at a public hearing as well as written public comment. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**

40 CFR 51.166 (r) - Source obligation: Approval to construct a source shall not relieve any owner or operator of the responsibility to comply fully with applicable provisions of the state implementation plan and any other requirements under local, State or Federal law. **(does not apply to these generators, ID Nos. ES-EG#7 through EG#11, Generator Nos. 36 & 67)**

SUMMARY: The PSD regulations exempt this educational nonprofit institution from having to do best available control technology (BACT), source impact analysis, air quality models, air quality analysis, additional impact analysis, and public notice. However, the State of North Carolina, Division of Air Quality is obligated to insure that the National Ambient Air Standards have not been violated. Therefore the Division has requested that this facility perform modeling to show that this modification does not violated the National Ambient Air Quality Standards (NAAQS) for both nitrogen dioxide emissions and sulfur dioxide emissions.

- iii. Potential emissions of criteria pollutants from the new emergency generators were found using AP-42 factors, Fifth Edition, Supplement B, from Section 3.3 "Gasoline And Diesel Industrial Engines Less Than 600 horsepower", Table 3.3-1, and from AP-42 factors, Fifth Edition, Supplement B, Section 3.4 "Large Stationary Diesel And All Station Dual-fuel Engines Greater Than 600 Horsepower".

AP-42 Emission Factor (generators ≥ 600 horsepower) = 0.00405 lbs/hp-hr
 AP-42 Emission Factor (generators < 600 horsepower) = 0.00205 lbs/hp-hr
 Annual hours of operation for each generator = 500 hours
 Diesel fuel containing ≤0.5% sulfur by weight

Table I

Generator	Size (kW)	Size (hp)	AP-42 Factor (Sulfur Dioxide)	Annual Operation	Lbs SO ₂ /yr	Tons SO ₂ /yr
ES-EG#7	1,200 kW	1609 hp	0.00405 lbs/hp-hr	500 hours	3259 lbs SO ₂ /yr	1.63 tons SO ₂ /yr
ES-EG#8	1,500 kW	2011.5 hp	0.00405 lbs/hp-hr	500 hours	4073 lbs SO ₂ /yr	2.04 tons SO ₂ /yr
ES-EG#9	1,000 kW	1341 hp	0.00405 lbs/hp-hr	500 hours	2716 lbs SO ₂ /yr	1.4 tons SO ₂ /yr
ES-EG#10	800 kW	1073 hp	0.00405 lbs/hp-hr	500 hours	2173 lbs SO ₂ /yr	1.09 tons SO ₂ /yr
ES-EG#11	1,500 kW	2011.5 hp	0.00405 lbs/hp-hr	500 hours	4073 lbs SO ₂ /yr	2.04 tons SO ₂ /yr
Generator#36	30 kW	40 hp	0	500 hours	0 lbs SO ₂ /yr	0 tons SO ₂ /yr
Generator#67	125 kW	168 hp	0.00205 lbs/hp-hr	500 hours	172 lbs SO ₂ /yr	.086 tons SO ₂ /yr
Total					16,466 SO ₂ /yr	8.23 tons SO ₂ /yr

A sample calculation for sulfur dioxide emissions from emergency generator (ID No. ES-EG#7) follows using the AP-42 factors. The emission rates of the other generators were found in a similar manner.

$$1,200 \text{ kW} \times \frac{1.341 \text{ hp}}{1 \text{ kW}} \times \frac{0.00405 \text{ lbs SO}_2}{\text{hp} - \text{hour}} \times \frac{500 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton SO}_2}{2000 \text{ lbs SO}_2} = 1.63 \frac{\text{tons SO}_2}{\text{year}}$$

Table II below lists the potential emissions of criteria pollutants from the seven new emergency generators using AP-42 factors, Fifth Edition, Supplement B, from Section 3.3 "Gasoline And Diesel Industrial Engines Less Than 600 Horsepower", Table 3.3-1, and from AP-42 factors, Fifth Edition, Supplement B, Section 3.4 "Large stationary Diesel And All Station Dual-fuel Engines Greater Than 600 Horsepower".

Table II

Summary of criteria pollutants from the new emergency generators.

Pollutant	EG#7 (1,200 kW) (1609 hp)	EG#8 (1,500 kW) (2011.5 hp)	EG#9 (1,000 kW) (1341 hp)	EG#10 (800kW) (1073 hp)	EG#11 (1,500 kW) (2011.5 hp)	Generator#36 (30 kW) (40 hp)	Generator#67 (125 kW) (168 hp)	Totals
SO ₂	1.63 tons/yr	2.04 tons/yr	1.4 tons/yr	1.09 tons/yr	2.04 tons/yr	0	.086 tons/yr	8.23 tons/yr
CO	2.21 tons/yr	2.77 tons/yr	1.84 tons/yr	1.48 tons/yr	2.77 tons/yr	0	0.28 tons/yr	11.34 tons/yr
VOC	0.28 tons/yr	0.36 tons/yr	0.24 tons/yr	0.19 tons/yr	0.36 tons/yr	0	0.105 tons/yr	1.52 tons/yr
NOx	9.66 tons/yr	12.07 tons/yr	8.05 tons/yr	6.44 tons/yr	12.07 tons/yr	0	1.3 tons/yr	49.58 tons/yr
PM-10	0.28 tons/yr	0.35 tons/yr	0.235 tons/yr	0.19 tons/yr	0.35 tons/yr	0	0.092 tons/yr	1.50 tons/yr
PM	0.28 tons/yr	0.35 tons/yr	0.235 tons/yr	0.19 tons/yr	0.35 tons/yr	0	0.092 tons/yr	1.50 tons/yr

Since this facility is a Major Source for PSD, the net increases of criteria pollutants shown in Table II shall now be compared to the PSD major source significant increase (tons/year) levels to determine if a PSD modification is required for this project.

Pollutant	Net increase in criteria pollutants	PSD Significance level	PSD Modification Required
PM	1.50 tons/yr	25 tpy	No
PM10	1.50 tons/yr	15 tpy	No
SO ₂ *	8.23 tons/yr	40 tpy	No
NOx **	49.58 tons/yr	40 tpy	Yes
CO	11.34 tons/yr	100 tpy	No
VOCs	1.52 tons/yr	40 tpy	No
Lead	0	0.6 tpy	No

* Will be modeled due to the large number of combustion sources at the site

** Will be modeled due to the large number of combustion sources at the site

The emissions of nitrogen dioxide (NO_x) coming from this modification to add new emergency generators operating at 500 hours or less, exceed the PSD significance levels. Therefore, this modification is subject to PSD requirements. UNC Chapel Hill is classified as a nonprofit educational institution. The PSD regulations exempt an educational nonprofit institution from having to do best available control technology (BACT), source impact analysis, air quality models, air quality analysis, additional impact analysis, and public notice. However, the State of North Carolina, Division of Air Quality is obligated to insure that the National Ambient Air Standards have not been violated. Therefore the DAQ has requested that this facility perform modeling for the criteria pollutants NO_x and SO₂ due to the large number of combustion sources at the facility, to show that this modification will not violate the National Ambient Air Quality Standards (NAAQS). **Each time that the University of North Carolina at Chapel Hill adds a combustion source to the facility, they will be required to update the facility-wide SO₂ and NO_x modeling analysis whether the modification is PSD or not.**

iv. SO₂ Modeling

In April 2002, UNC Chapel Hill submitted a permit modification for the addition of twelve new generators, all of which were classified as insignificant sources. The DAQ requested that the permit application include a modeling demonstration that the new generator units would not increase ambient SO₂ concentrations in the maximum impact areas of the Cogeneration Facility to levels above the NAAQS. The modeling analysis provided with the permit application for the twelve-generator project included four previously modeled emergency generators, each of the twelve new “insignificant source” generators in the project, and the three remaining permitted significant emergency generators that had not been previously modeled. At the request of the DAQ, the remaining previously existing insignificant source generators were also included in the facility-wide modeling analysis. Modeling of the previously existing insignificant units utilized a DAQ approved approach, based on merged stacks, to reduce the level of effort associated with the modeling. The results of the modeling indicated no potential for a violation of the SO₂ NAAQS.

Two existing generators, a 20 kW natural gas-fired unit and a 105 kW diesel-fired unit, were inadvertently left off of the insignificant activities list. The two generators are now added to the modeling analysis for SO₂. The four new diesel-fired generators and the three larger replacement generators (2 diesel and 1 natural gas) will result in a total of 69 emergency generators on the campus, comprised of 11 significant diesel-fired units, 54 insignificant diesel-fired units, 2 insignificant propane-fired units, and 2 insignificant natural gas-fired units. Since this modeling effort is an update following the previously established, and DAQ approved, modeling approach, no new modeling protocol was submitted with this permit modification. However, a protocol checklist was included in the modeling report. The seven generators added in this modification were added to the existing modeling files as discrete emission sources with their own site-specific locations and stack parameters (no merged stacks).

The model was set up in the following format:

- (A) The four Cogeneration Facility boilers
- (B) The 11 permitted significant source diesel-fired emergency generators
- (C) The 15 insignificant source diesel fired units added since the original modeling analysis
- (D) The nine merged stacks representing the other 39 insignificant source diesel-fire units existing prior to the original modeling analysis, and
- (E) All significant off-site SO₂ sources (within 70 km of the Cogeneration Facility)

Mr. Jerry Freeman, Meteorologist, Air Quality Analysis Branch, reviewed the model submitted by UNC Chapel Hill and had the following comments:

- (1) UNC used ISCST3 to model 46 point sources in full terrain and with normal regulatory defaults. By earlier agreement with DAQ, receptors were only placed around the Cogeneration Facility, beginning at a fence line and extending outward about 400 meters from the center of that location. Offsite sources, previously coordinated, were used in the modeling, and approved background concentrations were added to all modeled concentrations. Two different scenarios were modeled involving boilers. In one scenario, boiler #8 was operating only. In the other scenario, both boilers 5 and 8 were operating and were venting through the same stack. **The impacts occurred within 100 meters of the fence line, and reached 48% of the annual SO₂ NAAQS, 78% of the 24-hr SO₂ NAAQS, and 65% of the 3-hr SO₂ NAAQS at the maximum permitted rates. Based on earlier reviews, no cavity concentrations were produced by the sources.**

v. **NO_x Modeling**

In accordance with PSD regulations 40 CFR 51.166 (i)(4)(i), educational nonprofit institutions are exempted from having to do best available control technology (BACT), source impact analysis, air quality models, air quality analysis, additional impact analysis, and public notice. (Note: Even though the PSD regulations do not require public participation, the Part 70 Title V regulations require public participation in order for the new sources to obtain a permit shield, therefore these source will eventually be required to go through public notice.) Also, the State of North Carolina, Division of Air Quality is obligated to insure that the National Ambient Air Standards have not been violated. On April 4, 2003, the DAQ sent a letter to UNC Chapel Hill concerning additional modeling requirements for this facility.

Due to the large number and size of the combustion sources at the University of North Carolina at Chapel Hill, the DAQ requested that this facility perform modeling to show that this modification does not violate the National Ambient Air Quality Standards (NAAQS) for both nitrogen dioxide as well as sulfur dioxide emissions. The sulfur dioxide modeling was included with the original submittal of the application, and was found to be in compliance with the NAAQS.

TRC Environmental Corporation submitted the NO_x dispersion modeling requested by the DAQ on May 24, 2003. Mr. Mark Yoder, Meteorologist, Air Quality Analysis Branch, reviewed the model submitted by UNC Chapel Hill and had the following comments:

- (1) The ISCST3 was used to assess simple and complex terrain NO_x impacts from four boilers, 43 existing emergency generators, seven new emergency generators, and seven off-site sources. The dimensions of the on-site buildings were entered into the Building Profile Input Program (BPIB) to evaluate downwash and wake effects. In accordance with discussions with AQAB personnel, receptors were located along the property line and out to 400 kilometers from the Cogeneration Facility.

- (2) Five years (1987 –1991) of available meteorological data from Raleigh (surface)/Greensboro (upper air) was used. Two scenarios were modeled. In on scenario, boiler #5 was not operating, while in the other scenario, both boilers #5 and #8 were operating. Background monitor data provided by DAQ was added to the final modeled concentrations. The modeling analysis indicated that the NOx impacts are 53% of the respective NAAQS standards.

B. Multiple Emissions Source limits:

The installation of the new emergency generators and replacement emergency generators will emit NOx in an amount greater than the PSD major source threshold of 40 tons per year, even if each generator operates at 500 hour per year or less. The facility is required to update the SO₂ facility-wide modeling analysis each time that a combustion source is added to the facility. As a result, a limit of 500 hours per year operation will be placed in the permit for each of the new generators, because the NOx modeling and the SO₂ modeling is based on 500 hours of operation or less for each generator.

- ES-EG#7
- ES-EG#8
- ES-EG#9
- ES-EG#10
- ES-EG#11
- Generator#36
- Generator#67

1. **15A NCAC 2D .0530 (PSD) [40 CFR 51.166 (a) through (i), (s)] and 15ANCAC 2D .0501(e)**

In order to ensure that the annual NOx National Ambient Air Quality Standard (NAAQS) is not exceeded, each emergency generator (**ID Nos. ES-EG#7, EG#8, EG#9, EG#10, EG#11, Generator No. 36, and Generator No. 67**) shall operate 500 hours or less in a year, and total nitrogen dioxide emissions from these generators shall be less than **49.6 tons per consecutive 12 months**.

Monitoring/Recordkeeping [15A NCAC 2Q .0508 (f)]

2. The Permittee shall maintain records of the hours of operation of **each** emergency generator (ID Nos. ES-EG#7, EG#8, EG#9, EG#10, EG#11, Generator No. 36, and Generator No. 67).

3. Reporting [15A NCAC 2Q .0508 (f)]

The Permittee shall submit a summary report, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities within 30 days after each calendar year quarter, due and postmarked on or before January 30 of each calendar year for the preceding three-month period between October and December, April 30 of each calendar year for the preceding three-month period between January and March, July 30 of each calendar year for the preceding three-month period between April and June, and October 30 for the calendar year for the preceding three-month period between July and September.

The report shall contain the following:

- i. The hours of operation for the previous 14 months. The hours of operation must be calculated for each of the 12-month periods over the previous 14 months;
- ii. All instances of deviations from the requirements of this permit must be clearly identified.

VI. Summary of Emission Sources added/changed in modification for permit revision T16, Application No. 6800043.03A

Summary of Emission Sources and Control Devices added in this modification:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-004-Boiler #9 PSD, NSPS, Subpart Db	One natural gas/No. 2 fuel oil-fired boiler, 249 million Btu heat input capacity,	None	None
ES-005-Boiler #10 PSD, NSPS, Subpart Db	One natural gas/No. 2 fuel oil-fired boiler, 249 million Btu heat input capacity,	None	None
ES-006 PSD	One No. 2 fuel oil-fired generator (2000 kW) located at the Manning Drive Steam Plant	None	None
ES-007 PSD ES-008 PSD ES-009 PSD	Three No. 2 fuel oil-fired generators (2,000 kW each) located at the Cogeneration Facility with exhaust to No. 4 stack (208 feet high)	None	None
ES-EG#13 PSD ES-EG#14 PSD	Two diesel-fired emergency generators (1,000 kW each) located at the Genetic Medicine Building	None	None
ES-EG#12 PSD	One diesel-fired emergency generator (1,350 kW) located at the Mary Ellen Jones Building	None	None
ES-T-003 ES-T-004 NSPS, Subpart Kb	Two No. 2 fuel oil storage tanks (175,000 gallon capacity each) located at the Manning Drive Steam Plant	None	None

A. Two boilers (natural gas/No. 2 fuel oil-fired, 249 million Btu per hour heat input capacity each, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)

1. Description: These boilers are uncontrolled but are operated using low NOx burners and flue gas recirculation (FGR). The application states “that the addition of these new boilers are necessary to support the projected demand for steam as a result of the expansion of the University”.
2. Applicable Regulatory Requirements: 40 CFR Part 60, Subpart Db **does apply** to these boilers because they are each a steam generating unit, with heat input rate greater than 100 million Btu per hour, and will have a manufacture date after June 19, 1984.

Since these boilers have a heat input capacity greater than 100 million Btu per hour each, Subpart Dc **does not** apply.

According to Mr. Walt Stevenson of the Environmental Protection Agency Combustion Group, there will be no more Subpart D boilers built. There are still some boilers subject to Subpart D in operation in this country. However, any boilers built after June 19, 1984, that have a heat input capacity greater than 100 million Btu per hour, will be subject to Subpart Db.

The following provides a summary of limits and/or standards for the emission source(s) described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Particulate matter	0.164 pounds particulate matter per million Btu heat input capacity	15A NCAC 2D .0503
Sulfur dioxide	Burn low sulfur fuel (No. 2 fuel oil limited to 0.5 percent sulfur by weight)	15A NCAC 2D .0524 40 CFR Part 60, Subpart Db
Visible emissions	20 percent opacity (six-minute average)	15A NCAC 2D .0524 40 CFR Part 60, Subpart Db
Nitrogen dioxide	0.20 lbs/million Btu heat input	15A NCAC 2D .0524 40 CFR Part 60, Subpart Db

a. **15A NCAC 2D .0503 (a) "PARTICULATES FROM FUEL BURNING INDIRECT HEAT EXCHANGERS"**

Regulation Analysis

- i. Each boiler is subject to this regulation since natural gas or No. 2 fuel oil is burned for the primary purpose of producing heat by indirect heat transfer. Each boiler is subject to 15A NCAC 2D .0524, 40 CFR Part 60, Subpart Db. However, there are no particulate limits that apply to the firing of natural gas or No. 2 fuel oil listed in this regulation. Therefore, the SIP regulation shall be placed in the body of the permit. Allowable emissions of particulate matter from fuel combustion were found in the following manner.

$$E = 1.090 \times Q^{-0.2594} \quad \text{Where: } E = \text{allowable particulate emission rate in pounds per million Btu}$$

$$Q = \text{maximum heat input rate in million Btu per hour (1482.34)}$$

As part of this modification package, existing boiler (ID No. Boiler #5, natural gas/No. 2 fuel oil-fired, 196.4 million Btu heat input) will be decommissioned and removed in order to install the three new No. 2 fuel oil-fired generators (2000 kW each, ID Nos. ES-007, 008, & 009) in the boiler's location. Therefore, the total maximum heat input of all the fuel burning indirect heat exchangers at this site involved in this modification, including the two new boilers at the Manning Steam Plant and the removal of boiler #5 will be:

$$Q = 323.17 + 323.17 + 338 + 249 \text{ (new)} + 249 \text{ (new)} = 1482.34 \text{ million Btu per hour heat input (heat input from boiler #5 is not included)}$$

This total heat value is used to determine the allowable emission limit **{E_{allow} = 0.164 pounds PM per million Btu heat input (40.83 lbs PM /hour)}** for each boiler (ID Nos. ES-004-Boiler #9, ES-005-Boiler #10).

$$E_{\text{allow}} = 1.090 (1482.34)^{-0.2594}$$

$$= 0.164 \text{ lbs PM per million Btu heat input}$$

Particulate emissions (PM) are uncontrolled. Actual PM were estimated using AP-42 factor, fifth edition, supplement E, revised 9/98, for the burning of the worse case fuel which is No. 2 fuel oil having 0.5 percent sulfur content (NSPS limit).

$$E_{\text{actual}} = \frac{2 \text{ lbs PM}}{1000 \text{ gal. fuel oil}} \times \frac{1 \text{ gal. fuel oil}}{140,000 \text{ Btu}} \times \frac{1 \times 10^6 \text{ Btu}}{\text{million Btu}} = 0.014 \frac{\text{lbs PM}}{\text{million Btu}}$$

Compliance is indicated since the actual PM emissions **(0.014 lbs Pm/million Btu)** are less than the allowable PM emissions **(0.164 lbs PM/million Btu)**.

- ii. No monitoring, recordkeeping, or reporting are required for PM emissions from the firing of natural gas or No. 2 fuel oil in either boiler (ID No. ES-004-Boiler #9 or ES-005-Boiler #10). Stack testing **is not** required to ensure compliance with this regulation at this time.

b. **15A NCAC 2D .0524, 40 CFR 60.42b (j), "SULFUR DIOXIDE EMISSIONS"**

Regulation Analysis:

- i. Sulfur dioxide emissions from the boilers (natural gas/No. 2 fuel oil-fired, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10) shall be controlled by **burning low sulfur No. 2. fuel** oil or natural gas. The facility has stated in the application that No. 2 fuel oil having a sulfur content of 0.5 percent or less will be burned in this boiler. The facility should be in compliance with this regulation as all the No. 2 fuel oil sold in North Carolina is considered low sulfur (0.5 percent or less sulfur by weight). Natural gas is inherently low in sulfur content and much less than 0.5 percent sulfur by weight.

- ii. Testing Requirements {40 CFR 60.45b (j)}:
The owner and operator of an affected facility that burns very low sulfur oil is not subject to the compliance and performance testing requirements of this section if the owner or operator obtains fuel receipts as described in §60.49b (r).

Monitoring Requirements {40 CFR 60.47b (f)}:

- iii. The Permittee shall obtain fuel receipts from the fuel supplier.

Recordkeeping/Reporting Requirements {40 CFR 60.49b (r)}:

- iv. The Permittee shall obtain and maintain fuel receipts from the fuel supplier that certify that the oil meets the definition of distillate oil as defined in 40 CFR 60.41b. **Semi-annual reports** shall be submitted to the Division of Air Quality certifying that only very low sulfur oil was burned during the preceding quarter. Records shall be kept for two years following the date of such record.

The Permittee shall be deemed in noncompliance with 15A NCAC 2D .0524 if the above records are not kept or if the sulfur dioxide emissions exceed the limit specified above.

c. 15A NCAC 2D .0524, 40 CFR 60.43b (f) "CONTROL OF VISIBLE EMISSIONS"

Regulation Analysis:

- i. Boilers (ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10) will be manufactured after June 19, 1984 and have a heat input capacity greater than 100 million Btu per hour. Each boiler is therefore subject to 15A NCAC 2D .0524, 40 CFR Part 60, Subpart Db. Per this regulation, visible emissions shall not be more than **20 percent opacity** when averaged over a six-minute period except for one six-minute period per hour of not more than **27 percent opacity**. [40 CFR 60.43b (f)]

Monitoring. {40 CFR 60.48b(a)}

- ii. The Permittee **shall** install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system.

Recordkeeping/Reporting. {40 CFR 60.49b}

- iii. The Permittee shall submit **semi-annual reports** to the Division of Air Quality in accordance with 40 CFR Part 60.49b. Records shall be kept for two years following the date of such record.

The Permittee shall be deemed in noncompliance with 15A NCAC 2D .0524 if the above monitoring and recordkeeping is not done or if visible emissions exceed the limit specified above.

d. 15A NCAC 2D .0524, 40 CFR 60.44b (a) "CONTROL OF NITROGEN OXIDES"

Regulation Analysis:

- i. Boilers (ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10) will be manufactured after June 19, 1984 and each boiler has a heat input capacity greater than 100 million Btu per hour. These boilers are therefore subject to 15A NCAC 2D .0524, 40 CFR Subpart Db. Per this regulation, no operator of an affected facility that combusts only coal, oil, or natural gas shall cause to be discharged into the atmosphere from that affected facility any gases that contain nitrogen oxides in excess of the following emission limits:

Natural gas and distillate oil

Low heat release rate

High heat release rate

Nitrogen oxide emission limit

0.10 lbs/million Btu heat input

0.20 lbs/million Btu heat input

Heat release rate means the steam generation unit design heat input capacity (in Btu/hour) divided by the furnace volume in cubic feet. The furnace volume is that volume bounded by the front furnace wall where the burner is located, the furnace side waterwall, and extending to the level just below or in front of the first row of convection pass tubes.

A high heat release rate means a heat release rate greater than 70,000 Btu/hr-ft³.

A low heat release rate means a heat release rate less than 70,000 Btu/hr-ft³.

According to the application, these are high heat release rate boilers and therefore they will be subject to a NOx emission rate of **0.20 lbs/million Btu heat input (49.8 lbs NOx per hour)**. Enhanced monitoring is applicable {(40 CFR 60.46b (e))} to these boilers and a NOx continuous emission monitor (CEM) shall be installed for each boiler.

These boilers (ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10) do not have any added on controls, but will have methods of operation that will lower the actual NOx emissions. The boilers will be equipped with low NOx burners and a flue gas recirculation (FGR) system. The FGR system involves recycling a portion of the cooled exit flue gas back into the primary combustion zone. Typically this will reduce the thermal NOx formation by lowering the oxygen concentration in the combustion zone.

The potential emissions of NOx from each boiler when firing **No. 2 fuel oil** can be calculated using AP-42 factors, 5th edition, Supplement E (September -98 update) as follows:

$$E_{actual} = \frac{10 \text{ lbs NOx}}{1000 \text{ gal. fuel oil}} \times \frac{1 \text{ gal. fuel oil}}{140,000 \text{ Btu}} \times \frac{1 \times 10^6 \text{ Btu}}{\text{million Btu}} = 0.071 \frac{\text{lbs NOx}}{\text{million Btu}}$$

Compliance is indicated when burning No. 2 fuel oil since the actual emissions (**0.071 lbs NOx per million Btu**) are less than the allowable emissions limit (**0.20 lbs NOx per million Btu**).

The potential emissions of NOx from each boiler when firing **natural gas** can be estimated using AP-42 factors, 5th edition, Supplement D (March -98 update) as follows:

$$E_{actual} = \frac{140 \text{ lbs NOx}}{10^6 \text{ scf nat. gas}} \times \frac{1 \text{ scf nat. gas}}{1,030 \text{ Btu}} \times \frac{1 \times 10^6 \text{ Btu}}{\text{million Btu}} = 0.14 \frac{\text{lbs NOx}}{\text{million Btu}}$$

Compliance is indicated when burning natural gas since the estimated emission rate (**0.14 lbs NOx per million Btu**) is less than the allowable emission rate limit (**0.2 lbs NOx per million Btu**).

Monitoring {40 CFR 60.48b (b), (c), (d), (e), and (f)}

- ii. The Permittee shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the emissions of NOx discharged to the atmosphere and record the output of the system.

Recordkeeping/Reporting. {40 CFR 60.49b}

- iii. The Permittee shall submit **semi-annual reports** to the Division of Air Quality in accordance with 40 CFR 60.49b. Records shall be kept for two years following the date of such record.

B. Generators located in various buildings as listed below in the table:

ID Number	Source Description	Size of Generator	Building Location
ES-006	No. 2 fuel oil	1,200 kW maximum output	Manning Drive Steam Plant
ES-007	No. 2 fuel oil	1,500 kW maximum output	Cogeneration Facility
ES-008	No. 2 fuel oil	1,000 kW maximum output	Cogeneration Facility
ES-009	No. 2 fuel oil	800 kW maximum output	Cogeneration Facility
ES-EG #12	Diesel-fired	1,350 kW maximum output	Mary Ellen Jones Building
ES-EG#13	Diesel-fired	1,000 kW maximum output	Genetic Medicine Building
ES-EG#14	Diesel-fired	1,000 kW maximum output	Genetic Medicine Building

- Description:** Three of these generators (ID Nos. EG#12, EG#13, and EG#14) are fired by diesel fuel and four generators (ID Nos. ES-006, 007, 008, and 009) are fired by No. 2 fuel oil. Only three of these generators are emergency generators (ID Nos. EG#12, EG#13, EG#14) which means that they shall not exceed 500 hours of operation in a year per the 1995 EPA guidance from John S. Seitz, Director of the Office of Air Quality Planning and Standards. Emissions from the generators are uncontrolled.
- Applicable Regulatory Requirements:** All the generators will be installed after July 1, 1971. NSPS does not apply to any of these generators.

The following provides a summary of limits and/or 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	15A NCAC 2D .0521

a. 15A NCAC 2D .0516 “Sulfur Dioxide Emissions from Combustion Sources”

Regulation Analysis:

- Emissions of sulfur dioxide from each generator shall not exceed **2.3 pounds per million Btu heat input**. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard.

Three of these generators (ID Nos. ES-EG#12, EG#13, and EG#14) are fired by diesel fuel and four generators (ID Nos. ES-006, 007, 008, and 009) are fired by No. 2 fuel oil. The diesel fuel, and the No. 2 fuel oil that is sold in North Carolina contain 0.5% or less sulfur content by weight.

Compliance is indicated since the actual emissions of sulfur dioxide from diesel fuel with ≤ 0.5% sulfur by weight will be less than the allowable emissions (**2.3 pounds SO₂ per million Btu heat input**).

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- No monitoring, recordkeeping, or reporting is required for sulfur dioxide emissions from the firing of diesel fuel or No. 2 fuel oil in any emergency generator.

b. 15A NCAC 2D .0521 “Control Of Visible Emissions”

Regulation Analysis:

- These generators will be installed after July 1, 1971, and each is therefore subject to the State regulation 15A NCAC 2D .0521(d). Per this regulation visible emissions shall not be more than **20 percent opacity** when averaged over a six-minute period except that six-minute periods averaging more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period for each boiler.

Compliance is expected with this regulation because all of the generators will be firing diesel fuel or No. 2 fuel oil.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for visible emissions from the firing of diesel fuel or No. 2 fuel oil in any generator because it should always be in compliance with the opacity standard during normal operation.

C. Two above ground No. 2 fuel oil storage tanks (175,000 gallon capacity, ID Nos. T-003 and T-004)

1. **Description:** Fuel is dispensed to generators and boilers.
2. **Applicable Regulatory Requirements:** These tanks will be placed in operation in 2004. These tanks are subject to New Source Performance Standards as listed in 40 CFR Part 60, Subpart Kb. These tanks **are not subject** to 15A NCAC 2D .0925 (vapor pressure of No. 2 fuel oil below threshold), 15A NCAC 2D .0926 (liquid is not gasoline; nor at a gasoline plant), 15A NCAC 2D .0927 (liquid is not gasoline; nor at a gasoline plant), 15A NCAC 2D .0928 (liquid is not gasoline; nor at a gasoline service station), 15A NCAC 2D .0932 (liquid is not gasoline), 15A NCAC 2D .0933 (tank does not have an external floating roof; vapor pressure of liquid below threshold), 15A NCAC 2D .0948 (vapor pressure of No. 2 fuel oil is below threshold), or 15A NCAC 2D .0949 (vapor pressure of No. 2 fuel oil is below threshold).

The following provides a summary of limits and/or standards for the emission source(s) described above.

Emission Source ID No.	Description	Operation Date	Liquid Stored	True Vapor pressure
ES-T-003	No. 2 fuel oil storage tank, 175,000 gallon capacity	2004	No. 2 fuel oil	0.022 psia
ES-T-004	No. 2 fuel oil storage tank, 175,000 gallon capacity	2004	No. 2 fuel oil	0.022 psia

The following provides a summary of limits and/or standards for the emission source(s) described above.

Regulated Pollutant	Limits/Standards	Applicable Regulation
Volatile organic compounds	Keep readily accessible records of tanks	15A NCAC 2D .0524 40 CFR Part 60, Subpart Kb

a. 15A NCAC 2D .024, 40 CFR Part 60, Subpart Kb: New Source Performance Standards

- i. The Permittee shall comply with all applicable provisions, including the notification, testing, reporting, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards (NSPS) as promulgated in 40 CFR Part 60, Subpart Kb, including Subpart A "General Provisions." [15A NCAC 2D .0524]

Aboveground storage tanks {(ID Nos. ES-T-003, and T-004, 175,000 gallon capacity each), are each greater than 39,840 gallons (151 m³), however, the No. 2 fuel oil that is stored in these tanks has a vapor pressure that is less than 3.5 kPa (0.5 psia). Therefore, these tanks are only required to perform the monitoring and recordkeeping requirements as listed in §60.116b, which states that the Permittee shall maintain records of the dimensions and an analysis showing the capacity of the storage tank. These records shall be maintained for the life of the tank.

D. Multiple Emissions Section

A. 15A NCAC 2D .1417: Emission Allocations For Large Combustion Sources

1. After November 1, 2000 and after the EPA promulgates revisions to 40 CFR Part 51, Subpart G, revising the nitrogen oxide budget for North Carolina, the following limits apply beginning May 31 through September 30, 2004 and May 1 through September 30, 2005 and each year thereafter until revised according to 15A NCAC 2D .1420, except as allowed by 15A NCAC 2D .1419:
 - Natural gas/No. 2 fuel oil-fired boiler (196.4 million Btu per hour heat input capacity, ID No. ES-Boiler #5) *Note: This boiler is less than 250 million Btu per hour heat input capacity, but is listed in the NOx allocation table in this regulation*
 - Coal/natural gas/No. 2 fuel oil-fired boiler (323.17 million Btu per hour heat input capacity, ID No. ES-001-Boiler #6)
 - Coal/natural gas/No. 2 fuel oil-fired boiler (323.17 million Btu per hour heat input capacity, ID No. ES-002-Boiler #7)
 - Natural gas/No. 2 fuel oil-fired boiler (338 million Btu per hour heat input capacity , ID No. ES-003-Boiler #8)

Facility (County)	Source	NOx Emission Allocations (tons/ozone season)		
		2004	2005	2006 and later
UNC-Chapel Hill (Orange County)	Boiler #5 *			
	Boiler #6	116 tons	145 tons	128 tons
	Boiler #7			
	Boiler #8	120 tons	150 tons	113 tons

* Boiler (ID No. 5) will be removed in the near future as part of this modification

2. These sources may comply with the requirements of 15A NCAC 2D .1417 using the nitrogen oxide budget trading program set out in 15A NCAC 2D .1419.
3. **Monitoring/Recordkeeping/Reporting** [15A NCAC 2Q .0508(f)]
 The Permittee shall assure compliance with 15A NCAC 2D .1417 by determining nitrogen oxide emissions in tons per ozone season using a continuous emissions monitoring (CEM) system that meets the requirements of 40 CFR Part 75 Subpart H, with such exceptions as allowed under 40 CFR Part 75, Subpart H or 40 CFR 96. The Permittee shall also comply with 40 CFR 96, Budget Trading Program for State Implementation Plans, for recordkeeping and reporting requirements. All instances of deviations from the requirements of this permit must be clearly identified. If the nitrogen oxides emissions for any ozone season exceed the applicable emission allocations indicated above or the recordkeeping requirements are not complied with, the Permittee shall be deemed in noncompliance with 15A NCAC 2D .1417.

E. Prevention of Significant Deterioration (PSD) does apply. The installation of these boilers (natural gas/No. 2 fuel oil-fired, 249 million Btu per hour each, ID Nos. ES-004-Boiler No. 9 & ES-005Boiler #10) will be a major modification by themselves and will be located in an area designated attainment for all criteria pollutants. These sources **are on** the list of PSD categories with a 100 ton per year threshold because they are fossil fuel fired boilers with total heating value of more than 250 million Btu per hour heat input {see 40 CFR 51.166 (b)(1)(i)(a)}. These proposed boilers are subject PSD because the emissions of NOx and SO₂ are greater than 100 tons per year. In accordance with 40 CFR 51.166, a major modification at a nonprofit educational institution **is only subject to a portion** of the PSD program {40 CFR 51.166 (a) through (i) and (s)} listed below. The PSD regulations 40 CFR 51.166 (a) through (s), spell out the requirements of each State for assuring air quality within the entire geographic area comprising such State. By submitting an implementation plan, each State will specify the manner in which national primary and secondary ambient air quality standards will be achieved and maintained with each air quality control region in such State (Section 107 of the Clean Air Act).

E. Prevention of Significant Deterioration (PSD) does apply: - continued

1. **40 CFR 51.166 (a)** - Plan requirements: (1) a major source or major modification will be considered to cause or contribute to a violation of a national ambient air quality standard when such source or modification would, at a minimum, exceed the significance levels at any locality that does not or would not meet the applicable national standard; (2) state implementation plan revisions; (3) assessments, (4) public participation, and (5) amendments.
40 CFR 51.166 (b) - Definitions: state implementation plans should use the definitions listed in this section for PSD permitting.
40 CFR 51.166 (c) - Ambient air increments: each state implementation plan shall contain emission limitations and such other measures as may be necessary to assure that in areas designated as Class I, II, or III, increases in pollutant concentration over baseline concentration shall be limited to the maximum allowable increases (in micrograms per cubic meter) listed in this section of the PSD regulation.
40 CFR 51.166 (d) - Ambient air ceilings: no concentration of pollutant shall exceed the secondary or primary ambient air quality standard.
40 CFR 51.166 (e) - Restrictions on area classifications: restrictions on designated/redesignated Class I and Class II areas.
40 CFR 51.166 (f) - Exclusions from increment consumption: circumstances where concentrations attributable to an emissions increase should not be used in determining compliance with a maximum allowable increases.
40 CFR 51.166 (g) - Redesignation: procedures for the designation/redesignation of Class I, Class II, and Class III areas.
40 CFR 51.166 (h) - Stack heights: good engineering practices.
40 CFR 51.166 (i) - Review of major stationary sources and major modifications: source applicability and exemptions (nonprofit educational institution exemption from paragraphs (r) through (i) of 40CFR 51.166).
40 CFR 51.166 (s) - Innovative control technology: the owner or operator of a major source can request that the reviewing authority approve a system of innovative control technology.
2. In accordance with 40 CFR 51.166 (i) {review of major stationary sources and major modifications-source applicability and exemptions}, these boilers (ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10) **are not subject to the sections in 40 CFR 51.166 (j) through (r) of the PSD program.**
40 CFR 51.166 (j) - Control technology review: best available control technology (BACT). **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
40 CFR 51.166 (k) - Source impact analysis: The allowable emissions from the proposed modification, in conjunction with all other applicable emissions increases or reduction (including secondary emissions) would not cause or contribute to air pollution in violation of the NAAQS or the applicable maximum allowable increase over the baseline concentration in any area. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
40 CFR 51.166 (l) - Air quality models: all applications of air quality modeling involved in this subpart shall be based on the applicable models, data bases, and other requirements specified in appendix W (guideline on Air Quality Models) of 40 CFR 51. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**

E. Prevention of Significant Deterioration (PSD) does apply: - continued

- 40 CFR 51.166 (m)** - Air quality analysis: (i) pre-application analysis, (ii) post-construction monitoring, and (iii) operation of monitoring stations. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
- 40 CFR 51.166 (n)** - Source information: The owner or operator of a proposed source or modification shall submit all information necessary to perform any analysis or make any determination required under procedures established in accordance with this section. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
- 40 CFR 51.166 (o)** - Provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification and general commercial, residential, industrial, and other growth associated with the source or modification. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
- 40 CFR 51.166 (p)** - The reviewing authority shall transmit to the EPA a copy of each permit application relating to a major stationary source or major modification and provide notice to the EPA of every action related to the consideration of such permit. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
- 40 CFR 51.166 (q)** - Public participation: notify the public, by advertisement in a newspaper of general circulation in each region in which the proposed source would be constructed, of the application, the preliminary determination, the degree of increment consumption that is expected from the source or modification, and of the opportunity for comment at a public hearing as well as written public comment. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**
- 40 CFR 51.166 (r)** - Source obligation: Approval to construct a source shall not relieve any owner or operator of the responsibility to comply fully with applicable provisions of the state implementation plan and any other requirements under local, State or Federal law. **(does not apply to these boilers, ID Nos. ES-004-Boiler #9 & ES-005-Boiler #10)**

SUMMARY: The PSD regulations exempt this educational nonprofit organization from having to perform best available control technology (BACT), source impact analysis, air quality models, air quality analysis, additional impact analysis, and public notice. However, the State of North Carolina, Division of Air Quality is obligated to insure that the National Ambient Air Standards have not been violated. Therefore the Division has requested that this facility perform modeling to show that this modification does not violate the National Ambient Air Quality Standards (NAAQS).

Summary of Emissions from boilers (ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10) used in the NAAQS compliance demonstration. The primary fuel for boilers ES-004-Boiler # 9 and ES-005-Boiler #10 is natural gas with No. 2 fuel oil used as backup.

- a. Emission increases at the facility from the combustion of **No. 2 fuel oil** in the new boilers (249 million Btu per hour heat input capacity each, ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10) using low NO_x burners, flue gas recirculation (FGR), burning low sulfur content fuel oil (0.5 percent by weight) with a heat content of 141,000 Btu per gallon are as follows.

Fuel oil consumption per hour: 1,778.6 gallons per hour each boiler
(Total consumption for both boilers = 1,778.6 + 1,778.6 = 3557.2 gal/hr)

Design heat input: 249 million Btu per hour

Example Calculation:

$$E_{potential} = \frac{10.0 \text{ lbs NOx}}{1000 \text{ gal. No.2 fuel}} \times \frac{3557.2 \text{ gal. No.2 fuel}}{\text{hour}} \times \frac{8760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 155.8 \frac{\text{tons}}{\text{year}}$$

No. 2 fuel oil firing: Total emissions from both boilers (ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10), **firing No. 2 fuel oil.** Emission factors are from AP-42, fifth edition supplement E, revised 9/98 with the corrections from the Errata for section 1.3, included

Pollutant	Emission Factor (lbs/1000 gallons)	Fuel Consumption (total for both boilers)	Hourly Emissions	Annual Emissions	Major Source Significance Level
Particulate (PM)	2.0	3557.2 gallon/hour	7.11 lbs/hr	31.14 tpy	25
Particulate (PM-10)	1.0	3557.2 gallon/hour	3.56 lbs/hr	15.58 tpy	15
Sulfur dioxide	142 (S)**	3557.2 gallon/hour	252.56 lbs/hr	1106.21 tpy	40
Nitrogen dioxide	10.0 (low NOx)	3557.2 gallon/hour	35.57 lbs/hr	155.8 tpy	40
Volatile organic compounds	0.252	3557.2 gallon/hour	0.90 lbs/hr	3.94 tpy	40
Carbon monoxide	5.0	3557.2 gallon/hour	17.79 lbs/hr	77.90 tpy	100

**** S = sulfur content of fuel in percentage by weight**

- b. Emission increases at the facility from the combustion of **natural gas** in the new boilers (249 million Btu per hour heat input capacity each, ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10) using low NOx burners, flue gas recirculation (FGR), with a heat content of 1,030 Btu per million cubic feet:

Fuel oil consumption per hour: 241,747 ft³/hr each boiler
 (Total consumption for both boilers = 241,747 + 241,747 = 483,494 ft³/hr)

Design heat input: 249 million Btu per hour

Example Calculation:

$$E_{potential} = \frac{140.0 \text{ lbs NOx}}{10^6 \text{ ft}^3} \times \frac{483,494 \text{ ft}^3}{\text{hour}} \times \frac{8760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 296.5 \frac{\text{tons}}{\text{year}}$$

Natural gas firing: Total emissions from both boilers (ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10) Emission factors are from AP-42, fifth edition supplement D, revised 7/98

Pollutant	Emission Factor (lbs/million ft ³)	Fuel Consumption (total for both boilers)	Hourly Emissions	Annual Emissions	Major Source Significance Level
Particulate (PM)	7.6 lbs/million ft ³	483,494 ft ³ /hr	3.67 lbs/hr	16.09 tpy	25
Particulate (PM-10)	7.6 lbs/million ft ³	483,494 ft ³ /hr	3.67 lbs/hr	8.05 tpy	15
Sulfur dioxide	0.6 lbs/million ft ³	483,494 ft ³ /hr	0.29 lbs/hr	1.27 tpy	40
Nitrogen dioxide (Low NOx burners)	140 lbs/million ft ³	483,494 ft ³ /hr	67.69 lbs/hr	296.5 tpy	40
Volatile organic compounds	5.5 lbs/million ft ³	483,494 ft ³ /hr	2.66 lbs/hr	11.65 tpy	40
Carbon monoxide	84.0 lbs/million ft ³	483,494 ft ³ /hr	40.61 lbs/hr	177.89 tpy	100

- c. Emissions from the combustion of fuel in the No. 2 fuel oil-fired generator (2000 kW, ID No. ES-006)

2000 kW, generator maximum output rating
 2,682 hp, generator maximum output rating
 0.5 wt % maximum fuel oil sulfur content
 8760 hours per year operation

Vendor (Catepillar) supplied emission factor guarantee: CO = 0.20 g/bhp-hr
 PM = 0.075 g/bhp-hr

Orange County North Carolina is expected to be nonattainment for ozone, the RACT NOx Limit = 8.0 g/bhp-hr

Example calculation to convert vendor furnished emission factor (grams/bhp-hr) to lbs pollutant /bhp-hr.

$$\text{Emission Factor} \left(\frac{\text{lbs NOx}}{\text{bhp-hr}} \right) = \frac{8.0 \text{ grams}}{\text{bhp-hr}} \times \frac{1 \text{ lb NOx}}{453.59 \text{ grams}} \equiv 0.018 \frac{\text{lbs NOx}}{\text{bhp-hr}}$$

Example calculation to obtain tons of pollutant/year:

$$E_{\text{potential}} = \frac{0.018 \text{ lbs NOx}}{\text{bhp-hr}} \times \frac{2,682 \text{ hp}}{1} \times \frac{8760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 211.45 \frac{\text{tons NOx}}{\text{year}}$$

Diesel fuel firing: Emission factors are from vendor supplied information and AP-42, fifth edition, revised 10/96, Section 3.4-1 "Large Stationary Diesel and All Stationary Dual-fuel Engines (ID No. ES-006)

Pollutant	Emission Factor (lb/hp-hr)	Generator Output	Hourly Emissions	Annual Emissions	Major Source Significance Level
Particulate (PM) ¹	0.00017 lbs PM/bhp-hr	2,682 hp	0.44 lbs/hr	1.94 tpy	25
Particulate (PM-10) ¹	0.00017 lbs PM ₁₀ /bhp-hr	2,682 hp	0.44 lbs/hr	1.94 tpy	15
Sulfur dioxide ²	0.00809S ₁ lbs/SO ₂ /bhp-hr	2,682 hp	10.84 lbs/hr	47.51 tpy	40
Nitrogen dioxide ³	0.018 lbs NOx/bhp-hr	2,682 hp	48.28 lbs/hr	211.45 tpy	40
Volatile organic compounds ²	0.000705 lbs VOC/bhp-hr	2,682 hp	1.89 lbs/hr	8.28 tpy	40
Carbon monoxide ¹	0.00044 lbs NOx/bhp-hr	2,682 hp	1.18 lbs/hr	5.18 tpy	100

S₁ = 0.5% sulfur content

¹ Emission factor is based on the vendor furnished emission factor (g/bhp-hr converted to lbs/bhp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 "Large Stationary Diesel engines"

³ Emission factor is based on the NOx RACT Limit for Ozone nonattainment [2D .1409]

- d. Emissions from the combustion of **No. 2 fuel oil** in generators (2000 kW each, ID No. ES-007, 008, & 009)

2000 kW, generator maximum output rating each

2,682 hp, generator maximum output rating

0.5 wt % maximum fuel oil sulfur content

8760 hours per year operation

Vendor (Catepillar) supplied emission factor guarantee: CO = 0.20 g/bhp-hr

PM = 0.075 g/bhp-hr

Orange County North Carolina is expected to be nonattainment for ozone, the RACT NOx Limit = 8.0 g/bhp-hr

Example calculation to convert the emission factor (grams PM /bhp-hr) to lbs PM/bhp-hr.

$$\text{Emission Factor} \left(\frac{\text{lbs PM}}{\text{bhp-hr}} \right) = \frac{0.075 \text{ grams}}{\text{bhp-hr}} \times \frac{1 \text{ lb PM}}{453.59 \text{ grams}} \equiv 0.00017 \frac{\text{lbs PM}}{\text{bhp-hr}}$$

Example calculation to obtain tons of pollutant/year:

$$E_{\text{potential}} = \frac{0.018 \text{ lbs NOx}}{\text{bhp-hr}} \times \frac{2,682 \text{ hp}}{1} \times \frac{8760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} = 211.45 \frac{\text{tons NOx}}{\text{year}}$$

No. 2 fuel Oil: Emission factors are from vendor supplied information and AP-42, fifth edition, revised 10/96, Section 3.4-1 “Large Stationary Diesel and All Stationary Dual-fuel Engines (ID Nos. ES-007, 008, & 009)

Pollutant	Emission Factor (lb/hp-hr)	Generator Output	Hourly Emissions	Annual Emissions	Total tons per year for three
Particulate (PM) ¹	0.00017 lbs PM/bhp-hr	2,682 hp	0.44 lbs/hr	1.94 tpy	5.82 tpy
Particulate (PM-10) ¹	0.00017 lbs PM ₁₀ /bhp-hr	2,682 hp	0.44 lbs/hr	1.94 tpy	5.82 tpy
Sulfur dioxide ²	0.00809S ₁ lbs/SO ₂ /bhp-hr	2,682 hp	10.84 lbs/hr	47.50 tpy	142.5 tpy
Nitrogen dioxide ³	0.018 lbs NO _x /bhp-hr	2,682 hp	48.28 lbs/hr	211.45 tpy	634.35 tpy
Volatile organic compounds ²	0.000705 lbs VOC/bhp-hr	2,682 hp	1.89 lbs/hr	8.28 tpy	24.84 tpy
Carbon monoxide ¹	0.00044 lbs NO _x /bhp-hr	2,682 hp	1.18 lbs/hr	5.18 tpy	15.54 tpy

S₁ = 0.5% sulfur content

¹ Emission factor is based on the vendor furnished emission factor (g/bhp-hr converted to lbs/bhp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 “Large Stationary Diesel engines”

³ Emission factor is based on the NO_x RACT Limit for Ozone nonattainment [2D .1409]

- e. Emissions from the combustion of diesel fuel in emergency generators (1000 kW each, ID No. ES-EG #13 and EG#14)

1000 kW, generator maximum output rating each

1,341 hp, generator maximum output rating

0.5 wt % maximum fuel oil sulfur content

500 hours per year operation

Vendor (Catepillar) supplied emission factor guarantee: CO = 0.20 g/bhp-hr

PM = 0.075 g/bhp-hr

Orange County North Carolina is expected to be nonattainment for ozone, the RACT NO_x Limit = 8.0 g/bhp-hr

Example calculation to convert the emission factor (grams NO_x /bhp-hr) to lbs NO_x/bhp-hr.

$$Emission\ Factor \left(\frac{lbs\ NO_x}{bhp-hr} \right) = \frac{8.0\ grams}{bhp-hr} \times \frac{1\ lb\ NO_x}{453.59\ grams} = 0.018 \frac{lbs\ NO_x}{bhp-hr}$$

Example calculation to obtain tons of pollutant/year:

$$E_{potential} = \frac{0.018\ lbs\ NO_x}{bhp-hr} \times \frac{1,341\ hp}{1} \times \frac{500\ hours}{year} \times \frac{1\ ton}{2000\ lbs} = 6.03 \frac{tons\ NO_x}{year}$$

Diesel fuel fired: Emission factors are from vendor supplied information and AP-42, fifth edition, revised 10/96, Section 3.4-1 “Large Stationary Diesel and All Stationary Dual-fuel Engines. Annual emissions are based on 500 hours of operation per year maximum. (ID Nos. ES-EG#13 and EG#14)

Pollutant	Emission Factor (lb/hp-hr)	Generator Output	Hourly Emissions	Annual Emissions (500 hours)	Total tons per year for two
Particulate (PM) ¹	0.00017 lbs PM/bhp-hr	1,341 hp	0.23 lbs/hr	0.06 tpy	0.12 tpy
Particulate (PM-10) ¹	0.00017 lbs PM ₁₀ /bhp-hr	1,341 hp	0.23 lbs/hr	0.06 tpy	0.12 tpy
Sulfur dioxide ²	0.00809S ₁ lbs/SO ₂ /bhp-hr	1,341 hp	5.42 lbs/hr	1.36 tpy	2.71 tpy
Nitrogen dioxide ³	0.018 lbs NO _x /bhp-hr	1,341 hp	24.14 lbs/hr	6.03 tpy	12.07 tpy
Volatile organic compounds ²	0.000705 lbs VOC/bhp-hr	1,341 hp	0.95 lbs/hr	0.24 tpy	0.48 tpy
Carbon monoxide ¹	0.00044 lbs NO _x /bhp-hr	1,341 hp	0.59 lbs/hr	0.15	0.30 tpy

S₁ = 0.5% sulfur content

¹ Emission factor is based on the vendor furnished emission factor (g/bhp-hr converted to lbs/bhp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 “Large Stationary Diesel engines”

³ Emission factor is based on the NO_x RACT Limit for Ozone nonattainment [2D .1409]

- f. Emissions from the combustion of diesel fuel in emergency generator (1,350 kW, ID No. ES-EG #12)

1,350 kW, generator maximum output rating
 1,810 hp, generator maximum output rating
 0.5 wt % maximum fuel oil sulfur content
 500 hours per year operation

Vendor (Catepillar) supplied emission factor guarantee: CO = 0.20 g/bhp-hr
 PM = 0.075 g/bhp-hr

Orange County North Carolina is expected to be nonattainment for ozone, the RACT NOx Limit = NOx = 8.0 g/bhp-hr

Example calculation to convert the emission factor (grams NOx /bhp-hr) to lbs NOx/bhp-hr.

$$Emission\ Factor\left(\frac{lbs\ NOx}{bhp-hr}\right) = \frac{8.0\ grams}{bhp-hr} \times \frac{1\ lb\ NOx}{453.59\ grams} = 0.018\ \frac{lbs\ NOx}{bhp-hr}$$

$$E_{potential} = \frac{0.018\ lbs\ NOx}{bhp-hr} \times \frac{1,810\ hp}{1} \times \frac{500\ hours}{year} \times \frac{1\ ton}{2000\ lbs} = 8.15\ \frac{tons\ NOx}{year}$$

Diesel fuel fired: Emission factors are from vendor supplied information and AP-42, fifth edition, revised 10/96, Section 3.4-1 “Large Stationary Diesel and All Stationary Diesel-fuel Engines. Annual emissions are based on 500 hours of operation per year maximum. (ID No. ES-EG #12)

Pollutant	Emission Factor (lb/hp-hr)	Generator Output	Hourly Emissions	Annual Emissions (500 hours)
Particulate (PM) ¹	0.00017 lbs PM/bhp-hr	1,810 hp	0.31 ls/hr	0.077 tpy
Particulate (PM-10) ¹	0.00017 lbs PM ₁₀ /bhp-hr	1,810 hp	0.31 lbs/hr	0.077 tpy
Sulfur dioxide ²	0.00809S ₁ lbs/SO ₂ /bhp-hr	1,810 hp	7.32 lbs/hr	1.83 tpy
Nitrogen dioxide ³	0.018 lbs NOx/bhp-hr	1,810 hp	32.58 lbs/hr	8.15 tpy
Volatile organic compounds ²	0.000705 lbs VOC/bhp-hr	1,810 hp	1.28 lbs/hr	0.32 tpy
Carbon monoxide ¹	0.00044 lbs NOx/bhp-hr	1,810 hp	0.80 lbs/hr	0.20 tpy

S₁ = 0.5% sulfur content

¹ Emission factor is based on the vendor furnished emission factor (g/bhp-hr converted to lbs/bhp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 “Large Stationary Diesel engines”

³ Emission factor is based on the NOx RACT Limit for Ozone nonattainment [2D .1409]

- g. Summary table containing the worse case emissions of criteria pollutant increases associated with this modification except the VOCs from the two new tanks.

Pollutant	Boilers 9 & 10	Generator (ES-006)	Generator (ES-007, 008, & 009)	Generator (EG-13 & 14)	Generator (EG-12)	Annual Totals	Signif. Levels
PM	31.14 tpy ¹	1.94 tpy ³	5.82 tpy ¹	0.12 tpy ³	0.077 tpy ³	39.1 tpy	25 tpy
PM ₁₀	15.58 tpy ¹	1.94 tpy ³	5.82 tpy ¹	0.12 tpy ³	0.077 tpy ³	23.54 tpy	15 tpy
SO ₂	1106.21 tpy ¹	47.51 tpy ³	142.5 tpy ¹	2.71 tpy ³	1.83 tpy ³	1300.76 tpy	40 tpy
NOx	296.5 tpy ²	211.45 tpy ³	634.35 tpy ¹	12.07 tpy ³	8.15 tpy ³	1162.52 tpy	40 tpy
VOCs	11.65 tpy ²	8.28 tpy ³	24.84 tpy ¹	0.48 tpy ³	0.32 tpy ³	45.57 tpy	40 tpy
CO	177.89 tpy ²	5.18 tpy ³	15.54 tpy ¹	0.30 tpy ³	0.20 tpy ³	199.11 tpy	100 tpy

¹ fuel oil No. 2

² natural gas

³ diesel fuel

DAQ requested modeling of NOx and SO2 emissions to protect the NAAQs even though this facility is a nonprofit education facility

- h. Summary table containing the worse case emissions of criteria pollutant increases associated with this modification minus the emissions from the decommissioned Boiler #5.

Pollutant	Annual Totals	Boiler #5 (removed)	Adjusted Annual Totals	Signif. Levels
PM	39.1 tpy	- 20.6 tpy *	+ 18.5 tpy	25 tpy
PM ₁₀	23.54 tpy	- 10.3 tpy *	+ 13.24 tpy	15 tpy
SO ₂	1300.76 tpy	- 442.6 tpy *	+ 858.16 tpy	40 tpy
NOx	1162.52 tpy	- 230.0 tpy *	+ 932.52 tpy	40 tpy
VOCs	45.57 tpy	- 4.6 tpy *	+ 40.97 tpy	40 tpy
CO	199.11 tpy	- 70.0 tpy *	+ 129.11 tpy	100 tpy

* Values taken from application calculated using the DAQ spread sheets for fuel combustion

- i. Emissions from two aboveground, fixed roof, No. 2 fuel oil storage tanks (175,000 gallon capacity each, ID Nos. ES-T-003 & T-004)

The total annual VOC losses from the two storage tanks were calculated using the Tanks 4.0 program using a net fuel oil through put of 1,445,220 gallons per year. The breathing and working losses were calculated to be **64.4 lbs per year** of VOCs.

VI. Summary of Emission Sources added/changed in modification for permit revision T17, Application No. 6800043.03A

A. Emergency generators located in various buildings as listed below in the table:

ID Number	Source Description	Size of Generator	Building Location
58	Diesel-fired	154 kW maximum output	Carrington Building (insignificant activity)
60	Diesel-fired	148 kW maximum output	Health Sciences Library (insignificant activity)
ES-EG#7	Diesel-fired	1,250 kW maximum output	School of Public Health
ES-EG#15	Diesel-fired	2,000 kW maximum output	Rams Head Center

- Description:** All four of these of these generators are emergency generators which means that they shall not exceed 500 hours of operation in a year per the 1995 EPA guidance from John S. Seitz, Director of the Office of Air Quality Planning and Standards. Emissions from the generators are uncontrolled.
- Applicable Regulatory Requirements:** All the generators will be installed after July 1, 1971. NSPS does not apply to any of these generators.

The following provides a summary of limits and/or 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	15A NCAC 2D .0521

a. 15A NCAC 2D .0516 “Sulfur Dioxide Emissions from Combustion Sources”

Regulation Analysis:

- Emissions of sulfur dioxide from each generator shall not exceed **2.3 pounds per million Btu heat input**. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard.

The diesel fuel that is sold in North Carolina contains 0.5% or less sulfur content by weight.

Compliance is indicated since the actual emissions of sulfur dioxide from diesel fuel with \leq 0.5% sulfur by weight will be less than the allowable emissions (**2.3 pounds SO₂ per million Btu heat input**).

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for sulfur dioxide emissions from the firing of diesel fuel in any emergency generator.

b. 15A NCAC 2D .0521 "Control Of Visible Emissions"

Regulation Analysis:

- iii. These generators will be installed after July 1, 1971, and each is therefore subject to the State regulation 15A NCAC 2D .0521(d). Per this regulation visible emissions shall not be more than **20 percent opacity** when averaged over a six-minute period except that six-minute periods averaging more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period for each boiler.

Compliance is expected with this regulation because all of the generators will be firing diesel fuel.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for visible emissions from the firing of diesel fuel in any generator because it should always be in compliance with the opacity standard during normal operation.

B. Prevention of Significant Deterioration and Ozone Nonattainment

The University of North Carolina at Chapel Hill is a major source for PSD purposes. Therefore, any modifications at this facility shall be compared to the PSD significance levels to determine if a the modification triggers New Source Review.

Also, this facility is a major source of pollutants (NO_x and VOCs) that contribute to ozone. Orange County is located in an ozone nonattainment area, therefore any modifications at this facility shall be compared to the ozone nonattainment significance levels to determine if a the modification triggers New Source Review for nonattainment.

Vendor Factor for large engines (greater than 600 hp)

NO_x = 0.020 lbs/hp-hr
CO = 0.0004 lbs/hp-hr
PM = 0.0002 lbs/hp-hr
VOCs = 0.00035 lbs/hp-hr

Example calculations for new diesel-fired emergency generator ID No. ES-EG#15

2000 kW, generator maximum output rating
2682 hp, generator maximum output rating
0.5 wt % maximum fuel oil sulfur content
500 hours per year operation
Vendor (Catepillar) supplied emission factors:

$$E_{potential\ NOx} = \frac{0.020\ lbs\ NOx}{hp-hr} \times \frac{2682\ hp}{1} \times \frac{500\ hours}{year} \times \frac{1\ ton}{2000\ lbs} = 13.41 \frac{tons\ NOx}{year}$$

Vendor Factor for small engines (less than 600 hp)

NO_x = 0.031 lbs/hp-hr
CO = 0.0067 lbs/hp-hr
SO₂ = 0.00205 lbs/hp-hr
PM = 0.0022 lbs/hp-hr
VOCs = 0.00251 lbs/hp-hr

Diesel fuel fired: Emission factors are from vendor supplied information, and AP-42, fifth edition, revised 10/96, Section 3.4-1 “Large Stationary Diesel and All Stationary Dual-fuel Engines. Annual emissions are based on 500 hours of operation per year maximum.

Pollutant	Emission Factor (lb/hp-hr)	Generator Output	Hourly Emissions	Annual Emissions (500 hours)
Particulate (PM) ¹	0.0002 lbs PM/hp-hr	2682 hp	0.536 lbs/hr	0.13 tons/yr
Particulate (PM-10) ¹	0.0002 lbs PM ₁₀ /hp-hr	2682 hp	0.536 lbs/hr	0.13 tons/yr
Sulfur dioxide ²	0.00809S ₁ lbs SO ₂ /hp-hr	2682 hp	10.85 lbs/hr	2.71 tons/yr
Nitrogen dioxide ¹	0.02 lbs NOx/hp-hr	2682 hp	53.64 lbs/hr	13.41 tons/yr
Volatile organic compounds ¹	0.00035 lbs VOC/hp-hr	2682 hp	0.235 lbs/hr	0.473 tons/yr
Carbon monoxide ¹	0.0004 lbs NOx/hp-hr	2682 hp	1.07 lbs/hr	0.27 tons/yr

S₁ = 0.5% sulfur content

¹ Emission factor is based on the vendor furnished emission factor (lbs/hp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 “Large Stationary Diesel Engines”

Summary table containing information from all four generators for PSD

Pollutant	Generator (ES-EG#15)	Generator (ES-EG#7)	Generator (ID No. 58)	Generator (ID No. 60)	Annual Totals	PSD Signif. Levels
Particulate (PM) ¹	0.13 tpy	0.08 tpy	0.114 tpy	0.11 tpy	0.43 tpy	25 tpy
Particulate (PM-10) ¹	0.13 tpy	0.08 tpy	0.114 tpy	0.11 tpy	0.43 tpy	15 tpy
Sulfur dioxide ²	2.71 tpy	1.695 tpy	0.11 tpy	0.10 tpy	4.62 tpy	40 tpy
Nitrogen dioxide ¹	13.41 tpy	8.38 tpy	1.60 tpy	1.54 tpy	24.93 tpy	40 tpy
Volatile organic compounds ¹	0.235 tpy	0.15 tpy	0.13 tpy	0.12 tpy	0.635 tpy	40 tpy
Carbon monoxide ¹	0.27 tpy	0.17 tpy	0.35 tpy	0.33 tpy	1.12 tpy	100 tpy

¹ Emission factor is based on the vendor furnished emission factor (lbs/hp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 for “Large Stationary Diesel Engines (greater than 600 hp)” and on vendor factor for small emergency generators (less than 600 hp)

Summary table containing information from all four generators for Nonattainment

Pollutant	Generator (ES-EG#15)	Generator (ES-EG#7)	Generator (ID No. 58)	Generator (ID No. 60)	Annual Totals	Nonattainment Significant Levels
Nitrogen dioxide ¹	13.41 tpy	8.38 tpy	1.60 tpy	1.54 tpy	24.93 tpy	40 tpy
Volatile organic compounds ¹	0.235 tpy	0.15 tpy	0.13 tpy	0.12 tpy	0.635 tpy	40 tpy

¹ Emission factor is based on the vendor furnished emission factor (lbs/hp-hr)

² Emission factor is based on AP-42 factors, Section 3.4-1 for “Large Stationary Diesel Engines (greater than 600 hp)” and on vendor factor for small emergency generators (less than 600 hp)

New Source Review is not required for this modification for either PSD or Nonattainment.

(Note: the most conservative approach was used to calculate the emissions from the emergency generators listed above. The emissions were calculated as if all four of the units were brand new and the emissions calculations from them do not take into account that some rates were only increased from what was previously listed in the permit.

VI. Summary of Emission Sources added/changed in modification for permit revision T18, Application No. 6800043.03A

A. Emergency generators located in various buildings as listed below in the table:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-EG#12 MACT	One diesel-fired emergency generator (1,250 kW) located at the Mary Ellen Jones Building	None	None
ES-EG#13 MACT	One diesel-fired emergency generator (2,000 kW) located at the Genetic Medicines Building	None	None
ES-EG#14 MACT	One diesel-fired emergency generator (1,000 kW) located at the 440 West Franklin Building	None	None
ES-EG#16 MACT	One diesel-fired emergency generator (2,000 kW) located at the ITS Building	None	None
IS-4 Insignificant activity	One diesel-fired emergency generator (20 kW) located at the Cheek/Clark Building	None	None
IS-71 Insignificant activity	One diesel-fired emergency generator (250 kW) located at the Global Education Building	None	None
IS-72 Insignificant activity	One diesel-fired emergency generator (30 kW) located at the Hamilton Building	None	None
IS-74 Insignificant activity	One diesel-fired emergency generator (250 kW) located at the Joyner/Alexander Dorms	None	None
IS-75 Insignificant activity	One diesel-fired emergency generator (250 kW) located at the McIver, Kenan, Alderman Dorms	None	None

1. **Description:** All of these generators are emergency generators which means that they shall not exceed 500 hours of operation in a year per the 1995 EPA guidance from John S. Seitz, Director of the Office of Air Quality Planning and Standards. Emissions from the generators are uncontrolled.
2. **Applicable Regulatory Requirements:** All the generators will be installed after July 1, 1971. NSPS does not apply to any of these generators. Emergency generators (ID Nos. EG#12, EG#13, EG#14, and EG#16) are subject to 40 CFR Part 63, Subpart ZZZZ, and are considered “new” affected sources because they were installed or will be installed after December 19, 2002, and they have a capacity rating greater than 500 horsepower (\approx 373 kW).

The following provides a summary of limits and/or 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	15A NCAC 2D .0521
Hazardous Air Pollutants	Notification Requirements	15A NCAC 2D .1111

a. 15A NCAC 2D .0516 “Sulfur Dioxide Emissions from Combustion Sources”

Regulation Analysis:

- i. Emissions of sulfur dioxide from each generator shall not exceed **2.3 pounds per million Btu heat input**. Sulfur dioxide formed by the combustion of sulfur in fuels, wastes, ores, and other substances shall be included when determining compliance with this standard.

The diesel fuel that is sold in North Carolina contains 0.5% or less sulfur content by weight. Compliance is indicated since the actual emissions of sulfur dioxide from diesel fuel with \leq 0.5% sulfur by weight will be less than the allowable emissions (**2.3 pounds SO₂ per million Btu heat input**).

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for sulfur dioxide emissions from the firing of diesel fuel in any emergency generator.

b. 15A NCAC 2D .0521"Control Of Visible Emissions"

Regulation Analysis:

- iv. These generators were/will be installed after July 1, 1971, and each is therefore subject to the State regulation 15A NCAC 2D .0521(d). Per this regulation visible emissions shall not be more than **20 percent opacity** when averaged over a six-minute period except that six-minute periods averaging more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period for each boiler.

Compliance is expected with this regulation because all of the generators will be firing diesel fuel.

Monitoring/Recordkeeping/Reporting [15A NCAC 2Q .0508(f)]

- ii. No monitoring, recordkeeping, or reporting is required for visible emissions from the firing of diesel fuel in any generator because it should always be in compliance with the opacity standard during normal operation.

c. Prevention of Significant Deterioration and Ozone Nonattainment

The University of North Carolina at Chapel Hill is a major source for PSD purposes. Therefore, any modifications at this facility shall be compared to the PSD significance levels (40 tpy NOx and 40 tpy SO₂) to determine if the modification triggers New Source Review.

Also, this facility is a major source of pollutants (NOx and VOCs are greater than 100 tpy) that contribute to ozone. Orange County is located in an ozone nonattainment area, therefore any modifications at this facility shall be compared to the ozone nonattainment significance levels (40 tpy NOx and 40 tpy SO₂) to determine if the modification triggers New Source Review for nonattainment.

Changes and additions per this modification

- i. *Change Genetic Medicine Building generators (ID No. EG#13) from two 1000 kW units each (ID Nos. EG#13 and EG#14) to one 2000 kW unit (ID No. will stay EG#13).*
--No change in emission rate
- ii. *Change Mary Ellen Jones Building generator (ID No. EG#12) from 1350 kW to 1250 kw.*
--Reduction in emissions
- iii. *Add other new emergency generators (ID Nos. EG#14, EG#16, IS-4, IS-71, Gen-72, IS-74, IS-75)*

Vendor supplied (Catepillar) Factor for generators

<u>2000 kW generator units</u>	<u>1,250 generator unit</u>	<u>1000 kw generator unit</u>
NOx = 0.020 lbs/hp-hr	NOx = 0.019 lbs/hp-hr	NOx = 0.018 lbs/hp-hr
CO = 0.0004 lbs/hp-hr	CO = 0.0014 lbs/hp-hr	CO = 0.0011 lbs/hp-hr
PM = 0.0002 lbs/hp-hr	PM = 0.0002 lbs/hp-hr	PM = 0.0002 lbs/hp-hr
VOCs = 0.00035 lbs/hp-hr	VOCs = 0.00044 lbs/hp-hr	VOCs = 0.00049 lbs/hp-hr

Example calculations for new diesel-fired emergency generator ID No. ES-EG#16

2000 kW, generator maximum output rating
 2682 hp, generator maximum output rating
 0.25 wt % maximum fuel oil sulfur content
 500 hours per year operation
 Vendor (Catepillar) supplied emission factors:

$$E_{potential\ NOx} (ID\ No.\ ES - EG\#16) = \frac{0.020\ lbs\ NOx}{hp - hr} \times \frac{2682\ hp}{1} \times \frac{500\ hours}{year} \times \frac{1\ ton}{2000\ lbs} = 13.41 \frac{tons\ NOx}{year}$$

DAQ spreadsheet factors (AP-42) for small engines (less than 600 hp)

NOx = 0.031 lbs/hp-hr
 CO = 0.0067 lbs/hp-hr
 SO₂ = 0.00205 lbs/hp-hr
 PM = 0.0022 lbs/hp-hr
 VOCs = 0.00251 lbs/hp-hr

Example calculations for new diesel-fired emergency generator ID No. IS-72

30 kW, generator maximum output rating
 40 hp, generator maximum output rating
 0.25 wt % maximum fuel oil sulfur content
 500 hours per year operation
 DAQ spreadsheet (AP-42) emission factors:

$$E_{potential\ NOx} (ID\ No.\ Gen - 72) = \frac{0.031\ lbs\ NOx}{hp - hr} \times \frac{40\ hp}{1} \times \frac{500\ hours}{year} \times \frac{1\ ton}{2000\ lbs} = 0.31 \frac{tons\ NOx}{year}$$

c. Prevention of Significant Deterioration and Ozone Nonattainment (continued)

Summary Table (1) containing information from all generators for PSD per application 6800043.05A

Unit	Size	NOx	CO	SO ₂	PM /PM ₁₀	VOCs
Generator (ES-EG#12) ¹	1,350 kW	-8.60 tpy	-0.63 tpy	-0.93 tpy	-0.09 tpy	-0.20 tpy
Size change from 1,350 kW to 1,250 kW	1,250 kW	7.96 tpy	0.59 tpy	0.86 tpy	0.08 tpy	0.18 tpy
Generator (ES-EG#13) ^{1,3}	2,000 kW	13.41 tpy	0.27 tpy	1.37 tpy	0.13 tpy	0.24 tpy
Generator (ES-EG#14) ¹	1,000 kW	6.035 tpy	0.37 tpy	0.69 tpy	0.07 tpy	0.16 tpy
Generator (ES-EG#16) ¹	2,000 kW	13.41 tpy	0.27 tpy	1.37 tpy	0.13 tpy	0.24 tpy
Removal of two generator units from Genetics Bldg.	1000 kW each	- 12.07 tpy	-0.74 tpy	-1.37 tpy	-0.13 tpy	-0.33 tpy
Generator (IS-4) ² (Insignificant activity)	20 kW	0.2 tpy	0.04 tpy	0.01 tpy	0.01	0.02 tpy
Generator (IS-71) ² (Insignificant activity)	250 kW	2.60 tpy	0.56 tpy	0.17 tpy	0.18 tpy	0.21 tpy
Generator (IS-72) ² (Insignificant activity)	30 kW	0.31 tpy	0.07 tpy	0.02 tpy	0.02	0.03 tpy
Generator (IS-74) ² (Insignificant activity)	250 kW	2.60 tpy	0.56 tpy	0.17 tpy	0.18 tpy	0.21 tpy
Generator (IS-75) ² (Insignificant activity)	250 kW	2.60 tpy	0.56 tpy	0.17 tpy	0.18 tpy	0.21 tpy
Total		28.46 tpy	1.92 tpy	2.53 tpy	0.76 tpy	0.97 tpy

¹ Emission factor is based on the vendor furnished emission factor (lbs/hp-hr)

² Emission factor is based on DAQ spreadsheet factors (AP-42 for small emergency generators less than 600 hp)

³ Emissions from the replacement of two 1000 kW units (ID Nos. EG#13 and EG#14) to one 2000 kW unit (ID No. will stay EG#13 have a net emissions increase of approximately zero.

Summary Table (2) containing information from all generators for Non-attainment

Unit	NOx	VOCs
Generator (ES-EG#12) ¹	-8.60 tpy	- 0.20 tpy
Size change from 1,350 kW to 1,250 kW	7.96 tpy	0.18 tpy
Generator (ES-EG#13) ¹	13.41 tpy	0.24 tpy
Generator (ES-EG#14) ¹	6.035 tpy	0.16 tpy
Generator (ES-EG#16) ¹	13.41 tpy	0.24 tpy
Removal of two generator units from Genetics Bldg.	- 12.07 tpy	-0.33 tpy
Generator (IS-4) ² (Insignificant activity)	0.2 tpy	0.02 tpy
Generator (IS-71) ² (Insignificant activity)	2.60 tpy	0.21 tpy
Generator (IS-72) ² (Insignificant activity)	0.31 tpy	0.03 tpy
Generator (IS-74) ² (Insignificant activity)	2.60 tpy	0.21 tpy
Generator (IS-75) ² (Insignificant activity)	2.60 tpy	0.21 tpy
Total increase	28.46 tpy	0.97 tpy

¹ Emission factor is based on the vendor furnished emission factor (lbs/hp-hr)

² Emission factor is based on DAQ spreadsheet factors (AP-42 for small emergency generators less than 600 hp)

New Source Review for PSD is not required for this modification because the net increase in criteria pollutants is below the PSD Significance levels [SO₂ (40 tpy), NOx (40 tpy), CO (100tpy), PM (25 tpy), and PM10 (15 tpy) as shown summary Table 1, above.

New Source Review for Nonattainment is not required for this modification because the increase in emissions of NOx and VOCs is less than the non attainment significant levels [NOx (40 tpy), and VOCs (40 tpy)]. The greatest change in total emissions for this modification is a net increase of 28.46 tons of NOx. However, it should be noted that Orange County was designated as a non-attainment area on April 15, 2004. Subsequent to this designation, the previous permit revision (T17, with a November 2004 application submittal) to change the size of four emergency generators resulted in an increase in potential NOx emissions of 11.3 tons/yr. Because the total cumulative NOx emissions increase (39.76 tons/yr) since the non-attainment designation is also less than 40 tons/yr.

For increment tracking, Orange County has triggered the baseline dates for PM₁₀, SO₂, and NOx. PM₁₀ emissions from this modification are increased by **0.30** pounds per hour (this equates to 0.76 tons per year using 500 hours of operation for emergency generators).

Sulfur dioxide emissions from this modification are increased by **10.12** pounds per hour (this equates to 2.53 tons per year using 500 hours of operation for emergency generators).

Nitrogen dioxide emissions from this modification are increased by **113.84** pounds per hour (this equates to 28.46 tons per year using 500 hours of operation for emergency generators).

VI. Summary of Changes for in modification for permit revision T19, Application Nos. 6800043.04A and 6800043.04C {Consolidation of applications for 501(c)(2) and Renewal}----Continued-----

- A. Remove NSPS Subpart Kb requirements for Tanks ES-T-001, 002 003 and 004 because of the newly revised NSPS Subpart Kb applicability thresholds.
- B. Revise the NSPS, Subpart Db SO₂ limit for boilers ES-001-Boiler #6 and Boiler #7 to include the newly added alternative limit of 0.2 lbs per million Btu heat input per the latest revision (February 27, 2006) to Subpart Db.
- C. Add Boiler MACT (Subpart DDDDD) “place holder language” to the permit for existing boilers (ID Nos. ES-001-Boiler #6, 002-Boiler #7, and 003-Boiler #8) which were built prior to January 13, 2003).

- D. Add Boiler MACT (Subpart DDDDD) language to the permit for the new boilers (ID Nos. ES-004-Boiler #9 and ES-005-Boiler #10) which were/will be built after January 13, 2003.
- E. Add RICE MACT (Subpart ZZZZ) language to **emergency** generators classified as “new” under RICE MACT Subpart ZZZZ (ID Nos. ES-EG#7 through #16, ES-006, 007, 008, & 009, GEN-57 and GEN-59).

Add RICE MACT (Subpart ZZZZ) language to **emergency** generators classified as “existing” under RICE MACT Subpart ZZZZ (ID Nos. GEN-5, 30, 38, 40, & 50, and ES-EG#1 through #6).

Add RICE MACT (Subpart ZZZZ) language to **non-emergency** generators classified as “new” under RICE MACT Subpart ZZZZ (ES-006, 007, 008, & 009).

- F. Add compliance assurance monitoring (CAM) language to the permit for the coal fired boilers (ID Nos. ES-001-Boiler #6, and Boiler #7) in the interim between the permit issuance and the Boiler MACT (Subpart DDDDD) compliance date of September 13, 2007.
- G. Removed emergency generators (GEN-5, 30, 38, 40 and 50) from insignificant activities list and placed them among the significant sources because of MACT applicability.

VII. Past Modeling History for the University of North Carolina at Chapel Hill

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.

- December 11, 1998 – Application for a new boiler (Boiler #8) at the Cogeneration Facility. Modeling for sulfur dioxide emissions submitted in August 1999.
- October 1999 – Application for a new 1,000 kW diesel-fired emergency generator (ID No. EG#4). Modeling for sulfur dioxide emissions submitted.
- November 1999 – Application for two new emergency generators (ID Nos. EG#5, #6). Modeling for sulfur dioxide emissions submitted.
- May 2000 – Additional dispersion modeling was performed to support the permitting of the new emergency generator located at Beard Hall as an insignificant source. Consistent with the analysis for EG#5 and EG#6, the analysis evaluated the short-term sulfur dioxide impacts from the Cogeneration Facility, EG#4, EG#5, EG#6, the Beard Hall emergency generator, and off-site sources identified for the boiler No. 8 application.
- April 2002 – Application for the addition of twelve new emergency generators, all of which were classified as insignificant sources. Modeling for sulfur dioxide emissions submitted which included all of the generators (significant and insignificant) that had never been modeled previously.
- December 2002 - Application for nine new emergency generators. Modeling for sulfur dioxide emissions submitted.
- April 2003 – The DAQ sent UNC chapel Hill a letter requesting nitrogen dioxide dispersion modeling update to include the nine new emergency generators. The modeling analysis was submitted to the DAQ on May 5, 2003.

- VIII.** On July 21, 2003, the DAQ received a NAAQS compliance demonstration from the consulting firm of TRC Environmental Corporation. Mr. Jerry Freeman of the Air Quality Analysis Unit reviewed the compliance demonstration and sent a response to me dated August 25, 2003. Mr. Freeman stated that two criteria pollutants, SO₂, and NO_x, were modeled with on-site sources, off-site sources, and background concentrations included. ISCST3 was used to model the facility utilizing full terrain and five years of meteorological data, 1987-1991, from Raleigh/Greensboro.

Adequate receptors, agreed to in earlier submissions, were used to ensure maximum concentrations were discovered. In an effort to make the modeling of numerous sources more manageable, reasonable merging of selected sources was used, as also approved in earlier modeling efforts for this facility. In selecting the parameters for the Manning Steam Plant, load impacts were analyzed at 10%, 50%, and 100% loads. The 100% load scenario is what was modeled. Off-site sources, as identified and approved in 2002, were included in the modeling. Additionally, UNC added conservative background concentrations (compared to 2002 monitor data) to their modeled impacts.

The final results of the analysis indicated concentrations of SO₂ at 29%, 67%, and 71% of the NAAQS for the 3hr, 24 hr, and annual periods respectively, while NO_x reached 38% of the NAAQS. Due to the interior location of the new stem plant and the determinations from previous modeling, there were no additional cavity analyses.

In October 2003, a consulting firm named RST Engineering Solutions, submitted an addendum to the original application which added six additional generators to the project and stated that steam boiler (ID No. Boiler #5) was being decommissioned and removed from the site to accommodate the installation of three out of the six new generators.

Also, in October 2003, a revised modeling exercise was submitted to include the additional generators and removal of Boiler #5 in the ambient modeling. Mrs. Jamie Sellman, Meteorologist, AQAB, reviewed the revised modeling for the Manning Drive Steam Plant Project. She had the following comments:

The modeling analysis adequately demonstrates on a source-by-source basis, compliance with the NAAQS as defined in the New Source Review Workshop manual. *The ISCST3 (02035) model was run for simple and complex terrain to evaluate impacts of NO_x and SO₂ for simultaneous operation of the new Manning Drive Steam Plant boilers and generator, the three remaining boilers and the 3 proposed generators at the Cogeneration Facility, all 70 emergency generators, and all significant off-site sources. Building information was entered into the Building Profile Input Program (BPIP) and imported into the refined model to assess downwash. Five years of meteorological data (1987-1991) from Raleigh (surface) and Greensboro (upper air) were used. The modeling analysis indicated that the maximum impacts were 59%, 67%, and 29% of the 3-hour, 24-hour, and annual NAAQS for SO₂, and 42% of the annual NAAQS for NO_x.*

XIX. The following sources at the site have not been changed since the last significant modification at this facility:

The following table contains a summary of all permitted emission sources and associated air pollution control devices and appurtenances that were not modified in Revisions T15, T16, T17, or T18:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
Boilers			
ES-001-Boiler #6 NSPS, MACT	One coal/natural gas/No. 2 fuel oil-fired, circulating fluidized combustion boiler, 323.17 million Btu heat input capacity,	CD-004	One bagfilter with 36,614 square feet of filter surface area Calcium carbonate injection system
ES- 002-Boiler #7 NSPS, MACT	One coal/natural gas/No. 2 fuel oil-fired, circulating fluidized combustion boiler, 323.17 million Btu heat input capacity,	CD-005	One bagfilter with 36,614 square feet of filter surface area Calcium carbonate injection system
ES-003-Boiler #8 PSD {40 CFR 51.166 (a) through (i) and (s)} NSPS, MACT	One natural gas/No. 2 fuel oil-fired boiler, 338 million Btu per hour heat input capacity with the exhaust to the No. 4 stack (208 feet high),	None	None
One coal handling, conveying, crushing, and storage system (NSPS, Subpart Y) consisting of :			
ES-010	Three enclosed railcar dump pits,	CD-018	Wet spray dust suppression systems (100 gal per min. injection rate in each hopper)

-Table continued on the next page-

The following table contains a summary of all permitted emission sources and associated air pollution control devices and appurtenances that were not modified in Revisions T15, T16, T17, or T18:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
One coal handling, conveying, crushing, and storage system (NSPS, Subpart Y) consisting of: Cont.			
ES-1	One coal silo,	CD-011	One bagfilter with 533 square feet of filter surface area
ES-2	One coal silo	CD-012	One bagfilter with 533 square feet of filter surface area
ES-3	Five silo feed conveyors	CD-019	One bagfilter with 1598 square feet of filter surface area
ES-010A	One coal crusher building,	CD-013	One bagfilter with 1330 square feet of filter surface area
One ash handling, storage, and loading system consisting of:			
ES-030	One ash storage silo equipped with dry loadout system,	CD-031	One bagfilter with 577 square feet of filter surface area
ES-030A	Enclosed wet ash loadout system,	CD-032	Water injection system (8.64 gal per min. injection rate)
Storage Tanks			
ES-T-001 ES-T-002	Two No. 2 fuel oil storage tanks (500,000 gallons each),	None	None
ES-T-003 ES-T-004	Two No. 2 fuel oil storage tanks (175,000 gallon capacity each) located at the Manning Drive Steam Plant)	None	None
Emergency Generators			
ES-EG#1 Existing under MACT	One diesel-fired emergency generator (900 kW), located at the EPA Building,	None	None
ES-EG#2 Existing under MACT	One diesel-fired emergency generator (1600 kW), located at the Thurston Bowles Building,	None	None
ES-EG#3 Existing under MACT	One diesel-fired emergency generator (728 kW), located at the Lineberger Cancer Research Building,	None	None
ES-EG#4 Existing under MACT	One diesel-fired emergency generator (1000 kW) located at Taylor Hall,	None	None
ES-EG#5 Existing under MACT	One diesel-fired emergency generator (910 kW) located at the Neuroscience Research Building,	None	None
ES-EG#6 Existing under MACT	One diesel-fired emergency generator (1500 kW) located at the Medical Biomolecular Research Building.	None	None

A. Two coal/natural gas/No. 2 fuel oil-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, MACT Subpart DDDDD)

1. 15A NCAC 2D. 0503: Particulate Emissions From Fuel Burning Indirect Heat Exchangers (natural gas firing)
2. 15A NCAC 2D .0501 (e): Measures to avoid exceedance of ambient standards for sulfur dioxide
3. 15A NCAC 2D .0516: Sulfur Dioxide Emissions From Combustion Sources (natural gas)
4. 15A NCAC 2D .0524: Particulate Emissions From Combustion Sources (Coal or fuel oil)
5. 15A NCAC 2D .0524: Sulfur Dioxide Emissions From Combustion Sources (Coal and/or fuel oil)
6. 15A NCAC 2D .0524: Nitrogen Dioxide Emissions From Combustion Sources (coal, fuel oil, and/or natural gas firing)
7. 15A NCAC 2D .0524: Visible Emissions
8. 15A NCAC 2D .1111: MACT for Boilers, Subpart DDDDD
9. 15A NCAC 2D .1417: Emissions Allocations for Large Combustion Sources
10. 15A NCAC 2D .0614: Compliance Assurance Monitoring (CAM)

No regulatory review is required for the regulations listed above except for CAM, at this time since there have been no changes to this source since the last significant modification. Each of these boilers is **subject** to the boiler MACT in accordance with 40 CFR Part 63, Subpart DDDDD. These boilers are classified as “existing boilers” because they were constructed prior to January 13, 2003. The compliance date for existing boilers is September 13, 2007.

Since these boilers were installed, NSPS 40 CFR Part 60, Subpart Db (Federal Register Publication 2/27/06) was amended to include an alternative compliance standard for SO₂ from coal fired boilers. Facilities can now choose to comply with either a 90% reduction or a 0.20 lbs SO₂/million Btu emission limit. UNC-Chapel Hill, would like to use the 0.20 lbs SO₂/mmBtu limit instead of the 90% reduction limit. This new limit will be placed into the permit.

CAM, as listed under 15A NCAC 2D .0614, **does apply** because each coal-fired boiler has the potential to emit greater than 100 tons per year of PM₁₀ and SO₂ prior to control.

CAM For Sulfur Dioxide

1. Background SO₂ control:

ES-001-Boiler #6 and ES-002-Boiler #7 are identical boilers (323.2 mmBtu per hour circulating fluidized-bed, coal/No. 2 fuel oil/natural gas-fired). SO₂ emissions from each boiler are controlled by a calcium carbonate injection system. The flue gas exhaust from each baghouse is equipped with a CEMs for continuous measurement of SO₂ emissions.

2. Applicable Emission Limits and Standards

Applicable SO₂ emission limits for the two boilers are presented in 15A NCAC 2D .0516 and .0524. When firing only natural gas, the boilers are subject to Rule 2D .0516 and the two boilers are limited to 2.3 lbs SO₂/mmBtu heat input. When firing either coal, fuel oil, or combinations of fuels, the boilers are subject to Rule 2D .0524. These boilers are subject to NSPS, Subpart Db and are limited to 1.2 lbs SO₂/mmBtu per hour heat input when firing coal and the sulfur content of oil is limited 0.5% by weight when firing No. 2 fuel oil only. In addition to the maximum mass emission limits, Subpart Db also requires a minimum 90% reduction or 0.20 lbs SO₂/million Btu in uncontrolled SO₂ emissions when coal or coal in combination with No. 2 fuel is fired.

3. Performance Indicator/Performance Criteria/Implementation Plan

Due to the fact that NSPS, Subpart Db requires a Continuous Emissions Monitor (CEMs) to monitor SO₂ emissions from these boilers, there will be no further monitoring requirements under CAM because the CEMs can be used to satisfy the requirements of CAM in accordance with 40 CFR Part 64, §64.3(d)(1).

CAM For Particulate Matter

1. Background PM control:

ES-001-Boiler #6 and ES-002-Boiler #7 are identical boilers (323.2 mmBtu per hour circulating fluidized-bed, coal/No. 2 fuel oil/natural gas-fired). PM emissions from each boiler are controlled by a bagfilter (36,614 square feet of filter surface area). The flue gas exhaust from each baghouse is equipped with a COMS for continuous measurement of opacity.

2. Applicable Emission Limit Standards PM control:

Applicable PM emission limits for the two boilers are presented in 15A NCAC 2D .0503 and .0504. When firing only natural gas, the boilers are subject to Rule 2D .0503 and the two boilers are limited to 0.174 lbs PM/mmBtu heat input. When firing coal, fuel oil, or combinations of fuels, the boilers are subject to Rule 2D .0524. These boilers are subject to NSPS, Subpart Db and are limited to 0.05 lbs PM/mmBtu per hour heat input.

3. Rationale for selection of Performance Indicator :

The most stringent emission standard for which boilers ES-001-Boiler #6 and ES-002-Boiler #7 have to be in compliance for PM are contained in NSPS, Subpart Db. In 40 CFR Part 64.4, the CAM Rule establishes the concept of presumptively acceptable monitoring approaches. This concept presumes that existing monitoring requirements specified by USEPA or permitting authorities for specific emission sources establishes acceptable monitoring approaches for other similar sources. Subpart Db requires the installation, calibration, maintenance, and operation of a continuous opacity monitoring system (COMS). These requirements establish monitoring of opacity as a surrogate indicator of compliance with applicable PM monitoring as required in 40 CFR Part 60.48b for compliance with the Rule 2D .0524 PM requirements. The Subpart Db and Title V permit monitoring requirements have established COMS as a presumptively acceptable monitoring approach for PM emissions from a baghouse controlled coal-fired boiler. Therefore, UNC Chapel Hill proposes to utilize the current Subpart Db COMS system measurement of opacity as the PM performance indicator.

4. Rationale for Selection of Performance Indicator :

No correlation analysis of measured opacity and corresponding PM emission rates has been performed on the two baghouse-controlled boilers. However, as discussed below, stack testing of both units in 1992 indicated a maximum PM emission rate of 0.0033 lbs/mmBtu relative to the Subpart Db emission limit of 0.05 lb/mmBtu. The order of magnitude lower controlled PM emission rate relative to the emission limit is assumed to be due the higher control efficiency of the installed baghouse relative to the ESP control systems used by the USEPA as the technology basis for establishment of the Subpart Db emission limit.

This data indicates that there is a low probability of the baghouse control systems exceeding the PM emission limit, provided the baghouse are properly maintained. A decrease in baghouse performance that would result in an order of magnitude increase in the controlled PM emission rate from 0.0033lbs/mmBtu to the 0.05 lbs/mmBtu emission limit would also be expected to produce corresponding increase in opacity. Based on typical COMS measurement of 2 to 5% opacity during normal operation, an order of magnitude increase in PM emissions would be expected to increase opacity above 20%. As noted above, Subpart Db presents a visible emission limit of 20% opacity (6-minute average), except for one 6-minute period per hour of not more than 27% opacity under 40 CFR 60.43.(f).

5. Performance Criteria :

Representative Data: - Acquisition of representative data is assured by the installation of the existing COMS in compliance with 40 CFR 60, Appendix B, Performance Specification 1.

Quality Assurance and Control Procedures - The existing COMS are calibrated daily and operated in compliance with the 40 CFR 60 QA/QC procedures. Documentation of calibration and maintenance activities are maintained in the Title V compliance files.

Monitoring Frequency - NSPS, Subpart Db, §60.13 requires that COMS complete a minimum of one cycle of sampling for each 10-second period and one cycle of data recording for each successive 6-minute period. The COMS at UNC Chapel Hill is operated in compliance with this monitoring requirement.

Data Collection Procedure - The COMS data is continuously recorded in the DAHS.

Data Averaging Period - The averaging period is every 6-minutes.

6. Performance Test Data :

The air permit does not require regularly scheduled stack emissions testing for compliance demonstrations with the PM emission limit. However, additional PM stack testing of Boilers ES-001-Boiler #6 and ES-002-Boiler #7 was performed in July and August 1992. The highest controlled PM emission rate during the tests of the two boilers was 0.0033 lbs/mmBtu heat input relative to the 0.05 lbs/mmBtu emission limit.

7. Implementation Plan :

The COMS already installed and in operation in accordance with Subpart Db.

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, MACT Subpart DDDDD

1. 15A NCAC 2D .0503: Particulate Emissions From Fuel Burning Indirect Heat Exchangers
2. 15A NCAC 2D .0501 (e): Measures to avoid exceedance of ambient standards for sulfur dioxide
3. 15A NCAC 2D .0516: Sulfur Dioxide Emissions From Combustion Sources (natural gas)
4. 15A NCAC 2D .0524: Visible Emissions
5. 15A NCAC 2D .0524: Sulfur Dioxide Emissions From Combustion Sources
6. 15A NCAC 2D .0524: Nitrogen Dioxide Emissions From Combustion Sources
7. 15A NCAC 2D .1111: MACT for Boilers, Subpart DDDDD
8. 15A NCAC 2D .1417: Emissions Allocations for Large Combustion Sources
9. 15A NCAC 2D .0614: Compliance Assurance Monitoring

No regulatory review is required for the regulations listed above at this time since there are no modifications to this source for this renewal application. This boiler **is subject** to the boiler MACT in accordance with 40 CFR Part 63, Subpart DDDDD. It is classified as existing because it was constructed prior to January 13, 2003. The compliance date for an existing boiler is September 13, 2007.

CAM under 15A NCAC 2D .0614 **does not apply** because this boiler does not have a control device. No additional monitoring, recordkeeping, or reporting is required.

C. One coal handling, conveying, crushing, and storage system consisting of :

- * **Three enclosed railcar dump pits (ID No. ES-010) 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 No. ES-3) with associated bagfilter (1598 square feet of filter surface area, ID No. CD-019)**
1. 15A NCAC 2D .0515: Particulates From Miscellaneous Industrial Processes
 2. 15A NCAC 2D .0524, Part 6, Subpart Y: Visible Emissions

No regulatory review is required for the regulations listed above at this time since there are no modifications to this source for this renewal application or from any previous modifications that did not go through public notice or the EPA 45 day review. This boiler has to be in compliance with the boiler MACT in accordance with 40 CFR Part 63, Subpart DDDDD upon startup. Compliance Assurance Monitoring (CAM) under 15A NCAC 2D .0614 does not apply because the potential emissions of PM10 are less than 100 tons per year before control. No additional monitoring, recordkeeping, or reporting is required.

D. 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
 2. 15A NCAC 2D .0521: Visible Emissions

No regulatory review is required for the regulations listed above at this time since there are no modifications to this source for this renewal application or any previous applications that did not go through public notice and the EPA 45 day review. Compliance Assurance Monitoring (CAM) under 15A NCAC 2D .0614 does not apply because the potential emissions of PM10 are less than 100 tons per year before control. No additional monitoring, recordkeeping, or reporting is required.

E. Four No. 2 fuel oil storage tanks

- * ID No. T-001, 500,000 capacity
- * ID No. T-002, 500,000 capacity
- * ID No. T-003, 175,000 capacity
- * ID No. T-004, 175,000 capacity

These tanks were previously listed as being subject to NSPS in accordance with 40 CFR Part 60, Subpart Kb. This NSPS regulation was amended on October 15, 2003. The applicability threshold, using maximum true vapor pressure for tanks greater than 39,800 gallons of fuel capacity, is that if these tanks store a liquid with a true vapor pressure of less than 3.5 kilopascals (0.5 psia) they are not subject to this regulation. These tanks are subject to this Subpart because the true vapor pressure of the No. 2 fuel oil is below the applicability threshold. The recordkeeping requirements will be removed from the permit during this renewal.

F. Diesel-fired emergency generators located in various buildings

ID Number	Source Description	Size of Generator	Location
ES-EG#1	Diesel-fired	900 kW maximum output	EPA Building
ES-EG#2	Diesel-fired	1600 kW maximum output	Thurston Bowles Building
ES-EG#3	Diesel-fired	728 kW maximum output	Lineberger Cancer Research Building
ES-EG#4	Diesel-fired	1000 kW maximum output	Taylor Hall
ES-EG#5	Diesel-fired	910 kW maximum output	Neuroscience Research Building
ES-EG#6	Diesel-fired	1500 kW maximum output	Medical Biomolecular Research Building

1. 15A NCAC 2D .0516: Sulfur Dioxide Emissions From Combustion Sources
2. 15A NCAC 2D .0521: Visible Remissions
3. 15A NCAC 2D .1111 : Hazardous Air Pollutants (40 CFR Part 63, Subpart ZZZZ, RICE)

No regulatory review is required for the regulations listed above at this time since there are no modifications to these sources for this renewal application or any previous applications that have not gone through public notice and the EPA 45 day review. Compliance Assurance Monitoring (CAM) under 15A NCAC 2D .0614 does not apply because these generators do not have control devices. No additional monitoring, recordkeeping, or reporting is required.

These generators are subject to the RICE MACT. They are classified as “existing emergency generators” under this MACT and do not have to meet the requirement of the subpart or the General Provisions of (40 CFR Part 63, Subpart A) because they are compression ignition units. The facility must make a written applicability determination for each of the existing compression ignition units and keep this determination on site for five years in accordance with §63.10(b)(3).

- XIX. Air Toxics:** an air toxics review **is not** required because all new toxic emissions will come from the combustion of unadulterated fuels in the generators or boilers or storage of unadulterated fuel in tanks. According to the present policy and 15A NCAC 2Q .0702 (18), the emissions from the burning of unadulterated fuels are exempt from triggering a toxics review and evaluation. Also, the “last” MACT for this facility will most likely be the boiler MACT. However, since a toxics demonstration is not required for combustion sources, this facility does not have to address toxics at this time.
- X.** A consistency determination **is not required** for this renewal/(second step of a significant modification).
- XI.** A Professional Engineer's seal is **not required for this renewal and the second step of a two-step significant modification.**
- XII.** 112(r) does not apply to this facility because none of these materials is stored in quantities above the applicable thresholds.
- XIII.** The appropriate number of copies of the application were received by the DAQ on December 15, 2004.
- XVI.** The application was signed by an authorized official as defined by 15A NCAC 2Q .0304(j).
- XVII. Public Comment**
Public Comment Period: May ___ to June ___2006
EPA 45-day review period: May _____ to July ___2006.
- XVIII. Recommendations:**
This permit, issued to the University of North Carolina at Chapel Hill, located in Chapel Hill, North Carolina, has been reviewed by the DAQ to determine compliance with all procedures and requirements. The Raleigh Regional Office concurs with the issuance of this permit.
- Issue permit No. 03069T19.**