NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF AIR QUALITY

PREVENTION OF SIGNIFICANT DETERIORATION PRECONSTRUCTION REVIEW AND PRELIMINARY DETERMINATION

FOR

UNITS 1-3
AT
DUKE POWER COMPANY LLC
DAN RIVER STEAM STATION
EDEN, ROCKINGHAM COUNTY
NORTH CAROLINA

THIS REVIEW WAS PERFORMED BY THE
AIR PERMITS SECTION
IN ACCORDANCE WITH 15A NCAC 2D .0530 - NCDAQ REGULATION
FOR
PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY

JULY 24, 2006

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SECTION 1.0

INTRODUCTION

Duke Power Company LLC ("Duke") has submitted to the North Carolina Division of Air Quality (NCDAQ) a Prevention of Significant Deterioration (PSD) permit application (7900015.06A) for the construction and operation of a new SOFA low-NOx burner controls on the existing Units 1-3 boilers at the Dan River Steam Station.

The application was deemed complete for review purposes for review purposes pursuant to 40 CFR 51.166 (q)(1) and 15A NCAC 2D .0530(o) on March 23, 2006.

Previously, similar SOFA low-NOx control projects have been exempt from PSD review under the provisions for Pollution Control Projects (PCPs) as defined under 40 CFR 51.166(b)(31) for electric utility steam generating units for projects undertaken for the purpose of reducing emissions. However, on June 24, 2005, the US Court of Appeals vacated the PCP exclusion under WEPCO, therefore making any project with a significant collateral increase of a secondary pollutant subject to PSD review.

The Dan River facility is located in Eden, Rockingham County, NC. It operates under the current air permit 03455T23.

Permitted equipment at the facility are the following: three coal/No. 2 fuel oil-fired electric utility boilers, three No. 2 fuel oil/natural gas-fired simple-cycle combustion turbines, two No. 2 fuel oil-fired starting diesel engines, one No. 2 fuel oil-fired auxiliary boiler, and one rail-car unloading system.

The facility is a PSD major stationary source, as per 40 CFR 51.166(b)(1)(i)(a), classified under the category of "fossil fuel-fired steam electric plants of more than 250 million Btu per hour heat input". The facility emits or has the potential to emit 100 tons per year of particulate matter (PM), $PM_{10,}$ sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC).

The proposed project will create a beneficial effect in reduction in NOx emissions at a rate of 923.4 tons/yr. It will result in an increase in carbon monoxide (CO) emissions of 1262.3 tons/yr. The modification is subject to PSD review for CO. The facility must also comply with other applicable NC DAQ air pollution regulations.

In accordance with PSD requirements, Duke has conducted a best available control technology (BACT) analysis, source impact analysis, additional impacts (soils, vegetation, visibility) analysis, and Class I area analysis.

The BACT analysis concluded the CO emission limit for the modifications to the Units 1-3 boilers is 0.25 lb/mmBtu with the control technology being "good combustion control."

A Class I analysis was not necessary since there are no Class I areas within 100 km of the site.

The application was sent to Mr. Gregg Worley at EPA Region 4 and to Ms. Cindy Huber at the USDA Forest Service on February 23, 2006, for review.

Pursuant to the Federal Register notice on February 23, 1982, North Carolina (NC) has full authority from the Environmental Protection Agency (EPA) to implement the PSD regulations in the State effective May 25, 1982. Accordingly, the NCDAQ will conduct a full PSD review and process the PSD permit application for the proposed project. NC's State Implementation Plan (SIP) - approved PSD regulations have been codified in 15A NCAC 2D .0530, which implement the requirements of 40 CFR 51.166.

1.1 Preliminary Determination

Duke's PSD application has been reviewed by the NCDAQ, Permits Section staff, to determine compliance with the requirements of all NCDAQ air pollution regulations. The review was performed for the following:

- PSD including determination of BACT with consideration of non-PSD regulated toxic pollutants, source impact analysis, additional impact analysis on soils, vegetation and visibility, and Class I analysis;

- Compliance with the North Carolina Air Quality Rules at 15A NCAC 2D and 2Q.

The NCDAQ, Permits Section staff has conducted a preconstruction review of the application and made a preliminary determination that the proposed project will comply will all applicable North Carolina air quality regulations including the PSD requirements. Therefore, the NCDAQ proposes to issue an air permit for the modification described in Section 1 above, with specific permit conditions and emission limits. Preliminary preconstruction approval under the PSD requirements was contingent upon the following findings:

- A demonstration that the BACT is applied to each emission unit that will contribute to increase in emissions of any pollutant above the significance threshold.

- A demonstration that National Ambient Air Quality Standards (NAAQS) and PSD Class II increments will not be violated as a result of emissions from the proposed project.

- A demonstration that emissions from the proposed project will neither cause adverse impacts to soils and vegetation nor cause degradation of visibility, and that economic growth associated with the project will not cause a significant increase in regional air pollutant levels.

- A demonstration that air emissions resulting from the proposed project will not adversely impact any PSD Class I area.

The remainder of this report contains a review by NCDAQ of the demonstration and analyses presented by Duke. Sections 2 and 3 of this report present a general description of the proposed project and a description of the site location. Section 4 presents a regulatory analysis of the

North Carolina and Federal air quality regulations that apply to the project construction and operation. Section 5 contains the BACT analysis and Section 6 presents the results of the air quality analysis. The emission calculations for PSD applicability have been included in Appendix A while the NCDAQ draft air permit is contained in Appendix B.

In addition to the regulatory analysis, the application must undergo adequate public participation. The NCDAQ solicits and encourages participation by the general public, industry, and other affected persons impacted by the proposed project. Specific public notice requirements and a 30-day public comment period are required before the NCDAQ can take final action on this application. Appendix C contains a copy of the public notice.

SECTION 2.0

GENERAL DESCRIPTION

2.1 Process Description

2.1.1 Existing Operations

Duke's Dan River Steam Station is an electric power production facility classified under the Standard Industrial Classification (SIC) 4911 "Electric Services." The facility has three coal/No. 2 fuel oil-fired electric utility boilers (ID Nos. ES-1 (U-1 Boiler), ES-2 (U-2 Boiler) and ES-3 (U-3 Boiler)), three No. 2 fuel oil/natural gas-fired simple-cycle combustion turbines (ID Nos. ES-4 (CT4C), ES-5 (CT5C) and ES-6 (CT6C)), two No. 2 fuel oil-fired starting diesel engines (ID Nos. ES-7 (4CStEng) and ES-8 (6CStEng)), one No. 2 fuel oil-fired auxiliary boiler (ID No. ES-9 (Aux)), and one rail-car unloading system (ID No. ES-10 (RCU)).

2.1.2 Proposed Modifications

Duke is proposing to install and operate separated overfire air (SOFA) low-NOx controls on the Dan River Units 1-3 boilers. The SOFA low-NOx controls are being installed on these units to help meet tonnage-based NOx reduction targets in accordance with the federal NOx SIP Call as implemented through the 15A NCAC 2D .1400 rules, and also to meet the Clean Smokestacks Act requirements for system-wide NOx reductions beginning 2007 for all Duke coal-fired boilers in NC. The equipment will be operated on an as-needed basis to meet the applicable 2D .1400 limits. These limits along with the associated monitoring, recordkeeping and reporting requirements are already in the permit for these sources.

The Foster Wheeler SOFA low-NOx controls redistribute combustion air in the boiler through redesign of existing air ports, and addition of SOFA ports above the existing burners. NOx is formed during combustion by oxidation of fuel-bound and atmospheric nitrogen at high temperatures. The SOFA technology modifies the combustion by re-distributing combustion air by reducing the amount of air in the high heat zone, which reduces the maximum flame temperature and providing additional secondary air above the main combustion zone to complete the combustion and will limit formation of thermal NOx.

2.2 Emissions

Duke expects to achieve a NOx emission rate of 0.25 lb/mmBtu during the five-month ozone season, which is a 38% reduction beyond the 0.45 lb/mmBtu Acid Rain annual-averaged emission limit for these units. Emissions of NOx are expected to be reduced by 923.4 tons during the 5-month ozone season each year (see Appendix A).

Emissions of carbon monoxide (CO) are expected to increase due to incomplete combustion of a small amount of carbon at the lower flame temperatures. The SOFA vendor (Foster Wheeler) states that CO emissions will increase from the baseline values of (see Appendix A):

Baseline CO Emissions

Unit 1:	0.0206 lb/mmBtu
Unit 2:	0.0191 lb/mmBtu
Unit 3:	0.0180 lb/mmBtu

In general, low-NOx controls can result in an increase in particulate emissions as a result of an increase in the amount of residual unburned carbon fly ash or loss on ignition (LOI), depending on the extent of the controls added. In this case, since only overfire air is being added and not new low-NOx burners, Duke claims that emissions of particulates will not increase and has provided operational data on opacity and particulate emissions from annual 2D .0536 stack tests from their other units where SOFA has been added to show no increases in particulates are expected (see e-mail to Ed Martin from Gary D, Taylor dated February 21, 2006) (also see Section 4.1).

Potential hourly emissions of CO from the proposed modification at the projected new CO emission rate are determined as follows:

Future Potential Hourly CO Emissions

	heat input		CO emission rate		
Unit 1:	1140 mmBtu/hr	x	0.25 lb/mmBtu	=	285.0 lb/hr
Unit 2:	1140 mmBtu/hr	x	0.25 lb/mmBtu	=	285.0 lb/hr
Unit 3:	1710 mmBtu/hr	x	0.25 lb/mmBtu	=	427.5 lb/hr

The permit will require testing for compliance with this CO limit.

These are the emission rates used for showing compliance with the NAAQS (see Section 6.0).

See Section 4.1 for the increase in annual CO emissions for PSD applicability.

SECTION 3.0

REGIONAL DESCRIPTION

3.1 Area Classification

The facility is located in northern Rockingham County. The approximate UTM coordinates of the facility are 614250 m East and 4038400 m North. The area is classified as "rural."

Air quality in Rockingham County is classified with respect to the NAAQS as listed below:

Pollutant	**Attainment Status**
PM_{10}	Attainment
$PM_{2.5}$	Attainment
Sulfur Dioxide	Attainment
Nitrogen Dioxide	Attainment
Carbon Monoxide	Attainment
Ozone	Non-Attainment

Rockingham County is considered a Class II Area with ambient air increments for PM_{10}, SO_2, and NO_x.

There are no Class I areas within 100 km of the site. The Federal Land Manager informed DAQ that there was no need for a Class I analysis of CO impacts (ref: e-mail to Ed Martin from Cindy Huber dated March 16, 2006).

SECTION 4.0

REGULATORY ANALYSIS

The following discussion pertains to the regulatory requirements that must be met for the proposed modification of the Dan River facility. These requirements include both PSD regulations and other State air quality regulations. Previously, similar SOFA low-NOx control projects have been exempt from PSD review under the provisions for Pollution Control Projects (PCPs) as defined under 40 CFR 51.166(b)(31) for electric utility steam generating units for projects undertaken for the purpose of reducing emissions. However, on June 24, 2005, the US Court of Appeals vacated the PCP exclusion under WEPCO, therefore making any project with a significant collateral increase of a secondary pollutant subject to PSD review.

4.1 PSD Applicability and Required Analysis

The basic goal of the PSD regulations is to ensure that the air quality in clean (i.e. attainment) areas does not significantly deteriorate while maintaining a margin for future industrial growth. The PSD regulations focus on industrial facilities, both new and modified, that create large increases in the emission of certain pollutants.

US Environmental Protection Agency (EPA)'s latest revisions governing the PSD regulation are included in the Federal Register (67 FR 80186, December 31, 2002 and 68 FR 63021, November 7, 2 003)[1]. As indicated above in Section 1, effective May 25, 1982, the NCDAQ received full authority from the EPA to implement PSD regulations in the state.

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

The Dan River facility is an existing PSD major stationary source. It emits or has the potential to emit 100 tons per year of PM, $PM_{10,}$ $PM_{2.5,}$ SO_2, NO_x, CO, and VOC. It has been classified under the category of "fossil fuel-fired steam electric plants of more than 250 million Btu per hour heat input".

Because the existing facility is considered a major stationary source, modification to an existing major source which results into emission increases for regulated pollutants in the amounts equal or greater than the significance levels, is subject to PSD review and must meet certain review requirements. Thus, the emission increases as a result of this modification must be compared to the "significance levels" as listed in 40 CFR 51.166(b)(23)(i) to determine which pollutants must undergo PSD review.

[1] The PSD regulation revisions in 40 CFR 51.166 as included in 15A NCAC 2D .0530, are currently not applicable in North Carolina.

On June 15, 2005, the Fourth Circuit Court of Appeals ruled that EPA must use a consistent definition of the term "modification" when applying an emissions test for both the NSPS and NSR programs; instead of the previous NSR method of comparing actual emissions to projected emissions. As a result, the NSPS emissions test, using the hourly increase, currently applies in all Fourth Circuit states (including North Carolina).

Therefore, Duke has performed the PSD applicability analysis using the following two steps:

Step 1 Determine whether the project results into an hourly emission increase for any NSPS regulated pollutant.

Emissions of CO will increase from the baseline actual emissions of (see Appendix A):

Unit 1:	0.0206 lb/mmBtu
Unit 2:	0.0191 lb/mmBtu
Unit 3:	0.0180 lb/mmBtu

to 0.25 lb/mmBtu for all units. Therefore hourly CO emissions will increase and a PSD applicability review must be performed for this modification.

Step 2 Determine whether project results into emission increase of any PSD regulated pollutant above the respective significance thresholds.

Using the WEPCO rule (57 FR 32314, July 21, 1992), Duke has performed calculations (see Appendix A) for actual (pre-change) and future actual (after-change) emissions for all PSD regulated pollutants. Duke used actual CO emissions and utilization data from the last five years for Units 1-3, as reported to DAQ through annual emission inventories, to determine baseline emissions. Baseline emissions have been determined using the highest two-year period from the last five years (2000-2004). Duke selected the baseline period as years 2003 and 2004. Then, future actual emissions were estimated for the five year period 2007-2011 using the projected future utilization and operating data for the units. From the initial estimate of future actual (annual) emissions, Duke has deducted those emissions which could have been accommodated during the baseline period and which are not related to the project. This can include emissions as a result of an increase in utilization of the units due to demand growth. This is in accordance with the provisions of 40 CFR 51.166(b)(21) "Actual Emissions" and (b)(32) "Representative Actual Annual Emissions" to perform the PSD major modification applicability analysis. The facility-wide potential increases in emissions are compared to the PSD "significance levels" as shown in Table 4-1.

Table 4-1 Emission Changes for the Proposed Project

Pollutant	Net Emissions Increase/Decrease (Tons Per Year)	PSD Significant Net Emissions Increase (Tons Per Year)	PSD Major Modification Review Required?
PM	0	25	no
PM_{10}	0	15	no
SO_2	0	40	no
NOx	-923.4*	40	no
CO	1262.3*	100	**yes**
VOC (ozone)	0	40	no
Lead	0	0.6	no
Sulfuric Acid Mist	0	7	no

* see Appendix A for calculations

Any pollutant which is emitted at a rate greater than the significance level must undergo a PSD review. The proposed modifications will produce significant emissions of, and is therefore subject to PSD review for CO. Duke performed the following reviews and analysis related to PSD for the emissions of CO:

1. A BACT determination, including an evaluation of unregulated pollutants such as toxic air pollutants,

2. An Air Quality Impact Analysis including monitoring and air modeling to determine extent and significance of any potential air quality impact, and

3. An Additional Impacts Analysis including effects on soils, vegetation, and visibility.

Under PSD regulations, the determination of the necessary emission control equipment is developed through a BACT review. BACT is defined, in pertinent part, at 40 CFR 51.166 (b)(12) as:

> *An emissions limitation... based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.*

The BACT requirements are intended to ensure that the control systems incorporated in the design of the proposed facility reflect the latest control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the facility. Additionally, the BACT analysis must consider the impacts of noncriteria pollutants and unregulated toxic air pollutants, if any are emitted, when making the BACT decision for regulated pollutants. Under the BACT requirements of the PSD regulations, all BACT emission limits must, at a minimum, comply with any applicable standard of performance under 40 CFR

Part 60 (New Source Performance Standards) and Part 61 (National Emission Standards for Hazardous Air Pollutants), and the North Carolina State Implementation Plan (SIP). A discussion of the BACT determination can be found in Section 5.

Future actual annual emissions projections for years 2007 to 2011 for PM/PM-10, SO_2 and sulfuric acid mist are larger than their respective significance thresholds when emissions unrelated to the project are included. Therefore, the permit will contain a requirement to report actual emissions for these pollutants for five years after the change as per 40 CFR 51.166(b)(21)(v), in order to verify that the project does not increase the representative actual annual emissions. Because the emission factors for SO_2 and sulfuric acid mist are not expected to change due to the project, the DAQ will require reporting of actual annual utilization data as a method of tracking post-change emissions for these pollutants (See 57 FR 32325, July 21, 1992). For VOC and lead, total future actual emissions (including projected demand growth) do not exceed the PSD significance thresholds, so there is no possibility that there will be a significant increase for these pollutants after the change; therefore, reporting of actual emissions for five years for VOC and lead is not required.

Duke has stated that there will be no change in heat input, capacity or emissions of pollutants other than CO (see Duke letter to Ms. Laura Butler from Mr. Gary D. Taylor dated March 20, 2006). As stated previously, low-NOx controls can result in an increase in particulate emissions as a result of an increase in the amount of residual unburned carbon fly ash or loss on ignition (LOI), depending on the extent of the controls added. In this case, since only overfire air is being added and not new low-NOx burners, Duke claims that emissions of particulates will not increase and has provided operational data on opacity and particulate emissions from annual 2D .0536 stack tests from their other units where SOFA has been added to show no increases in particulates are expected. While this data is favorable to showing no increases in particulates result from the SOFA modification, it is not conclusive and therefore stack testing for emissions of PM/PM-10 for one of the units (Unit 3 to be representative/typical of all three units) will be required to demonstrate that particulates will not increase as a result of installing the SOFA low-NOx burner controls.

The emission calculations for PSD applicability can be found in Appendix A.

4.2 NCDAQ Air Pollution Regulations

In addition to the PSD requirements, the NCDAQ has promulgated air quality rules under Title 15A NCAC Subchapter 2D and 2Q.

The NCDAQ emission control regulations that affect the proposed modification are summarized below:

Regulation	Affected Sources	Regulatory Requirements
2Q .0101	modified Units 1-3	A permit is required for all sources of air emissions not specifically exempted.
2D .0400	same as above	Compliance with NAAQS.
2D .0501(e)	same as above	SO_2 emissions cannot exceed 1.81 lb/mmBtu in order to comply with NAAQS.
2D .0519	same as above	NOx emissions cannot exceed 1.8 lb/mmBtu (when burning coal) and 0.8 lb/mmBtu (when burning oil).
2D .0521	same as above	Visible emissions cannot exceed 40 percent opacity.
2D .0530	same as above	PSD review is required for a major modification.
2D .0535	same as above	Emissions in excess of established permit limits that last for more than 4 hours require notification to the Director within 24 hours.
2D .0536	same as above	Particulate emissions cannot exceed: Unit 1 0.15 lb/mmBtu Unit 2 0.15 lb/mmBtu Unit 3 0.25 lb/mmBtu Average annual opacity cannot exceed (state-enforceable only): Unit 1 7 percent Unit 2 9 percent Unit 3 20 percent
2D .0606	same as above	Quarterly excess emissions reports are to be used as an indication of good operations and maintenance practices of ESP.
2D .1416	same as above	NOx emissions cannot exceed: Unit 1 124 tons/ozone season Unit 2 135 tons/ozone season Unit 3 286 tons/ozone season System-wide emissions of NOx emissions from all coal fired boilers and combustion turbines owned or operated in NC by the company and not listed in 2D .1417 cannot exceed 16,780 tons/ozone season.
2Q .0317(a)(1)	Unit 3	PSD avoidance for sulfuric acid mist from the Unit 3 sulfur trioxide flue gas treatment system.
2Q .0317(a)(1)	modified Units 1-3	PSD avoidance for PM/PM-10 for the SOFA low-NOx burner controls.
2Q .0402	same as above	SO_2 allocations for different years and NOx emission limit of 0.45 lb/million Btu. These limits cannot be exceeded.

4.2.1 15A NCAC 2Q .0101 - Required Air Quality Permits

This regulation requires the owner or operator of all sources for which there is an ambient air quality or emission control standard, that is not exempted from permit requirements, to apply for an air quality permit The owner or operator of a source required to have a permit shall not begin construction or operation of the source without first obtaining a permit. Units 1-3 are permitted sources and the proposed modification is not exempt from permitting. Thus, Duke is required to file an air permit application and obtain a revised permit prior to any construction or change in

method of operation of the source. Duke has submitted the required application and information sufficient to obtain an air quality permit, including all information required pursuant to 15A NCAC 2D .0530 "Prevention of Significant Deterioration".

4.2.2 15A NCAC 2D .0400 – Ambient Air Quality Standards

See Section 6.0.

4.2.3 15A NCAC 2D .0501(e) – Compliance With Emission Control Standards

In order to show compliance with the NAAQS, the Dan River facility had to reduce SO_2 emissions to 1.81 lb/mmBtu instead of the otherwise applicable standard of 2.3 lb/mmBtu under 2D .0516.

4.2.4 15A NCAC 2D .0519 – Control of Nitrogen Dioxide and Nitrogen Oxide Emissions

NOx emissions shall not exceed 0.8 lb/mmBtu of heat input from any oil or gas-fired boiler with a capacity of 250 mmBtu/hr or more; or 1.8 lb/mmBtu of heat input from any coal-fired boiler with a capacity of 250 mmBtu/hr or more.

4.2.5 15A NCAC 2D .0521 - Control of Visible Emissions

The intent of this Rule is to prevent, abate and control emissions generated from fuel burning operations and industrial processes where an emission can be reasonably expected to occur, except during startup, shutdowns, and malfunctions approved as such according to procedures approved under 15A NCAC 2D .0535.

For sources manufactured as of July 1, 1971, visible emissions shall not be more than 40 percent opacity when averaged over a six-minute period. For sources required to install, operate, and maintain continuous opacity monitoring systems (COMS), compliance with the 40 percent opacity limit shall be determined as follows:

i. No more than four six-minute periods shall exceed the opacity standard in any one day; and
ii. The percent of excess emissions (defined as the percentage of monitored operating time in a calendar quarter above the opacity limit) shall not exceed 0.8 percent of the total operating hours. If a source operates less than 500 hours during a calendar quarter, the percent of excess emissions shall be calculated by including hours operated immediately previous to this quarter until 500 operational hours are obtained.

Excess emissions during startup and shutdown shall be excluded from the determinations in paragraphs i and ii above, if the excess emissions are exempted according to the procedures set out in 2D .0535(g). Excess emissions during malfunctions shall be excluded from the determinations in paragraphs i and ii above, if the excess emissions are exempted according to the procedures set out in 2D .0535(c).

All periods of excess emissions shall be included in the determinations in paragraphs i and ii above until such time that the excess emissions are exempted according to the procedures in 2D .0535.

4.2.6 15A NCAC 2D .0530 - Prevention of Significant Deterioration

Facilities classified as major for PSD and applying for a significant modification are subject to all the requirements as defined in 40 CFR 51.166. These requirements include:

- A demonstration that the BACT is applied to each emission unit that will emit any PSD regulated pollutant above the significant threshold, including a demonstration that emissions of air toxics will not exceed the acceptable ambient levels (AAL's) as regulated by the NCDAQ.

- A demonstration that neither allowable PSD ambient air increments nor NAAQS will be violated as a result of emissions from the proposed project.

- A demonstration that emissions from the proposed project will neither cause adverse impacts to soils and vegetation nor cause degradation of visibility, and that economic growth associated with the project will not cause a significant increase in regional air pollutant levels.

- A demonstration that air emissions resulting from the proposed facility will not adversely impact any PSD Class I area.

For additional details on PSD regulatory analysis, see Section 4.1 above.

4.2.7 15A NCAC 2D .0535 - Excess Emissions Reporting and Malfunctions

This regulation applies to all permitted facilities and outlines the procedures of reporting excess emissions as a result of malfunctions or operational upsets. The facility owner/operator must notify the appropriate regional office of any excess emissions that last for greater than four hours. This report must be made within 24 hours of becoming aware of the occurrence.

4.2.8 15A NCAC 2D .0536 - Particulate Emissions from Electric Utility Boilers

The purpose of this regulation is to establish particulate and annual average opacity standards for electric utility boilers, as shown above. The visible emissions standards for all electric utility boilers in NC have been disapproved by EPA and hence, they are state-enforceable only.

4.2.9 15A NCAC 2D .0606 – Sources Covered by Appendix P of 40 CFR Part 51

Quarterly excess emissions reports are to be used as an indication of good operations and maintenance practices of ESP.

4.2.10 15A NCAC 2D .1416 - Emission Allocations for Utility Companies

This regulation is NC's NOx SIP-Call requirement. NOx emissions from Unit 2 boiler cannot exceed 150 tons per ozone season for 2006 and later. System-wide emissions of NOx (collective NOx emissions from all coal fired boilers and combustion turbines owned or operated in NC by the company and not listed in 2D .1417) also cannot exceed 11,320 tons per ozone season for 2006 and later. The modified Unit 2 boiler will continue to comply with the above NOx allocations.

4.2.11 15A NCAC 2D .0317(a)(1) – Avoidance Condition for PSD

The permit already contains PSD avoidance for sulfuric acid mist from the Unit 3 sulfur trioxide flue gas treatment system. A new condition is being added for PSD avoidance for PM/PM-10 for the SOFA low-NOx burner controls.

4.2.12 15A NCAC 2Q .0402 - Acid Rain Permitting Procedures

Unit 2 boiler is subject to Acid Rain program requirements under the CAA. The current permit includes SO_2 allocations for different years and NOx emission limit of 0.45 lb/million Btu for the boiler. The modification to Unit 2 boiler will not change this requirement.

SECTION 5.0

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

5.1 Introduction

Each pollutant subject to a PSD review must meet the criteria of BACT, which refers to the maximum amount of emission reduction currently possible with respect to technical application and economic, energy, and environmental considerations. Given the variation between emission sources, facility configuration, local airsheds, and other case-by case considerations, Congress determined that it was impossible to establish a single BACT determination for a particular pollutant or source. Economics, energy, and environmental impact are mandated in the CAA to be considered in the determination of case-by-case BACT for specific emission sources. In most instances, BACT may be defined through an emission limitation. In cases where this is impossible, BACT can be defined by the use of a particular type of control device and its achievable emission reduction efficiency. In no event can a technology be recommended which would not comply with any applicable standard of performance under 40 CFR Part 60 and 61.

Additionally, as a result of the EPA remand involving the North County Resource Recovery project in Region IX, the effects of non-regulated PSD pollutants, such as toxic air pollutants, are to be accounted for in determining if the BACT otherwise being prescribed for a regulated pollutant still represents an appropriate level and type of control. There is no specific formula for making PSD decisions for unregulated pollutants; this is a case-by-case process involving the judgment of the reviewing authority. If the reviewing authority judges the potential environmental effects of such unregulated pollutants to be of possible concern to the public, then the final BACT decision for a regulated pollutant should address these efforts and reflect, as appropriate, the control technology beyond what might otherwise be chosen as BACT.

To assist in bringing consistency to the BACT process, the EPA has issued guidance encouraging all PSD applicants to use the "top-down" approach to BACT. In this case, the applicant's BACT analysis is consistent with the EPA based "top-down" approach. However, NC DAQ does not strictly adhere to EPA's top-down guidance. Rather DAQ implements BACT in strict accordance with the statutory and regulatory language. As such, DAQ's BACT conclusions may differ from those of the applicant or EPA.

In general, the top-down approach consists of five basic steps. These are:

1) Identify all control technologies,
2) Eliminate technically infeasible options,
3) Rank remaining control technologies by control efficiencies,
4) Evaluate the most effective controls and document results, and
5) Select BACT

Step one in this approach is a comprehensive listing of control alternatives for each applicable regulated pollutant under evaluation. Available control alternatives are those technologies with practical potential for application on similar or identical sources. **Step two** is a evaluation of technical feasibility with respect to source-specific factors. A demonstration of technical

infeasibility is made to eliminate control options based on technical difficulties that would preclude the successful application of the option on the source being reviewed. Technically infeasible alternatives are then eliminated from further BACT analysis. **Step three** ranks the remaining control technologies by control effectiveness, including the control efficiencies (percent of pollutant removed), expected emission rate (tons per year and pounds per hour), expected emission reduction (tons per year), economic impacts (cost effectiveness), environmental impacts (including emission of toxic or hazardous air contaminants), and energy impacts (benefits or disadvantages). **Step four** is a case-by-case evaluation of energy, environmental, and economic impacts. **Step five** requires the selection of the most effective option not rejected as BACT for the emission source.

The PSD regulated pollutant, which is emitted above its significance thresholds for the change is CO. The BACT analysis will address applicable control techniques for this pollutant.

5.2 Previous BACT Determinations

A review of the RACT/BACT/LAER Clearinghouse for recent CO determinations for similar projects showed only two modifications where overfire air and/or low-NOx burners were added to existing boilers. These were for: (1) the George Neal North plant (RBLC ID IA-0081, permit issued December 19, 2005), which consisted of the addition of overfire air only and had a CO limit of 1.26 lb/mmBtu; and (2) the Neal Energy Center South plant (RBLC ID IA-0080, permit issued September 28, 2005), which consisted of new low-NOx burners and the addition of overfire air and had a CO limit of 0.42 lb/mmBtu. Note, neither of these included a PSD limit for any collateral increase in PM emissions due to the addition of overfire air. The control technology was "good combustion" in both cases. These previous determinations are included in Appendix E.

5.3 BACT Analysis for CO

CO is a product of incomplete combustion and its concentration in the exhaust gas is sensitive to boiler operating and combustion conditions. Operating conditions that increase CO formation include low combustion temperature, insufficient residence time, and insufficient oxygen as a result of low air-to-fuel ratios or inadequate mixing (which in turn can be due to improper burner settings and deteriorated burner components). In addition, increased CO is a natural consequence of using combustion controls that reduce emissions of NOx.

CO Top-Down Control Alternatives

The potential CO control techniques evaluated by Duke for reducing the formation of CO: good combustion control, catalytic oxidation and SCONOx.

Good Combustion Control

Combustion control refers to controlling emissions through proper design and operation of the boiler to minimize the formation as much as possible. This includes providing sufficient excess air for complete combustion, staged combustion or overfire air to complete burnout of CO, proper air-to-fuel ratios, and a boiler design that provides the necessary temperature, residence time and mixing conditions in the combustion zone. As

a result of economic incentives, as well as air pollution concerns, manufacturers have attempted to maximize combustion efficiency.

Catalytic Oxidation

Catalytic oxidation is an add-on or post-combustion exhaust gas treatment in which the boiler exhaust gases pass through a catalyst bed (typically platinum/rhodium), where CO is oxidized to CO_2. Elevated temperatures in the range of 600^{o}F are required for reaction efficiencies above 90% to take place for CO.

This technology, even though possible, has not been applied to a coal-fired boiler. Also, catalytic oxidation is not considered technically feasible for fuels containing sulfur compounds since these compounds are also oxidized in the catalyst, increasing collateral increases in SO_3 and sulfuric acid emissions. In addition to the increased emissions, this can cause corrosion problems in the air preheater, ductwork and stack.

SCONOx

SCONOx technology is similar to catalytic oxidation, using the same reduction catalyst material technology, primarily to reduce NOx emissions by oxidizing NO to NO_2 but with the additional benefit of also destroying CO. This technology, like catalytic oxidation, has not been applied to a coal-fired boiler.

CO BACT Determination

Table 5-1 Ranking of CO Control Technology

Control Technology	Emissions (lb/mmBtu)	Technically Feasible?
Good Combustion Control	0.03-0.44 (new boilers*)	yes
	0.42 & 1.26 (overfire air on existing boilers)	
Oxidation Catalyst	not feasible	no
SCONOx	not feasible	no

* This range taken from Duke's application. This closely matches DAQ's review of Clearinghouse data for the Progress Energy Lee plant low-NOx burner modification (ref: preliminary determination dated February 10, 2006.

Based on the above, it is concluded that the CO emission limit for the SOFA low-NOx control modifications to the Units 1-3 boilers is 0.25 lb/mmBtu with the control technology being "good combustion control."

SECTION 6.0

AIR QUALITY IMPACT ANALYSIS

6.1 PSD Requirements

PSD regulation 40 CFR 51.166 (k) requires an applicant to perform an ambient impact analysis to ensure the following:

1. No National Ambient Air Quality Standard (NAAQS) will be exceeded at any location during any time period where the proposed new source will have a significant impact.

2. The proposed new source, in combination with other increment-affecting sources, will not cause any allowable PSD increment to be exceeded.

PSD regulation 40 CFR 51.166 (m) requires the establishment of ambient air quality in the impact area of the proposed source for all pollutants (including those for which no NAAQS exists) with emissions increases which exceed the PSD significant levels (as defined by 40 CFR 51.166 (b)).

Duke submitted a PSD modeling analysis to support the installation of the SOFA low-NOx controls to be added to Units 1-3 at the Dan River Steam Station in Rockingham County. There will be a significant reduction of NOx as a result of the project. However, there will be a significant increase in CO emissions. No other changes are expected to other pollutants. The analysis shows that this project will not cause or contribute to an exceedence of the National Ambient Air Quality Standards (NAAQS).

6.2 Air Quality Impact Analysis

Location and Topography

The facility is located in northern Rockingham County. The approximate UTM coordinates of the facility are 614250 m East and 4038400 m North. The area is classified as "rural."

Rockingham County is considered a Class II Area with ambient air increments for PM_{10}, SO_2, and NO_x. However, an increment analysis was not required since there are no increases in emissions of these pollutants.

Modeled Sources

The proposed project consists of installing SOFA low-NOx burner on an existing Units 1-3 boilers. The only pollutant increases for the project are for CO emissions. Potential emissions from the boilers are determined using the expected 0.25 lb/mmBtu (see Section 2.2). In addition, CO emissions from the three existing combustion turbines were included, using AP-42 factors. Potential emissions are as follows:

Boilers

	heat input		CO emission rate	
Unit 1:	1140 mmBtu/hr	x	0.25 lb/mmBtu	= 285.0 lb/hr
Unit 2:	1140 mmBtu/hr	x	0.25 lb/mmBtu	= 285.0 lb/hr
Unit 3:	1710 mmBtu/hr	x	0.25 lb/mmBtu	= 427.5 lb/hr

Combustion Turbines

AP-42 Factors:	Natural Gas	8.2 E-2 lb/mmBtu
	Fuel Oil	3.3 E-3 lb/mmBtu

	heat input		CO emission rate	
Unit 4C:	712 mmBtu/hr	x	8.2 E-2 lb/mmBtu	= 58.384 lb/hr
Unit 5C:	712 mmBtu/hr	x	8.2 E-2 lb/mmBtu	= 58.384 lb/hr
Unit 6C:	712 mmBtu/hr	x	8.2 E-2 lb/mmBtu	= 58.384 lb/hr

Three load scenarios (100, 75, & 50 percent) were evaluated to determine the maximum impact from the project. Modeled rates for CO are shown in Table 6-1 for all sources.

Table 6-1 CO Emissions

Source	CO Emissions @100% load (lb/hr)
Unit 1 (boiler)	285.0
Unit 2 (boiler)	285.0
Unit 3 (3A + 3B boilers)	213.75 + 213.75
4C (combustion turbine)	58.384
5C (combustion turbine)	58.384
6C (combustion turbine)	58.384

6.3 Class II NAAQS Air Dispersion Modeling Analysis

Duke used EPA's Industrial Source Complex Short-Term (ISCST3) model to evaluate impacts from the facility. Model receptors were placed along the property boundary at spacing of 25 meters and extended outward for 10 km. Five years of NC DAQ approved meteorological data (1987-1991) from Greensboro (surface and upper air), were used with ISCST3. A GEP analysis was conducted using the BPIP program. The results of the refined NAAQS modeling is shown in Table 6-2.

Table 6-2 Class II Refined CO Modeling Results (ug/m^3)

Pollutant	Eval Period	Source Contribution (ug/m^3)	Background (ug/m^3)	Max Impact (ug/m^3)	NAAQS Standard	% of NAAQS
CO	1-hr	383.516	3321.0	3704.5	40,000	**9.3**
CO	8-hr	138.598	2634.0	2772.6	10,000	**27.7**

6.4 Additional Impact Analysis

6.4.1 Growth Impacts

No additional employees are planned to be hired and there is no increase in the capacity of Units 1-3; therefore no negative impacts to the area from growth are anticipated.

6.4.2 Soils and Vegetation

No adverse off-site impacts on soil or vegetation are expected since NOx emissions will decrease resulting in a decrease in ground-level ozone. Also, the increase in CO emissions results in ambient concentrations much below the secondary standard of 1,800,000 ug/m^3.

6.4.3 Class II Visibility Impairment Analysis

No adverse impacts on Class II visibility are expected since NOx emissions are being reduced significantly, resulting in a decrease in ground-level ozone.

6.5 Class I Increment/Air Quality Related Values (AQRV) Regional Haze Impact Analysis

There are no Class I areas within 100 km of the site. The Federal Land Manager informed DAQ that there was no need for a Class I analysis of CO impacts (ref: e-mail to Ed Martin from Cindy Huber dated March 16, 2006).

6.6 Source Impact Analysis Conclusion

Based on the ambient impact analysis, the proposed project at the Dan River Steam Station will not cause or contribute to any violation of: NAAQS, Class II PSD increment standards, Class I PSD increment, NC AAL, or any Federal Land Manager AQRVs.

APPENDIX A

Emission Calculations for PSD Applicability

APPENDIX B

Draft Permit

APPENDIX C

Public Notice

APPENDIX D

Correspondence

APPENDIX E

Previous BACT Determinations

APPENDIX F

Application