TECHNICAL EVALUATION
&
PRELIMINARY DETERMINATION

APPLICANT

City of Gainesville, Gainesville Regional Utilities
Post Office Box 147117 (A132)
Gainesville, Florida 32614-7117

Deerhaven Generating Station
Facility ID No. 0010006

PROJECT

Project No. 0010006-014-AC
Application for Minor Source Air Construction Permit
Low-NOx Burner Replacement for Unit 2

COUNTY

Alachua County, Florida

PERMITTING AUTHORITY

Florida Department of Environmental Protection
Division of Air Resource Management
Bureau of Air Regulation
New Source Review Section
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

February 16, 2011

1. GENERAL PROJECT INFORMATION

Air Pollution Regulations

Projects at stationary sources with the potential to emit air pollution are subject to the applicable environmental laws specified in Section 403 of the Florida Statutes (F.S.). The statutes authorize the Department of Environmental Protection (Department) to establish regulations regarding air quality as part of the Florida Administrative Code (F.A.C.), which includes the following applicable chapters: 62-4 (Permits); 62-204 (Air Pollution Control – General Provisions); 62-210 (Stationary Sources – General Requirements); 62-212 (Stationary Sources – Preconstruction Review); 62-213 (Operation Permits for Major Sources of Air Pollution); 62-296 (Stationary Sources - Emission Standards); and 62-297 (Stationary Sources – Emissions Monitoring). Specifically, air construction permits are required pursuant to Rules 62-4, 62-210 and 62-212, F.A.C.

In addition, the U. S. Environmental Protection Agency (EPA) establishes air quality regulations in Title 40 of the Code of Federal Regulations (CFR). Part 60 specifies New Source Performance Standards (NSPS) for numerous industrial categories. Part 61 specifies National Emission Standards for Hazardous Air Pollutants (NESHAP) based on specific pollutants. Part 63 specifies NESHAP based on the Maximum Achievable Control Technology (MACT) for numerous industrial categories. The Department adopts these federal regulations on a quarterly basis in Rule 62-204.800, F.A.C.

Glossary of Common Terms

Because of the technical nature of the project, the permit contains numerous acronyms and abbreviations, which are defined in Appendix A of this permit.

Facility Description and Location

Gainesville Regional Utilities (GRU) operates the existing Deerhaven Generating Station, which is an existing electrical generating plant categorized under Standard Industrial Classification Code No. 4911. The existing facility is located in Alachua County at 10001 NW 13th Street in Gainesville, Florida. The UTM coordinates of the existing facility are Zone 17, 365.7 km East, and 3292.6 km North. This site is in an area that is in attainment (or designated as unclassifiable) for all air pollutants subject to state and federal Ambient Air Quality Standards (AAQS).

Unit 2 is an existing 251 megawatt (MW, nominal) fossil fuel fired steam boiler. Unit 2 is authorized to fire coal, natural gas or distillate fuel oil (Nos. 1 or 2) with emissions exhausted through a 350 foot stack with a exit diameter of 18.5 feet. The actual volumetric flow rate is approximately 766,500 actual cubic feet per minute. Particulate matter emissions are controlled by a baghouse. Sulfur dioxide emissions are controlled by a circulating dry scrubber. Emissions of nitrogen oxides are controlled by a selective catalytic reduction (SCR) system. There is some ancillary support equipment for handling and storage.

Facility Regulatory Categories

- The facility is a major source of hazardous air pollutants (HAP).
- The facility operates units subject to the acid rain provisions of the Clean Air Act.
- The facility is a Title V major source of air pollution in accordance with Chapter 62-213, F.A.C.
- The facility is a major stationary source in accordance with Rule 62-212.400, F.A.C. for the Prevention of Significant Deterioration (PSD) of Air Quality.
- Units 1 and 2 are subject to the Clean Air Interstate Rule (CAIR).
- Unit 2 is subject to New Source Performance Standards (NSPS) in Subpart D of Title 40, Part 60 of the Code of Federal Regulations. The project will not affect the NSPS requirements.

Project Description

On January 19th, 2011, the Department received an application requesting the replacement of the existing Unit 2 coal burners with a low-NOx burner system and a modified over-fire air (OFA) system. The low-NOx burner project consists of an 18 Opti-Flow fuel injectors, secondary air nozzles, windbox compartment modifications, igniters, burner panels, over-fire air modifications, auxiliary air port modifications and coal piping. The emissions of nitrogen oxides (NOx) and carbon monoxide (CO) can be controlled by adjusting the low-NOx burners, enlarged auxiliary air ports and by modifying the over-fire air system which will allow tuning the entire combustion system. GRU had computational fluid dynamics (CFD) modeling performed to predict the performance of the new Siemens combustion system. The burner vendor expects NOx emissions to be 22% to 30% less than the existing uncontrolled NOx levels (0.45 lb/MMBtu), which will be approximately 0.32 to 0.35 lb/MMBtu. The same modeling indicates that CO emissions from the boiler furnace will remain the same or will be less.

Processing Schedule

01/13/2011	Received the application for a minor source air pollution construction permit.
01/31/2011	Requested additional information.
02/02/2011	Received additional information; application complete.

2. PSD APPLICABILITY

General PSD Applicability

For areas currently in attainment with the state and federal AAQS or areas otherwise designated as unclassifiable, the Department regulates major stationary sources of air pollution in accordance with Florida's PSD preconstruction review program as defined in Rule 62-212.400, F.A.C. Under preconstruction review, the Department first must determine if a project is subject to the PSD requirements ("PSD applicability review") and, if so, must conduct a PSD preconstruction review. A PSD applicability review is required for projects at new and existing major stationary sources. In addition, proposed projects at existing minor sources are subject to a PSD applicability review to determine whether potential emissions *from the proposed project itself* will exceed the PSD major stationary source thresholds. A facility is considered a major stationary source with respect to PSD if it emits or has the potential to emit:

- 5 tons per year or more of lead;
- 250 tons per year or more of any regulated air pollutant; or
- 100 tons per year or more of any regulated air pollutant and the facility belongs to one of the following 28 PSD-major facility categories: fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, coal cleaning plants (with thermal dryers), Kraft pulp mills, portland cement plants, primary zinc smelters, iron and steel mill plants, primary aluminum ore reduction plants, primary copper smelters, municipal incinerators capable of charging more than 250 tons of refuse per day, hydrofluoric, sulfuric, and nitric acid plants, petroleum refineries, lime plants, phosphate rock processing plants, coke oven batteries, sulfur recovery plants, carbon black plants (furnace process), primary lead smelters, fuel conversion plants, sintering plants, secondary metal production plants, chemical process plants, fossil fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input, petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels, taconite ore processing plants, glass fiber processing plants and charcoal production plants.

Once it is determined that a project is subject to PSD preconstruction review, the project emissions are compared to the "significant emission rates" defined in Rule 62-210.200, F.A.C. for the following pollutants: CO; NO_X; sulfur dioxide (SO_2); particulate matter (PM); particulate matter with a mean particle diameter of 10 microns or less (PM_{10}); volatile organic compounds (VOC); lead (Pb); fluorides (F); sulfuric acid mist (SAM); hydrogen sulfide (H_2S); total reduced sulfur (TRS), including H_2S; reduced sulfur compounds, including H_2S; municipal

waste combustor organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans; municipal waste combustor metals measured as particulate matter; municipal waste combustor acid gases measured as SO_2 and hydrogen chloride (HCl); municipal solid waste landfills emissions measured as non-methane organic compounds (NMOC); and mercury (Hg). In addition, significant emissions rate also means any emissions rate or any net emissions increase associated with a major stationary source or major modification which would construct within 10 kilometers of a Class I area and have an impact on such area equal to or greater than 1 $\mu g/m^3$, 24-hour average.

If the potential emission exceeds the defined significant emissions rate of a PSD pollutant, the project is considered "significant" for the pollutant and the applicant must employ the Best Available Control Technology (BACT) to minimize the emissions and evaluate the air quality impacts. Although a facility or project may be *major* with respect to PSD for only one regulated pollutant, it may be required to install BACT controls for several "significant" regulated pollutants.

PSD Applicability for Project

The low-NOx burner project will reduce the operational cost of the recently installed SCR control system by reducing the amount of ammonia consumption used to control NOx emissions. There will be no increase in the maximum heat input rate to the boiler. The low-NOx burner project is not expected to result in any increase in particulate matter, sulfur dioxide or volatile organic compounds. The project is intended to reduce NOx emissions before control by the existing SCR system to conserve ammonia consumption. Low-NOx burners can result in increased CO emissions. The application indicated baseline emission rates of 0.0143 lb CO/MMBtu and 0.475 lb NOx/MMBtu and projected actual emissions of 0.0143 lb CO/MMBtu and 0.10 lb NOx/MMBtu. Data from an existing process monitor in the boiler furnace was used to develop the baseline CO emissions. Acid Rain Data from the Clean Air Market website was used to develop baseline NOx emissions. The applicant provided the following table summarizing annual CO and NOx emissions and PSD applicability.

Table A: Applicant's Annual Emission Summary and PSD Applicability

Year	Heat Input (MMBtu/yr)	Projected Annual Emissions		Baseline Actual Emissions		Net Change in Emissions	
		CO (TPY)	NOx (TPY)	CO (TPY)	NOx (TPY)	CO (TPY)	NOx (TPY)
2011	13,698,489	97.9	684.9	100.0	3,799.2	-2.0	-3,114.3
2012	15,071,369	107.8	753.6	100.0	3,799.2	7.8	-3,045.6
2013	15,649,883	111.9	782.5	100.0	3,799.2	11.9	-3,016.7
2014	7,198,402	51.5	359.9	100.0	3,799.2	-48.5	-3,439.3
2015	7,099,003	50.8	355.0	100.0	3,799.2	-49.2	-3444.2

Notes:

a) CEMS data from the Acid Rain Program was used to obtain baseline actual emissions for NOx.

b) CO process monitoring data was used to obtain baseline actual emissions.

c) The projected actual emissions are predicted to be lower in 2014 and 2015 because the applicant believes Unit 2 will operate less once the proposed 100 MW biomass-fired power plant (adjacent to the Deerhaven Generating Station) begins commercial operation in 2014.

As shown in the above table, the applicant expect that no increases in emissions of NOx and CO from the project.

The following table summarizes the Department's estimate of actual annual emissions using baseline actual emissions values determined from data obtained on the Clean Air Market website. The baseline heat input rate was based on the average annual emissions data of the highest value of the two consecutive years (2009-2010).

The projected actual annual emissions are based on the same emissions factors (since no change is expected) and the highest annual heat input rate predicted by the applicant.

Table B: Department's Annual Emission Summary and PSD Applicability

Pollutants	Annual Actual Emissions, Tons/Year				Subject to PSD review?
	Baseline Actual Emissions [a]	Projected Actual Emissions [b]	Emissions Increase [c]	PSD Significant Emission Rate	
CO_2	107	112	5	100	No
NOx	471	493	22	40	No

Notes:

a) *Baseline*: The Department used 2010 heat input rate data (14,963,089 MMBtu/year) from the Acid Rain Program since the SCR system commenced operation in April of 2009. For the baseline actual emissions, the Department used the following emissions factors: 0.0143 lb CO_2/MMBtu (process CO monitoring data) and 475 tons NOx/year (Acid Rain data, equivalent to 0.063 lb NOx/MMBtu).

b) *Projected*: The Department used the applicant's 2013 heat input rate data (15,649,883 MMBtu/year), which was the highest projected rate for the five years following completion of the project. For the projected actual emissions, the Department used the following emissions factors: 0.0143 lb CO_2/MMBtu (process CO monitoring data) and 0.063 lb NOx /MMBtu (Acid Rain data). These factors were used since the vendor indicates CO emissions will not increase and the applicant states that the SCR system will be operated such that NOx emissions will remain unchanged.

c) The Department notes that the estimated emissions increases (5 tons CO/year and 22 tons NOx/year) could be deducted because Unit 2 could have accommodated these emissions, which were solely due to predicted demand growth (annual heat input rate).

The proposed project is not expected to exceed the PSD significant emission rates for any PSD pollutant; therefore, the project is not subject to PSD preconstruction review.

3. DEPARTMENT REVIEW

Low-NOx burners may create: (1) a reduced oxygen level in the combustion zone to limit fuel NOx formation; (2) a reduced flame temperature that limits thermal NOx formation; and/or (3) a reduced residence time at peak temperature which also limits thermal NOx formation. Over-fire air is a technique in which a percentage of the total combustion air is diverted from the burners and injected through ports above the top burner level. Over-fire air reduces NOx emissions by: (1) suppressing thermal NOx by partially delaying and extending the combustion process resulting in less intense combustion and cooler flame temperatures; and (2) suppressing fuel NOx formation by reducing the concentration of air in the combustion zone where volatile fuel nitrogen is evolved. Low-NOx burners with over-fire systems are capable of reducing nitrogen oxide emissions by as much as 60% from uncontrolled levels. [1]

In accordance with Permit No. 0010006-005-AC, GRU added a SCR system for Unit 2, which commenced operation in April of 2009 to reduce NOx emissions. The applicant conducted a review of current operational costs (e.g., ammonia) versus the annualized costs of a new low-NOx burner system with reduced operational costs (e.g., ammonia). Despite the predicted reduction in operation of Unit 2 by 2014, the applicant indicates the low-NOx burner system and modified over-fire air system will be cost effective for the plant.

[1] "External Combustion Sources"; AP-42, Emissions Factor Reference Document; EPA; February 02, 2011; ttp://www.epa.gov/ttn/chief/ap42/ch01/final/c01s01.pdf

As previously discussed, the installation and operation of low-NOx burners is not expected to result in PSD-significant emissions increases. Unit 2 is subject to the Acid Rain Program and is equipped with CEMS for monitoring NOx emissions. Unit 2 has a CO process monitor that is no longer used; however, the applicant agrees to repair and re-calibrate this device to monitor CO emissions. Therefore, the only two pollutants that could be impacted will be continuously monitored. In accordance with Rule 62-210.370(2)(d)(3), F.A.C, CO and NOx emissions must be reported for five years after completing the project, with the first reporting year being the first full calendar year after completing construction.

The applicant indicates that there will be no increase in the maximum heat input rate to the boiler. Current Title V Permit No. 0010006-010-AV specifies a maximum heat input rate of 2428 MMBtu/hour. The previous Title V permit included a permitting note indicating that the maximum heat input rate was identified for purposes of conducting emissions compliance tests. During the last renewal of the Title V permit, the permitting note was removed. The Department requested GRU to identify the current maximum heat input rate based on a 4-hour average of the CEMS data provided to the EPA Acid Rain Database. GRU concluded that the current maximum heat input rate is 2700 MMBtu/hour based on a 4-hour average of the EPA Acid Rain data. The Department verified maximum heat input rates of 2699 MMBtu/hour (1-hour average) and 2680 MMBtu/hour (4-hour average) using available data from the EPA Acid Rain Database in June of 2007.

Although this appears to be an 11% increase in the maximum heat input rate, this difference results from methods used to estimate the heat input rates. The current permitted rate (2428 MMBtu/hour) was based on the original vendor's estimate of the maximum coal firing rate and the approximate fuel heating value of coal. The maximum 4-hour average based on EPA Acid Rain data is predicted from the measured hourly stack flow rates and an F-Factor for coal. To ensure that this burner replacement project will not increase the capacity of Unit 2, the draft permit will recognize the maximum heat input rate as 2700 MMBtu/hour based on a 4-hour block average of the EPA Acid Rain CEMS data.

4. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations as conditioned by the draft permit. This determination is based on a technical review of the complete application, reasonable assurances provided by the applicant, and the conditions specified in the draft permit. No air quality modeling analysis is required because the project does not result in a significant increase in emissions. Heidi Coggins is the project engineer responsible for reviewing the application and drafting the permit. Additional details of this analysis may be obtained by contacting the project engineer at the Department's Bureau of Air Regulation at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.