# TECHNICAL EVALUATION
# &
# PRELIMINARY DETERMINATION

**APPLICANT**

Duke Energy Florida, Inc. (DEF)
299 First Avenue North, FL 903
St. Petersburg, FL 33701-3308

**Facility**

University of Florida Cogeneration Plant
1928 Mowry Road, Building 82
Gainesville FL 32611
Facility ID No. 0010001

**PROJECT**

Project No. 0010001-014-AC
Application for Minor Source Air Construction Permit
Boiler Replacement Project

**COUNTY**

Alachua County, Florida

**PERMITTING AUTHORITY**

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Permitting and Compliance
2600 Blair Stone Road, MS#5505
Tallahassee, Florida  32399-2400

April 22, 2014

# 1. GENERAL PROJECT INFORMATION

## 1.1. Facility Description and Location

Duke Energy Florida, Inc. (DEF) operates the existing University of Florida (UF) Cogeneration (CoGen) Plant which is located within the city of Gainesville in Alachua County, Florida (see **Figure 1** and **Figure 2**). The facility address is 1928 Mowry Road, Building 82, Gainesville, Florida 32611. The UTM coordinates are Zone 17, 369.39 kilometers (km) East, and 3279.29 km North. The facility is an electrical power generating plant with a Standard Industrial Classification Code (SIC) of No. 4911.

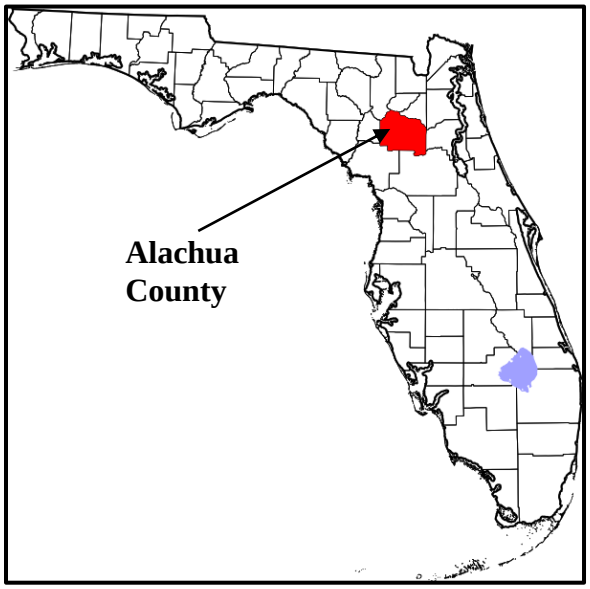


**Figure 1 – Alachua County in Florida.**

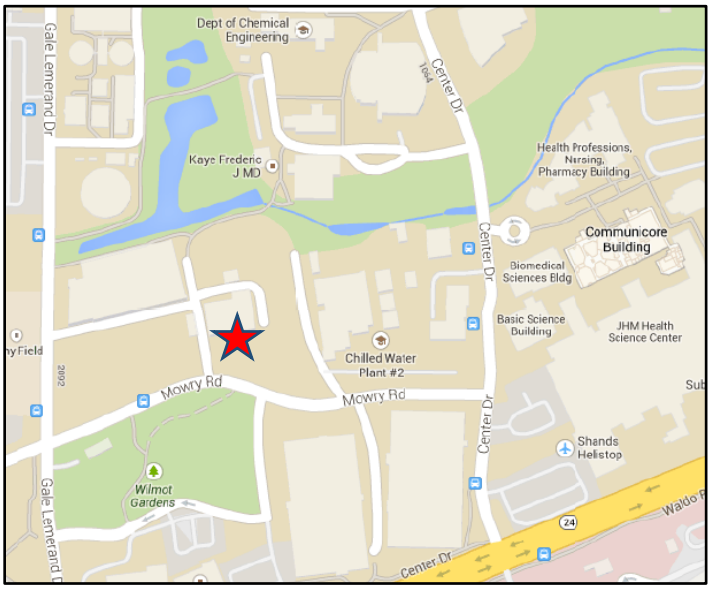


**Figure 2 – Location of UF CoGen Plant.**

**Figure 3 – Satellite View of UF CoGen Plant.**

**Figure 3** above shows a satellite view of the UF CoGen planet while **Figure 4 and Figure 5** below show two views of the combustion turbine (CT) at the plant.

**Figure 4 – View 1 of the CT at the Plant.**

**Figure 5 - View 2 of the CT at the Plant.**

The UF CoGen Plant consists of one nominal 48 megawatt General Electric LM6000-PC-ESPRINT Combustion Turbine (CT) with one Heat Recovery Steam Generator (HRSG) and Duct Burner (DB) system comprising a combined cycle unit. In addition, there are two Backup Steam Boilers. The CT utilizes spray intercooling to maximize throughput, thus reducing supplemental firing of the DB system for meeting steam and power requirements. Emissions from the CT and DB system are vented through the HRSG stack. $NO_X$ emissions are controlled with steam injection. Compliance is demonstrated with a $NO_X$ CEMS. The steam boilers, each having a separate exhaust stack, are used as back-up sources of steam and to provide supplemental steam during periods of high steam demand.

A summary of the regulated existing emission units at the UF CoGen Plant is given in below. The emission unit affected by this permitting action is highlighted in turquoise in the table.

**TABLE 1. EMISSION UNITS AT THE UF COGEN PLANT.**

| EU No. | Brief Description |
|---|---|
| 002 | No. 4 Backup Steam Boiler |
| 003 | No. 5 Backup Steam Boiler |
| 005 | Duct Burner System with HRSG |
| 007 | Combustion Turbine |

## 1.2. Primary Regulatory Categories

### 1.2.1. Federal Regulations

The U.S. Environmental Protection Agency (EPA) establishes air quality regulations in Title 40, Code of Federal Regulations, Part 60 (40 CFR 60) that identifies New Source Performance Standards (NSPS) for a variety of industrial activities. 40 CFR 61 specifies National Emission Standards for Hazardous Air Pollutants (NESHAP). 40 CFR 63 specifies NESHAP provisions based on the Maximum Achievable Control Technology (MACT) for given source categories.

Federal regulations adopted by reference are given in Rule 62-204.800, F.A.C. State regulations approved by EPA are given in 40 CFR 52, Subpart K – Florida; also known as the State Implementation Plan (SIP) for Florida.

The following federal regulations apply to the UF CoGen Plant and this project.

- The facility **is not** a major source of hazardous air pollutants (HAP).
- The facility has 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.
- This project (as discussed below) **does not** trigger a PSD review and a requirement to conduct Best Available Control Technology (BACT) determinations pursuant to Department Rule 62-212.400, F.A.C.
- The proposed project includes units subject to Clean Air Interstate Rule (CAIR).
- The proposed project includes units subject to the New Source Performance Standards (NSPS) of Title 40 Code of federal regulations (CFR) Part 60.
- The proposed project includes units subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) of 40 CFR 63.

### 1.2.2. State 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 air quality regulations as part of the Florida Administrative Code (F.A.C.), which includes the applicable chapters contained in **Table 2**.

**TABLE 2. APPLICABLE RULES FROM THE F.A.C.**

| Chapter | Description |
|---|---|
| 62-4 | Permits |
| 62-204 | Air Pollution Control – General Provisions |
| 62-210 | Stationary Sources of Air Pollution – General Requirements |
| 62-212 | Stationary Sources – Preconstruction Review |
| 62-213 | Operation Permits for Major Sources (Title V) of Air Pollution |
| 62-296 | Stationary Sources – Emission Standards |
| 62-297 | Stationary Sources – Emissions Monitoring |

## 1.3. Project Description

This project involves the construction of a new steam boiler to replace the existing Backup Steam Boiler No. 4 (EU 002) at the UF CoGen Plant. The new boiler will support the steam load requirements of the UF when the combined cycle unit is not available and provide supplemental steam during periods of high steam demand. UF is planning to replace Backup Steam Boiler No. 4, which is permitted at 69.6 million British thermal units per hour (MMBtu/hr) and 40,000 pounds per hour (lb/hr) of steam, with the new boiler (Backup Steam Boiler No. 6, EU 008) with a heat input of 99.9 MMBtu/hr and capacity to produce approximately 78,500 lb/hr of steam. UF will purchase and install the boiler, which is proposed to be a Cleaver Brooks Company model NB-300D-70 or other vendor equivalent, and Duke Energy Florida (DEF) will operate the boiler.

The project consists of the following steps:

- Dismantlement/removal of existing Backup Steam Boiler No. 4 in its entirety. Systems not included in the demolition will be protected and kept operable throughout
- Installation of a new 78,500 lb/hr packaged water-tube Backup Steam Boiler No. 6 and economizer to replace Backup Steam Boiler No. 4.

- Installation of all associated piping, appurtenances, and controls to make the new boiler fully functional. The controls system of the new boiler will be coordinated to be operated either locally or from the UF CoGen Plant.

The current proposed construction schedule calls for the replacement boiler to be delivered to the facility on about April 2014, and installation and testing are expected to be completed by about September 2014.

**Table 3** indicates the new emissions unit involved with the UF CoGen Plant boiler replacement project.

**TABLE 3. LIST OF NEW EMISSIONS UNIT FOR THE UF COGEN PLANT PROJECT.**

| New EU ID No. | Description |
|---|---|
| 008 | New Backup Steam Boiler No. 6<br>• Heat Input: 99.9 MMBtu/hr<br>• Steam Production: 78,500 lb/hr |

### 1.4. 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.

### 1.5. Processing Schedule

February 7, 2014: Received the application for a minor source air pollution construction permit.

February 10, 2014: Requested additional information.

April 15, 2014: Received additional information; application complete.

April 22, 2014: Draft permit package issued.

## 2. PSD APPLICABILITY

### 2.1. General PSD Applicability

The Department regulates major stationary sources in accordance with Florida's PSD program pursuant to Rule 62-212.400, F.A.C. PSD preconstruction review is required in areas that are currently in attainment with the state and federal ambient air quality standards (AAQS) or areas designated as "unclassifiable" for these regulated pollutants. Commonly addressed PSD pollutants in the power industry include: carbon monoxide (CO), $NO_X$, particulate matter (PM), PM with a mean diameter of 10 microns or less ($PM_{10}$), PM with a mean diameter of 2.5 microns or less ($PM_{2.5}$), sulfur dioxide ($SO_2$), volatile organic compounds (VOC), lead (Pb), fluorides (F), sulfuric acid mist (SAM), and mercury (Hg).

Additional PSD pollutants that are more common to certain other industries include: hydrogen sulfide ($H_2S$), total educed sulfur (TRS) including $H_2S$, reduced sulfur compounds (RSC) including $H_2S$, municipal waste combustor (MWC) organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (dioxin/furan), MWC metals measured as PM; MWC acid gases measured as $SO_2$ and HCl, and MSW landfill emissions as non-methane organic compounds (NMOC).

As defined in Rule 62-210.200(189)(a)1, F.A.C., a stationary source is a "major stationary source" (major PSD source) if it emits or has the potential to emit (PTE):

- 250 tons per year (TPY) or more of any PSD pollutant; <u>or</u>
- 100 TPY or more of any PSD pollutant <u>and</u> the facility belongs to one of the 28 listed PSD major facility categories.

The list given in the citation includes the category of "fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input". This category applies to the UF CoGen Plant before and after the proposed project. The UF CoGen Plant is a major stationary source based on actual emissions of and potential

to emit 100 TPY or more of several individual PSD pollutants.

For major stationary sources such as the UF CoGen Plant, PSD applicability for modification projects is based on thresholds known as the significant emission rates (SER) as defined in Rule 62-210.200(274), F.A.C. Any "net emissions increase" as defined in Rule 62-210.200(204), F.A.C. of a PSD pollutant from the project that equals or exceeds the respective SER is considered "significant". SER also means any emissions rate or any net emissions increase of a PSD pollutant associated with a major stationary source or major modification which would construct within 10 km of a Class I area and have an impact on such area equal to or greater than 1 gram per cubic meter, 24-hour average.

Although a facility may be "major" (i.e. emits or has the potential to emit 100 or 250 TPY as applicable) for only one PSD pollutant, a project must include BACT controls for any PSD pollutant that exceeds the corresponding SER given in **Table 4**.

According to 40 CFR 52.21, six greenhouse gases (GHG), are also subject to regulation at new stationary sources that will emit or have the potential to emit 100,000 TPY expressed as the carbon dioxide equivalent emissions ($CO_2e$). The PSD SER for $CO_2e$ is 75,000 TPY. This requirement has not been incorporated into Department rules but is a separate requirement of the EPA.

**TABLE 4. LIST OF SER BY PSD-POLLUTANT.** [1]

| Pollutant | SER (TPY) | Pollutant | SER (TPY) |
|---|---|---|---|
| CO | 100 | $NO_X$ | 40 |
| $PM/PM_{10}/PM_{2.5}$ | 25/15/10 | Ozone (VOC) [2] | 40 |
| $PM_{2.5}$ ($NO_X$) | 40 | $PM_{2.5}$ ($SO_2$) | 40 |
| Ozone ($NO_X$) [2] | 40 | SAM | 7 |
| $SO_2$ | 40 | Pb | 0.6 |
| Hg | 0.1 | GHG ($CO_2e$) | 75,000 [3] |

1. Excluding fluoride and those pollutants defined for Pulp and Paper, MWC, MSW landfills.
2. Ozone ($O_3$) is regulated by its precursors (VOC and $NO_X$). PSD for $PM_{2.5}$ can be triggered by its precursors ($NO_X$ and $SO_2$).
3. GHG is subject to federal regulation for projects at this stationary source that will result in an emissions increase 75,000 TPY of GHG (as CO2e) or more. GHG regulations have not been incorporated into Department rules

## 2.2. PSD Applicability for Project

Currently, Boiler Steam Boiler No. 4 (EU 002) at the UF CoGen Plant is permitted to fire natural gas or fuel oil with a maximum sulfur content of 0.5 percent for 8,760 hours per year. **Table 5** provides PSD applicability calculations from DEF based on the net emission increases expected to result from the boiler replacement project. The net emissions take into account the emissions of the new boiler involved in the project minus the emissions of the existing boiler that will be removed as a result of the project. The maximum emissions calculations assume that the new Backup Steam Boiler No. 6 (EU 008) will operate a total 3,260 hours per year while firing natural gas and 5,500 hours per year while firing fuel oil. In other words, DEF plans to limit the new boiler's operational hours in order to not trigger PSD. Finally, even though Backup Boiler No. 6 is capable of firing natural gas or No. 2 fuel oil, DEF intends to operate the Backup Boiler No. 6 under the "gas-fired boiler" exemption included in 40 CFR Part 63, subpart JJJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources. Consequently, DEF is requesting a federally enforceable limit in the permit of 48 hours of fuel oil firing during a calendar year during periods of natural gas availability in order to not be subject to 40 CFR 63, subpart JJJJJJ. It should be noted that subpart JJJJJJ allows unlimited fuel oil usage during periods of natural gas supply curtailment or interruption: Link to subpart JJJJJJ. Consequently, the oil firing limitation of 5,500 hr/yr while also firing natural gas only applies during periods of natural gas supply curtailments or interruptions. Otherwise the 48 hour per calendar year oil firing limitation will govern.

GHG emissions expressed as $CO_2e$ emissions are also included **Table 5** for comparison with federal greenhouse

gas PSD applicability criteria.

**TABLE 5. SUMMARY OF NETTING FROM THE PROJECT.**

| Pollutant | Maximum Potential Annual Emissions (TPY) | | | Netting Calculations | | SER (TPY) | Trigger PSD? |
|---|---|---|---|---|---|---|---|
| | Boiler Emissions- Gas Firing [a] | Boiler Emissions- Oil- Firing [b] | Maximum Case Both Fuels [c] | Max. 2-Year Avg. Existing Units [d] (TPY) | Change (TPY) | | |
| $SO_2$ | 2.5 | 31.8 | 29.1 | 0.04 | 29.1 | 40 | NO |
| PM | 2.2 | 15.2 | 14.3 | 0.3 | 14.0 | 25 | NO |
| $PM_{10}$ | 2.2 | 15.2 | 14.3 | 0.3 | 14.0 | 15 | NO |
| $PM_{2.5}$ | 3.3 | 7.3 | 7.7 | 0.3 | 7.4 | 10 | NO |
| $NO_X$ | 15.9 | 39.1 | 40.6 | 3.2 | 37.4 | 40 | NO |
| CO | 32.3 | 23.8 | 33.1 | 3.5 | 29.6 | 100 | NO |
| VOC | 2.4 | 0.4 | 1.3 | 0.2 | 1.1 | 40 | NO |
| SAM | 0.4 | 4.9 | 4.5 | 0.0 | 4.5 | 7 | NO |
| Lead | 0.002 | 0.003 | 0.003 | 0.001 | 0.00 | 0.6 | NO |
| CO2e [b] | 51,223 | 49,858 | 63,291 | 0.0 | 63,291 | 75,000 | NO |

a. Based on unlimited use (8,760 hours per year) of natural gas
b. Based on maximum oil firing of 6,200 hours per year.
c. Based on unlimited operation with maximum gas firing of 3,260 hours per year and maximum oil firing of 5,500 hours per year.
d. Based on actual emissions from Annual Operating Reports from 2008-2012.

## 3. DEPARTMENT'S REVIEW

The Department agrees that with the hourly fuel usage limitations proposed by DEF, the boiler replacement project will not trigger PSD. In addition, it is clear from **Table 5** that the governing pollutant with regard to PSD applicability is $NO_X$. However, the Department believes that the fuel limitations proposed by DEF are not necessary with the 48 hour fuel oil limitation in a calendar year imposed by NESHAP subpart JJJJJJ. Instead the Department will allow unlimited natural gas usage (8,760 hr/yr) on a calendar year basis during times of natural gas availability. During times of natural gas supply curtailment and interruption, the amount of fuel oil usage will be prorated based on the amount of natural gas that was fired during the calendar year when the natural gas curtailment or interruption occurred. In other words, using the appropriate $NO_X$ emissions factors for each fuel type (3.64 lb/hr natural gas and 12.6 lb/hr fuel oil), the $NO_X$ emissions resulting from natural gas firing during the calendar year will be subtracted from the 40 TPY $NO_X$ PSD SER to determine how much fuel oil firing is allowed during that year. The other constraint is that oil firing can only exceed 48 hours in any calendar year during periods of natural gas supply curtailment and interruption.

The three equations below will be included in the permit to allow the permittee to determine how much fuel oil can be fired in Backup Steam Boiler No. 6 in a calendar year during periods of natural gas supply curtailment and interruption.

| | | | | |
|---|---|---|---|---|
| *185.3* | — | — | — | — |

Annual $NO_X$ emissions from the backup steam boilers shall be determined based on the annual fuel consumption rates and the appropriate $NO_X$ emissions factors.

** CT emissions include emissions from the DB system and shall be determined by data collected from the $NO_X$ CEMS.

**Equation 1** above gives the allowable fuel oil firing hours during periods of natural gas curtailment based on the amount of natural gas previously fired in the boiler. For instance, if no natural gas had been fired, the allowable fuel oil usage in a calendar year would be 80,600/12.6 = 6,397 hours while if 4,380 hours (half a year) of natural gas was fired in a calendar year then 5,131 hours of fuel oil could be fired. However, these two hourly values exceed the total hours in a calendar year of 8,760 hours (4,380 + 5,131 = **9,511 hours**). Consequently, **Equation 2** is necessary. This equation assures that the total amount of natural gas and fuel oil firing does not exceed the total of 8,760 hours. Thus, when firing 4,380 hours of natural gas in a calendar year the actual allowable fuel oil firing would be 8,760 - 4,380 = 4,380 hours. **Equation 3** is necessary to assure that the current $NO_X$ emission cap applicable to the UF CoGen Plant is not exceeded. This $NO_X$ emissions cap is the result of PSD avoidance pursuant to 62-212.400(12), F.A.C.

The Department will set the emission limit given in **Table 6** for the new Backup Steam Boiler No. 6 based on the applicable NSPS and NESHAP federal requirements and state regulations.

**TABLE 6. NEW BACKUP STEAM BOILER NO. 6 EMISSION LIMITS.**

| Pollutant | lb/hr | lb/MMBtu [1] | Fuel [2] | Basis | Compliance Method |
|---|---|---|---|---|---|
| $NO_X$ | 3.64 | N/A [3] | Natural Gas | Rule 62-210.200(PTE), F.A.C. | Annual Stack Test |
| | 12.6 | | Fuel Oil | | |
| $SO_2$ | N/A | 050 | Fuel Oil | NSPS Subpart Dc | |
| PM | | 0.03 | | NSPS Subpart Dc and NESHAP Subpart JJJJJJ | |
| Opacity [4] | | 20/27 | Fuel Oil | NSPS Subpart Dc | |
| | | | Natural Gas | Rule 62-296.406, F.A.C. | |

1. Opacity limits are in percent (%) visible emissions (VE).
2. Fuel oil limits only apply when oil is fired in backup boiler No. 6 for more than 48 hours in a calendar year excluding periods of natural gas supply curtailment and interruption.
3. N/A = not applicable.
4. VE when firing any authorized fuel shall not exceed 20% opacity except for one, 6-minute block average per hour not to exceed 27% opacity

## 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. David Read, PE 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 by mail at the Department's Air Permitting and Compliance Section, 2600 Blair Stone Road, MS #5505, Tallahassee, FL, 32399-2400, by email at david.read@dep.state.fl.us or by phone at 850/717-9075.