TECHNICAL EVALUATION

&

PRELIMINARY DETERMINATION

APPLICANT

Florida Power & Light Company (FPL)
700 Universe Boulevard, JES/JB
Juno Beach, FL 33408

Lauderdale Plant
ARMS Facility ID No. 0110037

PROJECT

Replacement of Twenty Four Gas Turbine Peaking Units with
Five Simple Cycle Combustion Turbine Electric Generators
Draft Permit No. PSD-FL-423
Project No. 0110037-011-AC

COUNTY

Broward 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

February 27, 2014

1. GENERAL PROJECT INFORMATION

1.1. Facility Description and Location

The Florida Power & Light Company (FPL) operates the existing Lauderdale Plant which is located within the city of Dania Beach in Broward County, Florida (see **Figure 1** and **Figure 2**). The facility can be accessed from Southwest 42nd Street and Griffin Road. The UTM coordinates are Zone 17, 580.2 kilometers (km) East, and 2883.3km North. The facility is an electrical power generating plant with a Standard Industrial Classification Code (SIC) of No. 4911.

Figure 1. Location of Broward County.

Figure 2. Location of the Lauderdale Plant.

The Lauderdale Plant includes two banks of 12 simple cycle gas turbines units (GT1 through GT12 and GT13 through GT24). GT Units 1 through 12 began operation in August 1970 while GT Units 13 through 24 began operation in August 1972. Each bank of GTs has a nominal net capacity of 504 megawatts (MWs). Approximately 4.7 miles to the east of the Lauderdale Plant, and also in Broward County, is the Port Everglades Plant that includes one bank of similarly designed simple cycle gas turbines units (GT1 through GT12). These 12 GTs also have a nominal net capacity of 504 MWs and have been operating since August 1971. **Figure 3** presents a satellite view of the overall facility, while FIGURE 4 shows a close-up of some of the peaker units that will be replaced as a result of the current project. **Figure 5** shows the close proximity of the Lauderdale Plant to the Port Everglades Plant.

Figure 3. Satellite View of the Lauderdale Plant.

Figure 4. Some Existing Peaker Units.

Figure 5. View of FPL Lauderdale and Port Everglades Power Plants.

In addition to units GT1 through GT24, the Lauderdale Plant consists of two combined-cycle generating units (Unit 4 and Unit 5) and three fuel storage tanks. Each combined-cycle unit consists of two combustion turbines (CTs) which each exhaust through a separate heat recovery steam generator (HRSG). Each HRSG converts the heat from the CT exhaust into steam. The steam produced from the two HRSG units drives one steam turbine electrical generator (STEG). Each combined-cycle unit has a net summer continuous capability of 430 MW.

A summary of the regulated existing emission units at the Lauderdale Plant is given in **Table 1** below. The emission units that are involved in this project are highlighted in turquoise in the table.

TABLE 1 – REGULATED EMISSION UNITS AT THE LAUDERDALE PLANT.

EU ID No.	Brief Description
035	Combined-Cycle Combustion Turbine with Heat Recovery Steam Generator (CT 4A)
036	Combined-Cycle Combustion Turbine with Heat Recovery Steam Generator (CT 4B)
037	Combined-Cycle Combustion Turbine with Heat Recovery Steam Generator (CT 5A)
038	Combined-Cycle Combustion Turbine with Heat Recovery Steam Generator (CT 5B)
003	Bank of 12 Combustion Turbines (Nos. 1 to 12)
015	Bank of 12 Combustion Turbines (Nos. 13 to 24)
027	Fuel Oil Storage Tank #2 (80,000 barrel (bbl), Light Distillate Fuel Oil)
028	Fuel Oil Storage Tank #3 (150,000 bbl, Light Distillate Fuel Oil)
029	Fuel Oil Storage Tank #5 (75,000 bbl, Light Distillate Fuel Oil)
030	2 Fuel Oil Dump Tanks (2,500 gallon and 110 gallon)
039	Site Solvent Usage

EU ID No.	Brief Description
042	Auxiliary Boiler used to provide steam to the turbine shaft seals during a cold start of the plant. Maximum designed heat input rate is 15.5 million British thermal units per hour (MMBtu/hr).
044	Emergency Diesel Fire Pump Engine

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 Lauderdale Plant and this project.

- The existing 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 and Rule 62-210.200 (Definitions), F.A.C.
- This project (as discussed below) **does** 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 existing facility is a major source of hazardous air pollutants (HAP).
- The existing facility has units regulated under Clean Air Act, Title IV, Acid Rain provisions, Phase II.
- The existing facility is a Title V major source of air pollution in accordance with Chapter 62-213, F.A.C.
- The proposed project includes units subject to Clean Air Interstate Rule (CAIR).
- The proposed project includes units subject to the NSPS of 40 CFR 60.
- The proposed project includes units subject to the 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
62-17	Electrical Power Plant Siting
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

1.3.1. FPL Rational for the Project

According to FPL:

"The existing 36 GTs located in Broward County are first generation gas turbine units that are used to serve peak and emergency demands in a quick start manner. Each unit consists of two aero-derivative gas turbines coupled with a single gas flow driven turbine-electric generator. These units have low stack heights (less than 50 feet) and relatively high nitrogen oxides (NO_X) emissions rates typical of these older generation units. NO_X emissions principally consist of nitrogen oxide (NO) and nitrogen dioxide (NO_2). The low stack heights in proximity to nearby property boundaries result in decreased dispersion properties and when combined with the relatively high NO_X emission rates result in elevated concentrations of NO_2. A new 1-hour national ambient air quality standard (NAAQS) has been recently promulgated by EPA and adopted by FDEP that is much more stringent than the previous annual average NAAQS for NO_2. Analyses of these 36 GT units found that the emissions from these units would not disperse sufficiently to bring off-site concentrations below the 1-hour NO_2 NAAQS. FPL's evaluation concluded that the most cost effective solution is to replace the existing GTs with new, highly efficient combustion turbines with lower NO_X emission rates.....FPL plans to bring five new CTs into service by December 31, 2016, that would assure 1-hour NO_2 concentrations do not exceed the NAAQS at the property boundaries ....."

In addition, FPL states:

"There will be significant benefits associated with the Project. The five new CTs will be more energy efficient than the existing 36 GTs and will provide cleaner energy to FPL's customers. For the same amount of generation hourly, from 30 to 40 percent less fuel will be used in the new CT units compared to the older GT units. The maximum total air quality impacts for the Project are predicted to be well below and in compliance with the NAAQS. For pollutants such as NO_2, the Project's total air quality impacts are predicted to be significantly 40 percent or more lower than those predicted for the existing GTs. In addition, air emission rates for NO_X with the Project will be approximately 90 percent lower than the existing GT emission rates, resulting in significantly lower air quality impacts.

1.3.2. Department Assessment

The air dispersion modeling aspects of this project are discussed in **Section 4** of this document. However, the air dispersion modeling discussion only addresses the effects of the current proposed project and does not assess the effects of the existing GTs with respect to the 1-hour NO_2 NAAQS.

Based on their own analysis, FPL claims that by operating as permitted, the existing CTs could cause NO_2 ambient concentrations near the plant to exceed the design value for the 1-hour hour ambient air quality standard. Two active ambient NO_2 monitors in Broward County are located 8 and 26 km from the plant. Historical data from these monitors indicate no previous violations of the 1-hour hour ambient air quality standard. However, additional ambient monitors will be sited in Broward County in the future.

FPL claims that the predicted violations will be much more localized. Therefore, the Department will require FPL to install, operate and maintain two ambient NO_2 monitoring and meteorological stations at a locations predicted to experience violations. The monitors and stations will collect and electronically preserve representative data for up to 18 months. If four (4) exceedances of the 1-hour NO_2 standard are recorded during a six month interval during the 18-month monitoring period, the owner or operator shall discontinue monitoring and shall be required to implement the project contemplated by the air construction permit included in the package or propose an alternative project to DEP which will reduce NO_2 emissions sufficient to meet the new 1-hour NO_2 standard no later than December 31, 2018.

1.3.3. Project Overview

The existing peaking GTs at both the Lauderdale and Port Everglades Plants will be replaced with five nominal 200 MW CTs at the Lauderdale Plant, to provide equivalent peaking resources to reduce

emissions while providing far superior emission profiles and efficiency. The new CTs will be designated Units 6A through 6E at the Lauderdale Plant. Dismantlement of the existing GTs will occur after the new CTs are operational in order to maintain peak service capability in south Florida. However, there will be no overlap of operation between the existing GTs and new CTs.

The CTs being evaluated for the Project include the General Electric (GE) 7FA.05 and 7FA.04 CT models and the Siemens Power Generation, Inc. (Siemens) SGT6-5000F(5) CT model, i.e., F5, or other vendor equivalents. Each CT may utilize inlet air cooling that may consist of evaporative cooling or an alternative system. The evaporating water cools the inlet air stream when the water droplets are converted to water vapor. Inlet air temperature is reduced which results in a cooler, denser air stream. Consequently, more power can be produced than would be possible at ambient conditions. The CTs will fire natural gas and ultra-low sulfur distillate (ULSD) fuel oil. FPL has requested that use of ULSD oil be allowed for up to the equivalent of 500 hours per year (hr/yr) per CT at base load conditions. FPL has also requested that five CTs be allowed to operate up to a total of 3,390 hr/yr per turbine on all fuels (natural gas and fuel oil).

FPL has indicated that they may use four nominal 3,100 kilowatt (kW) reciprocating internal combustion engines (RICE) emergency generators firing ULSD fuel oil for black start capability, i.e., these emergency generators will be used when electric power is not available to start the CTs. This primarily would occur during catastrophic events such as hurricanes. The generators would be limited to 100 hr/yr of operation for maintenance and reliability testing. Alternatively, FPL has requested that two of the existing GTs from EU003 may remain on-site to provide the necessary black start capability. The existing GTs would also be limited to 100 hr/yr of operation for maintenance and reliability testing.

FPL and also indicated that the Lauderdale project will utilize a 300 horsepower (hp) fire pump engine using ULSD oil. According to FPL, this engine will be used when necessary during catastrophic events such as fires. The permit will limit the fire pump engine to 100 hr/yr operation for maintenance and reliability testing. Finally, the Lauderdale project will include two 3-million gallon ULSD fuel oil storage tanks. **Table 3** indicates the new emissions units involved with the Lauderdale project.

TABLE 3 – LIST OF NEW EMISSIONS UNITS FOR THE FPL LAUDERDALE PROJECT.

New EU ID No.	Description
045	Simple cycle combustion turbine-electrical generator (Unit 6A)
046	Simple cycle combustion turbine-electrical generator (Unit 6B)
047	Simple cycle combustion turbine-electrical generator (Unit 6C)
048	Simple cycle combustion turbine-electrical generator (Unit 6D)
049	Simple cycle combustion turbine-electrical generator (Unit 6E)
050	Four nominal 3,100 kW RICE emergency generators. **In lieu of these units, FPL may elect to retain two existing GTs to provide black start capability.**
051	300 hp Emergency diesel fire pump engine
052	Two 3-million gallon ULSD fuel oil storage tanks

1.4. Processing Schedule

July 31, 2013	The Department received a PSD air construction permit application from FPL for the Lauderdale peaking unit replacement project.
August 23, 2013	The Department issued a request for additional information (RAI).
February 27, 2014	The Department issued draft PSD air construction permit package

2. PSD APPLICABILITY REVIEW

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), 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 Lauderdale Plant before and after the proposed project. The Lauderdale 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 Lauderdale 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. FPL has submitted an PSD GHG application to EPA region 4 in Atlanta, GA.

The project is located in Broward County, which is in an area that is currently in attainment with the state and federal AAQS or otherwise designated as unclassifiable. The Lauderdale peaking unit project will emit the following PSD-pollutants SO_2, NO_X, CO, PM, PM_{10}, $PM_{2.5}$, SAM, VOC, lead (Pb) and CO_2e.

2.2. PSD Applicability for the Project

Table 5 provides PSD applicability calculations from FPL based on the net emission increases expected to result from the Lauderdale peaking unit project. The net emissions take into account the emission of the new units involved in the project minus the emission of the existing peaking units. GHG emissions expressed as CO_2e emissions are also included for comparison with federal greenhouse gas PSD applicability criteria.

TABLE 5 – NET PSD POLLUTANT EMISSION INCREASES DUE TO THE LAUDERDALE PROJECT IN TONS PER YEAR (TPY).

Pollutant	Emissions Increase CT	Emission Increase Engines & Tanks [1]	Total Project Increase [2]	Max. 2-Year Average Existing Units [3, 4]	Net Increase [5]	SER	PSD Applies? (Yes, No)
NO_X	1,041	16.55	1,057	(308)	749	40	**Yes**
PM	137	0.10	137	(5)	132	25	**Yes**
PM_{10}	137	0.10	137	(5)	132	15	**Yes**
$PM_{2.5}$	137	0.10	137	(5)	132	10	**Yes**
CO	565	2.13	567	(92)	475	100	**Yes**
SO_2	109	0.015	109	(75)	34	40	No
SAM	10.9	<0.001	10.9	(11.4)	-0.5	7	No
VOC	69.8	1.72	71.5	(1.6)	69.9	40	**Yes**
Pb	0.038	<0.001	<0.001	--	0.038	0.6	No
CO_2e	477,915	1,567	479,482	(76,136)	403,347	75,000	**Yes** [6]

1. Combined emission from black start emergency generators, fire pump engine and fuel oil storage tanks.
2. Combined emission increase from the three CT (worst case scenario) and the three 3,000 kW black start emergency generators (100 hr/yr operation by each).
3. Maximum 2-year average of specific pollutant from the GT units during the previous 5 years of operation at the Lauderdale Plant.
4. A number in parentheses represent a negative value for PSD applicability with regard to TPY increase for the specified pollutant and SER.
5. Total project increase minus the maximum 2-year average from the existing GT units for each pollutant.
6. The federal EPA significant emission rate applies to this project and the applicant has submitted a GHG PSD permit application to EPA.

As seen from Table 5, according to FPL, the Lauderdale peaking unit replacement project triggers a PSD preconstruction review for emissions of NO_X, PM, PM_{10}, $PM_{2.5}$, CO and VOC under Department rules and GHG under federal rules.

The above PSD netting analysis assumes that all 24 existing GTs will be retired as a result of this project. However, FPL has requested as an option to keep two of the GTs for black start capability instead of installing four RICE engines. When this is considered in the analysis, the following SO_2 emission increase occurs:

Consequently, when the two GTs that may be used for black start purposes are considered, the project results in an increase in SO_2 emission above the SER of 40 TPY. To eliminate this concern, FPL has

agreed to only operate each new CT on average no more than a 3,300 hr/yr per instead of the requested 3,390 hr/yr. When this hourly reduction is considered, the SO_2 emission increase as a result of this project becomes:

Based on the above calculation, with the 90 hour reduction in operational hours per CT, the project will no longer trigger PSD for SO_2 emissions.

3. BACT DETERMINATIONS

3.1. Definitions and Requirements Related to BACT

"Best Available Control Technology" or "BACT" is defined in Rule 62-210.200(40), F.A.C. as follows:

(a) An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account:

1. *Energy, environmental and economic impacts, and other costs,*
2. *All scientific, engineering, and technical material and other information available to the Department; and*
3. *The emission limiting standards or BACT determinations of Florida and any other state; determines is achievable through application of production processes and available methods, systems and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant.*

(b) If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of an emissions unit or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for eh application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice or operation.

(c) Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.

(d) In no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60, 61, and 63.

3.2. Draft BACT Determinations for the Combustion Turbine-Electrical Generators

3.2.1. How a Combustion Turbine-Electric Generator (CTG) Works

Figure 6. Parts and Internal View of a GE 7FA.05 Combustion Turbine-Electrical Generator.

Refer to **Figure 6** and **Figure 7** which is one of the models of CTG under consideration by FPL for the Lauderdale peaking unit replacement project. Henceforth a CTG will be referred to as a CT.

Figure 7. Siemens F5 Internal View and Overhead View of Compressor and Rotor.

A CT compresses air and mixes it with fuel. The fuel is burned and the hot air-fuel mixture is expanded through turbine blades, making them spin. The spinning turbine drives a generator which converts the spinning energy into electricity. In the Lauderdale project, the units will operate in simple cycle mode, meaning that the hot turbine exhaust gases are directed through a stack without prior waste heat recovery and steam generation via a HRSG and STEG.

3.2.2. BACT for Nitrogen Oxides (NO_X)

3.2.2.1. *NO_X Formation*

NO_X is formed during combustion as a result of the dissociation of molecular nitrogen (N_2) and oxygen (O_2) to their atomic forms and subsequent recombination into seven different oxides of nitrogen (especially NO and NO_2).

Thermal NO_X forms in the high temperature area of the combustor. Thermal NO_X increases exponentially with flame temperature and linearly with residence time. Flame temperature is dependent upon the ratio of fuel burned in a flame to the amount of fuel that consumes all of the available oxygen, also known as the equivalence ratio. By maintaining a low fuel ratio (lean combustion), the flame temperature will be lower, thus reducing the potential for NO_X formation. The relation of NO_X production with respect to flame and equivalence ratios (lean versus rich operation) is shown in **Figure 8**.

Figure 8. NO_X vs. Temperature, Equivalence Ratio [1]. **Figure 9. Hot Gas Path, NO_X Control.**

In most combustor designs, the high temperature combustion gases are cooled to an acceptable temperature with dilution air prior to entering the turbine (expansion) section. The sooner this cooling occurs, the lower the thermal NO_X formation. The relationship between flame temperature, firing temperature, work output and NO_X formation is depicted in Figure **9**, which is from a General Electric discussion on these principles.

[1] Technical Report GE Power Systems GER 3568G. Davis, L. B., and S.H. Black, General Electric. "Dry Low NO_X Combustion Systems for GE Heavy-Duty Gas Turbines." 2000.

Prompt NO_X is formed in the proximity of the flame front as intermediate combustion products. The contribution of prompt to overall NO_X is relatively small in near-stoichiometric combustors and increases for leaner fuel mixtures. This provides a practical limit for NO_X control by lean combustion.

Fuel NO_X is formed when fuels containing bound nitrogen are burned. This phenomenon is not of great concern when combusting natural gas.

Uncontrolled emissions from combustion turbines range from about 100 to 600 parts per million by volume, dry, corrected to 15 percent oxygen (ppmvd @15% O_2). The Department estimates uncontrolled emissions at approximately 200 ppmvd for large frame combustion turbines such as those under consideration for this project.[2]

3.2.2.2. *NO_X Controls*

The following discussion of NO_X controls and their associated performance in some cases uses GE F frame CT models as examples. However, F frame models from other manufactures, such as Siemens, offer similar controls and performance.

Wet Injection. Fuel and air are mixed within traditional combustors and the combustion actually occurs on the boundaries of the flame. This is termed "diffusion flame" combustion. Injection of either water or steam directly into the combustor lowers the flame temperature and thereby reduces thermal NO_X formation. There is a physical limit to the amount of water or steam that may be injected before flame instability or cold spots in the combustion zone would cause adverse operating conditions for the CT. Emissions of CO and VOC are very low for large gas turbines when operated at higher loads. However steam or water injection may increase emissions of both of these pollutants.

Advanced dual-fuel combustor designs can tolerate large amounts of steam or water without causing flame instability and can achieve NO_X emissions in the range of 30 to 42 ppmvd @15% O_2 when employing wet injection for backup fuel oil firing. Wet injection results in control efficiencies on the order of 80 to 90% for oil firing. These values often form the basis, particularly in combined cycle turbines, for further reduction to BACT limits by other techniques as discussed below.

Dry Low NO_X (DLN) Combustion. The excess air in lean combustion cools the flame and reduces the rate of thermal NO_X formation. Lean premixing of gaseous fuel and air prior to combustion can further reduce NO_X emissions. This is accomplished by minimizing localized fuel-rich pockets (and high temperatures) within the combustion zones. This principle is incorporated into the General Electric DLN-2.6 can-annular combustor design depicted in **Figure 10** below.

Each combustor includes six nozzles within which gaseous fuel and air have been fully pre-mixed. There are 16 small fuel passages around the circumference of each combustor known as quaternary fuel pegs. The six nozzles are sequentially ignited as load increases in a manner that maintains lean pre-mixed combustion and flame stability. Liquid fuel-based lean premix DLN combustion is generally not feasible for large combustion turbines.

Design NO_X, CO, and VOC emission characteristics (basis of guarantees) of the GE DLN-2.6 combustor for the GE 7FA.03 while firing natural gas are given in **Figure 11** below. The combustor design is such that NO_X concentrations can be tuned to achieve 9 ppmvd @15% O_2 at loads between 50 and 100 percent of capacity. However, *NO_X concentrations as high as 100 ppmvd may occur in the exhaust gas when the CT is at less than 50 percent of capacity*. This suggests the need to *minimize operation at low load conditions and during startup*. Units guaranteed to achieve 9 ppmvd @15% O_2 of NO_X were typically guaranteed to 9 ppmvd (uncorrected) of CO which equates to approximately 7.4 ppmvd CO @15% O_2. In the further discussion below use of the term ppmvd implies that the value is not corrected to 15% O_2.

[2] Technical Report GE 3695E. Badeer, G. H., General Electric. "GE Aeroderivative Gas Turbines – Design and Operating Features." 2000.

Figure 10. DLN-2.6 Fuel Nozzle Arrangement. **Figure 11. Design Characteristics for DLN-2.6.**

Figure 12 below is from a GE publication and is a plot of NO_X data from actual GE 7FA.03 combustion turbines (or earlier models) or possibly a test facility. Actual NO_X emissions are less than the design values. The Department has reviewed numerous reports and low load operation data from GE 7FA.03 units (or earlier 7FA models) in Florida and confirms the accuracy of **Figure 12**. Also actual emissions of CO at loads greater than 50% of full load have proven to be less than suggested by Figure 11 above and more like the behavior shown in **Figure 13** below.

Table 6 below summarizes the results of the new and clean tests conducted on a dual-fuel GE 7FA.03 CTG with DLN-2.6 combustors operating in simple cycle mode and burning natural gas at the existing Tampa Electric (TECO) Polk Power Station.[3] The test results over a range of loads confirm that NO_X, CO, and VOC emissions are, in practice, consistently less than the design (guarantee) values given in **Figure 11**

Figure 12. NO_X Performance of DLN-2.6 (GE 7FA.03). **Figure 13. CO Performance of DLN-2.6.**

TABLE 6 - PERFORMANCE OF DLN-2.6 COMBUSTORS ON GE 7FA.03, TECO POLK POWER STATION (ppmvd).

Percent of Full Load	NO_X (@15% O_2)	CO	VOC
50	5.3	1.6	0.5

[3] Report. Cubix Corporation. "Exhaust Emissions from a GE PG7241FA Simple Cycle Power Turbine at TEC Polk Power Station." September 2000.

Percent of Full Load	NO_X (@15% O_2)	CO	VOC
70	6.3	0.5	0.4
85	6.2	0.4	0.2
100	7.6	0.3	0.1

Numerous simple cycle GE 7FA.03 units with DLN-2.6 technology for NO_X control have been installed in Florida and throughout the United States with guarantees of 9 ppmvd @15% O_2. This represents a reduction greater than 95%, assuming uncontrolled emissions are 200 ppmvd.

Figure 14. DLN-2.6 with GE Start-up NO_X.

Figure 15. Low Load Opacity Improvement.

The larger GE 7FA.05 combustion turbines that FPL may install at the Lauderdale Plant could include features from a series of GE products known as Operational Flexibility Enhancements (OpFlex™) which involve advanced fuel scheduling. The Lauderdale peaking unit project may incorporate at least one the products that will reduce NO_X and visible emissions (and presumably CO) at low loads while minimizing startup and excess emissions. **Figure 14** above from a GE brochure on OpFlex™ indicates the substantial NO_X reductions during low load operation and startup expected from these features. **Figure 15** above shows the improvement in low load visible emissions following the installation of GE Start-up NO_X on an existing GE 7FA.03.

The GE Start-up NO_X profiles are similar to those shown in **Figure 11** and **Figure 12** for higher loads but are far superior for low load operation. Given simple cycle peaking operation, it is easy to conclude that startup and low load emissions will be less for the larger GE 7FA.05 units with GE Start-up NO_X than the smaller GE 7FA.03 and GE 7FA.04 units without the feature.

Selective Catalytic Reduction (SCR). SCR is an add-on NO_X control technology that is employed in the exhaust stream following the gas turbine. SCR reduces NO_X emissions by injecting ammonia (NH_3) into the flue gas in the presence of a catalyst. Ammonia reacts with NO_X in the presence of a catalyst and excess oxygen yielding molecular nitrogen and water (H_2O) according to the following simplified reaction:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$

The catalysts are available for applications at temperatures between roughly 300 and 1,100degrees Fahrenheit (^oF) and typically are comprised of titanium oxide (as TiO_2), vanadium (as V_2O_5) and tungsten (as WO_3). The formulations contain progressively less vanadium and become more costly for the higher temperature applications. There are numerous examples of SCR installations at continuous duty combined cycle units throughout Florida. In combined cycle units, the catalyst can be placed at an optimal temperature (roughly 400 to 600 ^oF) for the purposes of high efficiency and lowest cost within the heat recovery steam generator. In such applications, NO_X emissions on the order of 2.0 ppmvd @15% O_2 are achieved.

At higher temperatures, vanadium can actually contribute to ammonia oxidation forming more NO_X or forming nitrogen without reducing NO_X according to:

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \text{ and } 4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$$

Therefore, less V_2O_5 is used in formulations for higher temperature applications. The lowest cost for a given application may involve cost optimization between the selection of a catalyst formulation and the equipment to cool gas to the operating temperature of the formulation. SCR was installed on two small GE LM6000 simple cycle units at the City of Tallahassee's Hopkins facility. These are characterized by exhaust gas less than 900 ^oF and exhaust gas cooling was not required.

For the highest temperature applications (>1100 ^oF), such as large frame simple cycle turbines like the GE7FA.05, more expensive formulations or substantial tempering air would be required. Per the FPL Lauderdale Project application:

"The total capital costs of SCR for the Project exceed $15,000,000 per CT. The total annualized cost of applying SCR with low-NO_X combustion technology ranges from is approximately $3.3 million to $2.7 million. The incremental cost effectiveness of adding SCR to the low- NO_X combustors and water injection (for oil firing) is estimated at over $20,000 per ton of NOX removed, based on 3,390 hours of operation with 500 hour of oil firing."

The target values would be 14 and 2 ppmvd @15% O_2 while firing fuel oil and natural gas, respectively. The Department does not necessarily accept the FPL's cost estimates. However, the Department concurs that hot SCR is not cost-effective for the proposed primarily natural gas-fueled, limited operation, simple cycle units with a very high exhaust gas temperature.

Catalytic Combustion - XONON™. XONON™ operates by partially burning fuel in a low temperature pre-combustor and completing the combustion in a catalytic combustor. The overall result is low temperature partial combustion (and thus lower NO_X production) followed by flameless catalytic combustion to further attenuate NO_X formation.

In 1998, Catalytica announced the startup of a 1.5 MW Kawasaki gas turbine equipped with XONON™.[4] The turbine is owned by Catalytica and is located at the Gianera Generating Station of Silicon Valley Power, a municipally owned utility serving the City of Santa Clara, California. This turbine and XONON™ system successfully completed over 18,000 hours of commercial operation.[5] At least five such units are operating or under construction with emission limits ranging from 3 to 20 ppmvd @15% O_2.

Emission tests conducted through the EPA's Environmental Technology Verification Program (ETV) confirm NO_X emissions slightly greater than 1 ppm.[6] Despite the very low emission potential of XONON, the technology has not yet been demonstrated to achieve similarly low emissions on large turbines. It is difficult to apply XONON on large units because they require relatively large combustors and would not likely deliver the same power as a unit relying on conventional diffusion flame or lean premixed combustion. In 2008, the technology was available for gas turbines in the 10 to 15 MW bracket with an expectation of NO_X emissions less than 5 ppmvd @15% O_2. This technology is not feasible at this time for the Lauderdale project.

EMx (Formerly SCONO$_X$™) EMx is a NO_X and CO control system. Specialized potassium carbonate catalyst beds reduce NO_X emissions using an oxidation-absorption-regeneration cycle. One benefit is that it does not require ammonia injection. The required operating temperature range is between 300°F and 700°F, which exists within a heat recovery steam generator of a combined cycle unit but not in a simple cycle unit. Therefore substantial gas cooling would be required. EMx costs much more than SCR, is mechanically very complicated and requires on-site hydrogen production from natural gas. Even if it is technically feasible, it is not cost-effective for this project.

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4 News Release. Catalytica. First Gas Turbine with Catalytica's XONON installed to Produce Electricity at a Utility. October 8, 1998.

5 News Release. Catalytica. Catalytica Energy Systems XONON Cool Combustion System Demonstrating NO_X Emissions Well Below its 3 ppm Guarantee in Commercial Gas Turbine Applications. February 17, 2004.

6 Statement. EPA and Research Triangle Institute. ETV Joint Verification Statement. XONON™ Cool Combustion. December, 2000.

3.2.2.3. *Requirements of 40 CFR Parts 60 and 63 on the Combustion Turbines with Respect to NO_X*

As stated in the definition of BACT given above, *"in no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60, 61, and 63"*. The five new combustion turbines are subject to the requirements in 40 CFR 60, Subpart KKKK - Standards of Performance for Stationary Combustion Turbines that Commence Construction after February 18, 2005. The citation is abbreviated as NSPS Subpart KKKK for the purposes of subsequent discussion. Link to NSPS Subpart KKKK. **Table 7** below includes the emission standards applicable to the FPL Lauderdale project.

TABLE 7 – NSPS SUBPART KKKK STANDARDS FOR NEW LARGE STATIONARY COMBUSTION TURBINES.

Combustion Turbine Type	Peak Load Heat Input, Power Output [1]	NO_X Standard [2]
New, modified, or reconstructed turbine firing natural gas	> 850 MMBtu/hour	15 ppm @15% O_2 or 54 ng/J, useful output (0.43 lb/MW-hour)
New, modified, or reconstructed turbine firing fuels other than natural gas	> 850 MMBtu/hour	42 ppm @15% O_2 or 160 ng/J, useful output (1.3 lb/MW-hour)
Turbines located north of the Arctic Circle, **turbines operating at less than 75% of peak load**	> 30 MW output	96 ppm @15% O_2 or 590 ng/J, useful output (4.7 lb/MW-hour)

1. Heat input based on the higher heating value (HHV) or MW of useful output
2. ng/J means nanograms per joule

A NO_X standard of 96 ppmvd @15% O_2 is provided for combustion turbines operating at less than 75% of peak load. Per above **Figure 14** above, the GE NO_X Start-up product makes it possible to operate the GE 7FA.05 units at all loads while complying with the respective NSPS Subpart KKKK limits.

There are no NO_X standards in 40 CFR 63, Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines. The citation is abbreviated as NESHAP Subpart YYYY for the purposes of subsequent discussion. Link to NESHAP Subpart YYYY . As a major source of HAP, NESHAP Subpart YYYY does apply to the proposed Lauderdale project CT.

3.2.2.4. *Applicant's NO_X BACT Proposal*

The applicant proposes the following BACT determination for the control of NO_X emissions from the five proposed CT:

- NO_X emissions while firing natural gas shall be limited to 9.0 ppmvd @15% O_2 as BACT on a 24-hour block average basis achievable by lean premix Dry Low NO_X technology;
- NO_X emissions for limited ULSD fuel oil use shall be limited to 42.0 ppmvd @15% O_2 as BACT on a 4-hour rolling average basis achievable by water injection for flame cooling;
- Startup and low load emissions shall be further controlled by the GE OpFlex™ system or its Siemens equivalent and start-up NO_X work practices;
- The five CT may operate an average of no more than 3,300 hours/year/CT;
- Of this 3,300 hours/year/CT, the five CT may operate up to 500 hours/year using ULSD fuel oil; and
- Compliance shown by a NO_X continuous emissions monitoring system (CEMS).

3.2.2.5. *Further Fuel Oil Considerations*

It is recognized that some allowance can and should be made for limited back-up fuel oil firing to account for interruptions in the natural gas supply or sudden and unexpected price spikes. In that case a limit of 42 ppmvd @15% O_2 (equal to the NSPS Subpart KKKK requirement) achieved by wet injection during 500 hours of incidental fuel oil firing is appropriate but is not necessarily BACT when more significant

amounts of fuel oil are fired.

Typically ULSD fuel oil prices are significantly greater than natural gas prices and the fuels do not directly compete within the power industry in Florida. ULSD fuel oil is only used during short-term supply interruptions and temporary natural gas price dislocations.

Changing market conditions in the United States over recent years have led to dramatic decreases in natural gas prices from the higher levels in the mid-2000s. With the recent expansion of natural gas supplies from shale, it is reasonable to conclude that natural gas will continue to be more attractive for use in combustion turbines than ULSD fuel oil based price alone. In addition, fuel oil usage increases CT maintenance requirements.

The peaking units GT1 to GT12 began operation in August 1970 while the peaking units GT13 to GT24 began operation in August 1972. All the existing peaking units are allowed to operate using light distillate fuel oil and natural gas for 8,760 hours/year/GT. According to the actual fuel use records, during the past five years the units have operated for a minimum of 1,098 hours combined in 2008 to a maximum of 3,344 hours combined in 2010 with an average over the 5 year period of 2,151.4 hours. The maximum usage year of 2010 represents an in service percentage of 1.02% when compared the total available hours of 210,240 (8,760 hours/yr * 24 units), while the average in service percentage for the 5 year period is 1.02%. Most of the operating hours occurred firing natural gas with fuel oil used a maximum of 35% in 2010 and a minimum of 0.2% in 2012.

Based on this past GTs usage, natural gas cost and CT maintenance requirements it is reasonable to assume that the new CTs will rarely if ever reach 500 hours of fuel oil usage in any 12 month period. Thus the 42 ppmvd @15% O_2 NO_X emission limit for the five new CT at the Lauderdale Plant while using ULSD fuel oil is both reasonable and supportable.

3.2.2.6. *Department's Draft NO_X BACT Determination*

The Department concurs with the applicant's NO_X BACT proposal as described above. However, for the reasons already discussed at limit of 3,300 hours/year/CT will be imposed to ensure PSD is not triggered for SO_2. A NO_X CEMS will be used to demonstrate continuous compliance with the BACT emission limits and logging of excludable emissions. It will also be used to demonstrate compliance with the NSPS Subpart KKKK emission limits and logging of excess emissions. If after three years of operation any CT whose installation is authorized by this permitting action meets of the definition of a "*Peaking Unit*" per §72.2 – *Definitions*, FPL may request that the Department allow the NO_X emission rate methodology in Appendix E to 40 CFR Part 75 Appendix E – Optional NO_X Emissions Estimation Protocol for Gas-Fired Peaking Units and Oil-Fired Peaking Units to be used in lieu of the CEMS requirements specified as BACT.

In summary, the Department's NO_X BACT is:

- *Natural Gas*: 9 ppmvd @15% O_2 on a 24-hour block average basis with compliance by CEMS and achievable by lean premix Dry Low NO_X technology.
- *Natural Gas*: 77.0 lb/hr, one 24-hour block average. This is a onetime initial compliance demonstration by CEMS. Subject to the notification requirements in 62-297.310(7)(a)9., F.A.C. The demonstration period shall include all valid hours within the designated 24-hour block and not less than three valid hours during the block. Pound per hour NO_X values reported as NO_2 equivalent of NO plus NO_2.
- *Startup*: Startup and low load NO_X emissions shall also be further controlled by the GE OpFlexTM system or its Siemens equivalent and start-up NO_X work practices;
- *Fuel Oil*: 42 ppmvd @15% O_2 on a 4-hour rolling average basis with compliance by CEMS and achievable by water injection for flame cooling.
- *Fuel Oil*: 378.0 lb/hr, one 24-hour block average. This again is a onetime initial compliance demonstration by CEMS.

3.2.3. BACT for Carbon Monoxide (CO)

The following discussion of CO performance uses early or larger versions of the proposed CT for the Lauderdale project. Specifically, the earlier versions are GE 7FA.03 and a 2009 version of the Siemens SGT6-5000F CT while the larger version is a Siemens 8000H CT that recently began operation. The two Siemens models approximately equal or exceed in power (215 MW Siemens SGT6-5000F CT) and (250 MW Siemens 8000H CT) the two GE models (GE 7FA.04 and GE 7FA.05) proposed for the Fort Myers project while the GE 7FA.03 is slightly smaller. These GE and Siemens CT models should offer similar performance to the CT proposed for the Lauderdale project. In fact, as indicated in the FPL application, the newer Siemens F5 model shows superior performance and outperforms the newer GE models with respect to CO emissions (see **subsection 3.2.3.4**).

3.2.3.1. *CO Formation and Control Option Descriptions*

GE 7FA CT

CO is a product of incomplete combustion of carbon-containing fuels such as natural gas and fuel oil. Factors adversely affecting the combustion process are low temperatures, insufficient turbulence and residence times and inadequate amounts of excess air. Most CTs incorporate good combustion practices based on high temperature, sufficient time, turbulence and excess air to minimize emissions of CO. Additional control can be obtained by installation of oxidation catalyst, particularly on certain combustion turbines that do not perform well at low load conditions.

Although relatively high BACT CO limits are sometimes proposed when using combustion controls, much lower emissions are actually reported for very large combustion turbines (at least at full load operation) without use of oxidation catalyst. Based on testing discussed in the NO_X technology section (see **Table 6**) above, the earlier generation GE 7FA.03 units achieved CO emissions in the range of 0.3 to 1.6 ppmvd when firing gas at the TECO Polk Power Station Unit 2 at loads between 50 and 100 percent.

Some of the more recent turbine projects within the state have been permitted CEMS requirements for CO. Continuous data from these units verify the ability of the GE 7FA.03 (and presumably the GE 7 FA.04 and the GE 7 FA.05) to operate continuously with CO emission rates well below the manufacturer's guarantee. A summary of CO-CEMS data recorded at the TECO Bayside Station and reflecting very low CO emissions for four GE 7FA.03 units is shown in **Table 8** below.

CO and VOC emissions *should be and are* low because of the very high combustion temperatures, excess air, and turbulence characteristic of the GE 7FA. Performance guarantees are only now "catching up" with the field experience. GE recently published a report supporting the elimination of oxidation catalyst requirements for CO control on its units.[7] The following statement was taken from the report:

"GE is offering CO guarantees of 5 ppmvd for the GE PG7241FA DLN (now the GE 7FA.03) on a case-by-case basis following a detailed evaluation of the situation – thus validating its position that oxidation catalysts are not economically justified for CO emissions reduction for the GE PG7241FA (GE 7FA.03) DLN units while firing natural gas." (Parenthetical notes added by Department)

TABLE 8 - CO CEMS DATA IN ppmvd FROM GE 7FA.03 CTG AT TECO BAYSIDE UNIT 1.

Turbine	Quarter	CO Max 24-hr Block	CO Min 24-hr Block	CO Quarterly Average
1A	3rd Quarter 2003	4.3	0.3	0.83
1B		1.7	~0	1
1C		2.1	~0	0.8
1A	4th Quarter 2003	2.2	~0	0.76
1B		1.9	~0	1.14

[7] Technical Report GE 4213. Davis, L.B. and Black, S.H. GE Power Systems. "Support for Elimination of Oxidation Catalyst Requirements for GE PG7242FA DLN Combustion Turbines." August 2001.

1C		1.2	~0	0.74

A summary of stack test CO data in ppmvd while firing natural gas from the three existing Shady Hills units along with their reported annual emissions in tons/year are given in **Table 9**. For the year 2013 values in parenthesis are for oil firing. The annual emissions are probably under reported because they are based on near full load (low emissions) stack tests and do not consider the higher emitting startup and low load modes.

TABLE 9 – CO TEST RESULTS (ppmvd) AND ANNUAL EMISSIONS (TPY) - SHADY HILLS.

Year	Unit 1 (ppmvd)	Unit 2 (ppmvd)	Unit 3 (ppmvd)	Facility (tons/year)
2003	0.29	0.23	0.2	3.3
2004	0.14	0.2	0.3	1.1
2005	0.17	No Data	0.07	1.2
2006	0.25	0.21	0.36	0.9
2007	0.26	0.31	0.17	2.8
2008	0.42	0.67	0.32	6.1
2009	0.44	0.36	0.44	4.4
2010	0.24	0.35	0.66	4.4
2011	0.1	0.45	0.12	not reported
2012	0.09	0.15	0.3	2.95
2013	0.41 (1.18)	0.44 (1.13)	0.40 (1.2)	not yet reported
Average	0.26	0.35	0.29	4.0

A summary of stack test data from facilities that fire ULSD fuel oil on a limited basis is shown in **Table 10**. The results suggest that emissions when firing fuel oil are minimal and slightly greater than when firing natural gas.

Table 11 is a summary of annual CO (full load) stack test results for simple cycle Units 2A - 2D for the years 2000 through 2012. CO emissions are an order of magnitude less than the CO emission limits for all units. Units 2 C and 2 D are equipped with CEMS and annual tests are not required. However, the CO-CEMS record supports the conclusion that CO emissions are very low. Some of the results for tests conducted during the annual Relative Accuracy and Test Audits (RATA) of the CEMS are included in the table. Clearly emissions are equally low from a GE 7FA.03 CTG whether natural gas or fuel oil is used.

TABLE 10- CO, STACK TEST RESULTS FROM GE 7FA.03 SIMPLE CYCLE GAS TURBINES WHEN FIRING FUEL OIL.

Facility/Unit and percent (%) of Baseload	CO (ppmvd)
Martin Units 8A and 8B @100%	0.6 and 0.8
Purdom Unit 8 @50 and 100%	1.2 and 1.3
TECO Polk Unit 3 @100%	0.6
JEA Kennedy KCT-7 @100%	2.1
Stanton A – Units 25 and 26 @100%	1.0
Reliant Osceola Unit 1, 2, 3 @100%	0.04, 0.02 and 0.54
Oleander Power Units 1, 2, 3 and 4 @100%	1.8, 1.1, 3.8 and 2.7

TABLE 11 – CO STACK TEST RESULTS FROM PPS, UNITS 2A TO 2D (2000 TO 2012).

Year	CO (ppmvd @15% O_2) [1]					
	Unit 2A [2]		Unit 2B [2]		Unit 2C	Unit 2D
	Gas	Oil	Gas	Oil	Gas Only	Gas Only
2000	0.24	1.05	Not yet constructed		Not yet constructed	
2001	0.06	0.06				
2002	0.75	0.62	0.23	0.58		
2003	0.8	0.5	0.3	0.3		
2004	0.5		0.3			
2005	~0	~0	~0	~0		
2006	~0					
2007	0.57		1.0			
2008	0.22		0.21		0.2 [3]	0.19 [3]
2009	~0		~0			
2010	~0	0.04	0.04	0.04	0.7 [4]	1.2 [4]
2011	0.03		0.04		1.0 [4]	0.8 [4]
2012	0.4		0.6			
Average	**0.3**	**0.5**	**0.3**	**0.2**	**0.6**	**0.7**

1. Parts per million by volume @ 15% O_2.
2. Permit limit is 12 ppmvd @ 15% O_2 for gas firing and 20 ppmvd @ 15% O_2 for oil firing.
3. Initial stack test to validate emission rate of 9 ppmvd @15% O_2 or less. Subsequent compliance by CEMS to shown annual emission less than 100 TPY to avoid BACT.
4. Results from CO-CEMS data taken when demonstrating compliance at (near) full load.

Figure 16. Average CO Emissions versus Percent Load for GE 7FA.03 Combustion Turbines.

Figure 16 above is from a GE article and likely relates to CO emissions while firing natural gas. The data are consistent with those collected by the Department for both natural gas and fuel oil.

Siemens SGT6-5000F and 8000H CT

Figure 17 and **Figure 18** below show CO CEMS emissions data in ppmvd corrected to 15% oxygen measured at the bypass stack, i.e., in simple cycle mode, while firing natural gas from a Siemens SGT6-5000F CT. CO emission data is reported for loads of 100% and 55%. The Siemens CT is Unit 4A at the Duke Power Bartow Plant. Unit 4A is part of a combined cycle system consisting of: four Siemens Model SGT6-5000F CT with a nominal rating of 215 MW at ISO conditions when practicing power augmentation; four HRSG each equipped with a SCR and a nominal 500 MMBtu/hr duct burner; and a single nominal 420 MW STEG. The units are capable of operating in simple cycle mode via a by-pass stack.

As seen **Figure 17**, at 100% loading, the Siemens CT CO emissions average less than 1 ppmvd, while according to **Figure 18** at 55% load CO emission are less than 4 ppmvd. The actual permit limit (DEP File No. 1030011-010-AC) is 4.1 ppmvd @ 15% O_2 in simple cycle mode and combined cycle mode without firing duct burners. Compliance with this limit is based on 3-run average of stack tests. This data

indicates that the newer Siemens model proposed by FPL for the Lauderdale project should have no trouble meeting 4 ppmvd @ 15% O_2 at full load when firing natural gas and should be able to still comply with this limit a lower loads.

Figure 17. Siemens CO Data at 100% Load.

Figure 18. Siemens CO Data at 55% Load.

Figure 19. Siemens 8000H CT CO Emissions from FPL Cape Canaveral Energy Center.

Figure 19 above shows CO CEMS emissions data in ppmvd corrected to 15% oxygen while firing natural gas from three Siemens 8000H CT at 100% load. These Siemens CT are located at the FPL Cape Canaveral Energy Center. The Cape Canaveral Energy Center is a nominal 1,250 MW power plant located in Brevard County, Florida. The facility consists of three nominal 250 MW Model 8000H Siemens CT with three supplementary-fired HRSG and a common 500 MW STEG. The individual CT are identified as Units 3A, 3B, and 3C.

As seen from **Figure 19**, CO emissions from all three units are below 1.0 ppmvd during all test runs. Each test run was one hour in duration. These units are approximately 25% larger (200 versus 250 MW)

than the Siemens CT proposed for the Lauderdale project. This provides further assurance that the Lauderdale Siemens CT should easily me able to meet 4 ppmvd @ 15% O_2 when firing natural gas.

3.2.3.2. *Requirements of 40 CFR Parts 60 and 63 on the Combustion Turbines with respect to CO*

Neither the NSPS Subpart KKKK nor the NESHAP Subpart YYYY applicable to combustion turbines includes a CO emission standard and therefore are not considered when conducting a BACT determination for this pollutant.

3.2.3.3. *Applicant's CO BACT Proposal*

For the Lauderdale project, FPL has proposed BACT emission standards for the CT of 9 @ 15% O_2 for natural gas firing and 20 ppmvd uncorrected when firing ULSD fuel oil, with compliance shown by annual stack testing. The applicant stated:

"A review of the most recent BACT determinations for CO for large frame simple-cycle CT projects …… demonstrates that FDEP has historically established CT BACT emission rates based on the use of good combustion practices for minimizing CO emissions for simple cycle frame turbines. Although the Department has permitted GE7FA.03 and GE7FA.04 CT models with CO BACT levels as low as 4.1 for ppmvd natural gas firing and 8 ppmvd for ULSD oil firing based on operational data, the Project may utilize new GE model 7FA.05 or Siemens F5 turbines for which no operational data exists. The design of the new 7FA.05 differs from the 7FA.03 and 7FA.04 in that power generation has been increased by approximately 20% to over 200 MW at ISO conditions, through higher firing temperature and optimization. The new CT design yields uncertainty that the CO concentrations will be similar to the previous 7FA models. While other BACT determinations have established permit limits as low as 4.1 ppmvd, it has been through supporting operational data of their existing fleet of similar turbines. Because historical operating data are not available for the 7FA.05 and Siemens F5 units, vendor guarantees should be used to establish the BACT limits."

Also according to the applicant:

"The capital and annualized cost of a CO oxidation catalyst are approximately $2,100,000 and $600,000 per unit, respectively, corresponding to the most cost effective scenario. The resulting cost effectiveness is greater than $10,000 per ton of CO removed. The cost effectiveness is based on 2,890 hr/yr on natural gas and 500 hours per year of operation on ULSD oil. No costs are associated with combustion techniques since they are inherent in the design. In addition, actual CO emissions are likely to be less than the GE guaranteed rates of 9 ppmvd and 20 ppmvd (for gas and oil, respectively) and as a result the cost effectiveness based on actual emissions would be higher than $11,000 per ton of CO removed."

3.2.3.4. *Department's Assessment of Applicant's CO BACT Proposal*

The Department does not necessarily agree with the costs presented by the applicant. However, the Department concurs that oxidation catalyst is not cost-effective to reduce CO emissions by 80% (value given by the applicant) to levels of 2 and 4 ppmvd for natural gas and fuel oil, respectively. In fact, based on data from the GE 7FA.03 units presented in **subsection 3.2.3.1** an oxidation catalyst is not even necessary to meet the target values of 2 and 4 ppmvd.

In addition, to the cost considerations discussed above, another reason why an oxidation catalyst may not be desirable for this project is the possible affect that such a pollution control device may have on the emissions of NO_2 from a CT equipment. Per an email from Mike Bilelow of the Oglethorpe Power Corporation of Georgia, an oxidation catalyst may under certain circumstances oxidize NO to NO_2 which could have repercussions with regard to meeting the 1-hour NO_2 NAAQS[8]. In particular, Mr. Bilelow stated:

[8] Email dated November 11, 2013 from Mike Bilelow of Oglethorpe Power Corporation to Alvaro Linero of the Florida DEP.

"At our simple cycle CT plants the NO_2 is about 10% of the total NO_X, but our combined cycle Chattahoochee Energy Facility has both an Oxidation Catalyst and an SCR. The Oxidation Catalyst is responsible for converting the NO to NO_2."

The primary justification of FPL for this project is to reduce the likelihood of non-attainment with regard to the 1-hour NO_2 NAAQS near the Lauderdale Plant due to the high NO_X emission rates of the existing GT peaker units. Consequently, increasing the ratio of NO to NO_2 via installation of an oxidation catalyst on the new CT peaker units is problematic.

It should be noted that according to Table 2-1a of the FPL Lauderdale project application pertaining to the GE 7FA, CO emission rates while firing natural gas are all below 8 ppmvd @ 15% O_2 under all operating scenarios, while in Table 2-2a CO emission rates when firing ULSD fuel oil are all below 15 ppmvd @ 15% O_2 (below 18 ppmvd uncorrected) under all operating scenarios. In Table 2-1b of the application which pertains to the Siemens F5, CO emission rates while firing natural gas are 4 ppmvd @15% O_2 under all operating scenarios while in Table 2-2b CO emission rates when firing ULSD fuel oil are 9 ppmvd @ 15% O_2 (below 11 ppmvd uncorrected) under all operating scenarios.

Based on this information and the historic CO emissions data presented in **subsection 3.2.3.1**, the requested CO BACT of 9 ppmvd @ 15% O_2 and 20 ppmvd uncorrected for natural gas and ULSD fuel oil, respectively appears high, especially with regard to the Siemens F5 CT which is able to achieve CO emission rates approximately 55% less than the requested values when firing natural gas and ULSD fuel oil. In other words, both the GE 7FA.05 and Siemens F5 CT provide better CO emission rate performance then the 9 ppmvd @ 15% O_2 (natural gas) and 20 ppmvd (fuel oil) which FPL has proposed as BACT.

The Department accessed product development information for the GE7FA.05 combustion turbine at http://www.scribd.com/doc/44554552/7FA-GT-Classic-Re-Imagined-GEA17911 . According to **Table 12** below reproduced from their product information, it appears that they do not (yet) offer the 5 ppmvd guarantee for the GE 7FA.05 product. If they do offer such a guarantee on a case-by-case basis, they do not yet publicize it.

TABLE 12 – PERFORMANCE OF GE 7FA.05 COMBUSTION TURBINE-GENERATOR (SOURCE GE).

Parameter	Simple Cycle	Combined Cycle*
Output (MW)	211	627
Efficiency (%, Lower heating Value - LHV)	38.5	57.5
Heat Rate (Btu/kW-hour, LHV)	8,872	5,934
NO_X (ppmvd@15% O_2)	9	2
CO (ppmvd)	9	9
* Combined cycle values assume gas fuel, ISO base load condition, 1.5 inches mercury steam turbine back pressure, two-on-one combined cycle utilizing GE 207D-11 steam turbine, SCR, no duct firing and no CO catalyst		

However, the arguments presented by the applicant are difficult to understand from a technical point-of-view. For example, the GE 7FA.05 incorporates the same DLN-2.6 technology used by the 7FA.03 and 7FA.04. Clearly, GE had enough confidence to provide the same low NO_X guarantee of 9 ppmvd @15% O_2 for the newer and larger unit that was provided for the earlier ones. Generally, the entire GE 7FA line of turbines performs close to the guaranteed value for NO_X (refer to **Table 8 to Table 12**) but emits much less CO than the guaranteed values.

The following statements are from one of GE's technical documents for the GE 7FA.05 available at its web site:

"The 7FA.05 gas turbine will employ the proven DLN-2.6 combustor. The combustor has more than 15 million hours and 400,000 starts of operational experience. Minor modifications to the DLN2.6 combustion system will be required for the improved output and efficiency" ……"The higher

temperature-capable materials still operating in FA firing temperatures will further improve the successful experience of the 7FA wear modes for low cycle fatigue, oxidation and creep, thus supporting longer life and reduced repair costs." Link to GE 7FA.05 Test and Validation .

The inference from the statements is that the GE 7FA.05 will operate at the same firing temperature (and could at least theoretically operate at greater temperatures) than the rest of the 7FA line. It is difficult to attain greater output (such as characteristic of the GE 7FA.05) without increases in firing temperature. Increased firing temperatures simultaneously tend to lower CO emissions (other factors being equal). With only minimal modifications in the DLN-2.6 as stated, it is reasonable to conclude that the 7FA.05 will emit about the same and possibly a little less CO than the other units in the 7FA line.

FPL obtained the 5 ppmvd CO guarantee for GE 7FA.03 units installed at the Turkey Point Power Plant in Florida. FPL subsequently selected larger Mitsubishi 501G and Siemens SGT6-8000H for the West County and Riviera Power Plants, respectively. Both Mitsubishi and Siemens agreed to match the 5 ppmvd requirement based on the Department's BACT determination for the Turkey Point project. The technical differences between the GE 7FA.03 and the Mitsubishi and Siemens products are at least as great as the differences between the GE 7FA.03 and the GE 7FA.05.

The Department does not adopt the arguments presented by the applicant. However, it is understandable that commercial terms may require that the owner actually obtain a guarantee consistent with the issued construction permit.

3.2.3.5. *Department's Draft CO BACT Determination*

The Department **does not** concur with the applicant's CO BACT proposal due to the reasons described in **subsection 3.2.3.4** above. The Department feels that the CO emission rates of 4 ppmvd @15% O_2 while firing natural gas and 9 ppmvd @15% O_2 while firing fuel oil are readily achievable with all CT under consideration. After consultation with the Department, FPL has agreed to these BACT CO emission limits.

In summary, the Department's draft CO BACT is:

- *Natural Gas*: CO emissions while firing natural gas shall be limited to 4.0 ppmvd @ 15% O_2 as demonstrated by initial and annual stack tests. CO when firing natural gas shall also be controlled by DLN technology or equivalent technology (that limits CO as well as NO_X) and a high firing temperature.
- *Natural Gas*: 21.0 lb/hr, stack test. This is a onetime initial compliance demonstration.
- *Startup*: Startup and low load CO emissions shall also be further controlled by the GE OpFlex™ system or its Siemens equivalent and start-up CO work practices.
- *Fuel Oil*: CO for limited ULSD fuel oil shall be limited to 9.0 ppmvd @ 15% O_2 as demonstrated by initial and annual stack tests. This correct CO BACT emission limit equals approximately 12.5 ppmvd uncorrected. CO emissions for limited ULSD fuel oil shall also be controlled by a high firing temperature.
- *Fuel Oil*: 49.0 lb/hr, stack test. This is a onetime initial compliance demonstration.

3.2.4. BACT for Volatile Organic Compounds (VOC)

VOC is directly emitted from combustion turbines due to incomplete combustion. Such emissions are minimized by use of good combustion practices and high combustion temperatures with excess air.

3.2.4.1. *Applicant's VOC BACT Proposal*

The applicant proposes to use good combustion practices in combination with the high firing temperature of F frame type CT which is greater than 2,400 ^{o}F in combination with a great deal of excess air (greater than 10% O_2 in the exhaust gas) to control emissions of VOC.

3.2.4.2. *Department's VOC BACT Determination*

The Department concurs with the applicant's proposal and will set emission limits at 8.0 lb/hr while firing fuel oil and 3.77 lb/hr while firing natural gas. Compliance will be shown by annual stack testing.

3.2.5. BACT for Particulate Matter (PM, PM_{10} and $PM_{2.5}$)

Particulate matter ($PM/PM_{10}/PM_{2.5}$) is directly emitted from combustion turbines due to incomplete combustion, ash and sulfur present in the fuels. Such emissions are minimized by use of clean fuels, with low ash and sulfur content, and good combustion practices. Clean fuels are a necessity in combustion turbines in order to avoid excessive maintenance due to damaged turbine blades and other components already exposed to very high temperatures and pressures.

3.2.5.1. *Applicant's $PM/PM_{10}/PM_{2.5}$ BACT Proposal*

The applicant will use natural gas and ULSD fuel oil that are characterized by very low particulate formation potential. Furthermore, as previously indicated, F frame type CT have a firing temperature greater than 2,400 ^{o}F and the fuels will be burned with a great deal of excess air. Finally the low sulfur specifications, low NO_X and CO emissions and no usage of ammonia will minimize the potential to directly emit or subsequently form $PM_{2.5}$ and condensable PM.

The fuel specifications of 2.0 grains/100 standard cubic feet of natural gas and 0.0015% sulfur in the ULSD fuel together with a 10% opacity limits for visible emissions (VE) are proposed as BACT.

3.2.5.2. *Department's $PM/PM_{10}/PM_{2.5}$ BACT Determination*

The Department concurs with the applicant's proposal. Compliance will be shown by fuel sulfur monitoring or vendor certification and annual opacity testing for VE.

3.3. Draft BACT Determinations for Black Start Units

3.3.1. Draft BACT Determinations for Four 3,100 kW Black Start RICE Units

Four emergency generators are included in this project as an option for black start capability. Following are the specifications of the proposed emergency generators:

- Caterpillar Standby 3,100 kW 60 Hz 900 Diesel Generator or equivalent;
- Usage of 100 hours per year;
- Engine rated at 4,155 Brake Horse Power (BHP);
- Generator rated at 3,100 kilowatts (kW); and
- Heat Input is 2.32 MMBtu/hour (higher heating value).

The requirements of 40 CFR part 60, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (NSPS Subpart IIII) are given at: Link to NSPS Subpart IIII .

The major source requirements of 40 CFR 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (NESHAP Subpart ZZZZ) are given at: Link to NESHAP ZZZZ . A stationary reciprocating internal combustion engine subject to regulation under 40 CFR 60 (i.e. NSPS) and that meets any of the criteria in paragraphs 63.6590(c) (1) through (7) of the NESHAP Subpart ZZZZ, must meet the requirements of this regulation by meeting the requirements of 40 CFR 60, Subpart IIII. No further requirements apply for such engines under 40 CFR 63.

For the type of engine proposed by the applicant, the requirements of these two regulations are summarized in a third regulation which is 40 CFR 60, Subpart 89 – Control of Emissions from New and In-use Nonroad Compression-Ignition Engines. Link to 40 CFR 60, Subpart 89 . The applicable requirements are summarized at the following link: Link to Non-Road Engine Emission Standards . Those specifically applicable to the emergency generator engines specified by FPL are summarized in **Table 13**.

TABLE 13 – NSPS SUBPART IIII, STANDARDS FOR LARGE NONROAD ENGINES (TIER 2).

Emergency Generator (kW> 900)	**CO** (g/kW-hr) [1]	**PM** (g/kW-hr)	**NMHC [2]+NO_X** (g/kW-hr)	**Diesel Fuel [3]** (sulfur)
2011 and later	3.5	0.20	6.4	15 ppm

1. g/kW-hr means grams per kilowatt-hour.
2. NMHC means Non-Methane Hydrocarbons.
3. Nonroad diesel specification from 40 CFR part 80, subpart I – Motor Vehicle Diesel Fuel; Nonroad, Locomotive, and Marine Diesel Fuel; and ECA Marine Fuel. Link to Non-Road Diesel Spec

The Department determines that the requirements listed in **Table 13** satisfy the requirements of BACT for CO, NO_X and PM for the black start generators. Use of low ULSD fuel oil will result in substantially less PM than indicated above and will also further minimize PM_{10}, and $PM_{2.5}$ emissions and precursors.

Compliance shall be shown by an initial and annual stack tests or in lieu of stack test manufacturer engine certification. In the case of SO_2 emissions, compliance shall be shown by either fuel sulfur monitoring or vendor certification.

3.3.2. Two Existing GT as Black Start Units

If FPL elects the option of using two GTs from EU003 for black start capability at the facility BACT will consist of:

- Meet the emission limits and compliance requirement for these units that are in the current FPL Lauderdale Plant Title V Air Operation Permit No. 0110037-008-AV; and
- Each GT black start unit will be limited to of 100 hours per year for testing and maintenance purposes.

3.4. Draft BACT Determinations for 300 hp Fire Pump Engine

One emergency fire pump engine is included in this project. Following are the specifications of the proposed fire pump:

- Usage of 100 hours per year;
- Engine rated at 300 hp; and
- Heat Input is 29 MMBtu/hour (higher heating value).

As with the black start RICE emergency generators, the requirements of NSPS Subpart IIII and NESHAP Subpart ZZZZ apply to the fire pump engine. Also as with the generators, the fire pump engine meets the requirements of NESHAP Subpart ZZZZ by meeting the requirements of NSPS Subpart IIII. Those specifically applicable to the fire pump engine specified by FPL are summarized in **Table 14**.

TABLE 14 – NSPS SUBPART IIII STANDARDS FOR FIRE PUMP ENGINES.

Fire Pump Engine (300≤HP<600)	**CO** (g/kW-hr) [1]	**PM** (g/kW-hr)	**NMHC [2]+NO_X** (g/kW-hr)	**Diesel Fuel [3]** (sulfur)
2006 and later	3.5	0.20	4.0	15 ppm

1. g/kW-hr means grams per kilowatt-hour.
2. NMHC means Non-Methane Hydrocarbons.
3. Nonroad diesel specification from 40 CFR part 80, subpart I – Motor Vehicle Diesel Fuel; Nonroad, Locomotive, and Marine Diesel Fuel; and ECA Marine Fuel. Link to Non-Road Diesel Spec

The Department determines that the requirements listed in **Table 14** satisfy the requirements of BACT for CO, NO_X and PM for the fire pump engine. Use of ULSD fuel oil will result in substantially less PM than indicated above and will also further minimize PM_{10}, and $PM_{2.5}$ emissions and precursors.

Compliance shall be shown by an initial and annual stack tests or in lieu of stack tests, manufacturer engine certification. In the case of SO_2 emissions, compliance shall be shown by either fuel sulfur monitoring or vendor certification.

3.5. BACT Determination for the ULSD Fuel Oil Storage Tanks

FPL believes that the storage tanks are not subject to 40 CFR 60, Subpart Kb - NSPS for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 because the tanks store a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa). The Department agrees that these storage tanks are not subject to NSPS Subpart Kb: Link to NSPS Subpart Kb. The Department sets BACT for these storage tanks to minimize VOC emissions as the use of pressure relief valves/vapor condensers. In lieu of pressure relief valves/vapor condensers, FPL as an alternative, can use tanks with internal floating roofs or the equivalent to minimize VOC emissions.

3.6. NESHAP Subpart YYYY HAP Requirements

The emission limit for formaldehyde (CH_2O) of 91 parts per billion by volume dry (ppbvd) corrected to 15% O_2 in NESHAP Subpart YYYY for oil-fired Stationary Combustion Turbines shall apply to the CTs being considered for the Lauderdale Project if the facility cumulatively exceeds 1,000 oil-fired CT hours in any one year.

4. AIR QUALITY IMPACT ANALYSIS

The Lauderdale peaker unit replacement project has the PTE the following PSD-pollutants at levels in excess of their respective PSD SER: $PM/PM_{10}/PM_{2.5}$, CO, VOC and NO_X. FPL must provide a demonstration utilizing approved air quality models that the predicted emission levels of these pollutants will not cause or contribute to a violation of the AAQS or PSD increment for each where they apply. PM_{10}, $PM_{2.5}$, CO, SO_2, and NO_X (as NO_2) have defined national and state AAQS and PM_{10}, SO_2, and NO_2 have defined PSD increments. In addition, significant impact levels (SIL) and significant monitoring concentrations (SMC) are used to determine the scope of the modeling analyses and evaluate the need for pre-construction ambient air monitoring data.

4.1. Major Stationary Sources Near the Lauderdale Plant

To provide some perspective on the relative scale of the proposed Lauderdale Project refer to **Table 15** to **Table 18** below. These tables list the largest stationary sources of actual emissions, by pollutant, around the project site, with the project highlighted in **bold text**.

TABLE 15 – LARGEST SOURCES OF NO_X (2012) NEAR THE LAUDERDALE PLANT.

Owner/Company Name	Site Name	County	Emissions (TPY)
FP&L	Ft. Lauderdale Power Plant (Existing)	Broward	2067.0
FP&L	Port Everglades Power Plant	Broward	1347.8
Wheelabrator South Broward, INC	Wheelabrator South Broward	Broward	1339.0
FP&L	**Lauderdale Project**	**Broward**	**749** [a]
Miami-Dade Water and Sewer Department	North District Wastewater Treatment Plant	Broward	16.43

a. Based upon maximum potential emissions. Used data from Siemens F5 turbine

TABLE 16 – LARGEST SOURCES OF CO (2012) NEAR THE LAUDERDALE PLANT.

Owner/Company Name	Site Name	County	Emissions (TPY)
FP&L	Port Everglades Power Plant	Broward	532.8
FP&L	**Lauderdale Project**	**Broward**	**475** [a]
FP&L	Ft. Lauderdale Power Plant (Existing)	Broward	312.5
Wheelabrator South Broward, INC	Wheelabrator South Broward	Broward	59.7
Citgo Petroleum Group	Citgo – Port Everglades Terminal	Broward	7.5

a. Based upon maximum potential emissions. Used data from Siemens F5 turbine.

TABLE 17 – LARGEST SOURCES OF $PM_{2.5}/PM_{10}$ (2012) NEAR THE LAUDERDALE PLANT.

Owner/Company Name	Site Name	County	Emissions (TPY)
FP&L	**Lauderdale Project**	**Broward**	**132.0 [a]**
FP&L	Fort Lauderdale Power Plant (Existing)	Broward	119.8
Wheelabrator South Broward, INC	Wheelabrator South Broward	Broward	8.5
FP&L	Port Everglades Power Plant	Broward	7.8
G & K Services	G & K Services	Broward	1.9
a. Based upon maximum potential emissions. Used data from Siemens F5 turbine.			

TABLE 18 – LARGEST SOURCES OF VOC (2012) NEAR THE LAUDERDALE PLANT.

Owner/Company Name	Site Name	County	Emissions (TPY)
FP&L	Port Everglades Power Plant	Broward	384.1
Wheelabrator South Broward, INC	Wheelabrator South Broward	Broward	77.8
FP&L	**Lauderdale Project**	**Broward**	**69.9 [a]**
FP&L	Fort Lauderdale Power Plant (Existing)	Broward	11.0
High Sierra Terminaling LLC	High Sierra Terminaling LLC	Broward	3.4
a. Based upon maximum potential emissions. Used data from Siemens F5 turbine.			

In order to determine which sources could significantly interact with the project's $PM_{2.5}$ emissions, a screening technique called the "20D approach" was used. This technique is a quantifiable approach to relate a source's emissions to the distance from the project site. Facilities whose annual emissions are greater than a threshold value are included in the cumulative modeling analysis. The facilities that exceed this level are deemed "major sources", and are included in the cumulative modeling analysis. In addition, the department evaluated other sources outside the "20D" criteria in making the final determination of sources to include in the modeling. No other sources were predicted to have a significant impact in conjunction with the project's emissions. The sources included in the NO_2 and $PM_{2.5}$ modeling analysis are shown in **Figure 20** below.

Figure 20. Background NO_X (>25 TPY) and $PM_{2.5}$ Emission Sources Included in Modeling within 10 km of the Lauderdale Plant.

4.2. Ambient Air Monitoring Surrounding the Project Site

The State of Florida ambient air monitoring network operated by the Department and its partners (local air pollution control programs) includes monitors in many Florida counties. The chosen monitors shown in **Figure 21** are conservatively representative of the project site. These monitors are used to estimate the existing air quality in the area and to satisfy pre-construction monitoring requirements. **Table 19** below provides the ambient air quality design values for the selected monitors.

The ambient air measurements listed in **Table 19** are values that do not contain 'exceptional events'. An 'exceptional event' is defined by EPA in accordance with 40 CFR 50.14 as an event that affects air quality, is not reasonably controlled or preventable, and is an event caused by human activity that is unlikely to recur at a particular location or natural event.

Figure 21. Ambient Air Quality Measurements Nearest to the Lauderdale Plant (2010-2012).

TABLE 19 – AMBIENT AIR QUALITY MEASUREMENTS NEAREST TO THE LAUDERDALE PLANT (2010-2012).

Pollutant	Location (Site Number)	Averaging Period	Ambient Concentration			
			Compliance Period	Value	Standard	Units [a]
$PM_{2.5}$	Davie, FL (012-011-1002)	24-hour [b]	2010-2012	14.6	35	$\mu g/m^3$
		Annual [c]	2010-2012	6.7	12	$\mu g/m^3$
NO_2	Dania, FL (012-011-8002)	Annual [a]	2012	5.0	53	ppb
		1-hour [e]	2010-2012	45.4	100	ppb

Pollutant	Location	Averaging	Ambient Concentration			
Ozone	Dania, FL (012-011-8002)	8-hour [d]	2010-2012	0.063	0.075	ppm

a. Arithmetic mean.
b. Three year average of the 98th percentile of maximum daily 24-hour concentrations.
c. Three year average of the arithmetic annual means.
d. Three year average of the annual 4th highest daily 8-hour maximum.
e. Three-year average of the annual 98th percentile maximum daily 1-hour value

4.3. Existing Ambient Air Quality Near the Lauderdale Plant –Ozone, NO_2, and $PM_{2.5}$

The reported compliance values for ozone, $PM_{2.5}$ and NO_2 for the monitors in the vicinity of the project site are shown in **Figure 22, Figure 23**and **Figure 24** below, respectively. These monitors indicate that Broward County is well within attainment of all applicable national and state NAAQS.

Ozone is a key indicator of the overall state of regional air quality. It is not emitted directly from combustion processes; rather it is formed from VOC's and NO_2 emitted primarily from regional industrial and transportation sources. VOC are also emitted from agricultural fires, natural drought-related fires and natural emissions from vegetation. These two precursors participate in photochemical reactions that occur on an area-wide basis and are highly dependent on meteorological factors.

Figure 22. Florida Ozone Compliance Values.

$PM_{2.5}$ (also known as PMfine) is another important indicator of regional air quality. Some $PM_{2.5}$ is directly emitted as a product of combustion from transportation and industrial sources, as well as from fires. Much of it consists of particulate nitrates and sulfates formed through chemical reactions between gaseous precursors such as SO_2 and NO_X from combustion sources and ammonia (NH_3) naturally present in the air or added by other industrial sources.

Figure 23. Florida NO_2 Compliance Values

Figure 24. Florida $PM_{2.5}$ Compliance Values

4.4. Air Quality Impact Modeling

4.4.1. Models, Emissions Data, and Meteorological Data

The EPA-approved AERMOD modeling system was used to evaluate the pollutant emissions from the project in the surrounding Class II areas. AERMOD is a Gaussian steady-state plume dispersion modeling system that simulates pollutant dispersion methods based on planetary boundary layer turbulence structure and scaling concepts, including the treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD contains two input data processors: the AERMET meteorological processor and the AERMAP terrain processor.

The applicant used a series of specific model features recommended by the EPA that are referred to as the regulatory options. Direction specific downwash parameters were used for all sources for which downwash was considered. Emissions data used in the modeling analysis were obtained from the DEP ARMS database, DEP permit files, and recent PSD permit reviews.

The AERMET meteorological data used with the AERMOD model consisted of a continuous 5-year period of hourly surface weather observations from the National Weather Service (NWS) Automated Surface Observing System (ASOS) station located at the Fort Lauderdale-Hollywood International Airport (FLL). The upper air sounding data used was collected from the Florida International University in Miami (FIU). This data was compiled by the DEP for the period 2006 through 2010 with the inclusion of a land cover and use analysis input from AERSURFACE, and a detailed wind data from AERMINUTE. The ASOS station at FLL is located approximately 4 km due east of the FTY project site and is the closest primary weather station considered to have representative meteorological data. As the FMY ASOS station is only 4 km from the project site, both sites are in close proximity to the coastline and the terrain between the two sites is mostly flat, the wind direction and wind speed frequencies measured at the ASOS location are considered to be representative of the project site.

4.4.2. Significant Impact Analysis

The general modeling approach for the significant impact analysis for the Lauderdale peaker unit replacement project followed the EPA and the DEP modeling guidelines for determining compliance with NAAQS and PSD increments. For all criteria pollutants that will be emitted in excess of the PSD SER due to a proposed project, a significant impact analysis is performed to determine whether the emission and/or stack configuration changes due to the project alone will result in predicted impacts that are in excess of the SIL for Class I (designated areas such as National Parks) and Class II areas (everywhere else). For the proposed project, emissions increases above the PSD SER occur for the following criteria pollutants: PM_{10}, $PM_{2.5}$, CO, VOC's and NO_X. A significant impact analysis was completed for these pollutants (except VOC's) to determine if the project may cause an increase in ground-level concentration greater than the SIL for each.

If the modeling for a particular pollutant shows ground-level increases less than it's SIL, the applicant need not conduct any further modeling. If the modeled concentrations from the project exceed the SIL, then additional refined modeling, including emissions from nearby facilities and/or projects (cumulative modeling), is required to determine the proposed project's impacts compared to the NAAQS and PSD increments for those pollutants.

4.4.2.1. *Class II SIL*

A specific CT manufacturer for the project has yet to be chosen, however FPL has narrowed its choice down to two separate models. Thus, air quality modeling was performed for both candidate models. The highest concentration calculated for each pollutant from either of the CT models was used in the analysis. The applicant is conservatively seeking permitted authority to operate the turbines for up to 3,390 hours per year using natural gas, of which ULSD fuel oil could be used up to 500 hours per year. To determine the 'worst case scenario' for emissions, each turbine model was evaluated at a range of operating temperatures, loads, and fuels. To perform this evaluation, exhaust exit temperatures and velocities were calculated for each of the temperature, load, and fuel combinations. Using these figures AERMOD was

run with a generic emissions rate of 10 g/s (for all five turbines combined) for 8,760 hr/yr at each configuration. The resulting 1-hr, 3-hr, 8-hr, 24-hr, and annual average concentrations for each pollutant were then multiplied by the ratio of the pollutant-specific emission rate to the generic emission rate to determine actual ground-level concentrations. In general, lower ambient air temperatures and a higher operating load led to higher ground-level concentrations for NO_2. Concentrations of PM_{10}, $PM_{2.5}$, and CO however, exhibited higher concentrations at lower temperatures and lower operating loads. The highest calculated concentration for each pollutant, from any combination of temperature, load, fuel, and turbine model, was then compared to the PSD Class II SIL (see **Table 20**). This approach, including the assumption of 8,760 hr/yr operation on individual fuels, is considered to be conservative in nature.

In the Class II modeling analysis, receptor locations used in both modeling analyses were based on Universal Transverse Mercator (UTM) coordinates from Zone 17, North American Datum 1983 (NAD83). A combination of fence line, near-field and far-field receptors were chosen for predicting maximum concentrations in the vicinity of the project. The air modeling domain was set as a 20 km X 20 km grid centered at UTM 17N and east and north coordinates of 580,214 and 2,88,4227 meters, respectively. A discrete Cartesian grid of 3,068 receptors was located at the following intervals and distances:

- Every 50 meter (m) along the property boundary and fence line;
- Every 250 m in a 2 km square, centered at the origin, excluding areas within the property boundary;
- Every 500 m in a 10 km square, centered at the origin, excluding areas covered by the two smaller grids.

The modeling results shown in **Table 20** demonstrate that maximum concentrations due to the project are predicted to be less than the SIL for all pollutants except for the 24-hour $PM_{2.5}$ and 1-hour NO_2. As a result, additional modeling analysis for NO_2 and $PM_{2.5}$ must consider other nearby sources and background concentrations to determine the cumulative impact of these sources for comparison to NAAQS and PSD increments.

In addition, in order to verify compliance with NAAQS and PSD increments, the Department conducted an additional modeling analysis using a receptor grid resolution typical for this type of analysis. The intervals and distances used by the Department are listed below:

- Every 50 m along the property boundary and fence line;
- Every 100 m in a 2 km square, centered at the origin, excluding areas within the property boundary;
- Every 250 m in a 5 km square, centered at the origin, excluding areas covered by the two smaller grids.
- Every 500 m in a 10 km square, centered at the origin, excluding areas covered by the three smaller grids.

TABLE 20 – MAX PREDICTED AIR QUALITY IMPACTS OF THE PFM PROJECT COMPARED TO CLASS II SIL.

Pollutant	Averaging Time	Max Impact [b] ($\mu g/m^3$)	SIL ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Significant Impact?
PM_{10}	Annual 24-Hour	0.06 1.86	1 5	50 150	No No
$PM_{2.5}$	Annual 24-Hour	0.04 1.45	0.3 1.2	15 35	No **Yes**
NO_2 [a]	Annual 1-Hour	0.28 45.4	1 7.6	100 189	No **Yes**
CO	8-hour 1-hour	69.9 85.4	500 2,000	10,000 40,000	No No

a.	Assumes 75% conversion of NO_X to NO_2 on an annual basis and 80% conversion on a 1-hour basis, i.e., the tier 2 modeling approach.
b.	Maximum 24-hour impacts based on 10-hours of ULSD oil firing and 14-hours of natural gas firing

4.4.2.2. *Class I SIL*

The nearest Class I area to the FTY project site is Everglades National Park (ENP), which is located at a distance greater than 50.0 km to the southwest of the Project location. The EPA-approved CALPUFF non-steady-state puff dispersion model is recommended for evaluation of emission impacts at distances greater than 50 km. This model was used to evaluate pollutant dispersion, visibility impairment, and nitrogen (N) deposition in the ENP Class I area. This area contains 901 discrete modeling receptors that were provided by the Federal Land Manager (FLM) and the National Park Service (NPS). Meteorological input data used in the modeling analysis was also provided by the NPS for the years 2001-2003. The maximum pollutant concentrations predicted for the proposed Lauderdale peaker unit replacement project are compared to the PSD Class I SILs in **Table 21** below. The modeling results indicate that maximum concentrations due to the project are predicted to be less than the Class I SILs for all pollutants except for 24-hour $PM_{2.5}$ and PM_{10}. As a result, detailed analyses to demonstrate compliance with the allowable PSD Class I is required for these pollutants.

4.4.3. 1-Hour NO_2 and 24-Hour $PM_{2.5}$ Class II NAAQS Analysis

The 1-hour NO_2 NAAQS is a probabilistic standard, and compliance is based on the highest predicted 98th percentile (i.e., 8th highest) daily maximum 1-hour average concentrations, on a receptor-by-receptor basis, averaged over five years of meteorological data. The 24-hour $PM_{2.5}$ NAAQS is based on the 98th percentile of all daily measurements per year, averaged over five years.

TABLE 21 – MAX PREDICTED AIR QUALITY IMPACTS OF THE FTY PROJECT COMPARED TO CLASS I SIL (SIEMENS F5).

Pollutant	Averaging Time	Max. Predicted Impact (µg/m^3) at ENP	Class I SIL (µg/m^3)	Significant Impact?
NO_2 [a]	Annual	0.01 [c]	0.1	No
PM_{10}	Annual 24-Hour	0.002 [c] 0.38 [c]	0.2 0.3	No **Yes**
$PM_{2.5}$ [b]	Annual 24-hour	0.002 [c] 0.38 [c]	0.04 0.07	No **Yes**

a. Assumes 100% conversion of NO_X to NO_2, i.e., the tier 1 modeling approach.
b. Assumes 100% of PM_{10} consists of $PM_{2.5}$, i.e., the most conservative estimate.
c. Calculated based on emissions from five turbines operating on ULSD oil for 8,760 hr/yr.
d. Calculated based on emissions from five turbines operating on natural gas for 8,760 hr/yr.
e. Calculated based on emissions from five turbines operating on natural gas for 14 hr/day and ULSD oil for 10 hr/day.

The NAAQS and PSD analyses are cumulative source analyses that evaluate whether the air quality impact concentrations from all nearby sources will comply with the NAAQS and PSD increments. The analyses considered the modeled impacts from existing and future sources at the proposed Lauderdale Project site, emissions from other nearby facility sources, as applicable, and a non-modeled background concentration that is intended to account for all sources not included in the modeling analysis.

An increment analysis is not required for NO_2 because a 1-hour PSD Class II increment does not exist for that pollutant, however, a PSD Class II increment does exist for $PM_{2.5}$, and will be discussed in the next section.

It should be noted that the applicant used different receptor and grid parameters when evaluating $PM_{2.5}$ concentrations against the NAAQS. Single source modeling for $PM_{2.5}$ showed the only receptors to be in violation of the SIL was located within a radius of 4.2 kilometers around the source. Therefore, the applicant used a circular grid, with a radius of approximately 4.2 kilometers, which encompassed all receptors in violation. A discrete Cartesian grid of 1,032 receptors was located at the following intervals and distances:

- Every 50 m along the property boundary and fence line;
- Every 250 m in a 4.2 km semi-circle, centered at the origin, excluding areas within the property boundary;

To determine which sources would have a significant impact on $PM_{2.5}$ levels, sources were evaluated using the widely used "20D" approach. For NO_2, guidance issued by the EPA (Tyler Fox, March 1, 2011; Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard) suggests that background sources within 10 km are generally sufficient for assessing air quality impacts over a 1-hour averaging time. Considering this guidance, sources within 10 km of the project site with emissions greater than 25 TPY were included. Several sources located 10-30 km from the site were not included due to their low emission rates.

Data on current NO_2 and $PM_{2.5}$ background sources were obtained from the DEP and all facilities located within 10 km of the proposed project were identified. There are three background sources included in the cumulative modeling analysis (see **Figure 20**). The maximum allowable emissions for these sites were entered into AERMOD for the modeling demonstration. In addition, a non-modeled background concentration obtained from a nearby, representative monitor (see **Table 19**) for NO_2 (45.4 ppb) and $PM_{2.5}$ (14.6 µg/m^3) were included to represent potential impacts due to emission sources not directly included in the modeling analysis.

For both NO_2 and $PM_{2.5}$, the maximum emission rates are associated with a Siemens F5 turbine operating on ULSD oil, at 100% load, at an ambient air temperature of 35 ºF. Emission rates of 53.0 lb/hr and 378.0 lb/hr were used in the model for $PM_{2.5}$ and NO_2 respectively.

Table 22 shows the results of this analysis. In order to satisfy the NAAQS for NO_2, the 5-year average of the 98th percentile (eighth-high) daily maximum NO_2 concentration must not exceed the established limit. For $PM_{2.5}$, NAAQS is based on the 98th percentile of all daily measurements per year, averaged over five years. As shown in the table, NO_2 and $PM_{2.5}$ emissions from the proposed FTY project are not expected to cause or contribute to a violation of the 1-hour NO_2 or 24-hour $PM_{2.5}$ NAAQS.

TABLE 22 – AMBIENT AIR QUALITY IMPACTS FROM ALL SOURCES NEAR THE FTY PROJECT SITE.

Pollutant	Averaging Time	Major Sources Impact [a] (µg/m^3)	Monitored Background Conc.(µg/m^3)	Total Impact (µg/m^3)	NAAQS (µg/m^3)	Total Impact Greater Than NAAQS?
NO_2	1-hour	82.4	85.3	167.7	188.1	No
$PM_{2.5}$	24-hour	3.2	14.6	17.8	35	No

a. Calculated based on five turbines operating 8,760 hr/yr on ULSD oil, i.e., a conservative approach.

Secondary $PM_{2.5}$ formation from the emissions of SO_2, NO_X and VOC is expected to be minimal. The increases in emissions of these pollutants as a result of the Lauderdale Project are: 37 TPY (SO_2); 749 TPY (NO_X); and 70 TPY (VOC). Currently, air dispersion and transport models do not account for the contributions these compounds make in the formation of secondary $PM_{2.5}$. However, estimates of the relationship between $PM_{2.5}$ and its precursors can be made. Because secondarily formed $PM_{2.5}$ takes time for the chemistry conversions, this component of the $PM_{2.5}$ is more widespread and diffuse. An estimate of the change in $PM_{2.5}$ that could occur as a result of the NO_X increase can be made by noting that NO_X emissions in Broward County reduced by about 14,000 TPY from 2008 to 2011. The $PM_{2.5}$ 24-hr design values at monitors in the county reduced by 7.0 µg/m^3. Thus, if all of this $PM_{2.5}$ concentration reduction were attributed to the NO_X emissions reduction, the average reduction would be approximately 0.0005 µg/m^3 per ton. This would mean an increase of approximately 0.37 µg/m^3 of $PM_{2.5}$ for the 749 ton increase in NO_X resulting from the Lauderdale Project. Such an increase would not affect compliance with meeting the NAAQS or PSD increments.

4.4.4. 24-Hour $PM_{2.5}$ PSD Class II Increment Analysis

The PSD increment represents the amount new sources in an area may increase ambient ground level concentrations of a pollutant from a baseline concentration in order to avoid approaching the NAAQS. As mentioned, there is no established PSD increment for the 1-hour NO_2 standard but an increment analysis was required for the 24-hour $PM_{2.5}$ standard. The combined impacts of all increment-consuming sources in the area of the new source cannot exceed the PSD increment. The proposed Lauderdale Project was modeled assuming base load operation of the five new CT's as well as the operation of the Port Everglades Power Plant. No other PSD increment consuming sources were used in the area, as other sources in the region were built before the baseline date. The results of this analysis are presented in **Table 23** below and show that the combination of the emissions from the project and all background sources does not exceed the applicable PSD increment for 24-hour $PM_{2.5}$ concentrations.

TABLE 23 – PSD INCREMENT ANALYSIS RESULTS.

Pollutant	Averaging Time	Maximum Combined Impact (µg/m^3)	PSD Class II Increment (µg/m^3)	Total Impacts Exceed Increment?	Increment Consumed
$PM_{2.5}$[a]	24-hour	2.0	9.0	No	22.2%
a. Concentration reported is the highest, second highest 5-year daily value, based on five turbines operating 8,760 on ULSD oil					

4.4.5. 24-Hour $PM_{2.5}$ and PM_{10} PSD Class I Increment Analysis

Since both PM_{10} and $PM_{2.5}$ exceeded the Class I SIL's during single source modeling, Comprehensive multi-source modeling is necessary to show that concentrations of these pollutants will not exceed PSD Class I increments. The California Puff (CALPUFF) model is a non-steady state Langrangian puff long range transport model, recommended by the EPA for calculating long-range impacts and pollutant concentrations. The model is used by the applicant to predict the change in PSD increment for PM_{10} and $PM_{2.5}$ at ENP, located between 48.2 and 150 km away from the Project site. For both PM_{10} and $PM_{2.5}$, the highest, second highest 24-hour concentration for any year was compared to the PSD Class I increment. **Table 24** below shows the increment consumption for the sources modeled are well below the Class I PSD increments.

TABLE 24 – PSD CLASS I INCREMENT ANALYSIS.

Pollutant	Averaging Time	Highest, Second Highest Concentration (µg/m^3) at ENP	Class I PSD (µg/m^3)	Increment Consumed	Exceed Increment?
PM_{10}	24-Hour	1.29	4.0	32.3%	No
$PM_{2.5}$	24-hour	0.16	2.0	8.0%	No
a. Concentration reported is the highest, second highest 5-year daily value, based on five turbines operating 8,760 on ULSD oil					

4.4.6. Ozone Analysis

Projects with VOC or NO_X emissions greater than 100 TPY are required to perform an ambient air impact analysis for ozone including the gathering of pre-construction ambient air quality data. The applicant estimated annual potential VOC and NO_X emissions from the project to be 69.9 and 749 TPY, respectively, and is therefore required to provide an ambient air impact analysis for ozone.

Ozone site-specific modeling is not typically completed for single source permitting because of its complexity. Ozone is a secondarily formed pollutant that is known to be caused by the regional emissions of VOC and NO_X in combination with meteorological conducive meteorological conditions (temperature, rainfall, solar radiation, etc.). Despite significant increases in population and motor vehicle activity, ambient ozone air quality in Florida has improved over the last 5 years due to improvements in motor vehicle emissions rates. Continued reductions in average motor fleet emissions would be expected to further improve ozone air quality. In addition, implementation of CAIR has resulted in significant actual reductions in existing power plant NO_X emissions throughout Florida.

4.5. Additional Impacts Analysis

4.5.1. Growth-Related Impacts Due to the Proposed Project

The impacts associated with the construction of the FTY project are expected to be minor. Construction will occur over 18-24 months and will employ approximately 100 workers during that time frame. The impacts associated with the temporary increase in vehicular traffic are expected to be negligible. No additional permanent employees will be hired.

Existing infrastructure, both onsite and around the site, are sufficient to meet any support demands of the project. The project itself is being undertaken to improve the efficiency of the Fort Lauderdale Plant and actually results in a slightly decreased capacity and significant improvement in air quality associated with the retirement of the older turbines; therefore, little to no secondary growth as a result of the project is expected.

4.5.2. Impact on Soils and Vegetation

Emissions of pollutants have the potential to negatively affect soils and vegetation near the project site. To analyze these potential impacts, the applicant utilized a screening approach to compare the project's maximum potential ambient concentrations of pollutants with effect threshold limits as reported in the scientific literature. As previously mentioned, the project's maximum potential air quality impacts are expected to be less than the NAAQS and PSD increments and thus the project's impacts on soils and vegetation in the vicinity, including the ENP Class I area, are expected to be negligible.

4.5.3. Impact on Wildlife

Impacts to wildlife in the vicinity of the project are expected to be negligible as well. Conservative estimates of the project's pollutant emissions are expected to be below the applicable NAAQS and PSD increments.

4.5.4. Class I Area Impacts- Air Quality Related Values (AQRV)

According to the U.S. Department of the Interior, an AQRV is defined as "all those values possessed by an area except those that are not affected by changes in air quality and include all those assets of an area whose vitality, significance, or integrity is dependent in some way upon the air environment." An analysis of a project's impacts on AQRV in Class 1 areas is required as part of an application for an air construction permit.

In October 2010, the Federal Land Managers (FLMs), consisting of the National Park Service, U.S. Forest Service, and U.S. Fish and Wildlife Service, issued the Federal Land Managers' Air Quality Related Values Work Group (FLAG), Phase I Report- Revised (2010). Based on the report, the FLM recommended initial screening criteria that would exempt a source from AQRV impact review based on a source's annual emissions and distance from a Class I area.

The FLM will consider a source located greater than 50 km from a Class I area (the ENP is located between 48.2 and 150 km away) to have negligible impacts with respect to Class I AQRV if its total SO_2, NO_X, PM_{10}, and sulfuric acid mist (SAM) annual emissions in TPY (based on 24-hour maximum allowable emissions), divided by the distance (km) from the Class I area (Q/D) is 10 or less. The FLM would not request any further Class I AQRV impact analyses from such sources. However, as shown in **Table 25**, the Q/D value for the ENP is more than the screening criterion; therefore, additional analysis is required to assess visibility impairment and acid deposition at ENP

TABLE 25 – FLAG GUIDANCE SCREENING ANALYSIS.

Pollutant	SO_2	NO_X	SAM	PM_{10}	Total
Potential Emissions (Q) (TPY)	109	1041	11	137	1298
Class I area	Everglades National Park				
Minimum Distance (D) (km)	48.2				

FLAG screening ratio (Q/D) (TPY/km)	26.9
Greater than FLAG guidance (10)?	**Yes**

4.5.4.1. *Class I Area Visibility Impacts*

Certain Class I areas are protected against visibility impairment due to plume blight from nearby sources and regional haze from long distance sources. Since a large percentage of ENP is greater than 50 kilometers away from FTY, FTY is considered a long distance source. Therefore, an assessment of the project's regional haze impacts was conducted using the current EPA-approved CALPOST v.6.221 program, background light extinction Method 8, with sub-mode 5 monthly relative humidity data for the ENP in accordance with current FLM guidance. The assessment evaluated the 98th percentile of the 24-hour average impacts. The results indicate that the project will not have an adverse effect on visibility in the ENP as shown in **Table 26**.

TABLE 26 – VISIBILITY IMPAIRMENT ANALYSIS FOR THE ENP (SIEMENS F5).

Year	98th Percentile Maximum Visibility Impairment (deciview) [a]	FLM's Visibility Threshold (deciview)
2001	0.27	0.5
2002	0.37	0.5
2003	0.30	0.5

a. Calculated based on emissions from five turbines operating on ULSD fuel oil for 10 hr/day and gas 14 hr/day.

4.5.4.2. *Class I Area Nitrogen Deposition Impacts*

A total N deposition rate in the ENP was estimated for the project. The CALPUFF model was used to predict wet and dry deposition rates of four different N species in kg/ha/yr. These values are compared with FLM provided thresholds in **Table 27** and show that the project is expected to have a negligible impact on the ENP with respect to N deposition.

TABLE 27 – TOTAL NITROGEN DEPOSITION ANALYSIS FOR THE ENP.

Year	**Total Deposition** (kg/ha/yr)	**Deposition Analysis Threshold** (kg/ha/yr)
2001	0.0025 [a]	0.01
2002	0.0027 [a]	0.01
2003	0.0036 [a]	0.01

a. Calculated based on emissions from five turbines operating on ULSD oil for 500 hr/yr (10 hr/day) and natural gas for 2,890 hr/yr (14 hr/day).

4.6. Conclusion

Based on the results presented in the air quality analysis, the Department has reasonable assurance that the increased pollutant emissions associated with this project will not cause or contribute to any violation of an NAAQS or PSD increment. In addition, the Department finds that there will be no adverse impact on soils, vegetation, wildlife, or, in Class I areas, any AQRV.

5. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the 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 application, the reasonable assurances provided by the applicant, and the conditions specified in the Draft permit.

Tom Rogers is the meteorologist responsible for reviewing and preparing the ambient air quality analyses. David Read, P.E. is the project engineer responsible for reviewing the application, preparing the draft permit and writing the technical document. Details of the analyses may be obtained by contacting Mr. Tom Rogers at tom.rogers@dep.state.fl.us or Mr. David Read at david.read@dep.state.fl.us .