Florida Power
CORPORATION

February 2, 1994

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Bureau of
Air Regulation

Mr. Clair Fancy
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Re: Polk County Site
Site Certification No. PA-92-33

Florida Power Corporation (FPC) has reviewed the comments made in an undated draft letter prepared by the U.S. Fish and Wildlife Service (FWS) regarding the Prevention of Significant Deterioration (PSD) permit application and the Technical Evaluation and Preliminary Determination for the FPC Polk County Site. The FWS comments mostly pertain to the Best Available Control Technology (BACT), and Air Quality Related Values (AQRV) analyses. The following is our response to the FWS comments made in the draft letter.

Best Available Control Technology Analysis

FWS comments regarding the BACT determination for nitrogen oxide (NO_x) emissions from the combined cycle units are somewhat inconsistent. In the third paragraph of the FWS letter, they allege that the appropriate BACT determination is either dry low NO_x combustors, or water injection in combination with selective catalytic reduction (SCR) to achieve emission values of less than 15 ppm when burning gas using dry low NO_x combustors, and as low as 6 ppm when burning gas and 9 ppm when burning oil with SCR. Further, in the fifth paragraph of the FWS letter, they indicate that they "are pleased to see the Florida Department of Environmental Protection (FDEP) proposes to accept low-NO_x burner design with a maximum NO_x emission limit of 12 ppm", and "are also pleased to see the FDEP may lower the limit to 9 ppm". However, in the fifth paragraph FWS continues "As written now, it [the permit] requires configuration of the turbines to allow application of SCR, but the permit does not indicate that SCR will be required if the NO_x emission limit of 12 ppm cannot be met."

As you know, combustion turbine (CT) technology, specifically in the area of NO_x emissions control, is a quickly evolving area. In deliberations on the Polk County BACT analysis, it was determined that a limit based on volumetric concentration (ppm) may not be the most appropriate. For instance, if the combustion turbine selected for the project had very high energy conversion efficiencies, but somewhat higher pollutant volumetric concentrations, the normalized mass emission (lb/MWH) could result in lower net emissions from the facility. FPC and the FDEP are aware of recent combustion turbine supplier equipment developments that fit this characterization.

Currently, the draft air permit provides FPC the option of installing duct modules suitable for possible future addition of SCR. The draft air permit also indicates that if these duct modules are not installed, the retrofit costs associated with not making provisions for SCR installation shall not be considered in any economic evaluation to justify not installing SCR. Therefore, FPC cannot use the cost of installing space for a SCR system as justification for avoiding a future requirement for SCR installation. Because CT design is evolving so rapidly, it is essential to allow both FPC and FDEP the flexibility to respond to changes in technology. Without this flexibility, the requirement to install a duct module (or SCR) becomes punitive in nature. With the approach agreed to by FDEP in the draft permit, FDEP is not precluded from requiring SCR, and FPC is not required to install a module.

In their draft comment letter, FWS alleges that the costs for using an SCR system presented in the PSD application appear high. FWS indicates that "the only reason for the higher cost appears to be the fact that FPC will use fuel oil as a backup fuel." This is not the case. The predominant reason costs are higher for SCR in this case is the low base case NOx emission rate (12 ppmvd at 15 percent oxygen) when firing natural gas. Based on an assumption of 8,260 hours per year of natural gas firing and 500 hours per year of fuel oil firing, the costs for the use of SCR at Polk County, based on an SCR controlled outlet NOx emission of 6 ppmvd, were approximately $10,600 per ton of NOx removed. The costs in the BACT analysis were prepared consistent with industry practices for estimating SCR costs, and therefore, are considered representative.

In addition to economic arguments, the PSD application indicates a number of environmental disadvantages associated with the use of SCR. In summary, it remains the position of FPC that the use of SCR at Polk County does not represent BACT.

The BACT determination indicates that based on energy, environmental, and economic considerations, the use of combustion controls to limit carbon monoxide (CO) emissions is BACT. FWS indicates in their comments that they agree that an incremental cost effectiveness of $6,400 per ton of CO removed is unreasonable to justify use of an oxidation catalyst. However, FWS requests some documentation to support the FPC position. The following is a list of recent Florida combined cycle combustion turbine PSD carbon monoxide BACT determinations.

Project	Date	CO BACT Determination	Ox. Catalyst CO Removal Cost, $/ton
Intercession City	8/92	Combustion Controls	$ 7,099
Polk County Partners	11/92	Combustion Controls	$ 6,000
Auburndale Power Partners	12/92	Combustion Controls	$ 7,099
Kissimmee Utility Authority	4/93	Combustion Controls	$10,560
Central Florida Power	5/93	Combustion Controls	$10,000

The CO removal costs listed above indicate that the Polk County BACT analysis costs and determination are representative of other recent determinations in Florida. As indicated, none have required the initial use of oxidation catalysts. Accordingly, it remains FPC's position that combustion controls are BACT for the combined cycle combustion turbine units.

Air Quality Related Values (AQRV) Analysis

The FWS confirmed that the effects of gaseous emissions on AQRVs were adequately addressed. However, FWS criticized the use of a Forest Service (FS) document in the analysis of nitrogen (N) and sulfur (S) deposition. In developing the analysis of N and S effects on AQRVs of the Chassahowitzka National Wilderness Area (NWA), it was recognized that site-specific data would be desirable. A list of AQRVs, as well as background soil concentrations of N and S, was requested from the Chassahowitzka NWA. No such data were available. Therefore, other guidance on preparing impact analyses on PSD permit applications was consulted, including the FS document "A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas." This generic approach was chosen for the analysis because it was and remains the best available approach for the Chassahowitzka.

The FWS also suggested that future applicants should perform an analysis of the effects of PSD significant metals on organisms higher in the food chain than vegetation. An analysis of the effects of metals on organisms higher in the food chain is a difficult analysis to perform without statistically significant, site-specific data. The linkages between soil concentration and accumulation in various plants and in various parts of plants consumed by terrestrial organisms are not well defined in the literature for the variety of plant species found within the Chassahowitzka NWA. Likewise, baseline metal concentrations are not well defined for all metals and all organisms found in the NWA. The research required to address all of these data requirements would be well beyond the types of studies appropriate for the AQRVs analysis supporting the PSD application.

I hope these comment responses are helpful. Also enclosed, as requested, is the supporting documentation for emissions figures based on 59°F ambient conditions. If you should have any questions or require clarification, please contact me at (813) 866-5529 or Mr. Scott Osbourn at (813) 866-5158.

Very truly yours,

Kathy Small

Kathleen L. Small
Environmental Project Manager

cc: D. Arif
B. Thomas, SWDist
J. Harper, EPA
J. Bunyak, NPS

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BLACK & VEATCH ENGINEERS-ARCHITECTS

Owner FLORIDA POWER CORPORATION
Plant POLK COUNTY Unit 1A, 1B
Project No. 18313.030 File No.
Title 59 °F Emission Rate Sample Calculations

Computed By JOHN R. COCHRAN
Date 2/1 19 94
Checked By DONALD E. WOLF
Date 2/1 19 94
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DO NOT WRITE IN THIS SPACE

Reference attached combustion turbine performance data received from General Electric (dated 5/5/93) regarding their PG7221 (FA) machine's performance at an ambient temperature of 59° F. The following summarizes this data.

Emission	Emission Rate, lb/h (ppm) Natural Gas	Fuel Oil
NOx, Nitrogen Oxides (ppm @ 15% O_2)	73 (12)	305 (42)*
CO, Carbon Monoxide	77 (25)	93 (30)
UHC, Unburned Hydrocarbons	13 (7)	14 (7)
TSP, Particulate, lb/hr	9.0	17.0
Fuel Burn Rate, MBtu/hr	1507.8	1727.2

* Based on a fuel bound nitrogen content of 0.015%.

Fuel Oil NO_x Emissions

The worst case fuel bound nitrogen content anticipated is 0.030 % using the formula STD = 0.0042 + F where :

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REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED,

STD = allowable NO_x emissions (% by volume at 15% O_2)

F = NO_x emission allowance for fuel bound nitrogen
where for $0.015 < N_2 < 0.03$
$F = 0.04(N_2 - 0.015)$

- Since $N_2 = 0.030\%$ $F = 0.04(0.030 - 0.015) = 0.0006$
- Therefore STD = 0.0042 + 0.0006 = 0.0048

or STD = 48 ppmvd of NO_x at 15% O_2

- As a result, worst case NO_x emissions when burning fuel oil would be $\frac{48}{42}(305\ lb/hr) = 349\ lb/hr$

VOC Emissions

- Non-methane hydrocarbons are assumed to be representative of VOC (volatile organic compound) emissions.
- It is expected that 80% of the unburned hydrocarbons (UHC) from a combustion turbine will be non-methane hydrocarbons (NMHC).

∴ VOC = (0.8)(13 lb/hr) = 10.4 lb/hr when burning natural gas.

and VOC = (0.8)(14 lb/hr) = 11.2 lb/hr when burning fuel oil.

SO_2 Emissions

Assumptions: 1) SO_2 emission factor of 0.6 $\frac{lb\ SO_2}{MSCF}$ when firing natural gas.

2) Natural gas with a heating value of 918 $\frac{MBtu}{MSCF}$

3) Fuel oil with a S content of 0.05% and a heating value of 18400 Btu/lb.

Natural Gas $SO_2 = (0.60\ \frac{lb\ SO_2}{MSCF})(1507.8\ \frac{MBtu}{hr})(\frac{MSCF}{918\ MBtu})$

$= 0.99\ lb/hr$

Fuel Oil $SO_2 = (\frac{0.05}{100}\ \frac{lb\ S}{lb\ fuel})(1727.2\ \frac{MBtu}{hr})(\frac{lb}{18400 \times 10^{-6}\ MBtu})$

$\times (\frac{64}{32}\ \frac{lb\ SO_2}{lb\ S}) = 94\ lb/hr$

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In summary the maximum hourly CT emissions at an ambient temperature of 59°F are as follows:

Table 1

Emission	Emission Rate, lb/hr Natural Gas	Fuel Oil
NO_x	73	349
CO	77	93
VOC	10.4	11.2
SO_2	0.99	94
TSP	9.0	17.0

Annual Emission Rates

Assumptions :

1) Natural Gas will be burned 8260 hours per year
2) Fuel Oil will be burned 500 hours per year
3) Two combustion turbines
4) Table 1 (page 4) hourly emission rates.

Table 2

Emission	Annual Emission, tpy
NO_x	778
CO	683
VOC	91.5
SO_2	55.2
TSP	82.8

1.1 ESTIMATED PERFORMANCE – PG7221(FA)

LOAD CONDITION			BASE	BASE
FUEL TYPE			*CUST GA*	*DIST.*
FUEL LHV		– Btu/lb	20791	18550
AMBIENT TEMP.		– Deg F.	59	59
AMBIENT RELATIVE HUMID		– %	60	60
OUTPUT		– kW	155600.	169000.
HEAT RATE (LHV)		– Btu/kWh	9690.	10220.
HEAT CONS. (LHV)	X10–6	– Btu/h	1507.8	1727.2
EXHAUST FLOW	X10–3	– lb/h	3385.0	3527.0
EXHAUST TEMP		– Deg F.	1105.	1088.
EXHAUST HEAT	X10–6	– Btu/h	924.5	966.1
WATER FLOW		– lb/h	0.	121270.
NOX		– ppmvd @ 15% O2	12.	42.
NOX AS NO2		– lb/h	73.	305.
CO		– ppmvd	25.	30.
CO		– lb/h	77.	93.
UHC		– ppmvw	7.	7.
UHC		– lb/h	13.	14.
PART		– lb/h	9.0	17.0
EXHAUST ANALYSIS % VOL.				
ARGON			0.91	0.85
NITROGEN			74.46	70.94
OXYGEN			12.66	10.96
CARBON DIOXIDE			3.74	5.27
WATER			8.23	11.99

SITE CONDITIONS		
ELEVATION	– ft.	0
SITE PRESSURE	– psia	14.7
INLET LOSS	– in. Water	4
EXHAUST LOSS	– in. Water	12
RELATIVE HUMIDITY	– %	60
APPLICATION	–	7FH2 HYDROGEN COOLED GENERATOR
COMBUSTION SYSTEM	–	DRY LOW NOX

EMISSION INFORMATION BASED ON GE RECOMMENDED MEASUREMENT METHODS.
NOx EMISSIONS ARE CORRECTED TO 15% O2 WITHOUT HEAT RATE CORRECTION AND ARE NOT CORRECTED TO ISO REFERENCE CONDITIONS PER 40CFR 60.335(a)(1)(i).
NOx LEVELS SHOWN WILL BE CONTROLLED BY ALGORITHMS WITHIN THE SPEEDTRONIC CONTROL SYSTEM.
DISTILLATE FUEL IS ASSUMED TO HAVE .015% FUEL BOUND NITROGEN, OR LESS.
FBN AMOUNTS GREATER THAN .015% WILL ADD TO THE REPORTED NOx VALUE.
EMISSIONS NEED COMBUSTION APPROVAL.
IPS–8585
5/5/93