

**Golder Associates Inc.**

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May 6, 1999

9737572-0100

Mr. C.H. Fancy, P.E., Chief  
Bureau of Air Regulation  
Florida Department of Environmental Protection  
111 South Magnolia Drive, Suite 4  
Tallahassee, Florida 32301

**RECEIVED**

MAY 07 1999

BUREAU OF  
AIR REGULATION

Attention: Ms. Teresa Heron

RE: Inlet Foggers – Putnam Plant Combustion Turbines DEP File 1070014-003-AC  
Inlet Foggers – Martin Plant Combustion Turbines DEP File 0850001-005-AC  
Florida Power & Light Company (FPL)

Dear Teresa:

This correspondence is submitted to address the Department's information request related to the installation of direct water spray fogging system to the inlet of the Putnam and Martin combustion turbines. The information requested is presented below and in the attachments to this correspondence.

1. Information Requested: Please submit additional data to support the statement that the emission rate does not change as a result of inlet fogging.

Information Submitted: As discussed in the application, the use of the direct water spray fogging systems will increase the relative humidity of the gas stream while concomitantly reducing the temperature due to adiabatic cooling of the inlet air. This effect is no different than when the turbine is operated under the same ambient conditions that occurs during the normal course of operation in any year. However, it allows the turbine to operate under such ambient conditions more frequently and thus can effect annual emissions. The influence on the emission rate of increasing the relative humidity and temperature is explained in EPA's Alternative Control Techniques Document – NO<sub>x</sub> Emissions from Stationary Gas Turbines (EPA-453/R-93-007, January 1993). In Section 4.2.1.3 the report provides information that indicates emissions of NO<sub>x</sub> decrease with increasing relative humidity. Also, the mass emission of NO<sub>x</sub> decreases per mass of fuel input. This is also the same as lower emissions per amount electric power generated (since power and fuel input are directly related). The lower NO<sub>x</sub> emissions with increasing relative humidity and lower temperature can be shown using the equation in Section 4.2.1.3; the adjustment equation in 40 C.F.R. Part 60 Subpart GG, Section 60.335(c)(1).

Table 1 presents calculation of relative NO<sub>x</sub> concentrations for various temperatures and relative humidity. As can be seen from the table the relative NO<sub>x</sub> concentration decreases with increasing humidity and decreasing temperature. The combined effect can be seen in the last column. Please find attached relevant pages from the EPA cited document. This EPA information is supported by the results of the testing performed at the Putnam Plant that indicated no change in emission rate (concentration) when the fogging system was used. These data also demonstrated no statistical change in CO concentrations as well.

The potential applicability of New Source Performance Standards (NSPS) Subpart GG to the Putnam turbines would be dependant on whether the installation of a fogging system is considered a modification under Section 60.14 of 40 C.F.R. 60. (Note: The NSPS already apply to the Martin turbines; these turbines meet lower emission levels as BACT.) The determination is based on whether a physical change resulted in an increase in the emission rate that is expressed in kilograms per hour. The emission rate can be determined using AP-42, materials balance, CEMs or manual stack tests [see paragraphs (1) and (2) of Section 60.14]. The tests must conducted under representative performance of the facility and that all operating which can effect emissions must be held constant to the maximum degree feasible. As described above, the inlet foggers only changes the ambient conditions that do occur during the normal operation of the turbine. Testing under the requirement to maintain all operating which may effect emissions (i.e., in this case temperature and relative humidity) constant would produce the same result. Thus, the short-term emission rates do not change. Nonetheless, the fogging system does increase the long-term emissions for which a limit on the operation of the fogging system has been requested to keep the increase below the PSD significant emission rate.

2. Information Requested: In reference to Table 1 and 2. (Part II of the Supporting Information), indicate the nominal values for power out, heat rate and heat input.

Information Submitted: The information presented in Table 1 presents the *rate of change* of power, heat rate and heat input for the turbine. The basis of the information is the attached performance curves. As noted from the curves the performance (fuel input and power) is a linear function of inlet temperature. The primary purpose of using the performance curves is to determine the increase in heat rate as a function of temperature. This was determined from the performance curves as 4 mmBtu per °F for Putnam and as 4.7 mmBtu per °F shown in Table 1. Note that the Putnam calculations have been updated to reflect as 4 mmBtu per °F rather than 3 mmBtu per °F in the original submittal. This was then used with the hours of operation to calculate the tons per year. An example for Putnam: 4 mmBtu / °F x 0.44 lb/mmBtu x 8 °F/hour x 1,280 hours x 1 ton/2,000 lb = 9.01 tons/year for NO<sub>x</sub>. As noted in the application, AP-42 emission factors were used which for NO<sub>x</sub> are from 17 to 25 percent higher than the actual observed emissions. The 4 mmBtu / °F was determined from the performance curves as follows: At 50 °F the heat input is 1,100 mmBtu/hr based on high heating value (HHV). At 100 °F, the heat input is 900 mmBtu/hr (HHV). The difference is 200 mmBtu/hr (1,100 –

900) over 41 °F (100 – 59) or 4 mmBtu / °F. For oil firing the rate was determined to be 3.2 mmBtu / °F using the same procedure.

An example for Martin:  $4.7 \text{ mmBtu} / ^\circ\text{F} \times 0.09 \text{ lb/mmBtu} \times 5.5 \text{ } ^\circ\text{F}/\text{hour} \times 6,240 \text{ hours} \times 1 \text{ ton}/2,000 \text{ lb} = 7.26 \text{ tons/year}$  for  $\text{NO}_x$ . The Martin emission rates, as noted in Tables 1 and 2, are based on maximum potential rate in the PSD permit. For  $\text{NO}_x$ , the maximum emission rate is 177 lb/hour at maximum heat input of 1,966 mmBtu/hr which is 0.09 mmBtu/hr (177/1,966). The 4.7 mmBtu / °F was determined from the heat rate curves as follows: At 60 °F the heat input is 1,550 mmBtu/hr based on high heating value (HHV). At 90 °F, the heat input is 1,690 mmBtu/hr (HHV). The difference is 140 mmBtu/hr (1,690 – 1,550) over 30 °F (90 – 60) or 4.66 mmBtu / °F; this value was rounded to 4.7 mmBtu / °F. This rate was used for both gas and oil firing.

3. Information Requested: Submit the heat input curves for these units.

Information Submitted: The heat input curves for the Martin Units are attached. The heat input curves for the Putnam Plant are attached.

4. Information Requested: Estimate actual emissions for each facility's turbines and worst case emission rate scenario.

Information Submitted: The actual emission for each facility is presented in the Annual Operating Report (these will be forwarded separately). As noted in the information supplied in Item 2 above, the emission estimates are based the maximum potential emission rate based on either AP-42 in the case of Putnam and the PSD permit in the case of Martin. Since the requested is based on an incremental increase in annual emissions using the maximum potential emission rates and a maximum amount of fogging ( °F-hours per year), the worst case emission estimate is presented in the application.

5. Information Requested: Submit hours of operation for each turbine.

Information Submitted: The AOR contain the hours of operation.

Your prompt review of the application is appreciated. If there are any further questions, please call.

Sincerely,

GOLDER ASSOCIATES INC.



Kennard F. Kosky, P.E.  
Principal  
Professional Engineer No. 14996

SEAL 

KFK/jkk

Enclosures

cc: Rich Piper, Repowering Licensing Manager  
Robert Bergstrom, Putnam Plant General Manager  
John Lindsay, Martin Plant General Manager  
Bob Burgess, FPL  
Jay Blum, FPL

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**Table 1a** Emission Estimates of the Putnam Facility Combined Cycle Combustion Turbines with Inlet Air Cooling System with Direct Water Spray Inlet Fogging (Natural Gas Combustion).

**Performance Basis**

Temperature Decrease	°F (1)	8	
Power Increase		3.28%	PPN Charts
Heat Rate Decrease		1.06%	Westinghouse
Heat Input Increase		2.22%	
Heat Input Change	mmBtu/°F	4	
Hours/year		1280 (2)	
Hours-°F/year		10,240	hours/year times temperature decrease

**Pollutants Units Emissions (3) Comments**

PM	lb/MMBtu	0.0168	AP-42 Section 3.1 per machine
	TPY	0.34	
NO <sub>x</sub>	lb/MMBtu	0.44	AP-42 Section 3.1 per machine
	TPY	9.01	
SO <sub>2</sub>	lb/MMBtu	0.00286	1 grain/100 cf natural gas per machine
	TPY	0.06	
CO	lb/MMBtu	0.11	AP-42 Section 3.1 per machine
	TPY	2.25	
VOC	lb/MMBtu	0.024	AP-42 Section 3.1 per machine
	TPY	0.49	

Legend - TPY: tons per year

(1) Temperature decrease is annual average temperature differential of ambient temperature to compressor inlet temperature utilizing inlet fogger.

(2) Hours of fogger operation based on estimate of 8 hours per day and 160 days per year.

(3) Emission factor references - Title V Permit No. 1070014-001-AV, PPSC PA 74-0, EPA AP-42 Emission Factors Section 3.1 "Stationary Gas Turbines".

**Table 2a** Emission Estimates of the Putnam Facility Combined Cycle Combustion Turbines with Inlet Air Cooling System with Direct Water Spray Inlet Fogging (No. 2 Fuel Oil Combustion).

Performance Basis			
Temperature Decrease	°F (1)	8	
Power Increase		3.28%	PPN Charts
Heat Rate Decrease		1.06%	Westinghouse
Heat Input Increase		2.22%	
Heat Input Change	mmBtu/ °F	3.2	
Hours/year		100 (2)	
Hours-°F/year		800	hours/year times temperature decrease

Pollutants	Units	Emissions (3)	Comments
PM	Ib/MMBtu	0.0293	AP-42 Section 3.1 per machine
	TPY	0.04	
NO <sub>x</sub>	Ib/MMBtu	0.698	AP-42 Section 3.1 per machine
	TPY	0.89	
SO <sub>2</sub>	Ib/MMBtu	0.7	Based on Title V Permit per machine
	TPY	0.90	
CO	Ib/MMBtu	0.048	AP-42 Section 3.1 per machine
	TPY	0.06	
VOC	Ib/MMBtu	0.017	AP-42 Section 3.1 per machine
	TPY	0.02	

Legend - TPY: tons per year

(1) Temperature decrease is annual average temperature differential of ambient temperature to compressor inlet temperature utilizing inlet fogger.

(2) Hours of fogger operation.

(3) Emission factor references - Title V Permit No. 1070014-001-AV, PPSC PA 74-01, EPA AP-42 Emission Factors Section 3.1 "Stationary Gas Turbines".

## Part II

### Application for Air Permit Installation of Direct Water Spray Fogging Systems Putnam Plant

#### Introduction

Florida Power & Light Company is proposing to install direct water spray fogging systems in the inlet ducts of the existing 4 combustion turbines in combined cycle configuration at the Putnam Plant. The purpose of the inlet foggers to provide adiabatic inlet air cooling which increase turbine output and decreases heat rate. The project is part of increasing capacity in a cost effective manner.

#### Description

The direct inlet fogging systems achieve adiabatic cooling using water to form fine droplets (fog). The fog is produced by injection grids placed in the turbine inlet duct that use nozzles that produce a fine spray. The small fog particles (about 10 to 20 microns) extract the latent heat of vaporization from the gas stream when the water droplet is converted to gas. Heat is removed at a rate of 1,075 Btu/lb of water. The result of the fogging is a cooler more moisture laden air stream. Figure 1 presents a schematic of a typical fogging system.

The amount of heat removed is highly dependent upon the ambient air conditions. The two most important parameters are the dry bulb temperature and relative humidity. As moisture is added to the inlet air by the fogging, the vaporization of the fog droplets cools the air toward the wet-bulb temperature. For the proposed project, the design condition is 95°F and 50 percent relative humidity. The resultant wet bulb temperature, based on psychrometric charts is 79°F. At 100 percent saturation the inlet cooling system would result in a 16°F decrease of the turbine inlet air.

While adiabatic cooling is most efficient for dry climates, adiabatic cooling in Florida can be an effective means of inlet air cooling during the late morning to evening hours. This period is typically 8 to 10 hours per day from about 10 am to 8 pm. In the early morning hours and

evening hours, the typical relative humidity in Florida is 70 to 90 percent depending on the climatic conditions. Because of the highly variable nature of ambient air conditions, the annual average inlet cooling was assumed to be 8°F. This average was reviewed against a 30 year record of meteorological data for Jacksonville and found to be representative of the range in conditions that occur over an annual period. This includes cooling associated with the typical mid-afternoon summer days and early morning/evening periods that occur year-round. The typical mid-afternoon cooling for Jacksonville would be 14°F and would occur in July with a mid-afternoon temperature of 91°F and 58 percent relative humidity. During January, the mid-afternoon cooling would be about 7°F. The typical cooling that would occur in the early morning hours of evening hours with temperatures of about 80°F and a relative humidity of 80 percent would be 5°F. This cooling also assumes that the gas stream can be 100 percent saturated. The ambient air conditions that are modified by the fogging system occur naturally but are more frequent with the fogging system. For example, the average minimum temperatures for the months of November through April range from 41.7°F to 55.7°F with relative humidities ranging from 83 to 88 percent. The amount of adiabatic cooling would range from 1 to 2°F. For the Putnam Plant, an 8°F average reduction was assumed in the calculations for primarily daytime operation.

#### **Turbine Performance and Emission Estimates**

The effect of decreasing the turbine inlet air through the use of fogging will be to increase the mass flow of air that can go through the turbine which allows higher heat input and power output. The combustion turbine is also more efficient since the heat rate decreases with decreasing temperature. For the Westinghouse Model 501B5A combustion turbines at the Putnam plant, an 8°F average decrease in temperature would result in a 3.3 percent increase in power and an associated 1.1 percent decrease in heat rate. Thus, while power increases, the production of power is more efficient with concomitant lower emissions per MW-hr generated. The increase in heat rate as a function of temperature decrease is a linear function and for the Putnam turbines would be 4 mmBtu/hr/°F for gas firing and 3.2 mmBtu/hr/°F for oil firing. The data were determined using Westinghouse supplied data (see Attachment A).



Because the turbine is operating on its original power curve, the emission characteristics do not change from what would normally occur at that temperature and relative humidity. An evaluation of emissions from the fogging tests conducted at the FPL Putnam plant did not result in any statistically significant differences in emission rates (see Attachment B). The increase in emissions of criteria pollutants associated with fogging were determined using emission limits contained in the Title V Permit for the facility. This provides the maximum potential allowed and would conservatively estimate emission rates. Table 1 and 2 presents a summary of the operating conditions and emission increases resulting from fogging firing natural gas and distillate fuel oil, respectively. The annual emissions were determined by multiplying the heat input increase per degree Fahrenheit times the emissions rate in lb/mmBtu for the number of hours of proposed for the turbines. The degree F-hours/year is the total amount of annual temperature reduction proposed for fogging and was calculated by using the average temperature reduction multiplied by the hours of year assumed. For example, the degree F-hours for gas firing are calculated by multiplying 1,280 hours times 8°F or 10,240°F-hours. Each turbine inlet fogging system will be equipped with temperature probes to determine the amount of inlet cooling. This reduction will be recorded for each hour of fogger operation. For the Putnam turbines, a maximum of 10,240°F-hours of operation when firing natural gas and 800°F-hours of operation when firing distillate fuel oil was used as the basis for annual emission estimates for each turbine.

The use of AP-42 emission factors is appropriate for estimating maximum potential annual emissions since there are no emission limits for NO<sub>x</sub>. This is especially conservative for NO<sub>x</sub> since actual emissions are much lower. Over the last two years, quarterly emissions reported from CEM data ranged from 0.322 lb/mmBtu to 0.398 lb/mmBtu. The annual averages from CEM data ranged from 0.351 to 0.371 lb/mmBtu for 1997 and 0.354 to 0.375 lb/mmBtu for 1998. Using an emission factor of 0.44 lb/mmBtu to estimate maximum potential annual emissions, would overestimate annual emissions from 17 to 25 percent greater than that actual observed. Thus, the annual estimated emissions based on AP-42 emission factors are conservative.

**Regulatory Applicability**

A modification is defined in Rule 62-210.200 Florida Administrative Code (F.A.C.) as any physical change in, or a change in the method of operation of, or addition to a facility which would result in an increase in the actual emissions of any air pollutant subject to regulation under the Clean Air Act. A modification to a major source of air pollution, such as the Putnam Plant, may be subject to review under the Department's Prevention of Significant Deterioration (PSD) rules codified in Rule 62-212.400 F.A.C.

The proposed installation of direct water spray fogging systems is a modification according to Rule 62-212.200 (188) F.A.C., since annual emissions will potentially increase as a result of the increased power and heat input. This has been confirmed by the Department in its December 31, 1998 correspondence to FPL.

Based on the available data, it is concluded that the emission rate does not change as a result of inlet fogging. Therefore, increase in annual potential emissions can be conservatively determined through the use of increases in heat input associated with the use of the fogging systems. For the 4 combustion turbines (CTs) the maximum potential annual increase in emissions is estimated as follows:

Summary of Maximum Annual Emissions - All Units

<u>Pollutant</u>	<u>Gas</u> <u>Tons/Year</u>	<u>Oil</u> <u>Tons/Year</u>	<u>Oil &amp; Gas</u> <u>Total</u>
PM	1.38	0.15	1.53
NO <sub>x</sub>	36.04	3.57	39.62
SO <sub>2</sub>	0.23	3.58	3.82
CO	9.01	0.25	9.26
VOC	1.97	0.09	2.08
Degree Fahrenheit-Hours per year	10,240	800	
Additional Degree Fahrenheit-Hours on Gas	1,015	0	
Total Degree Fahrenheit-Hours Gas Only	11,255	0	

These maximum potential emission rates are less than the significant emission rates in Table 62-212.400-2 in Rule 62-212.400 F.A.C. and therefore PSD would not apply. The pollutant closest to the PSD significant emission rates when firing natural gas is NO<sub>x</sub>. Emissions of SO<sub>2</sub> are primarily associated with distillate fuel oil which is only used a backup to natural gas. For natural gas only, the maximum potential NO<sub>x</sub> emissions would be 39.62 tons/year at 11,255°F-hours per year per CT. This is equivalent to 1.6°F-hours of gas firing for each hour of oil firing (i.e., 1,015°F-hours/800°F-hours = 1.27°F-hours). The emissions of the other pollutants would be 1.52 tons/year for PM, 0.25 tons/year for SO<sub>2</sub>, 9.9 tons/year for CO and 2.16 tons/year for VOC.

FPL proposes that the amount of fogging allowed by the Department be based on a cumulative amount of operating hours for the 4 combustion turbines. This would amount to 45,020°F-hours of operation when firing only natural gas. If only natural gas is fired, the proposed amount of hours would be decreased by 1.27°F-hours for each °F-hour when fuel oil was fired during an annual period. As described previously, the emission rates would not be affected. In addition, during periods when the fogging system is not used, the operation of the CTs will not be affected by this request and will be operated according to the Department's previous approvals (e.g., authorized to operate 8,760 hours/year/CT).

As described previously, the inlet fogging systems will have temperature monitoring equipment which will record the actual temperature reduction for each hour of operation. These data will be summarized monthly and reported to the Department with the Annual Operating Reports demonstrating that the annual period does not exceed 45,020°F-hours for the facility.

**Attachment A**

The following data were obtained from performance curves in the range that fogging would be most effective (gas firing shown).

Plant Site: Putnam Plant; GTs 11, 12, 21 and 22  
Turbine Model: Westinghouse 501B5A

Turbine Inlet Temperature ( °F)	100	50
Difference ( °F)		50
Heat Input (mmBtu/hr)	900	1,100
Difference (mmBtu/hr)		200
Rate (mmBtu/hr/ °F) <sup>a</sup>		4.00

Note: <sup>a</sup> heat input difference divided by temperature difference..

PB93-156586

EPA-453/R-93-007

**Alternative Control  
Techniques Document--  
NO<sub>x</sub> Emissions from Stationary  
Gas Turbines**

**Emission Standards Division**

**U. S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Air and Radiation  
Office of Air Quality Planning and Standards  
Research Triangle Park, North Carolina 27711  
January 1993**

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U.S. DEPARTMENT OF COMMERCE  
NATIONAL TECHNICAL  
INFORMATION SERVICE  
SPRINGFIELD, VA 22161

substantially lower thermal NO<sub>x</sub> emissions than natural gas or DF-2.<sup>18</sup> For fuels containing FBN, the fuel NO<sub>x</sub> production increases with increasing levels of FBN.

4.2.1.3 Ambient Conditions. Ambient conditions that affect NO<sub>x</sub> formation are humidity, temperature, and pressure. Of these ambient conditions, humidity has the greatest effect on NO<sub>x</sub> formation.<sup>19</sup> The energy required to heat the airborne water vapor has a quenching effect on combustion temperatures, which reduces thermal NO<sub>x</sub> formation. At low humidity levels, NO<sub>x</sub> emissions increase with increases in ambient temperature. At high humidity levels, the effect of changes in ambient temperature on NO<sub>x</sub> formation varies. At high humidity levels and low ambient temperatures, NO<sub>x</sub> emissions increase with increasing temperature. Conversely, at high humidity levels and ambient temperatures above 10°C (50°F), NO<sub>x</sub> emissions decrease with increasing temperature. This effect of humidity and temperature on NO<sub>x</sub> formation is shown in Figure 4-4. A rise in ambient pressure results in higher pressure and temperature levels entering the combustor and so NO<sub>x</sub> production levels increase with increases in ambient pressure.<sup>19</sup>

The influence of ambient conditions on measured NO<sub>x</sub> emission levels can be corrected using the following equation:<sup>20</sup>

$$NO_x = (NO_{x0}) (P_r/P_o)^{0.5} e^{19(Ho-0.00633)} (288^\circ K/T_a)^{1.53}$$

where:

NO<sub>x</sub> = emission rate of NO<sub>x</sub> at 15 percent O<sub>2</sub> and International Standards Organization (ISO) ambient conditions, volume percent;

NO<sub>x0</sub> = observed NO<sub>x</sub> concentration, parts per million by volume (ppmv) referenced to 15 percent O<sub>2</sub>;

P<sub>r</sub> = reference compressor inlet absolute pressure at 101.3 kilopascals ambient pressure, millimeters mercury (mm Hg);

P<sub>o</sub> = observed compressor inlet absolute pressure at test, mm Hg;

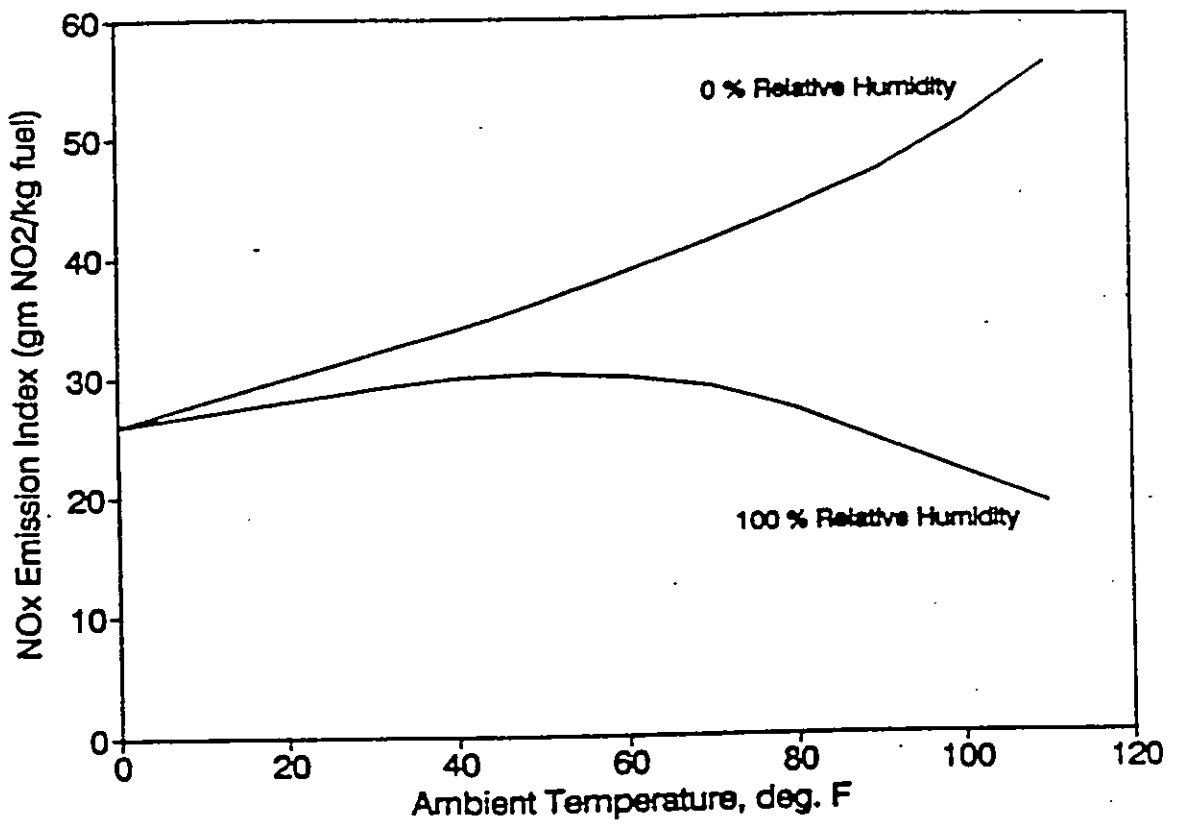


Figure 4-4. Influence of relative humidity and ambient temperature on NO<sub>x</sub> formation.<sup>19</sup>

$H_0$  = observed humidity of ambient air, g  $H_2O$ /g air;

$e$  = transcendental constant, 2.718; and

$T_a$  = ambient temperature, K.

At least two manufacturers state that this equation does not accurately correct  $NO_x$  emissions for their turbine models.<sup>8,12</sup> It is expected that these turbine manufacturers could provide corrections to this equation that would more accurately correct  $NO_x$  emissions for the effects of ambient conditions based on test data for their turbine models.

4.2.1.4 Operating Cycles. Emissions from identical turbines used in simple and cogeneration cycles have similar  $NO_x$  emissions levels, provided no duct burner is used in heat recovery applications. The  $NO_x$  emissions are similar because, as stated in Section 4.2,  $NO_x$  is formed only in the turbine combustor and remains at this level regardless of downstream temperature reductions. A turbine operated in a regenerative cycle produces higher  $NO_x$  levels, however, due to increased combustor inlet temperatures present in regenerative cycle applications.<sup>21</sup>

4.2.1.5 Power Output Level. The power output level of a gas turbine is directly related to the firing temperature, which is directly related to flame temperature. Each gas turbine has a base-rated power level and corresponding  $NO_x$  level. At power outputs below this base-rated level, the flame temperature is lower, so  $NO_x$  emissions are lower. Conversely, at peak power outputs above the base rating,  $NO_x$  emissions are higher due to higher flame temperature. The  $NO_x$  emissions for a range of firing temperatures are shown in Figure 4-3 for one manufacturer's gas turbine.<sup>17</sup>

#### 4.2.2 $NO_x$ Emissions From Duct Burners

In some cogeneration and combined cycle applications, the exhaust heat from the gas turbine is not sufficient to produce the desired quantity of steam from the HRSG, and a supplemental burner, or duct burner, is placed in the exhaust duct between the





Florida Power & Light Company, Environmental Services Dept., P.O. Box 14000, Juno Beach, FL 33408

September 18, 1997

Mr. Scott M. Sheplak, P.E.  
State of Florida  
Department of Environmental Protection  
Division of Air Resources Management  
2600 Blair Stone Road  
Tallahassee, FL 32399-2400

Re: Draft Permit No. 1070014-001-AV  
FPL Putnam Plant Initial Title V Permit

Dear Mr. Sheplak:

Enclosed for your use please find a copy of the heat input vs. ambient temperature graph for the subject facility.

If you have any questions, please do not hesitate to contact me at (561) 691-7058.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Richard Piper', is written over the typed name.

Richard Piper  
Senior Environmental Specialist  
Florida Power & Light Company

**RECEIVED**

SEP 22 1997

BUREAU OF  
AIR REGULATION

cc: Pat Wilson

PPN / PPN



Florida Power & Light Company, Environmental Services Dept., P.O. Box 14000, Juno Beach, FL 33408

November 10, 1997

Mr. Scott M. Sheplak, P.E.  
State of Florida  
Department of Environmental Protection  
Division of Air Resources Management  
2600 Blair Stone Road  
Tallahassee, FL 32399-2400

Re: Draft Permit No. 1070014-001-AV  
Heat Input Information for Oil Firing  
FPL Putnam Plant Initial Title V Permit

Dear Mr. Sheplak:

Attached for your use please find a graph of the ambient temperature vs. heat input data for the Putnam plant combustion turbine units for distillate oil firing.

If you have any questions, please do not hesitate to contact me at (561) 691-7058.

Very truly yours,

A handwritten signature in cursive script that reads "Rich Piper".

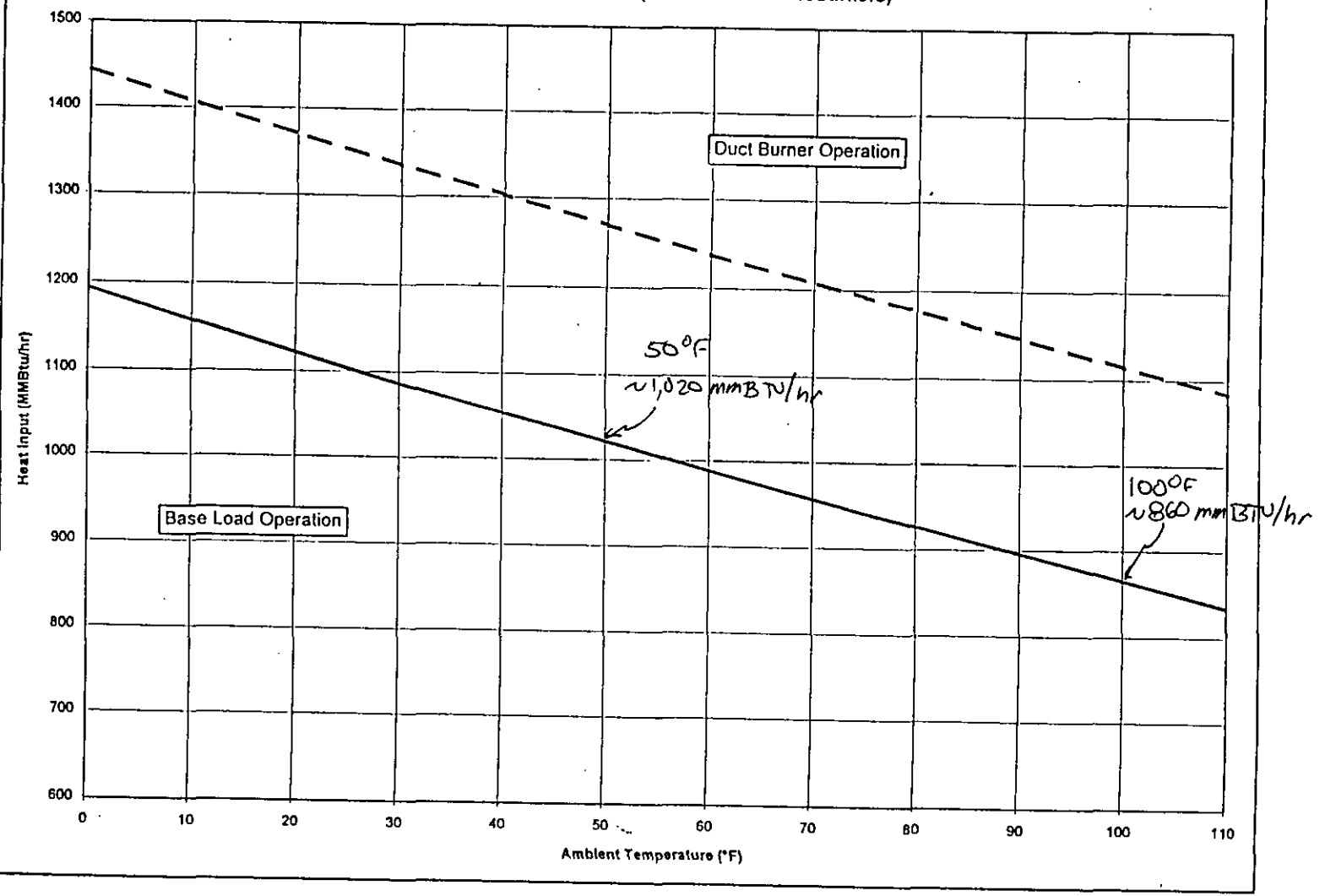
Rich Piper  
Senior Environmental Specialist  
Florida Power & Light Company

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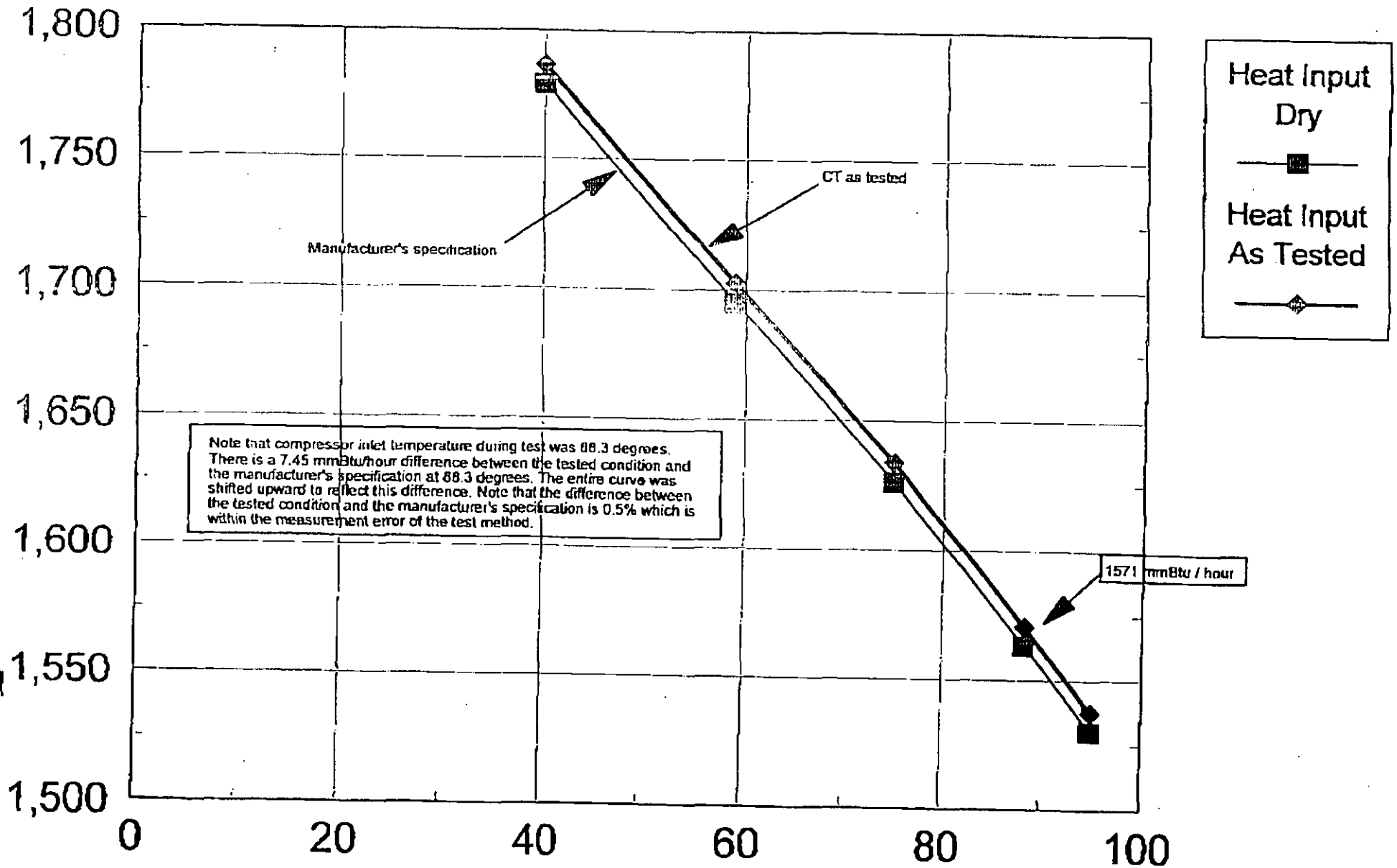
BUREAU OF  
AIR REGULATION

Putnam Plant Unit 1 or 2  
Heat Input Variation With Ambient Temperature (Oil)  
Each Combustion Turbine (with / without duct burners)



# Martin Unit 3B

## Heat Input vs. Ambient Temperature Curve





Jeb Bush  
Governor

# Department of Environmental Protection

Twin Towers Office Building  
2600 Blair Stone Road  
Tallahassee, Florida 32399-2400

David B. Struhs  
Secretary

April 26, 1999

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Richard Piper  
Repowering Licensing Manager  
Florida Power & Light Company  
Post Office Box 14000  
Juno Beach, Florida 33408

Re: Inlet Foggers – Putnan Plant Combustion Turbines DEP File 1070014-003- AC  
Inlet Foggers – Martin Plant Combustion Turbines DEP File 0850001-005- AC

Dear Mr. Piper:

The Department received your applications for the installation of the direct water spray fogging system at the FPL's Martin and Putnan Plants. Based on a technical review, the applications are incomplete. Pursuant to Rules 62-4, 62-204, 62-210, 62-212, 62-296 and 62-297, F.A.C., please submit the following information, including all relevant reference materials and calculations:

1. Please submit additional data to support the statement that the emission rate does not change as a result of inlet fogging.
2. In reference to Table 1 and 2. (Part II of the Supporting Information), indicate the nominal values for power output, heat rate and heat input increase.
3. Submit the heat input curves for these units.
4. Estimate actual emissions for each facility's turbines and worst case emission rate scenario.
5. Submit hours of operations for each turbine.

Please contact Teresa Heron at 850/921-9529 if you have any questions.

Sincerely,

C. H. Fancy, P.E., Chief  
Bureau of Air Regulation

CHF/th

cc: Ken Kosky, P.E  
Chris Kirts, NED  
Isidore Goldman, SED

*"Protect, Conserve and Manage Florida's Environment and Natural Resources"*

Z 333 618 104

US Postal Service  
**Receipt for Certified Mail**  
No Insurance Coverage Provided.  
Do not use for International Mail (See reverse)

Sent To <b>Richard Piper</b>	
Street & Number <b>FP + L</b>	
Post Office, State, & ZIP Code <b>Juno Beach FL</b>	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$
Postmark or Date	<b>4-27-99</b>
<b>Putnam - 1070014-003-AC</b>	
<b>Martin - 0850001-05-AC</b>	

PS Form 3800, April 1995

Fold at line over top of envelope to

<p><b>SENDER:</b></p> <ul style="list-style-type: none"> <li>Complete items 1 and/or 2 for additional services.</li> <li>Complete items 3, 4a, and 4b.</li> <li>Print your name and address on the reverse of this form so that we can return this card to you.</li> <li>Attach this form to the front of the mailpiece, or on the back if space does not permit.</li> <li>Write "Return Receipt Requested" on the mailpiece below the article number.</li> <li>The Return Receipt will show to whom the article was delivered and the date delivered.</li> </ul>	<p>I also wish to receive the following services (for an extra fee):</p> <p>1. <input type="checkbox"/> Addressee's Address</p> <p>2. <input type="checkbox"/> Restricted Delivery</p> <p>Consult postmaster for fee.</p>
	<p>3. Article Addressed to: <b>Richard Piper</b> <b>FP + L</b> <b>PO Box 14000</b> <b>Juno Beach, FL</b></p>
<p>5. Received By: (Print Name) <b>H. Kayside</b></p> <p>6. Signature: (Addressee or Agent) <b>X</b></p>	<p>8. Addressee's Address (Only if requested and fee is paid)</p>

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.