Golder Associates Inc.

6241 NW 23rd Street, Suite 500
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Golder Associates

March 26, 1999

Project No. 9737572

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

Attention: Mr. A. A. Linero, P.E. Administrator; New Source Review Section

RE: Florida Power & Light Company Putnam - 1070014-003-AC
Spray Fogging Systems-Martin and Putnam Plants

Dear Al: 0850001-005-AC -Martin

On behalf of FPL, I am submitting air construction permit applications for the installation of direct fogging systems for the FPL Martin Plant, Units 3 and 4 and the Putnam Plant. As you will note from the discussion in Part II of the applications, the request will not trigger review under the Department's Prevention of Significant Deterioration Rules in Chapter 62-212 Florida adminsitrative Code.

The proposed method for assuring the Department that the PSD review is not required and to monitor operation is to record the degree Fahranheit-hours that actually occur. The degree F-hours will be recorded from temperature probes determining the turbine air inlet temperatures before and after the fogging systems. This will record data on the actual temperature decrease for the facility.

Please call me or Rich Piper of FPL (561-691-7058), if you have any questions.

Sincerely,

GOLDER ASSOCIATES INC.

Ken

Kennard F. Kosky, P.E.
Principal

KFK/jkk

Enclosures

cc: Rich Piper, FPL

9737572A/01.ltr

RECEIVED
MAR 29 1999
BUREAU OF
AIR REGULATION

APPLICATION FOR AIR PERMIT
INSTALLATION OF DIRECT WATER SPRAY FOGGING SYSTEMS
PUTNAM PLANT

Prepared For:

Florida Power & Light, Inc.
700 Universe Blvd.
Juno Beach, Florida 33408

Prepared By:

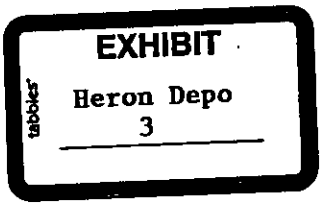
Golder Associates Inc.
6241 NW 23rd Street, Suite 500
Gainesville, Florida 32653

March 1999
9737572Y/F2

NE District

DISTRIBUTION:

6 Copies - Florida Power & Light, Inc. (4 signatures, 2 photocopy signatures)
2 Copies - Golder Associates Inc.



PART I

APPLICATION FOR AIR PERMIT
LONG FORM

Department of
Environmental Protection

DIVISION OF AIR RESOURCES MANAGEMENT

APPLICATION FOR AIR PERMIT - LONG FORM

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

This section of the Application for Air Permit form identifies the facility and provides general information on the scope and purpose of this application. This section also includes information on the owner or authorized representative of the facility (or the responsible official in the case of a Title V source) and the necessary statements for the applicant and professional engineer, where required, to sign and date for formal submittal of the Application for Air Permit to the Department. If the application form is submitted to the Department using ELSA, this section of the Application for Air Permit must also be submitted in hard-copy.

Identification of Facility Addressed in This Application

Enter the name of the corporation, business, governmental entity, or individual that has ownership or control of the facility; the facility site name, if any; and the facility's physical location. If known, also enter the facility identification number.

1. Facility Owner/Company Name:	Florida Power & Light Company	
2. Site Name:	Putnam Plant	
3. Facility Identification Number:	1070014	[ ] Unknown
4. Facility Location Information: Street Address or Other Locator:	392 US Highway 17 South	
City: East Palatka	County: Putnam	Zip Code: 32131
5. Relocatable Facility? [ ] Yes [X] No	6. Existing Permitted Facility? [X] Yes [ ] No	

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	March 29, 1999
2. Permit Number:	1070014-003-AC
3. PSD Number (if applicable):	
4. Siting Number (if applicable):	

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official:

   Robert Bergstrom, Plant General Manager

2. Owner/Authorized Representative or Responsible Official Mailing Address:

Organization/Firm: **FPL - Putnam Plant**
Street Address: **392 US Hwy 17 South**
City: **East Palatka** State: **FL** Zip Code: **32131**

3. Owner/Authorized Representative or Responsible Official Telephone Numbers:

Telephone: **(941) 325-1206** Fax: **(904) 329-4699**

4. Owner/Authorized Representative or Responsible Official Statement:

I, the undersigned, am the owner or authorized representative of the non-Title V source addressed in this Application for Air Permit or the responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

Signature

3/17/99
Date

* Attach letter of authorization if not currently on file.

Scope of Application

This Application for Air Permit addresses the following emissions unit(s) at the facility. An Emissions Unit Information Section (a Section III of the form) must be included for each emissions unit listed.

Emissions Unit ID		Description of Emissions Unit	Permit Type
Unit #	Unit ID		
1	003	Gas Turbine 1GT Unit 1	AC1B
2	004	Gas Turbine 2GT Unit 1	AC1B
3	005	Gas Turbine 1GT Unit 2	AC1B
4	006	Gas Turbine 2GT Unit 2	AC1B

See individual Emissions Unit (EU) sections for more detailed descriptions.
Multiple EU IDs indicated with an asterisk (*). Regulated EU indicated with an "R".

Purpose of Application and Category

Check one (except as otherwise indicated):

Category I: All Air Operation Permit Applications Subject to Processing Under Chapter 62-213, F.A.C.

This Application for Air Permit is submitted to obtain:

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for an existing facility which is classified as a Title V source.

[ ] Initial air operation permit under Chapter 62-213, F.A.C., for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number: _____

[ ] Air operation permit renewal under Chapter 62-213, F.A.C., for a Title V source.

Operation permit to be renewed: _____

[ ] Air operation permit revision for a Title V source to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number: _____

Operation permit to be renewed: _____

[ ] Air operation permit revision or administrative correction for a Title V source to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. Also check Category III.

Operation permit to be revised/corrected: _____

_____

[ ] Air operation permit revision for a Title V source for reasons other than construction or modification of an emissions unit. Give reason for the revision e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit to be revised: _____

Reason for revision: _____

_____

Category II: All Air Construction Permit Applications Subject to Processing Under Rule 62-210.300(2)(b),F.A.C.

This Application for Air Permit is submitted to obtain:

[ ] Initial air operation permit under Rule 62-210.300(2)(b), F.A.C., for an existing facility seeking classification as a synthetic non-Title V source.

Current operation/construction permit number(s): _____

_____

[ ] Renewal air operation permit under Rule 62-210.300(2)(b), F.A.C., for a synthetic non-Title V source.

Operation permit to be renewed: _____

[ ] Air operation permit revision for a synthetic non-Title V source. Give reason for revision; e.g.; to address one or more newly constructed or modified emissions units.

Operation permit to be revised: _____

Reason for revision: _____

_____

Category III: All Air Construction Permit Applications for All Facilities and Emissions Units.

This Application for Air Permit is submitted to obtain:

[x] Air construction permit to construct or modify one or more emissions units within a facility (including any facility classified as a Title V source).

Current operation permit number(s), if any: _____

1070014-001-AV

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

Current operation permit number(s): _____

_____

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Application Processing Fee

Check one:

[ ] Attached - Amount: _____ [X] Not Applicable.

Construction/Modification Information

1. Description of Proposed Project or Alterations:

Installation of direct water spray inlet fogging systems. Since the facility holds a Title V permit pursuant to Chapter 62-213 F.A.C., a permit fee is not required. Refer to Part II for discussion.

2. Projected or Actual Date of Commencement of Construction :

3. Projected Date of Completion of Construction :

Professional Engineer Certification

1. Professional Engineer Name: **Kennard F. Kosky**
   Registration Number: **14996**

2. Professional Engineer Mailing Address:
   Organization/Firm: **Golder Associates Inc.**
   Street Address: **6241 NW 23rd Street, Suite 500**
   City: **Gainesville** State: **FL** Zip Code: **32653-1500**

3. Professional Engineer Telephone Numbers:
   Telephone: **(352) 336-5600** Fax: **(352) 336-6603**

4. Professional Engineer's Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ] if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X] if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [ ] if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Thomas F. Kirby — 3/3/99

Signature — Date

(seal) PE

* Attach any exception to certification statement.

Application Contact

1. Name and Title of Application Contact:
   Mr. Richard G. Piper, Repowering Licensing Manager

2. Application Contact Mailing Address:

   Organization/Firm: **FPL Environmental Services Dep.**
   Street Address: **700 Universe Blvd.**
   City: **Juno Beach** State: **FL** Zip Code: **33408**

3. Application Contact Telephone Numbers:

   Telephone: **(561) 691-7058** Fax: **(561) 691-7070**

Application Comment

The existing 4 combustion turbines (GT 11,12,21 and 22) will be installed with direct water spray fogging systems that will reduce the turbine inlet air temperature. The temperature reduction will improve the heat rate and increase power due to the cooler-denser inlet air. The net emissions change from this project will not result in an increase of any regulated pollutant greater than the PSD significiant emission rates. PSD review does not apply to proposed project. Discussion in Part II.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates:
   Zone: **17** East (km): **443.3** North (km): **3277.80**

2. Facility Latitude/Longitude:
   Latitude (DD/MM/SS): **29 / 37 / 44** Longitude: (DD/MM/SS): **81 / 35 / 6**

3. Governmental Facility Code:	4. Facility Status Code:	5. Facility Major Group SIC Code:	6. Facility SIC(s):
0	**A**	**49**	**4911**

7. Facility Comment (limit to 500 characters):

The existing Putnam Plant consists of 2 combined cycle units. Each unit consists of 2 combustion turbines and associated heat recovery steam generators (HRSG). The HRSGs have duct burners. The primary fuel for the turbines and duct burners is natural gas. Distillate oil is used as back-up in the combustion turbines. Refer to Part II fo discussion.

Facility Contact

1. Name and Title of Facility Contact:
   Pat Wilson, Environmental Specialist

2. Facility Contact Mailing Address:
   Organization/Firm: **FPL - Putnam Plant**
   Street Address: **392 US Hwy 17 South**
   City: **East Paltka** State: **FL** Zip Code: **32131**

3. Facility Contact Telephone Numbers:
   Telephone: **(904) 329-4609** Fax: **(904) 329-4699**

Facility Regulatory Classifications

1. Small Business Stationary Source?		
[ ] Yes	[x] No	[ ] Unknown
2. Title V Source?		
[x] Yes	[ ] No	
3. Synthetic Non-Title V Source?		
[ ] Yes	[x] No	
4. Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?		
[x] Yes	[ ] No	
5. Synthetic Minor Source of Pollutants Other than HAPs?		
[ ] Yes	[x] No	
6. Major Source of Hazardous Air Pollutants (HAPs)?		
[x] Yes	[ ] No	
7. Synthetic Minor Source of HAPs?		
[ ] Yes	[x] No	
8. One or More Emissions Units Subject to NSPS?		
[ ] Yes	[x] No	
9. One or More Emissions Units Subject to NESHAP?		
[ ] Yes	[x] No	
10. Title V Source by EPA Designation?		
[ ] Yes	[x] No	
11. Facility Regulatory Classifications Comment (limit to 200 characters):		

B. FACILITY REGULATIONS

Rule Applicability Analysis (Required for Category II applications and Category III applications involving non Title-V sources. See Instructions.)

List of Applicable Regulations (Required for Category I applications and Category III applications involving Title-V sources. See Instructions.)

Facility emissions covered under existing Title V permit, no additional facility or emission unit applicable requirements as a result of the proposed change.

C. FACILITY POLLUTANTS

Facility Pollutant Information

1. Pollutant Emitted	2. Pollutant Classification

D. FACILITY POLLUTANT DETAIL INFORMATION

Facility Pollutant Detail Information:

1. Pollutant Emitted:		
2. Requested Emissions Cap:	(lb/hr)	(tons/yr)
3. Basis for Emissions Cap Code:		
4. Facility Pollutant Comment (limit to 400 characters):		

Facility Pollutant Detail Information:

1. Pollutant Emitted:		
2. Requested Emissions Cap:	(lb/hr)	(tons/yr)
3. Basis for Emissions Cap Code:		
4. Facility Pollutant Comment (limit to 400 characters):		

E. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements for All Applications

1. Area Map Showing Facility Location:
   [ ] Attached, Document ID: _____
   [x] Not Applicable [ ] Waiver Requested

2. Facility Plot Plan:
   [ ] Attached, Document ID: _____
   [x] Not Applicable [ ] Waiver Requested

3. Process Flow Diagram(s):
   [x] Attached, Document ID(s): Part II
   [ ] Not Applicable [ ] Waiver Requested

4. Precautions to Prevent Emissions of Unconfined Particulate Matter:
   [ ] Attached, Document ID: _____
   [x] Not Applicable [ ] Waiver Requested

5. Fugitive Emissions Identification:
   [ ] Attached, Document ID: _____
   [x] Not Applicable [ ] Waiver Requested

6. Supplemental Information for Construction Permit Application:
   [x] Attached, Document ID: Part II
   [ ] Not Applicable

Additional Supplemental Requirements for Category I Applications Only

7. List of Proposed Exempt Activities:
   [ ] Attached, Document ID: _____
   [ ] Not Applicable

8. List of Equipment/Activities Regulated under Title VI:
   [ ] Attached, Document ID: _____
   [ ] Equipment/Activities On site but Not Required to be Individually Listed
   [ ] Not Applicable

9. Alternative Methods of Operation:
   [ ] Attached, Document ID: _____
   [ ] Not Applicable

10. Alternative Modes of Operation (Emissions Trading):
    [ ] Attached, Document ID: _____
    [ ] Not Applicable

11. Identification of Additional Applicable Requirements: [ ] Attached, Document ID: _____ [ ] Not Applicable
12. Compliance Assurance Monitoring Plan: [ ] Attached, Document ID: _____ [ ] Not Applicable
13. Risk Management Plan Verification: [ ] Plan Submitted to Implementing Agency - Verification Attached Document ID: _____ [ ] Plan to be Submitted to Implementing Agency by Required Date [ ] Not Applicable
14. Compliance Report and Plan [ ] Attached, Document ID: _____ [ ] Not Applicable
15. Compliance Statement (Hard-copy Required) [ ] Attached, Document ID: _____ [ ] Not Applicable

PART II

SUPPORTING INFORMATION

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 relatively 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 3 mmBtu/hr/°F. 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 1,440 hours times 8°F or 11,520°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 11,520°F-hours of operation when firing natural gas and 1,920°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_x. This is especially conservative for NO_x 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

Pollutant	Tons/Year	Tons/Year	Total (Oil & Gas)
PM	1.16	0.34	1.50
NO_x	30.41	8.04	38.45
SO_2	0.20	8.06	8.26
CO	7.60	0.55	8.16
VOC	1.66	0.20	1.85
Degree Fahrenheit-Hours per year	11,520	1,920	
Additional Degree Fahrenheit-Hours on Gas	3,046	0	
Total Degree Fahrenheit-Hours Gas Only	14,566	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_x. Emissions of SO_2 are primarily associated with distillate fuel oil which is only used a backup to natural gas. For natural gas only, the maximum potential NO_x emissions would be 38.45 tons/year at 14,566°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., 3,046°F-hours/1,920°F-hours = 1.6°F-hours). The emissions of the other pollutants would be 1.47 tons/year for PM, 0.25 tons/year for SO_2, 9.61 tons/year for CO and 2.10 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 58,264°F-hours of operation when firing only natural gas. If only natural gas is fired, the proposed amount of hours would be decreased by 1.6°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 58,264°F-hours for the facility.

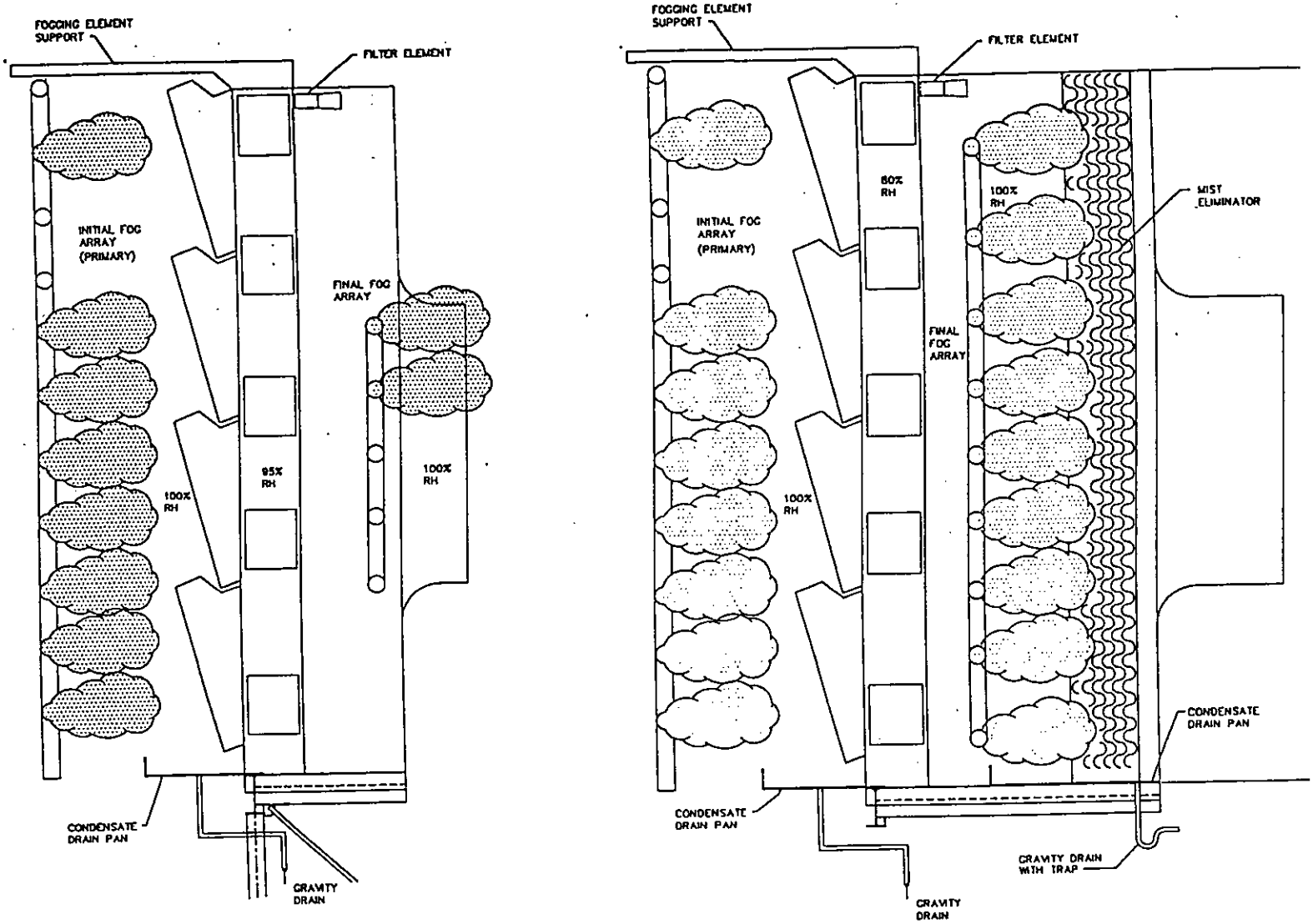


Figure 1. Illustrative Fogging System Schematic
Florida Power & Light, Inc.

Source: Caldwell Energy and Environmental, Inc.

Golder Associates

Table 1 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	3		@ 85 °F
Hours/year		1,440	(2)	
°F-hours/year		11,520		hours/year times temperature decrease
Pollutants	**Units**	**Emissions**	**(3)**	**Comments**
PM	lb/MMBtu	0.0168		AP-42 Section 3.1
	TPY	0.29		per machine
NOx	lb/MMBtu	0.44		AP-42 Section 3.1
	TPY	7.60		per machine
SO_2	lb/MMBtu	0.00286		1 grain/100 cf natural gas
	TPY	0.05		per machine
CO	lb/MMBtu	0.11		AP-42 Section 3.1
	TPY	1.90		per machine
VOC	lb/MMBtu	0.024		AP-42 Section 3.1
	TPY	0.41		per machine

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 180 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 2 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		
Hours/year		240	(2)	
°F-hours/year		1,920		hours/year times temperature decrease
Pollutants	**Units**	**Emissions (3)**		**Comments**
PM	lb/MMBtu	0.0293		AP-42 Section 3.1
	TPY	0.08		per machine
NOx	lb/MMBtu	0.698		AP-42 Section 3.1
	TPY	2.01		per machine
SO_2	lb/MMBtu	0.7		Based on Title V Permit
	TPY	2.02		per machine
CO	lb/MMBtu	0.048		AP-42 Section 3.1
	TPY	0.14		per machine
VOC	lb/MMBtu	0.017		AP-42 Section 3.1
	TPY	0.05		per machine

Legend - TPY: tons per year

(1) Temperature decrease isannual 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".

ATTACHMENT A

Attachment A

The following data were obtained from performance curves in the range that fogging would be most effective.

Plant Site:	Putnam Plant; GTs 11, 12, 21 and 22	
Turbine Model:	Westinghouse 501B5A	
Turbine Inlet Temperature (°F)	100	59
Difference (°F)		41
Heat Input (mmBtu/hr)	877	1,005
Difference (mmBtu/hr)		127.65
Rate (mmBtu/hr/ °F)[a]		3.11

Note: [a] heat input difference divided by temperature difference.

ATTACHMENT B

Golder Associates Inc.

6241 NW 23rd Street, Suite 500
Gainesville, FL 32653-1500
Telephone (352) 336-5600
Fax (352) 336-6603

December 15, 1998

9737572A/1

Florida Power & Light Company
700 Universe Blvd.
P.O. Box 14000
Juno Beach, Florida 33408

Attention: Mr. John Hampp, Environmental Specialist

RE: Putnam Inlet Fogging Emission Tests
Analysis of Data

Dear John:

Golder Associates Inc. has evaluated the emissions data taken during August 25 and 26, 1998 to determine the potential effect of inlet fogging on emission rates of nitrogen oxides (NO_x) and carbon monoxide (CO). The data were obtained at the Putnam Plant using various inlet fogging conditions while operating the unit at nearly constant heat input. The heat input during testing on August 25, 1998 varied by less than 1.5 percent while heat input during testing on August 26, 1998 varied by about 2.5 percent. The data evaluated represented 178 individual 3 minute readings using continuous emission monitoring equipment. There were 72 data points when the inlet foggers were not operating (i.e., "off") while there were 106 data points where the various foggers were operating (i.e., "on").

The data were evaluated using the procedures in Appendix C to 40 CFR Part 60; Determination of Emission Rate Change. The data were also evaluated in terms of the potential effect of inlet fogging. Tables 1.1a and 1.1b present the results of Appendix C evaluation for NO_x and CO, respectively for the data recorded on August 25, 1998. Tables 1.2a and 1.2b present the results of Appendix C evaluation for NO_x and CO, respectively for the data recorded on August 26, 1998. Taken together, the analysis suggests that NO_x concentrations may decrease slightly while CO may increase slightly with the operation of inlet foggers. However, the trend was not always consistent and the differences are small (i.e., up to a few ppm). Other factors also likely played a role in the variability of the data such as the response in continuous emission monitoring equipment, fuel input, ambient temperature and combustion turbine operation variability. Such changes, which cannot be completely accounted for in the data, would make it inappropriate to develop a specific relationships regarding emission rates at this time. Please call if you have any questions.

Sincerely,

GOLDER ASSOCIATES INC.

Kennard F. Kosky, P.E.
Principal

KFK/arz

Table 1.1a Florida Power And Light (FP&L) Test data for the Combustion Turbine Inlet Air Cooling System with Direct Water Spray Inlet Fogging (8/25/98) NO_x Statistical Analysis (Unit 1GT2 - Putnam Plant, Palatka, Fl.)

Hour Range	Fogger on/off	n	v (n-1)	Mean	Std Dev	t	95% C.I.	Upper C.I.	Lower C.I.
1345-1421	off (baseline)	13	12	87.8	0.98	1.782	0.485	88.3	87.4
1424-1521	on	20	19	86.5	1.33	1.729	0.514	87.0	85.9
1524	off	1	0	-	-	-	-		
1527-1533	on	3	2	89.0	0.35	2.92	0.592	89.6	88.4
1536-1539	off	2	1	88.5	0.78	1.86	1.023	89.5	87.4

Legend: n= sample size, v = sample size -1, t=t distribution

Table 1.1b Florida Power And Light (FP&L) Test data for the Combustion Turbine Inlet Air Cooling System with Direct Water Spray Inlet Fogging (8/25/98) CO Statistical Analysis (Unit 1GT2 - Putnam Plant, Palatka, Fl.)

Hour Range	Fogger on/off	n	v (n-1)	Mean	Std Dev	t	95% C.I.	Upper C.I.	Lower C.I.
1345-1421	off (baseline)	13	12	75.9	2.90	1.782	1.433	77.4	74.5
1424-1521	on	20	19	81.0	1.43	1.729	0.554	81.5	80.4
1524	off	1	0	-	-	-	-		
1527-1533	on	3	2	78.0	2.00	2.92	3.372	81.4	74.6
1536-1539	off	2	1	79.5	2.12	1.86	2.790	82.3	76.7

Legend: n= sample size, v = sample size -1, t=t distribution

Table 1.2a Florida Power And Light (FP&L) Test data for the Combustion Turbine Inlet Air Cooling System with Direct Water Spray Inlet Fogging (8/26/98) NO_x Statistical Analysis (Unit 1GT2 - Putnam Plant, Palatka, Fl.)

Hour Range	Fogger on/off	n	v (n-1)	Mean	Std Dev	t	z	95% C.I.	Upper C.I.	Lower C.I.
1103-1227	off (baseline)	29	28	89.1	0.7	1.701	-	0.236	89.4	88.9
1230-1430	on	41	-	90.5	1.3	-	1.645	0.334	90.8	90.2
1433-1539	off	23		96.8	1.3	1.717		0.466	97.3	96.4
1542-1745	on	42		92.4	2.2		1.645	0.561	93.0	91.9
1748-1800	off	5	4	97.7	0.4	2.132	-	0.429	98.1	97.3

Legend: n= sample size, v = sample size -1, t=t distribution, z = z distribution (used when sample size is >30)

Table 1.2b Florida Power And Light (FP&L) Test data for the Combustion Turbine Inlet Air Cooling System with Direct Water Spray Inlet Fogging (8/26/98) CO Statistical Analysis (Unit 1GT2 - Putnam Plant, Palatka, Fl.)

Hour Range	Fogger on/off	n	v (n-1)	Mean	Std Dev	t		95% C.I.	Upper C.I.	Lower C.I.
1103-1227	off (baseline)	29	28	72.6	2.3	1.701	-	0.728	73.3	71.9
1230-1430	on	41	-	70.9	1.9	-	1.645	0.494	71.4	70.4
1433-1539	off	23		67.2	1.9	1.717		0.688	67.9	66.5
1542-1745	on	42		69.5	3.3		1.645	0.828	70.4	68.7
1748-1800	off	5	4	63.4	0.9	2.132	-	0.853	64.3	62.5

Legend: n= sample size, v = sample size -1, t=t distribution, z = z distribution (used when sample size is >30)