Cindy Phillips

P.O. Box 078768, West Palm Beach, FL 33407-0768
5500 Village Blvd.

(407) 697-6931

FPL

RECEIVED

JUL 0 5 1991

Division of Air
Resources Management

June 28, 1991

Mr. A. Alexander, P.E.
Deputy Assistant Secretary
Florida Department of Environmental Regulation
Central Florida District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

RE: **Florida Power & Light Company**
Sanford Unit No. 4
Air Operating Permit No. A064-132055
Request for Amendment

Dear Mr. Alexander:

As you are likely aware, the Orimulsion test burn at Florida Power & Light Company's (FPL) Sanford Unit No. 4 was a success. We wish to again express our appreciation for the support and consideration of the Department during the test burn.

ORIMULSION TEST BURN SUCCESS

As scheduled, the testing of 100 percent Orimulsion fuel was stopped on May 31, 1991, although the test burn permit does not terminate until June 30, 1992, or until 90 full-power burn days have been consumed. FPL does not anticipate the need for further testing at this time, but will officially notify the Department when a final decision is made in this regard. We will also notify the Department if some unanticipated consideration requires us to pursue further testing.

FPL is presently evaluating the results of the test burn and planning for the possible permanent conversion of certain units, including Sanford Unit Nos. 4 and 5 and Cape Canaveral Unit Nos. 1 and 2, to the permanent use of Orimulsion. Any such conversion would include the associated retrofitting of pollution control equipment. FPL believes that these activities would result in substantial environmental improvements clearly attributable to the success of the Sanford test burn.

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER 864036992[illegible]

8640369920

Date 7/02/91

RECIPIENT'S COPY

1 From (Your Name) Please Print: Martin J. Smith
Your Phone Number (Very Important): (407) 694-6930
Company: FPL
Department/Floor No.:
Street Address: 9500 VILLAGE BLVD
City: WEST PALM BEACH State: FL ZIP Required: 3 3 4 0 7

2 To (Recipient's Name) Please Print: Ms. Cindy Phillips ~~Mr. Clair H. Yancy~~
Recipient's Phone Number (Very Important): (904) 488-1344
Company: Dept. of Environmental Regulation
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): Twin Towers Office Building
City: 2600 Blair Stone Road Tallahassee State: FL ZIP Required: ~~32399-2400~~

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.) [redacted] 7599-90-000-00-0-626

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address:
City: State: ZIP Required:

3 PAYMENT 1 ☐ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☒ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash/Check

4 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)	Standard Overnight Service (Delivery by next business afternoon†)
11 ☐ YOUR PACKAGING	51 ☐
16 ☒ FEDEX LETTER *	56 ☐ FEDEX LETTER *
12 ☐ FEDEX PAK *	52 ☐ FEDEX PAK *
13 ☐ FEDEX BOX	53 ☐ FEDEX BOX
14 ☐ FEDEX TUBE	54 ☐ FEDEX TUBE

Economy Distribution Service (formerly Standard Air) (Delivery by second business day†)	Heavyweight Service (for Extra Large or any package over 150 lbs.)
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	80 ☐ DEFERRED HEAVYWEIGHT **

†Delivery commitment may be later in some areas. *Declared Value Limit $100. **Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING (Check services required)

1 ☐ HOLD FOR PICK-UP (Fill in Box H)
2 ☒ DELIVER WEEKDAY
3 ☐ DELIVER SATURDAY (Extra charge) (Not available to all locations) ☐
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐
6 ☐ DRY ICE ____ Lbs
7 ☐ OTHER SPECIAL SERVICE
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charge)
10 ☐
11 ☐ [illegible]
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE
Total 2	Total	Total

DIM SHIPMENT (Chargeable Weight) ☐ ____ lbs.

Received At
1 ☒ Regular Stop 3 ☐ Drop Box 4 ☐ B.S.C. 2 ☐ On-Call Stop 5 ☐ Station

FedEx Emp. No.

5 Emp. No. Date
☐ Cash Received
☐ Return Shipment ☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By X
Date/Time Received FedEx Employee Number
Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 4/90
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JUL 02 1991
DIVISION OF WATER MANAGEMENT

REQUEST FOR APPROVAL OF CO-FIRING

During the test burn project, your staff recommended that FPL analyze the feasibility of co-firing Orimulsion and natural gas, and such initial co-firing tests have been conducted. The results of the co-firing tests indicate that emission levels during co-firing would in general be less than or equal to overall air pollutant emission normally experienced during the firing of No. 6 fuel oil at the plant. Additionally, it is estimated that co-firing natural gas and Orimulsion at a single 400 MW unit would save FPL customers approximately $6 million per year in fuel costs. Thus, co-firing Orimulsion and natural gas would provide immediate interim environmental and economic benefits until permanent conversion to Orimulsion can be completed. No construction or physical modification is required to co-fire in Unit No. 4 because all necessary facilities are currently in place. Therefore, FPL is hereby respectfully requesting that the air operating permit for Sanford Unit No. 4, number A064-132055, be amended.

We are attaching information necessary for amending the current Sanford Unit No. 4 air operating permit, including emissions test data, continuous emissions monitoring records, and other relevant information. (The Department's air permit application form was used as the basis for providing appropriate information for review.) These data confirm that while co-firing Orimulsion and natural gas, air emissions can generally be reduced below levels experienced while firing residual oil (see Composite Exhibit A). In particular, when the unit is co-fired with Orimulsion and natural gas, the emissions of sulfur dioxide, particulate matter, and opacity will be at or below both the permitted and the actual emission rates experienced with No. 6 fuel oil fired at Unit No. 4 prior to the test burn, as indicated in the table below:

Pollutant	Current Opr. Permit	No. 6 Fuel Oil	Co-firing Nat. Gas and Orimulsion
SO_2	2.75 lb/mmBtu	1.65-2.2 lb/mmBtu	1.6 lb/mmBtu
PM	.1/.3 lb/mmBtu	.1/.3 lb/mmBtu	.1/.3 lb/mmBtu
Opacity	40/60 percent	40/60 percent	35/60 percent

The plant is capable of varying the natural gas and Orimulsion fuel ratio as needed, based upon the sulfur content of the Orimulsion received, to ensure that emissions for the major regulated pollutants during co-firing do not exceed the limits proposed above. Emission levels of other regulated pollutants and other pollutants of interest during co-firing of natural gas and Orimulsion are shown in Tables A-1 and A-2 included in the information attached.

SUGGESTED PERMIT LANGUAGE

FPL requests that air operating permit number A064-132055 be amended per the language suggested in Attachments 1 and 2.

The emission reductions achieved while co-firing Orimulsion and natural gas are not as great as can be obtained once permanent conversion is complete; nevertheless, FPL believes that the benefits provided, both environmental and economic, are worth pursuing in the interim. While FPL proceeds with efforts for full conversion, and in view of the Department's interest in FPL's activities in this regard, FPL intends and hereby commits to provide the Department with quarterly progress reports on its plans regarding conversion to 100 percent Orimulsion, when even greater economic and environmental benefits can be achieved. The quarterly progress reports will be submitted within 45 days following the end of the respective calendar quarter.

Again, we appreciate the District's cooperation and support throughout the Orimulsion test burn. As always, if you have any questions or need additional information, please do not hesitate to call us.

Sincerely,

Martin A. Smith, Ph.D.
Manager
Environmental Permitting & Programs

MAS/er
Enclosure

cc: Steve Smallwood, FDER - (w/o encl.)
Clair Fancy, FDER - (w/o encl.)
Cindy Phillips, FDER - (w/ encl.)
Charles Collins, FDER - (w/o encl.)
Tom Hansen, EPA - (w/ encl.)
W. H. Green, HBGS - (w/o encl.)
A. Morrison, HBGS - (w/encl.)
P. C. Cunningham, HBGS - (w/o encl.)
K. F. Kosky, KBN - (w/encl.)

ATTACHMENT 1

DESCRIPTION (Page 1)

The unit has a maximum heat input rate of 4,050 MMBTU/hour while fired with Residual Oil or Used Oil and a maximum heat input of 4,230 MMBTU/hour while fired with Natural Gas or cofired with Natural Gas and Orimulsion, . . .

bjh:insertmod

SPECIFIC CONDITIONS:

(1) Heat Input Rate:

The permitted heat input rate for this source is 4,050 MMBTU/hour for Residual Oil or Used Oil and 4,230 MMBTU/hour for Natural Gas or for a mixture of Natural Gas and Orimulsion.

(2) Permitted Fuels:

This source shall be fired with No. 6 Residual Oil, No. 2 Fuel Oil, Used Oil or Natural Gas, or cofired with Natural Gas and Orimulsion only.

(3) Source Emission Limiting Standards and Compliance Testing Requirements:

POLLUTANT	EMISSION[1] LIMITING STANDARDS	TESTING FREQUENCY[2] ANNUAL	QTLY.	OTHER	TEST[3] METHOD
Particulate Matter					
- Steady State	0.1 lb/MMBtu	X *	---	---	EPA Method 5 or 17*
- Sootblowing	0.3 lb/MMBtu; Maximum 3 hrs.	X	---	---	EPA Method 5 or 17*
Sulfur Dioxide					
- While burning Residual Oil, Fuel Oil, Used Oil, or Natural Gas	2.75 lb/MMBtu	---	---	X	Monthly Fuel Analysis
- While burning mixture of Natural Gas and Orimulsion	1.6 lb/MMBtu	X	---	X	EPA Method 6C or Monthly Fuel Analysis
Visible Emissions					
- Steady State		X *	---	---	DER Method 9 CEM
- While burning Residual Oil, Fuel Oil, Used Oil, or Natural Gas	40% Opacity				
- While burning mixture of Natural Gas and Orimulsion	35% Opacity	X			CEM
- Sootblowing	60% Opacity; for up to 3 hrs. in 24 hrs. with up to 4 6-min. periods of up to 100% if unit has an operational opacity CEM	X	---	---	DER Method 9 CEM
- Load Changing	60% Opacity; for up to 3 hrs. in 24 hrs. with up to 4 6-min. periods of up to 100% if unit has an operational opacity CEM	---	---	---	---

*EPA Method 17 may be used only if the stack temperature is less than 375° F.

1. - FAC 17-2.600(5) and FAC 17-2.250(3)
2. - FAC 17-2.700(2)
3. - FAC 17-2.700(1)(d)

* The source may elect to test particulates (steady-state) quarterly and to test visible emissions annually with a 40% opacity limit, or to test particulates (steady-state) and visible emissions annually with a 20% opacity limit. Currently the source has elected to test particulates quarterly and visible emissions annually with a 40% opacity limit.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

(For Information Only)

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: *Fossil Fuel Steam Generator* [ ] New[1] [X] Existing[1]

APPLICATION TYPE: [ ] Construction [ ] Operation [X] *Amendment to existing Operation Permit*

COMPANY NAME: *Florida Power & Light Company* COUNTY: *Volusia*

Identify the specific emission point source(s) addressed in this application (i.e., Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) *Sanford Unit 4*

SOURCE LOCATION: Street *Lake Monroe off Highway 17-92* City *Sanford*

UTM: East *17-468.3* North *3190.3*

Latitude *28* ° *50* ' *31* "N Longitude *81* ° *19* ' *32* "W

APPLICANT NAME AND TITLE: *Martin A. Smith, Ph.D., Mgr. Environmental Permitting & Programs*

APPLICANT ADDRESS: *P.O. Box 078768, West Palm Beach, FL 33407-0768*

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

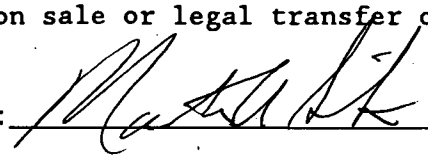
A. APPLICANT

I am the undersigned owner or authorized representative* of *Florida Power & Light*

I certify that the statements made in this amendment to existing Operation permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

(Letter of Authorization on File)

Signed: 

Martin A. Smith, Ph.D. Mgr., Env. Permitting & Programs

Name and Title (Please Type)

Date: 7/1/91 Telephone No. *(407) 697-6930*

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)
This is to certify that the engineering features of this pollution control project have been ~~designed~~/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgement, that

[1]See Florida Administration Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Kennard F. Kosky

Kennard F. Kosky
Name (Please Type)

KBN Engineering and Applied Sciences, Inc.
Company Name (Please Type)

1034 N.W. 57th Street, Gainesville, FL 32605
Mailing Address (Please Type)

Florida Registration No. *14996* Date: June 28, 1991 Telephone No. *(904) 331-9000*

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Co-firing of natural gas and Orimulsion. See Attachment A for further description.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction *NA (SEE NOTE BELOW)* Completion of Construction *NA (SEE NOTE BELOW)*

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

N/A

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

AO64-132055 Issued 12/16/87 Expires 10/17/92

AC64-180842 Issued 10/2/90 (test burn permit) Expires 6/30/92 or upon consumption of 90 full-power burn days.

Note: The proposed co-firing natural gas and Orimulsion does not require any physical changes to the unit or fuel system.

E. Requested permitted equipment operating time: hrs/day *24*; days/wk *7*; wks/yr *52*;
If power plant, hrs/yr *8,760*; if seasonal, describe: _____

F. If this is a new source or major modification, answer the following questions.
(Yes or No) ***Not Applicable***

1. Is this source in a non-attainment area for a particular pollutant? _____

a. If yes, has "offset" been applied? _____

b. If yes, has "Lowest Achievable Emission Rate" been applied? _____

c. If yes, list non-attainment pollutants. _____

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. _____

3. Does the State "Prevention of Significant Deterioration" (PSD) requirement apply to this source? If yes, see Sections VI and VII. _____

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? _____

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? _____

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? ***No***

a. If yes, for what pollutants? _____

b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable: *None for co-firing Orimulsion and natural gas*

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): *N/A*

2. Product Weight (lbs/hr): *N/A*

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

(SEE ATTACHMENT A, TABLE A-1)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Multicyclones	*Particulate*	*30.3%*	*0-5 μm*	*Manufacturer*
		66.2%	*5-10 μm*	*Manufacturer*
		86.6%	*10-20 μm*	*Manufacturer*
		99.1%	*20-45 μm*	*Manufacturer*
		99.5%	*> 45 μm*	*Manufacturer*

E. Fuels (Note: Fuel information for other currently-permitted fuels unchanged)

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural gas / Orimulsion (Co-Fired)	**N/A**	**approx. 253,000 lb/hr****	**4230**

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, others--lbs/hr.

** Represents expected fuel ratio of 65% natural gas and 35% Orimulsion

Fuel Analysis: ***(TYPICAL UNLESS OTHERWISE NOTED)***

Percent Sulfur: *1 grain per 100 CF/2.8* Percent Ash: *0.21 for Orimulsion*

Density: *8.4 for Orimulsion* lbs/gal Typical Percent Nitrogen: *0.5 for Orimulsion*

Heat Capacity: *19,780/13,000* BTU/lb *110,000 for Orimulsion* BTU/gal
(gas / Orimulsion)

Other Fuel Contaminants (which may cause air pollution): *see Tables A-1, A-2, and A-3.*

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average *N/A* Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

Ash is sent to ash retaining basin.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: *400* ft. Stack Diameter: *19.2* ft.

Gas Flow Rate: 1,600,000 ACFM 837,000 DSCFM Gas Exit Temperature: *375- 425* °F.

Water Vapor Content: *17* % Velocity: *90.5* FPS

Note: ***Natural gas and Orimulsion co-firing flow characteristics were developed from co-firing tests.***

SECTION IV: INCINERATOR INFORMATION

Not Applicable

Type of Waste	Type 0 (Plastics)	Type II (Rubbish)	Type III (Refuse)	Type IV (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diameter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control devices: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) _____

Brief description of operating characteristics of control devices: _____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
   Not Applicable
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods, 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
   See Attachment A; Table A-1; Table A-3
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   See Attachment A; Table A-1
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
   Not Applicable
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency). ***Not Applicable***

6. An 8 ½" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained. ***See Attachment A; Figure A-3***

7. An 8 ½" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Examples: Copy of relevant portion of USGS topographic map).
   See Attachment A; Figure A-1
8. An 8 ½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
   See Attachment A; Figure A-2

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation. ***Not Applicable***

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit. ***Not Applicable***

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

Not Applicable

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[ ] Yes [ ] No

Contaminant	Rate or Concentration

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Devices:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

Not Applicable

A. Company Monitored Data

1. _____ no. sites _____ TSP _____ ( ) SO^{2*} _____ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from _____/_____/_____ to _____/_____/_____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location) _____

4. Stability wind rose (STAR) data obtained from (location) _____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	_____ grams/sec
SO^2	_____ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e, jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

ATTACHMENT A

1.0 BACKGROUND

The Florida Power & Light Company (FPL) Sanford Plant is located in Volusia County adjacent to Lake Monroe (see Figure A-1). The Sanford Plant comprises three fossil-fuel-fired steam electric generating units, designated as Units No. 3, 4, and 5 (see Figure A-2). Unit No. 3 is a 160-megawatt (MW) class unit placed in service in 1959, and Units No. 4 and 5 are 400-MW class units placed in service in 1972 and 1973, respectively.

Sanford Unit No. 4 includes a Foster-Wheeler steam generator originally designed to fire a variety of fossil fuels and has been typically fired with liquid fossil fuels and natural gas, as currently authorized under Florida Department of Environmental Regulation (FDER) air permit No. AO64-132055. The unit is classified as an "existing fossil fuel steam generator" and is subject to the emission-limiting standards set forth in Florida Administrative Code (FAC) Rule 17-2.600(5)(a).

Orimulsion is a heavy hydrocarbon fuel consisting of an emulsion of a heavy bitumen in water. On October 4, 1990, FPL received authorization (FDER permit number AC64-180842; PSD-FL-150; Research and Testing Order) to test burn Orimulsion in Unit 4. The results of this test indicated that Orimulsion could effectively be burned in Unit 4 as an alternative fuel either by itself or in conjunction with natural gas.

2.0 PROJECT DESCRIPTION

Sanford Unit 4 currently has the full capability of burning residual oil, natural gas, and Orimulsion. No additional equipment or modifications to existing equipment will be required for co-firing. A flow diagram of Unit No. 4 is provided in Figure A-3. FPL proposes to co-fire a mixture of natural gas and Orimulsion. The maximum percentage of Orimulsion that will be co-fired with natural gas will be consistent with the proposed emission limits. The proposed emission limits are at or below those currently authorized for Unit 4.

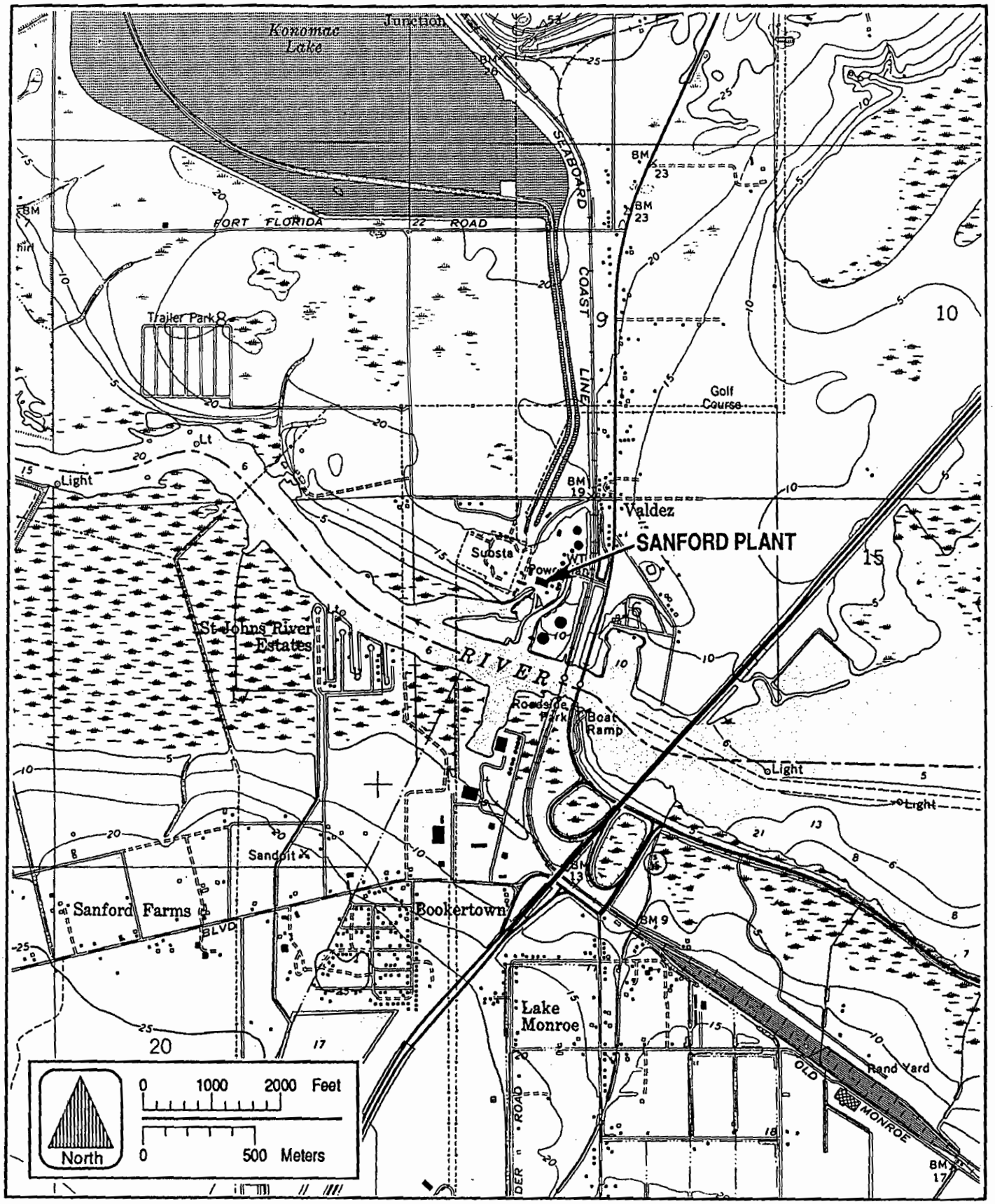


Figure A-1 SANFORD PLANT LOCATION MAP

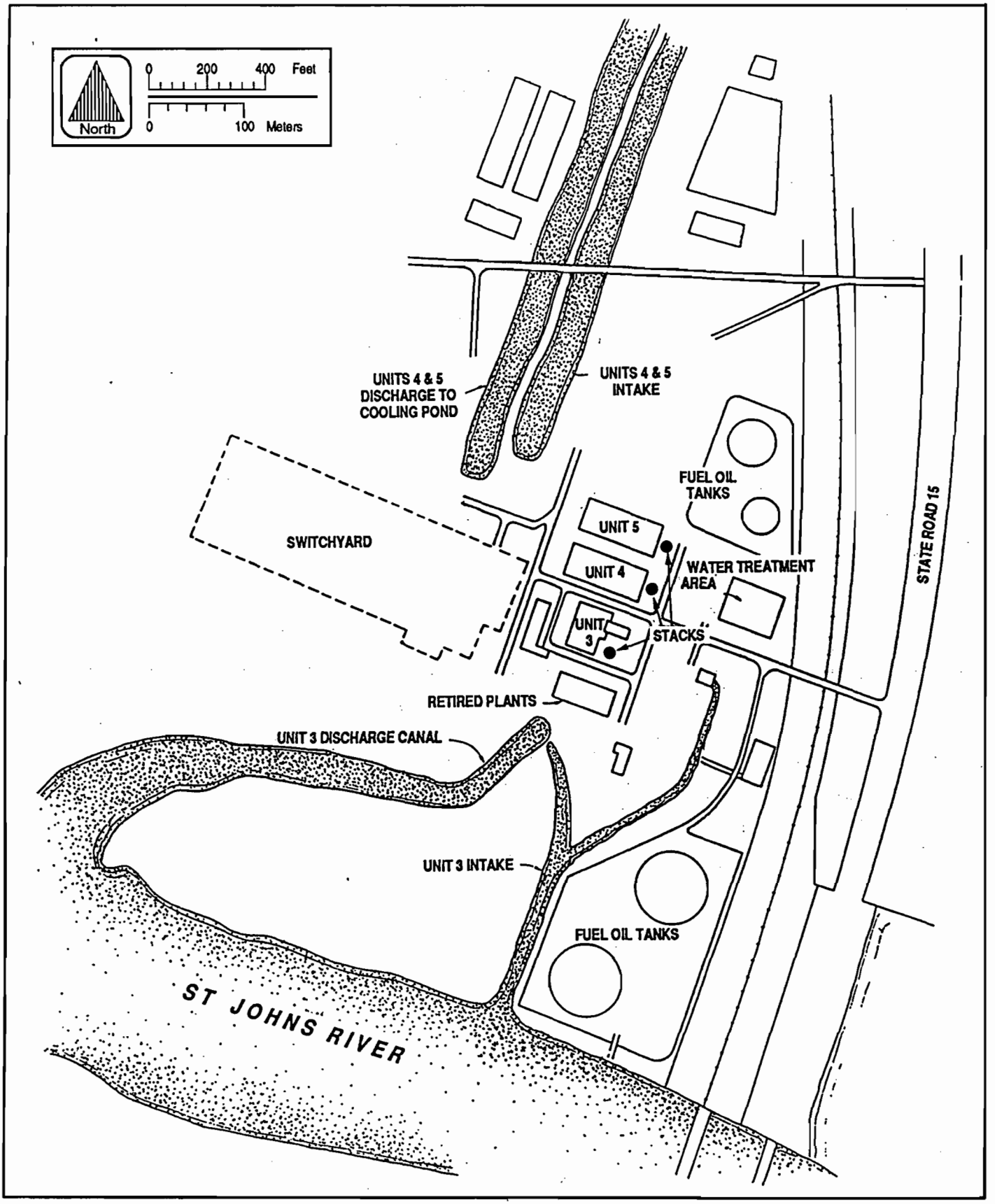


Figure A-2 PLOT PLAN OF FPL SANFORD PLANT

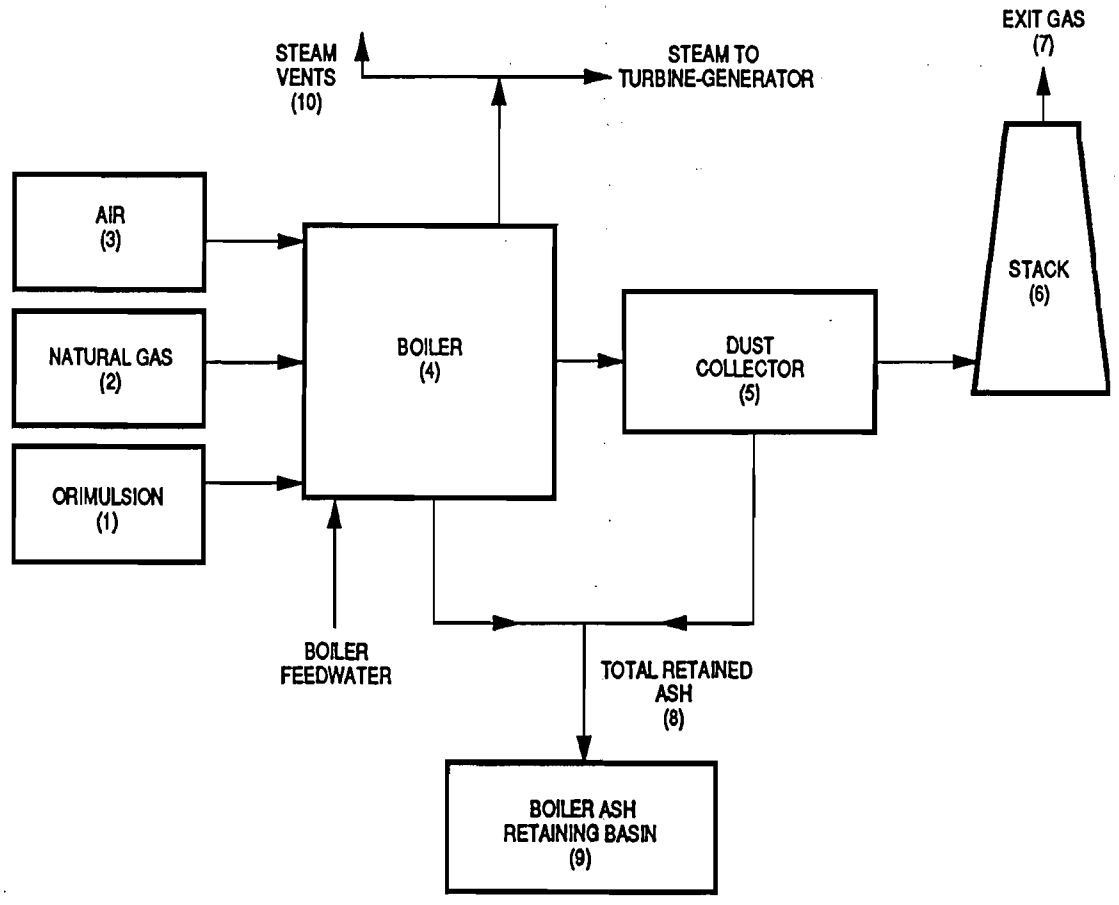


Figure A-3 FLOW DIAGRAM, SANFORD UNIT 4

Because the cost of Orimulsion is much lower than residual oil or natural gas, this project will allow FPL's customers to directly benefit from co-firing.

3.0 REGULATED POLLUTANT EMISSIONS

Maximum potential air emissions from Unit No. 4 when burning either No. 6 oil, natural gas, or natural gas and Orimulsion are presented in Table A-1.* The maximum allowable emissions when burning No. 6 (i.e., residual) oil, based upon limitations in Rule 17-2.600 (5)(a) Florida Administrative Code (FAC) and the current operating permit, are as follows:

Particulate matter	- 0.1 lb/million (MM) Btu (steady state)
	- 0.3 lb/MM Btu, maximum 3-hours (soot blowing/load changes)
Sulfur dioxide	- 2.75 lb/MM Btu
Visible Emissions	- 40 percent opacity (steady state)
	- 60 percent opacity (soot blowing/load changes)

The proposed maximum emission, and opacity limitations for co-firing* are:

Particulate matter	- 0.1 lb/MM Btu (steady state)
	- 0.3 lb/MM Btu, maximum 3-hours (soot blowing/load changes)
Sulfur dioxide	- 1.6 lb/MM Btu
Visible Emissions	- 35 percent opacity (steady state)
	- 60 percent opacity (soot blowing/load changes)

The maximum emissions of particulate matter will be no higher than the present limitations for residual oil. During the Orimulsion test burn, particulate matter testing was conducted on May 28 and 29, 1991, for co-firing natural gas and Orimulsion at a ratio of 60 and 40 percent of total heat input, respectively.* Results of this testing indicated an emission rate of 0.09 lb/MMBtu and 0.15 lb/MMBtu during steady-state and soot blowing conditions, respectively. (These tests results for co-firing were transmitted to the FDER central district office on June 12, 1991.) Opacity

*Note: Data presented are based on a conservative ratio of 60% natural gas and 40% Orimulsion; limits proposed represent an expected fuel ratio of 65% natural gas and 35% Orimulsion.

during the co-firing test, as measured by the continuous opacity measurement instrument, averaged 18 percent under steady-state conditions and 28.5 percent under soot-blowing conditions. FPL proposes a sulfur dioxide limit of 1.6 lb/MMBtu. Compliance will be assured by limiting the maximum percentage of Orimulsion in the co-firing mixture to meet the proposed limit based on sulfur and heat content of the Orimulsion being fired.

As shown in Table A-1, co-firing a representative mixture of natural gas and Orimulsion will result in emission rates for virtually all regulated pollutants that are generally lower than burning No. 6 fuel oil. Where actual test data were unavailable, AP-42 emission factors were used in Table A-1 to reflect estimated emissions.

4.0 NONREGULATED POLLUTANT EMISSIONS

Nonregulated pollutant emissions for co-firing natural gas and Orimulsion were estimated using test results taken by Entropy Environmentalists Inc. in April 1991 with Unit 4 operating on 100 percent Orimulsion. A copy of these test results has been submitted to FDER as part of the Orimulsion test burn program (May 1991). Table A-2 presents a comparison of nonregulated pollutant emissions for residual oil, natural gas and, natural gas and Orimulsion.* EPA emission factors were used to estimate emissions for residual oil firing. Natural gas is believed to contain negligible quantities for these pollutants.

Table A-2 indicates that nonregulated pollutant emissions produced by co-firing natural gas and Orimulsion* are generally lower than those for residual oil firing except for nickel.

5.0 EMISSION CALCULATIONS

Table A-3 presents the emission calculations for co-firing. EPA emission factors and the summary from the Entropy Environmentalists Inc. tests are attached.

* See note of p. A-5

Table A-1. Estimated Potential Emissions Representative of Residual Oil, Natural Gas, and Natural Gas/Orimulsion Firing at FPL Sanford Unit Regulated Pollutants (Page 1 of 3)

Data	Residual Oil	Natural Gas	Natural Gas and Orimulsion[a]
Heat Input (10^6 Btu/hr)	4,050	4,230	4,230
Fuel Flow (lb/hr)	221,311	213,852	258,465
Sulfur Dioxide			
Emissions Basis	Permit	See Note b	See Note c
Emissions Basis (lb/10^6 Btu)	2.75	0.00286	1.6
Emissions (lb/hour)	11,138	12	6,768
Emissions (tons/year)[d]	48,782	53	29,644
Particulate Matter			
Emissions Basis	Permit[e]	AP-42	Proposed[f]
Emissions Basis (lb/10^6 Btu)	0.125	0.0050	0.120
Emissions (lb/hour)	506	21	506
Emissions (tons/year)[d]	2,217	93	2,217
Particulate Matter (PM10)			
Emissions Basis	Permit[e]	AP-42	Proposed[f]
Emissions Basis (lb/10^6 Btu)	0.125	0.0050	0.120
Emissions (lb/hour)	506	21	506
Emissions (tons/year)[d]	2,217	93	2,217
Nitrogen Oxides			
Emissions Basis	AP-42[g]	AP-42	See Table A-3
Emissions Basis (lb/10^6 Btu)	0.70	0.55	0.56
Emissions (lb/hour)	2,834	2,327	2,377
Emissions (tons/year)[d]	12,412	10,190	10,412
Carbon Monoxide			
Emissions Basis	AP-42[h]	AP-42[h]	AP-42[h]
Emissions Basis (lb/10^6 Btu)	0.03	0.04	0.04
Emissions (lb/hour)	135	169	158
Emissions (tons/year)[d]	591	741	692

Table A-1. Estimated Potential Emissions Representative of Residual Oil, Natural Gas, and Natural Gas/Orimulsion Firing at FPL Sanford Unit Regulated Pollutants (Page 2 of 3)

Data	Residual Oil	Natural Gas	Natural Gas and Orimulsion[a]
Volatile Organic Compounds			
Emissions Basis	AP-42	AP-42	See Table A-3
Emissions Basis (lb/10^6 Btu)	0.005	0.0014	0.003
Emissions (lb/hour)	20.5	5.9	13.2
Emissions (tons/year)[d]	89.8	25.9	51.7
Lead			
Emissions Basis	EPA(1989)	--	--
Emissions Basis (lb/10^6 Btu)	2.80E-05	neg.	ND
Emissions (lb/hour)	0.11	0.00	ND
Emissions (tons/year)[d]	0.50	0	ND
Sulfuric Acid Mist			
Emissions Basis	AP-42	AP-42	See Table A-3
Emissions Basis (lb/10^6 Btu)	0.048	2.86E-05	0.0029
Emissions (lb/hour)	196	0.12	12.3
Emissions (tons/year)[d]	857	1	45
Total Fluorides			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	6.29E-06	neg.	2.52E-06
Emissions (lb/hour)	2.55E-02	0.00	1.06E-02
Emissions (tons/year)[d]	1.12E-01	0	4.66E-02
Mercury			
Emissions Basis	EPA (1989)	EPA (1980)	See Table A-3
Emissions Basis (lb/10^6 Btu)	3.2E-06	1.14E-05	6.93E-06
Emissions (lb/hour)	1.30E-02	4.83E-02	2.93E-02
Emissions (tons/year)[d]	5.68E-02	2.12E-01	1.28E-01
Beryllium			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	4.20E-06	neg.	2.46E-08
Emissions (lb/hour)	1.70E-02	0.00	1.04E-04
Emissions (tons/year)[d]	7.45E-02	0	4.56E-04

Table A-1. Estimated Potential Emissions Representative of Residual Oil, Natural Gas, and Natural Gas/Orimulsion Firing at FPL Sanford Unit Regulated Pollutants (Page 3 of 3)

Data	Residual Oil	Natural Gas	Natural Gas and Orimulsion[a]
Arsenic			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	1.9E-05	neg.	9.80E-07
Emissions (lb/hour)	7.69E-02	0.00	4.15E-03
Emissions (tons/year)[d]	0.34	0	1.82E-02

Note: ND = none detected in stack test.

[a] Estimated emissions based on 60% natural gas and 40% Orimulsion; see Table A-3.

[b] 1 grain sulfur/100 scf from Florida Gas Transmission data.

[c] Proposed emission limit.

[d] Assumes 8,760 hours per year operation.

[e] Based on an average of 0.1 lb/10^6 Btu for 21 hours and excess emissions of 0.3 lb/10^6 Btu for 3 hours; particulate matter and PM10 are assumed to be the same.

[f] Particulate matter emissions will not exceed those on residual oil. Particulate matter and PM10 are assumed to be the same.

[g] Based on vertical fired boilers, could be as high as 1 lb/10^6 Btu as a result of low excess air burners.

[h] Carbon monoxide emissions vary according to combustion conditions; AP-42 was used to provide representative emission estimates.

Environmental Protection Agency (EPA). 1989. Estimating Air Toxics Emissions from Coal and Oil Combustion Sources. EPA-450/2-89-001.

Environmental Protection Agency (EPA). 1981. Emissions Assessment of Conventional Stationary Systems: Volume III. External Combustion Sources of Electricity Generation. EPA-600/7-81-003a.

Environmental Protection Agency (EPA). 1980. Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted From Stationary Conventional Combustion Processes. EPA-450/2-80-074.

Environmental Protectection Agengcy (EPA). 1990. Compilation of Air Pollutant Emission Factors. Volume I: Stationary Point and Area Sources. AP-42, Supplement C.

Table A-2. Estimated Emissions Representative of Residual Oil, Natural Gas, and Natural Gas/Orimulsion Firing at FPL Sanford Unit 4 Nonregulated Pollutants (Page 1 of 2)

Data	Residual Oil	Natural Gas	Natural Gas and Orimulsion[a]
Antimony			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	2.33E-05	neg.	1.05E-06
Emissions (lb/hour)	9.44E-02	0.00	4.43E-03
Emissions (tons/year)[b]	0.41	0	0.019
Barium			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	6.71E-05	neg.	1.67E-06
Emissions (lb/hour)	2.72E-01	0.00	7.06E-03
Emissions (tons/year)[b]	1.19	0	0.031
Cadmium			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	1.57E-05	neg.	2.28E-06
Emissions (lb/hour)	6.36E-02	0.00	9.63E-03
Emissions (tons/year)[b]	0.28	0	0.042
Chromium			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	2.10E-05	neg.	7.84E-06
Emissions (lb/hour)	8.51E-02	0.00	3.32E-02
Emissions (tons/year)[b]	0.37	0	0.145
Copper			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	2.80E-04	neg.	4.76E-06
Emissions (lb/hour)	1.13	0.00	2.01E-02
Emissions (tons/year)[b]	4.97	0	0.088
Manganese			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	2.60E-05	neg.	8.04E-06
Emissions (lb/hour)	0.11	0.00	3.40E-02
Emissions (tons/year)[b]	0.46	0	0.149
Nickel			
Emissions Basis	EPA (1989)		See Table A-3
Emissions Basis (lb/10^6 Btu)	1.26E-03	neg.	1.46E-03
Emissions (lb/hour)	5.10	0.00	6.18
Emissions (tons/year)[b]	22.35	0	27.05
Phosphorus			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	5.82E-05	neg.	1.22E-05
Emissions (lb/hour)	0.24	0.00	0.052
Emissions (tons/year)[b]	1.03	0	0.23

Table A-2. Estimated Emissions Representative of Residual Oil, Natural Gas, and Natural Gas/Orimulsion Firing at FPL Sanford Unit 4 Nonregulated Pollutants (Page 2 of 2)

Data	Residual Oil	Natural Gas	Natural Gas and Orimulsion[a]
Selenium			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	3.73E-05	neg.	5.04E-06
Emissions (lb/hour)	0.15	0.00	0.021
Emissions (tons/year)[b]	0.66	0	0.089
Silver			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	1.63E-05	neg.	1.22E-06
Emissions (lb/hour)	0.07	0.00	5.18E-03
Emissions (tons/year)[b]	0.29	0	0.02
Thallium			
Emissions Basis	EPA (1981)		–
Emissions Basis (lb/10^6 Btu)	1.09E-05	neg.	ND
Emissions (lb/hour)	0.04	0.00	ND
Emissions (tons/year)[b]	0.19	0	–
Vanadium			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	8.52E-03	neg.	5.80E-03
Emissions (lb/hour)	34.50	0.00	24.53
Emissions (tons/year)[b]	151.11	0	107.46
Zinc			
Emissions Basis	EPA (1981)		See Table A-3
Emissions Basis (lb/10^6 Btu)	6.71E-05	neg.	1.44E-05
Emissions (lb/hour)	0.27	0.00	0.061
Emissions (tons/year)[b]	1.19	0	0.27

[a] Estimated emissions based on 60% natural gas and 40% Orimulsion.
[b] Assumes 8,760 hours per year operation.

Environmental Protection Agency (EPA). 1989. Estimating Air Toxics Emissions from Coal and Oil Combustion Sources. EPA-450/2-89-001.

Environmental Protection Agency (EPA). 1981. Emissions Assessment of Conventional Stationary Systems: Volume III. External Combustion Sources of Electricity Generation. EPA-600/7-81-003a.

Table A-3. Emission Calculations for Co-Firing of Orimulsion and Natural Gas

Data	Orimulsion	Natural Gas	Combined Total Maximum
Heat Input (%)	40.00%	60.00%	100.00%
Heat Input (10^6 Btu/hr)[a]	1,692*	2,538 *	4,230
Fuel Flow (lb/hr)	130,154	128,311	258,465
Sulfur Dioxide			
Emissions Basis	Fuel[b]	1 gr/100 cf	
Emissions Basis (lb/10^6 Btu)	Fuel[b]	0.00286	1.60
Emissions (lb/hour)	6,761	7	6,768
Particulate Matter			
Emissions Basis	Proposed[c]	AP-42	
Emissions Basis (lb/10^6 Btu)	Proposed[c]	0.0050	0.120
Emissions (lb/hour)	493	13	506
Particulate Matter (PM10)			
Emissions Basis	Proposed[c]	AP-42	
Emissions Basis (lb/10^6 Btu)	Proposed[c]	0.0050	0.120
Emissions (lb/hour)	493	13	506
Nitrogen Oxides			
Emissions Basis	Test Results[d]	AP-42	
Emissions Basis (lb/10^6 Btu)	0.58	0.55	0.562
Emissions (lb/hour)	981	1,396	2,377
Carbon Monoxide			
Emissions Basis	AP-42[e]	AP-42[e]	
Emissions Basis (lb/10^6 Btu)	0.03	0.04	0.037
Emissions (lb/hour)	56	102	158
Volatile Organic Compounds			
Emissions Basis	Test Results[d]	AP-42	
Emissions Basis (lb/10^6 Btu)	0.006	0.0014	0.003
Emissions (lb/hour)	9.6	3.6	13.2
Sulfuric Acid Mist			
Emissions Basis	Test Results	AP-42	
Emissions Basis (lb/10^6 Btu)	0.0072	2.86E-05	0.0029
Emissions (lb/hour)	12.2	0.12	12.3
Total Fluorides			
Emissions Basis	EPA (1981)		
Emissions Basis (lb/10^6 Btu)	6.29E-06	neg.	2.52E-06
Emissions (lb/hour)	0.01	0.00	1.06E-02
Mercury			
Emissions Basis	Test Results	EPA (1980)	
Emissions Basis (lb/10^6 Btu)	2.10E-07	1.14E-05	6.93E-06
Emissions (lb/hour)	3.55E-04	2.90E-02	2.93E-02

* Note: Values shown are based on a conservative 60%/40% fuel mix. Actual individual fuel heat inputs will vary depending on fuel characteristics and/or fuel ratio.

Table A-3. Emission Calculations for Co-Firing of Orimulsion and Natural Gas

Data	Orimulsion	Natural Gas	Total
Beryllium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	6.15E-08	neg.	2.46E-08
Emissions (lb/hour)	1.04E-04	0.00	1.04E-04
Arsenic			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	2.45E-06	neg.	9.80E-07
Emissions (lb/hour)	4.15E-03	0.00	4.15E-03
Antimony			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	2.62E-06	neg.	1.05E-06
Emissions (lb/hour)	4.43E-03	0.00	4.43E-03
Barium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	4.17E-06	neg.	1.67E-06
Emissions (lb/hour)	7.06E-03	0.00	7.06E-03
Cadmium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	5.69E-06	neg.	2.28E-06
Emissions (lb/hour)	9.63E-03	0.00	9.63E-03
Chromium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	1.96E-05	neg.	7.84E-06
Emissions (lb/hour)	3.32E-02	0.00	3.32E-02
Copper			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	1.19E-05	neg.	4.76E-06
Emissions (lb/hour)	2.01E-02	0.00	2.01E-02
Manganese			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	2.01E-05	neg.	8.04E-06
Emissions (lb/hour)	3.40E-02	0.00	3.40E-02
Nickel			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	3.65E-03	neg.	1.46E-03
Emissions (lb/hour)	6.18	0.00	6.18
Phosphorpus			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	3.05E-05	neg.	1.22E-05
Emissions (lb/hour)	5.16E-02	0.00	5.16E-02

Table A-3. Emission Calculations for Co-Firing of Orimulsion and Natural Gas

Data	Orimulsion	Natural Gas	Total
Selenium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	1.26E-05	neg.	5.04E-06
Emissions (lb/hour)	2.13E-02	0.00	2.13E-02
Silver			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	3.06E-06	neg.	1.22E-06
Emissions (lb/hour)	5.18E-03	0.00	5.18E-03
Vanadium			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	1.45E-02	neg.	5.80E-03
Emissions (lb/hour)	2.45E+01	0.00	2.45E+01
Zinc			
Emissions Basis	Test Results		
Emissions Basis (lb/10^6 Btu)	3.60E-05	neg.	1.44E-05
Emissions (lb/hour)	6.09E-02	0.00	6.09E-02

[a] The heat input based on 40% Orimulsion and 60% natural gas.
Orimulsion = 4,230 10^6 Btu/hr * 0.40 = 1,692 10^6 Btu/hr
Natural Gas = 4,230 10^6 Btu/hr * 0.60 = 2,538 10^6 Btu/hr

[b] Based on a maximum emission rate when co-firing of 1.6 lb/10^6 Btu.

[c] Based on a maximum emission rate when co-firing of 0.1 lb/10^6 Btu under steady state (21 hours) and less than 0.3 lb/10^6 Btu for soot blowing/load changes (3 hours); PM and PM10 are assumed to be the same.

[d] Maximum from Entropy stack tests.

[e] Carbon monoxide emissions vary according to combustion conditions; AP-42 was used to provide representative emission estimates.

Notes:

1. lb/hr is calculated based on the heat input for the fuel specified.
2. "Test Results" refers to the stack tests performed by Entropy Environmentalists, Inc., April 1-5 and 8-12, 1991.
3. Total emissions (lb/hr) were determined by adding Orimulsion and natural gas emissions of the applicable pollutant; for example, total sulfur dioxide emissions are 6,761 lb/hr + 7 lb/hr = 6,768 lb/hr.
4. Total emission basis (lb/10^6 Btu) was calculated by dividing total heat input; for example, total emission basis for nitrogen oxides is 2,377 lb/hr ÷ 4,230 10^6 Btu/hr = 0.562 lb/10^6 Btu.
5. Reference to EPA can be found in Table A-1.

6.0 AIR QUALITY IMPACTS

The impacts of co-firing natural gas and Orimulsion will not exceed state or federal ambient air quality standards or Prevention of Significant Deterioration increments. This conclusion has been demonstrated in the modeling analysis performed for the test burn which evaluated 100 percent Orimulsion firing for Unit 4. A copy of the analysis can be found in the application for test burn.

7.0 SUMMARY

The fuel flexibility, cost savings to consumers, and environmental benefits of co-firing natural gas and Orimulsion in lieu of residual oil at Sanford Unit No. 4 are clear. The project described herein will allow FPL's customers to realize these benefits. The project is not subject to federal NSPS or PSD requirements.

EMISSION FACTORS

United States
Environmental Protection
Agency

Office of Air Quality
Planning And Standards
Research Triangle Park, NC 27711

EPA-450/2-89-001
April 1989

AIR

EPA

ESTIMATING AIR TOXICS EMISSIONS FROM COAL AND OIL COMBUSTION SOURCES

TABLE 4-1. SUMMARY OF TOXIC POLLUTANT EMISSION FACTORS FOR OIL COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^{12}$ Btu) Residual Oil	Distillate Oil
Arsenic	19	4.2
Beryllium	4.2	2.5
Cadmium	15.7	10.5
Chromium	21	48
Copper	280	280
Lead	28[c]	8.9[d]
Mercury	3.2	3.0
Manganese	26	14
Nickel	1260	170
POM	8.4[b]	22.5
Formaldehyde	405[e]	405[e]

[a]All emission factors are uncontrolled, and are applicable to oil-fired boilers and furnaces in all combustion sectors unless otherwise noted.

[b]This value was calculated using all available residual oil data given in Table 4-35. If the upper end of the range of available data is excluded when calculating an average value (which could be used in this table), the average factor for POM from residual oil combustion becomes 4.1 $lb/10^{12}$ BTU.

[c]Applicable to utility boilers only.

[d]Applicable to industrial, commercial, and residential boilers.

[e]The formaldehyde factors are based on very limited and relatively old data. Consult Table 4-37 and accompanying discussion for more detailed information.

PB81-145195

Emissions Assessment of Conventional Stationary Systems: Volume III. External Combustion Sources for Electricity Generation

TRW Environmental Engineering Div.
Redondo Beach, CA

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Jan 81

TABLE 71. EMISSION FACTORS AND MEAN SOURCE SEVERITIES OF TRACE ELEMENT EMISSIONS FROM OIL-FIRED UTILITY BOILERS

Trace Element	Concentration, ppm	Emission Factor, pg/J	Mean Severity Factor	
			Tangentially-fired Boilers	Wall-fired Boilers
Aluminum (Al)	3.8	87	0.0074	0.0027
Arsenic (As)	0.8	18	0.016	0.0059
Boron (B)	0.41	9.4	0.0013	0.0005
Barium (Ba)	1.26	28.8	0.025	0.0094
Beryllium (Be)	0.08	1.8	0.40	0.15
Bromine (Br)	0.13	3.0	0.0001	<0.0001
Calcium (Ca)	14	320	0.014	0.0052
Cadmium (Cd)	2.27	51.9	0.11	0.042
Chlorine (Cl)	12	274	0.018	0.0066
Cobalt (Co)	2.21	50.5	0.22	0.082
Chromium (Cr)	1.3	30	0.026	0.0098
Copper (Cu)	2.8	64	0.14	0.052
Fluorine (F)	0.12	2.7	0.0005	0.0002
Iron (Fe)	18	411	0.023	0.0086
Mercury (Hg)	0.04	0.9	0.0079	0.0029
Potassium (K)	34	777	0.0064	0.0024
Lithium (Li)	0.06	1.4	0.028	0.010
Magnesium (Mg)	13	297	0.022	0.0081
Manganese (Mn)	1.33	30.4	0.0027	0.0010
Molybdenum (Mo)	0.9	21	0.0018	0.0007
Sodium (Na)	31	708	0.0059	0.0022
Nickel (Ni)	42.2	964	4.2	1.6
Phosphorus (P)	1.1	25	0.11	0.041
Lead (Pb)	3.5	80	0.23	0.087
Antimony (Sb)	0.44	10	0.0088	0.0033
Selenium (Se)	0.7	16	0.035	0.013
Silicon (Si)	17.5	400	0.018	0.0065
Tin (Sn)	6.2	142	0.031	0.012
Strontium (Sr)	0.15	3.4	0.0005	0.0002
Thorium (Th)	<0.001	<0.02	<0.0001	<0.0001
Uranium (U)	0.7	16	0.035	0.013
Vanadium (V)	160	3656	3.2	1.2
Zinc (Zn)	1.26	28.8	0.0032	0.0012

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA-450/2-80-074
June 1980

Air

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Health Impacts, Emissions, and Emission Factors for Noncriteria Pollutants Subject to De Minimis Guidelines and Emitted from Stationary Conventional Combustion Processes

TABLE 4-3 TRACE ELEMENT EMISSION FACTORS FOR OIL-FIRED AND GAS-FIRED UTILITY AND INDUSTRIAL BOILERS

FURNACE TYPE	RESIDUAL OIL[a] pg/J			NATURAL GAS[b] pg/J		
	Hg	Be	F	Hg	Be	F
UNCONTROLLED[c]						
Tangential firing	23C	24C	23C	4.9	Nil	Nil
Wall firing	23C	24C	23C	4.9	Nil	Nil

(a) Emission factors for residual oil are calculated based on characterization of eleven residual oil samples and the assumption that all trace elements in the oil feed are emitted through the stack (Shih, et al, October 1979). C indicates the concentration of trace element in residual oil, in ppm.

(b) Based on stack test measurements for gas-fired utility boilers (1.).

(c) When boilers are equipped with wet scrubbers (used for flue gas desulfurization), the emission factor for Be may be assumed to be 0.01 times the uncontrolled factor given above, and emissions of Hg and F are .2 times the values given above (1.).

NOTE: To convert emission factor units to LB/10^{12}BTU, multiply factors by 2.33.

ENTROPY
ENVIRONMENTALISTS INC.

POST OFFICE BOX 12291
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27709-2291
919-781-3550

STATIONARY SOURCE SAMPLING REPORT

REFERENCE NO. 8165A

FLORIDA POWER AND LIGHT COMPANY

SANFORD PLANT

SANFORD, FLORIDA

EMISSIONS TESTING FOR:

Metals
Nitrogen Oxides
Particulate
Sulfur Dioxide
Sulfur Trioxide
Sulfuric Acid Mist
Total Hydrocarbons

UNIT NO. 4

APRIL 1 THROUGH 5 AND 8 THROUGH 12, 1991

TABLE 2-1

EMISSION RATES SUMMARY, LB/MMBTU

Unit No. 4 Stack

	Repetition 1	Repetition 2	Repetition 3	Average
April 1, 1991				
Nitrogen Oxides	0.512	0.472	0.485	0.490
Particulate	0.126	0.134	0.123	0.128
Sulfur Dioxide	4.228	4.198	4.208	4.211
Total Hydrocarbons	0.00336	0.00174	0.00120	0.00210
April 2, 1991				
Nitrogen Oxides	0.516	0.513	0.496	0.508
Particulate	0.137	0.138	0.126	0.134
Sulfur Dioxide	4.208	4.190	4.224	4.207
Total Hydrocarbons	0.00676	0.00596	0.00438	0.00570
April 3, 1991				
Nitrogen Oxides	0.534	0.559	0.552	0.548
Particulate	0.220	0.166	0.182	0.189
Sulfur Dioxide	4.233	4.189	4.237	4.220
Total Hydrocarbons	0.00272	0.00205	0.00259	0.00245
April 4, 1991				
Nitrogen Oxides	0.542	0.599	0.588	0.576
Particulate	0.156	0.169	0.169	0.165
Sulfur Dioxide	4.202	4.146	4.199	4.182
Total Hydrocarbons	0.00302	0.00286	0.00147	0.00245
April 5, 1991				
Nitrogen Oxides	0.466	0.480	0.442	0.463
Particulate	0.173	0.187	0.127	0.162
Sulfur Dioxide	4.170	4.155	4.232	4.186
Total Hydrocarbons	0.00210	0.00185	0.00168	0.00187
April 8, 1991				
Metals				
Antimony	3.62E-006	1.72E-006	2.52E-006	2.62E-006
Arsenic	2.62E-006	2.33E-006	2.39E-006	2.45E-006
Barium	ND	1.25E-005	ND	4.17E-006
Beryllium	7.50E-008	6.43E-008	4.51E-008	6.15E-008
Cadmium	5.09E-006	5.64E-006	6.35E-006	5.69E-006

Note: Compliance limits are 0.3 lb/MMBtu and 4.3 lb/MMBtu, for particulate and sulfur dioxide, respectively.

(continued next page)

TABLE 2-1 (continued)

EMISSION RATES SUMMARY, LB/MMBTU

Unit No. 4 Stack

	Repetition 1	Repetition 2	Repetition 3	Average
April 8, 1991				
Metals				
Chromium	2.22E-005	2.01E-005	1.65E-005	1.96E-005
Copper	1.46E-005	1.16E-005	9.53E-006	1.19E-005
Lead	ND	ND	ND	ND
Manganese	2.10E-005	1.76E-005	2.16E-005	2.01E-005
Mercury	2.00E-007	2.48E-007	1.81E-007	2.10E-007
Nickel	0.00394	0.00353	0.00349	0.00365
Phosphorous	3.40E-005	3.10E-005	2.65E-005	3.05E-005
Selenium	1.56E-005	1.16E-005	1.07E-005	1.26E-005
Silver	5.09E-006	4.08E-006	ND	3.06E-006
Thallium	ND	ND	ND	ND
Vanadium	0.0155	0.0141	0.0140	0.0145
Zinc	4.00E-005	2.98E-005	3.81E-005	3.60E-005
Nitrogen Oxides	0.534	0.556	0.571	0.554
Particulate	0.199	0.155	0.153	0.169
Sulfur Dioxide	4.282	4.214	4.187	4.228
Total Hydrocarbons	0.000897	0.00146	0.000677	0.00101
April 9, 1991				
Nitrogen Oxides	0.466	0.477	0.484	0.476
Particulate	0.195	0.186	0.263	0.215
Sulfur Dioxide	4.159	4.159	4.135	4.151
Total Hydrocarbons	0.00133	0.00151	0.00129	0.00137
April 10, 1991				
Nitrogen Oxides	0.548	0.437	0.549	0.511
Particulate	0.154	0.161	0.147	0.154
Sulfur Dioxide	4.216	4.233	4.206	4.218
Sulfuric Acid Mist (including SO3)	0.00395	0.0101	0.00753	0.00719
Total Hydrocarbons	0.000423	0.000339	0.000678	0.000480

Note: Compliance limits are 0.3 lb/MMBtu and 4.3 lb/MMBtu, for particulate and sulfur dioxide, respectively.

(continued next page)

TABLE 2-1 (continued)

EMISSION RATES SUMMARY, LB/MMBTU

Unit No. 4 Stack

	Repetition 1	Repetition 2	Repetition 3	Average
April 11, 1991				
Nitrogen Oxides	0.437	0.510	0.509	0.485
Particulate	0.189	0.234	0.210	0.211
Sulfur Dioxide	4.196	4.147	4.155	4.166
Total Hydrocarbons	0.000754	0.00115	0.00111	0.00101
April 12, 1991				
Nitrogen Oxides	0.485	0.520	0.518	0.508
Particulate	0.180	0.179	0.174	0.178
Sulfur Dioxide	4.166	4.133	4.154	4.151
Total Hydrocarbons	0.000043	0.000474	0.000517	0.000345

Note: Compliance limits are 0.3 lb/MMBtu and 4.3 lb/MMBtu, for particulate and sulfur dioxide, respectively.

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

June 20, 1990

Mr. Martin A. Smith, Ph.D.
Manager, Environmental Permitting & Programs
Florida Power & Light Company
P.O. Box 078768
West Palm Beach, FL 33407-0768

Dear Mr. Smith:

RE: Orimulsion Test Burn
Sanford Unit #4
PSD-FL-150
AC64-180842

On May 22, 1990, the Department received FP&L's application to construct equipment at the Sanford plant to perform test burns of Orimulsion fuel in Unit #4. The application is deemed incomplete. Additional information is required for further processing of this application.

Within 30 days of receipt of this letter, please respond to the following items of incompleteness:

1. As stated in the application, there was a successful long-term burning of Orimulsion in the 100 MW corner-fired Dalhousie Generating Station Unit 1 in New Brunswick, Canada. Please submit the results of those tests. What were the pollution control devices tested and what were their efficiencies?

2. The requested permitted equipment operating time is 120 full-capacity equivalent burn days when Orimulsion is fired. How much time will each pollution control device spend in operation? Please submit a detailed schedule of testing of the pollution control devices. How long will Unit #4 be burning Orimulsion before the stack emissions are tested? Will the test scale and duration be sufficient to size full-scale equipment or will future tests be necessary?

3. What is the estimated cost to FP&L for the individual components of the proposed pollution control pilot study?

4. What are the model names and expected efficiencies of each of the pollution control devices to be tested?

5. What type of continuous emissions monitors (opacity, SO2, NOX, etc.) will be used on the inlet and outlet pilot test gas streams? Will these be in use the entire time the pilot test control equipment is being operated?

6. What type of continuous emission monitors will be used on the Unit #4 exhaust stack while Orimulsion is being burned? Will these monitors also be used while No. 6 fuel oil is being fired?

7. What is the expected cost of No. 6 fuel oil per BTU during the next year? What is the expected cost of Orimulsion per BTU during the next year?

8. The solid waste generated during the test should go to a lined landfill with a leachate collection system. Is this type of landfill available for disposal of the solid waste?

9. For PSD purposes, potential emission increases from a modification are compared to past actual emissions on a tons per year basis. Why were the potential emissions resulting from any fuel oil burning (which could occur the remainder of the year when Orimulsion is not being burned) not included in the potential emissions?

10. Past actual emissions listed in Table 3-2 do not correspond to values calculated from information submitted in the 1989 annual operating reports. Please explain the discrepancies.

If you have any questions concerning this request for additional information, please contact Cindy Phillips at (904)488-1344.

Sincerely,

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

cc: Kennard F. Kosky, P.E., KBN
Elsa Bishop, FP&L
William Green, Equire, Hopping Boyd Green & Sams
Mark Armentrout, EPA
Chuck Collins, CDist