

Florida Department of Environmental Regulation

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

Bob Martinez, Governor

Dale Twachtman, Secretary

John Shearer, Assistant Secretary

April 12, 1990

Ms. Jewell Harper, Chief
Air Enforcement Branch
U.S. EPA - Region IV
345 Courtland Street, NE
Atlanta, Georgia 30365

Dear Ms. Harper:

As the State of Florida Department of Environmental Regulation acts as EPA's agent in the administration of the PSD and NSPS programs, I am requesting that the EPA evaluate the attached PSD and NSPS determination request from Florida Power and Light for the proposed improvement to it's Putnam Combined Cycle Power Plant. The Department is also evaluating this request.

Please respond to me as soon as possible on your assessment of how the rules and regulations will apply to this proposed project.

Sincerely,

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

CHF/kt

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March 26, 1990

OF COUNSEL

W. ROBERT FOKES

Dale S. Twachtmann, Secretary
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: PSD and NSPS Determination Request

Dear Secretary Twachtmann:

Florida Power & Light (FPL) is proposing to improve its Putnam Combined-Cycle Power Plant to achieve greater reliability, capability and efficiency. These improvements require review by the Department under its New Source Performance Standards (NSPS) and potentially under its Prevention of Significant Deterioration (PSD) responsibilities. FPL has had two preliminary meetings with Clair Fancy and Buck Oven of your staff, and now wishes to formally request a determination from the Florida Department of Environmental Regulation (DER) for the project, pursuant to 40 CFR §60.5. In particular, we seek the Department's concurrence, in view of the proposed work at the Putnam Plant, that the Heat Recovery Steam Generator (HRSG) components of the plant will be "reconstructed" and thus subject to the 40 CFR, Part 60, Subpart Db NSPS, and that the combustion turbine components will not be subject to the 40 CFR, Part 60, Subpart GG NSPS for nitrogen oxides (NO_x). FPL further requests concurrence that the facility will not be subject to PSD review.

BACKGROUND

FPL's Putnam Power Plant consists of two combined-cycle units each comprised of two combustion turbines, two afterburners, and two HRSGs. (See Attachment 1.) The Putnam Plant was the first power plant licensed under Chapter 403, Sections 403.501-403.517, Florida Statutes, the Florida Electrical Power Plant Siting Act (PPSA). Certification under the PPSA was issued in October, 1974. In December, 1975 the plant was issued a NPDES permit from EPA. Commercial operation of the Putnam Plant units began in August, 1977 (Unit 2) and April, 1978 (Unit 1).

Mr. Dale S. Twachtmann
March 26, 1990
Page 2

The Putnam Plant was designed to burn distillate oil, residual oil, and natural gas. The Plant operated exclusively on oil until 1981 when natural gas was added to the fuel mix and when rotor improvements allowed combustion of more distillate oil and natural gas fuel at an improved heat rate and marginally increased power output on the turbine side. The maximum design and maximum potential emission rate, reflecting use of residual oil, remained unchanged as a result of the work done in 1981-82, and actual emissions in terms of both the kg/hr rate and annual emissions decreased, since the plant has primarily operated on gas and distillate oil following the turbine efficiency improvements. DER was nevertheless apprised of the program to burn natural gas as a primary operational fuel, and DER subsequently modified the Site Certification to relax wind speed monitoring requirements when gas was being burned.

PROPOSED WORK

FPL is now proposing a modernization program at the Putnam Plant which would increase the plant's power output at a reduced heat rate. Steam cycle performance will be enhanced by complete tube bundle replacement in the existing HRSGs. A series of components will also be upgraded in the combustion turbines. The project promises to increase base load net output by 29.6 MW per unit, thus raising the total plant capability by 59.2 MW net generation.^{1/} The base load unit heat rate is expected to improve by an average of 542 BTU/kwh, thereby potentially ranking Putnam Plant as number one in the United States for heat rate (efficiency) performance.

The greatest potential regulatory impact on the proposed project is related to nitrogen oxides (NO_x) emissions. If the hardware changes resulted in an increase in short-term or long-term nitrogen oxide (NO_x) emissions from the combustion turbines, stringent NSPS or possibly even more stringent best available control technology (BACT) emission controls might be imposed, thereby making the project

^{1/} It should be noted that these improvements will not require an increase in the maximum operating capacity of the existing electric generators at the plant. See §403.506(2).

Mr. Dale S. Twachtmann
March 26, 1990
Page 3

economically infeasible. FPL proposes to avoid increased NO_x emissions by the installation of a water injection system and the acceptance of a federally enforceable NO_x emissions limitation for the combustion turbines.

REGULATORY ANALYSIS

Your review of this request will involve a determination of the applicability or non-applicability of various NSPS and PSD regulatory requirements. Our analysis of these requirements for the project follows.^{2/}

NSPS

Heat Recovery Steam Generators (HRSGs)

40 CFR, Part 60, Subpart Db is presumed to be applicable for the proposed changes to the Putnam Plant HRSGs because the fixed capital cost of the components being replaced in the HRSGs exceeds 50 percent of the fixed capital cost that would be required to construct comparable entirely new HRSGs. See 40 CFR §60.15.

This letter constitutes notice under 40 CFR §60.15(d), that under the proposed plan the HRSGs will be reconstructed and thus subject to NSPS. It is our understanding that the following standards will apply under Subpart Db:

<u>Pollutant</u>	<u>Emission Standard</u>
Particulate Matter 40 CFR §60.43b	No standard when burning very low sulfur oil. (<0.5% by weight) See 54 Fed. Reg. 51818
Visible Emissions 40 CFR §60.43b(f)	20% opacity, except for one 6-minute period per hour of up to 27% opacity

^{2/} This analysis does not cover the current conditions of site certification, which will be discussed in a subsequent letter.

Mr. Dale S. Twachtmann
March 26, 1990
Page 4

Sulfur Dioxides 40 CFR §60.42b(j)	0.5 lbs/10 ⁶ BTU heat input or 0.5% sulfur by weight
Nitrogen Oxides 40 CFR §60.44b(a)(4)	0.2 lbs/10 ⁶ BTU heat input (gas or distillate oil); 0.4 lbs/10 ⁶ BTU residual oil

The Company will burn only very low sulfur oil (maximum 0.5% sulfur content) or natural gas in the HRSGs. Therefore, the HRSGs will not be subject to performance and compliance testing for sulfur dioxide under 40 CFR §60.45b(j), or emission monitoring requirements for sulfur dioxide under 40 CFR §60.47b(f), provided that fuel receipts are obtained from the fuel supplier which certify that the oil meets the definition of distillate oil as defined in 40 CFR §60.41b. Compliance with the emission limit for nitrogen oxides will be determined by performance tests using procedures in 40 CFR Part 60, Appendix A, Method 20. See 40 CFR §60.46b(f). No continuous monitoring system is required to measure nitrogen oxides. 40 CFR §60.48b(h). The plant will operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system. 40 CFR §60.48b(a).

Combustion Turbines

For the combustion turbines, the potentially applicable standards are found in 40 CFR Part 60, Subpart GG, which contains NSPS for NO_x and SO₂. Subpart GG, does not currently apply to the Putnam Plant because construction of the combustion turbines commenced before October 3, 1977. Subpart GG could apply to the turbines if the proposed changes caused them to be "reconstructed" sources (see above discussion for HRSGs). However, on the basis of manufacturer's price estimates, fixed capital cost of those components that would be replaced for each combustion turbine as part of the modernization program is approximately \$2.8 million, whereas the cost of a comparable entirely new combustion turbine is estimated to range between \$15 and \$20 million dollars. See Attachment 2 (depicting the components included in the cost analysis). The capital cost for the combustion turbines work is less than 20 percent of the replacement value, well below the 50 percent range needed to constitute reconstruction.

Mr. Dale S. Twachtmann
March 26, 1990
Page 5

Under EPA regulation 40 CFR §60.14, adopted by reference in Florida Administrative Code Rule 17-2.660(2)(f), a source will be "modified" if physical or operational changes to it would increase, or initiate for the first time, emissions (in kg/hr) to the atmosphere of any pollutant to which a standard applies; NSPS would be triggered for each such pollutant.

Anticipated differences in the combustion turbine emissions at the Putnam Plant are depicted in Table 1. (Table 2, Attachment 3, provides estimated short-term emissions for the proposed changes for all pollutants.) Water injection, designed to achieve a 100 ppm NO_x emissions limit, will preclude any increase in nitrogen oxides emissions after the proposed changes. The installation of water injection capability to reduce air pollutants is exempt from the definition of modification under 40 CFR §60.15(e)(5).

Table 1. Emissions Rates (kg/hr) Per Combustion Turbine Before and After the Proposed Changes

<u>FUEL</u>	<u>POLLUTANT</u>	<u>BEFORE</u>	<u>AFTER</u>
Residual Oil	NO _x	433	433
	SO ₂	279	279
Distillate Oil	NO _x	388	191
	SO ₂	204	225
Natural Gas	NO _x	233	177
	SO ₂	0.26	0.28

The proposed changes would theoretically increase the short-term (kg/hr) emission rate for SO₂. Therefore, the combustion turbines will be subject to the 40 CFR Part 60, Subpart GG NSPS standard for SO₂ which limits the sulfur content of fuel to 0.8% sulfur by weight. The combustion turbines share a common fuel storage with the HRSG's afterburners. The 40 CFR Part 60, Subpart Db, SO₂ NSPS standard applicable to the reconstructed HRSGs will require FPL to reduce its currently allowed fuel sulfur content from 0.7% to 0.5% (see HRSG discussion above). Thus, the combustion turbines will meet the Subpart GG SO₂ standard.

Mr. Dale S. Twachtmann
March 26, 1990
Page 6

FPL will monitor the sulfur fuel content of its Putnam Plant fuel by maintaining fuel receipts from the fuel supplier as required under Subpart Db.

PSD

Although no PSD permit was required for the construction of the Putnam Plant because construction commenced prior to the June 1, 1975 applicability date of the PSD regulations, current DER regulations require a PSD permit when a major facility is modified such that it experiences a significant net increase in emissions of any pollutant regulated under the Clean Air Act. Fla. Admin. Code R. 17-2.500(2)(d)(4)(ii)(1989)^{3/}

In order to determine whether a source will experience a significant net increase in actual emissions of a regulated pollutant, emissions from the entire plant site before and after the proposed work must be examined on a tons-per-year basis. PSD review will only be triggered for those pollutants for which the source will experience a significant net emission increase, after taking into account contemporaneous creditable increases and decreases in actual emissions. Fla. Admin. Code R. 17-2.500(2)(e). The pre-alteration emission rate for the Putnam Plant is listed in Table 3, Attachment 4. The pre-alteration actual emission rate was calculated by computing the average rate, in tons per year, at which the Putnam Plant actually emitted the pollutant during the two-year period preceding the proposed change (1988-89). Actual operating conditions and fuel usage were used in the computation. Also displayed in Table 3. for comparison are the emissions that would have resulted if 100% residual oil had been burned in 1988-89;^{4/} the proposed changes will not alter these emissions. Also

^{3/} See the definition of "modification" at Fla. Admin. Code R. 17-2.100(126) (1989) and "significant net emissions increase" at Fla. Admin. Code R. 17-2.500(2)(e)(2) (1989) and Table 500-2, Regulated Air Pollutants - Significant Emission Rates.

^{4/} At this time, the Company has no plans to burn residual oil in the future, though it wishes to retain this option.

Mr. Dale S. Twachtmann
March 26, 1990
Page 7

displayed in Table 3. are the potential actual emissions of the plant for distillate oil and natural gas usage after the proposed work, assuming that reductions in NO_x emissions are made federally enforceable. Fla. Admin. Code R. 17-2.500(2)(e)4.c.(ii)(1989). The emissions were calculated assuming the same capacity factor and fuel use conditions before and after the proposed work. This approach is consistent with the recent holding of Wisconsin Electric Power Co. v. Reilly, 893 F.2d 901, 918 n.14 (7th Cir. 1990).

As Table 3. shows, NO_x emissions will decrease somewhat after the change because of water injection control. The emissions of other regulated pollutants will not significantly increase.

To further conservatively depict the effects of the proposed work to the Putnam Plant, the plant's theoretical maximum potential to emit regulated pollutants from the three fuels, before and after the proposed work, is displayed in Table 4, Attachment 5. Also, note that the plant will actually observe a decrease in emissions per megawatt as a result of being operated at a higher efficiency rate. Table 5, Attachment 6, displays the emissions rates in tons/MW of electricity produced. Table 5. shows that the proposed project will allow FPL to produce more electricity while decreasing pollutant emissions per MW.

CONCLUSION

FPL remains committed to providing its customers with improved reliability, capability and efficiency and to maintaining its concern for the environment. The changes that FPL is proposing for the Putnam Plant provide an increase in generating capability and efficiency, a decrease in the emission rate of NO_x, and minimal increases in the emission rates of other pollutants. Indeed, with water injection, the maximum NO_x emissions are projected to decrease by approximately 20% and 50% respectively for natural gas and distillate oil. FPL therefore respectfully requests that DER issue a written determination concurring with our conclusions that the changes proposed at the Putnam Plant:

Mr. Dale S. Twachtmann
March 26, 1990
Page 8

(a) would constitute reconstruction of the HRSGs, thereby triggering the applicability of 40 CFR, Part 60, Subpart Db to the HRSGs;

(b) would not trigger the applicability of 40 CFR, Part 60, Subpart GG to the combustion turbines, provided that:

(i) NO_x controls (water injection) are installed so as to avoid any increase in the maximum short term emission rate (kg/hr); and

(ii) the sulfur content in distillate oil burned is limited to 0.5% by weight; and

(c) Would not trigger PSD/BACT review for the plant, provided that a federally enforceable NO_x emissions limit based upon water injection is imposed.

In view of the increased generating capacity needs projected for the State of Florida by 1992, FPL will need all generating units operational to meet demand. FPL would greatly appreciate your response to this request within the next 45 days, in order to allow construction to begin as soon as possible and thus allow the units to return to service in time to meet the projected demand. In the interim, if you have any questions or would like more information about the project, please contact us.

Thanks for your assistance in this matter.

Respectfully submitted,

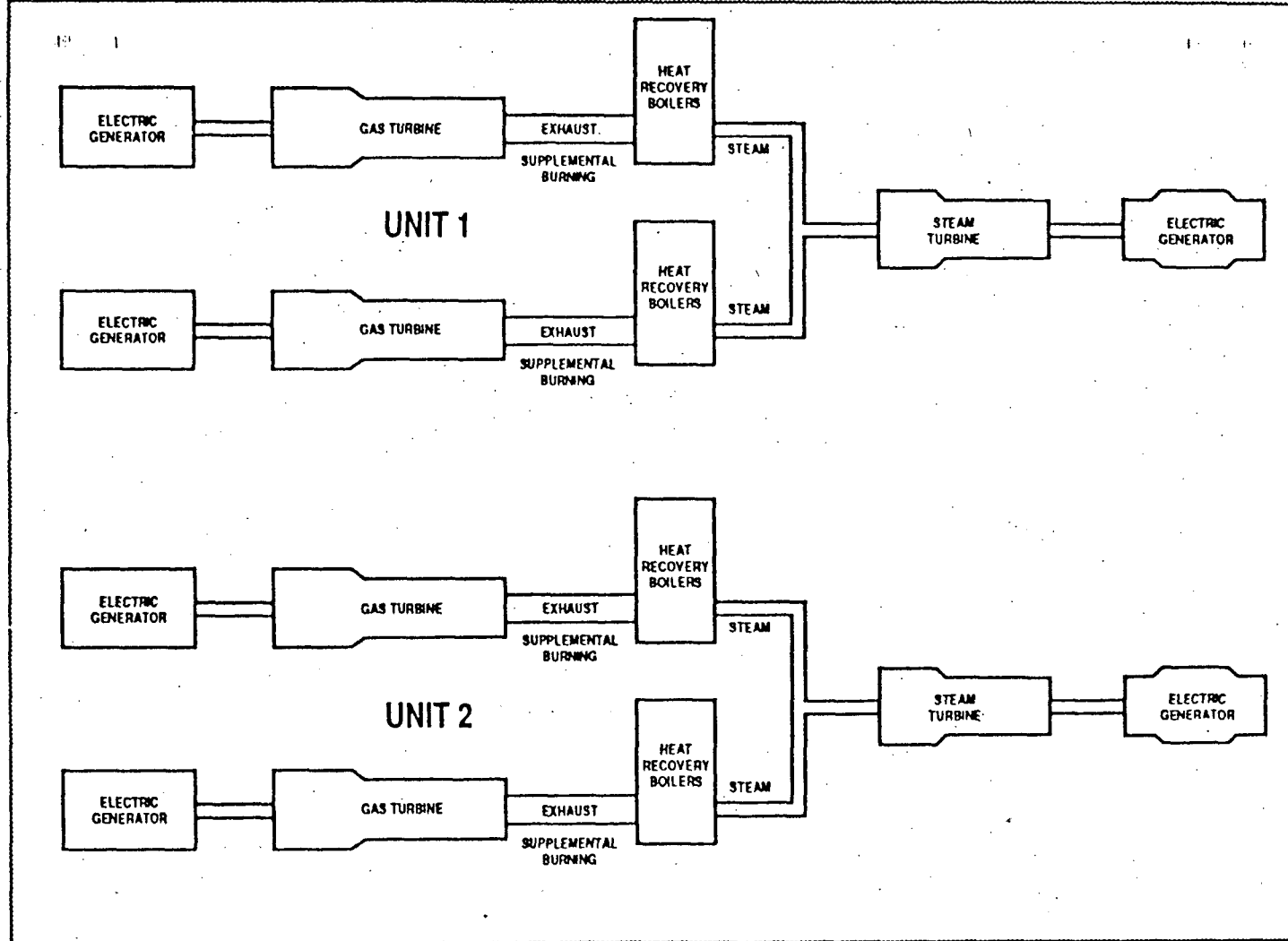


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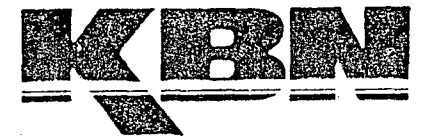
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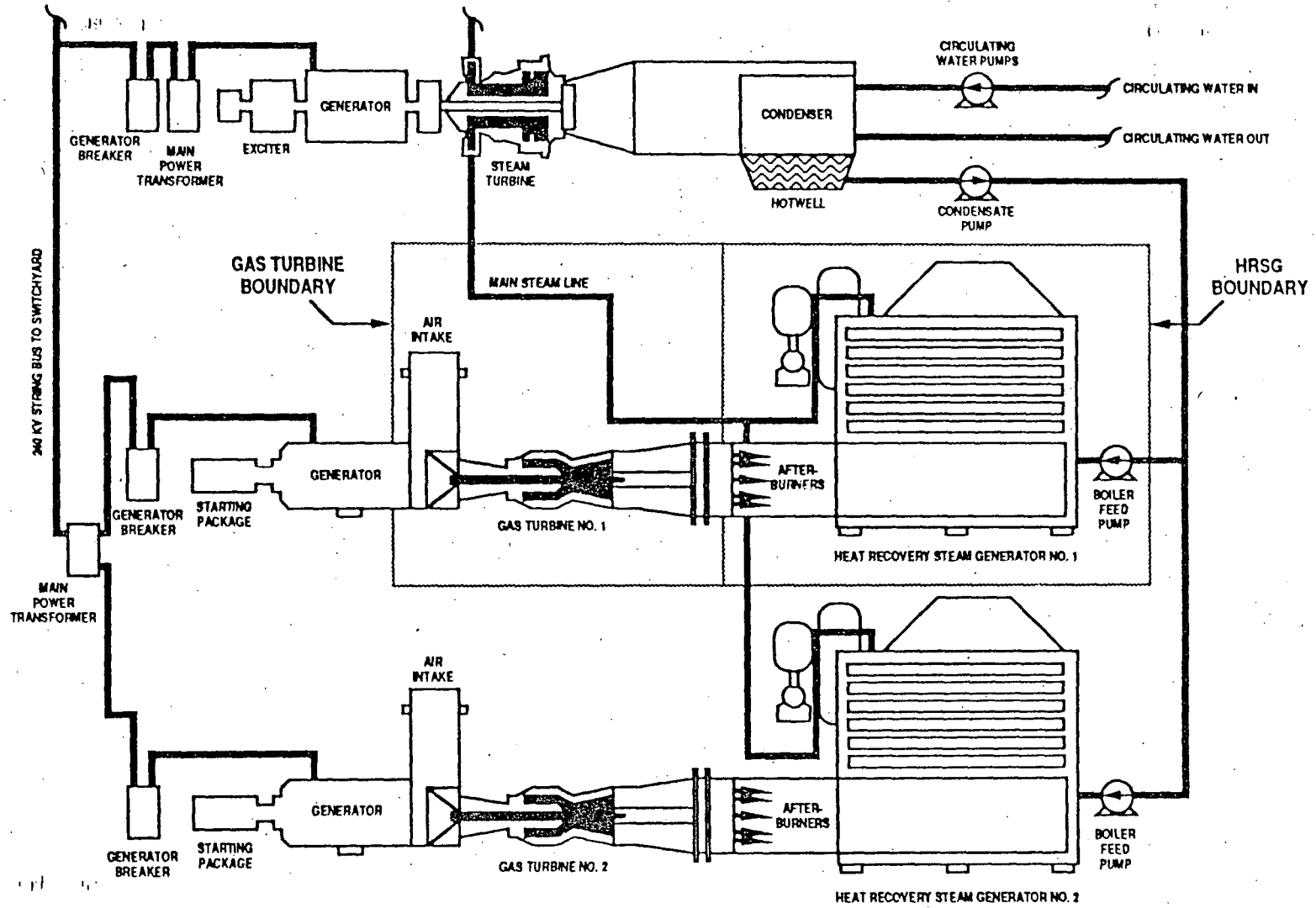
cc: Mr. Hamilton S. Oven, Jr., P.E., DER
Mr. Clair Fancy, DER
Mr. Steve Smallwood, DER



Attachment 1

FPL PUTNAM COMBINED CYCLE POWER PLANT
(Block Diagram)





Attachment 2

FPL PUTNAM PLANT COMBINED CYCLE UNIT



Table 2. Estimated Emissions for Putnam Plant Changes

	CT/Natural Gas		CT/Fuel Oil		HRSG/Natural Gas		HRSG/Fuel Oil		Total - Before		Total - After	
	Before	After	Before	After	Before	After	Before	After	Natural Gas	Oil	Natural Gas	Oil
Fuel Flow (lb/hr)	44,100	47,160	47,200	52,020	8,140	6,522	8,516	6,923	52,240.0	55,716.0	53,682.0	58,943.0
Heat Input (mmBtu/hr)	968.3	1035.4	910.8	1003.6	178.7	143.2	164.3	133.8	1,147.0	1,074.9	1,178.6	1,157.2
NOx - lb/hr	490	390	853.3	420.6	17.9	14.3	23.9	19.4	507.9	877.2	404.3	440
- kg/hr	223	177	388	191	8	7	11	9				
SO2 - lb/hr	0.57	0.61	448.4	494.2	0.105	0.084	80.9	65.8	0.67	529.30	0.69	560.00
	0.26	0.28	204	225								
CO - lb/hr	6	7	5	14	7.36	5.90	5.91	4.81	13.36	10.91	12.90	18.81
PM10 - lb/hr	1	1	8	9	0.92	0.74	2.37	1.92	1.92	10.37	1.74	10.92
VOC - lb/hr	1	1	1	1	0.26	0.21	0.24	0.19	1.26	1.24	1.21	1.19
H2SO4 - lb/hr	0.046	0.049	36.1	39.8	0.008	0.007	6.5	5.3	0.05	42.62	0.06	45.09
Pb - lb/hr	0	0	0.0081	0.0089	0	0	0.0015	0.0012	0.000	0.010	0.000	0.010
Be - lb/hr	0	0	0.0023	0.0025	0	0	0.0004	0.0003	0.000	0.003	0.000	0.003
Hg - lb/hr	0.0110	0.0118	0.0027	0.0030	0.0020	0.0016	0.0005	0.0004	0.013	0.003	0.013	0.003
Fl - lb/hr	0	0	0.028	0.031	0	0	0.005	0.004	0.000	0.034	0.000	0.036
As - lb/hr	0	0	0.0038	0.0042	0	0	0.0007	0.0006	0.000	0.005	0.000	0.005

Note: Based on manufacturer design data, AP-42, or other EPA referenced documents.

Table 3. Actual Emissions in tons/year

Pollutant	RESIDUAL OIL**	BEFORE		AFTER *		INCREASE/(DECREASE)	
		NATURAL GAS	DISTILLATE OIL	NATURAL GAS	DISTILLATE OIL	NATURAL GAS	DISTILLATE OIL
Nitrogen Oxides	9,322	4,733	69.1	3,800	35.2	(933)	(33.9)
Sulfur Dioxide	7,728	6.3	42.7	6.5	44.8	0.2	3.1
Carbon Monoxide	98.6	125	0.86	121	1.5	(4)	0.65
PM ₁₀	702	17.9	0.82	16.3	0.87	(1.5)	0.06
VOC	16.7	11.7	0.097	11.3	0.095	(0.4)	(0.002)
Sulfuric Acid Mist	622	0.51	3.36	0.53	3.61	0.02	0.25
Lead	0.26	0	0.00075	0	0.00081	0	0.00006
Beryllium	0.039	0	0.00021	0	0.00023	0	0.00002
Mercury	0.030	0.122	0.00025	0.126	0.00027	0.004	0.00002
Flouride	1.063	0	0.00265	0	0.00285	0	0.00020
Arsenic	0.78	0	0.00036	0	0.00038	0	0.00003

* Water injection to 100 ppm gas/oil + allowance for FBN of 0.015% in oil
 Water injected gas - 7,075 lb/hr, 0.15 lb H₂O/lb Fuel
 oil - 23,410 lb/hr, 0.45 lb H₂O/lb Fuel

** Not changed by proposed work.

Table 4. Potential Emissions in tons/year (8760 hrs/yr)

Pollutant	RESIDUAL OIL**	BEFORE		AFTER *		INCREASE/(DECREASE)	
		NATURAL GAS	DISTILLATE OIL	NATURAL GAS	DISTILLATE OIL	NATURAL GAS	DISTILLATE OIL
Nitrogen Oxides	17,227	8,898	15,368	7,683	7,709	(1,815)	(7,659)
Sulfur Dioxide	14,282	11.8	9,273	12.2	9,811	0.4	538
Carbon Monoxide	182	234	191	226	330	(8)	139
PM ₁₀	1,297	34	182	30	191	(4)	9
VOC	30.9	22.0	21.7	21.1	20.9	(0.9)	(0.8)
Sulfuric Acid Mist	1,150	0.95	747	0.98	790	0.03	43
Lead	0.48	0	0.168	0	0.177	0	0.009
Beryllium	0.073	0	0.047	0	0.050	0	0.003
Mercury	0.055	0.228	0.057	0.235	0.060	0.007	0.003
Flouride	1.965	0	0.589	0	0.623	0	0.034
Arsenic	0.328	0	0.079	0	0.084	0	0.004

* Water injection to 100 ppm gas/oil + allowance for FBN of 0.015% in oil
 Water injected gas - 7,075 lb/hr, 0.15 lb H₂O/lb Fuel
 oil - 23,410 lb/hr, 0.45 lb H₂O/lb Fuel

** Not changed by proposed work.

Table 5. Emission Rate (Tons/Mw)

<u>Pollutant</u>	<u>BEFORE</u>			<u>AFTER</u>	
	<u>RESIDUAL OIL*</u>	<u>NATURAL GAS</u>	<u>DISTILLATE OIL</u>	<u>NATURAL GAS</u>	<u>DISTILLATE OIL</u>
Nitrogen Oxides	9.64	4.97	8.59	3.46	3.77
Sulfur Dioxide	7.99	0.0066	5.19	0.0059	4.79
Carbon Monoxide	0.102	0.131	0.107	0.110	0.161
PM ₁₀	0.726	0.0188	0.1016	0.0149	0.0935
VOC	0.017	0.0123	0.0121	0.0103	0.0102
Sulfuric Acid Mist	0.644	0.0005	0.4179	0.0005	0.3861
Lead	0.00027	0	0.00009	0	0.00009
Beryllium	0.00004	0	0.00003	0	0.00002
Mercury	0.00003	0.00013	0.00003	0.00011	0.00003
Flouride	0.00110	0	0.00033	0	0.00030
Arsenic	0.00018	0	0.00004	0	0.00004

* Not changed by proposed work.