

State of Florida
Department of Environmental Protection
Notice of Permit

In the matter of an
Application for Permit by:

DER File No. AC49-205703
PSD-FL-182


Mr. A. K. Sharmer
Director of Power Supply
Kissimmee Utility Authority
1701 West Carroll Street
Kissimmee, Florida 34741

Enclosed is Permit Number AC49-205703 to construct a 40 MW simple cycle combustion turbine (SCCT) and a 120 MW combined cycle combustion turbine (CCCT). The combustion turbines will have the capability to fire either natural gas or No. 2 fuel oil. Water injection or low NO_x combustors will be used to control nitrogen oxides (NO_x) emissions and low sulfur fuel (0.05% S) will be fired to control sulfur dioxide (SO₂) emissions. The CCCT will intermittently operate in a simple cycle when the HRSG or steam turbine is down for maintenance and/or repair. These two combustion gas turbines are located in Kissimmee, Osceola County, Florida.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION



C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed by certified mail before the close of business on 10-24-95 to the listed persons.

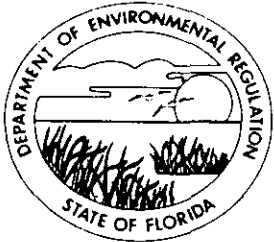
Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to
§120.52(11), Florida Statutes,
with the designated Department
Clerk, receipt of which is hereby
acknowledged.


Clerk
10-24-95
Date

Copies furnished to:

Mr. Charles Collins, CD



Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Virginia B. Wetherell, Secretary

PERMITTEE:

Kissimmee Utility Authority
1701 West Carroll Street
Kissimmee, Florida 34741

Permit Number: AC49-205703
PSD-FL-182

Expiration Date: March 31, 1995
County: Osceola

Latitude/Longitude: 28°16'40"N
81°30'42"W

Project: A 120 MW Combined
Cycle Turbine and a 40 MW Simple
Cycle Turbine

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-209 through 17-297. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

Kissimmee Utility Authority proposes to operate a 40 MW simple cycle combustion turbine (SCCT) and a 120 MW combined cycle combustion turbine (CCCT) consisting of one combustion turbine, one steam turbine, one heat recovery steam generator and ancillary equipment. This facility is located near Intercession City, Osceola County, Florida. The UTM coordinates are Zone 17, 447.722 km East and 3127.685 km North.

The sources shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. Kissimmee Utility Authority (KUA) applications received on November 15, 1991, and June 2, 1992.
2. Department's letter dated June 30, 1992.
3. KUA's letter received on July 30, 1992.
4. KUA's letters received on August 17 and October 8, 1992.

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Expiration Date: March 31, 1995

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

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7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

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10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (x) Determination of Best Available Control Technology (BACT)
- (x) Determination of Prevention of Significant Deterioration (PSD)
- (x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
- b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
- c. Records of monitoring information shall include:
 - the date, exact place, and time of sampling or measurements;

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- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

Emission Limits

1. The maximum allowable emissions from this source shall not exceed the emission rates listed in Tables 1 and 2.
2. Visible emissions during startup, shutdown, or period of part load operation shall not exceed 20% opacity during any 6-minute period. At full load operation, visible emissions shall not exceed 10% opacity.

Operating Rates

3. This source is allowed to operate continuously (8760 hours per year).
4. This source is allowed to use natural gas as the primary fuel and low sulfur No. 2 distillate oil as the secondary fuel up to 1,000 hours per year. Distillate fuel oil No. 2 (0.05% S) shall not be burned if natural gas is available.
5. The permitted materials and utilization rates for the combined cycle gas turbine shall not exceed the values as follows:

40 MW Simple Cycle Turbine

- a) The maximum heat input of 371 MMBtu/hr (LHV) at ISO conditions (base load) for distillate fuel oil No. 2.
- b) The maximum heat input of 367 MMBtu/hr (LHV) at ISO conditions (base load) for natural gas.

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120 MW Combined Cycle Turbine

- a) The maximum heat input of 928 MMBtu/hr (LHV) at ISO conditions (base load) for distillate fuel oil No. 2.
- b) The maximum heat input of 869 MMBtu/hr (LHV) at ISO conditions (base load) for natural gas.

6. Any change in the method of operation, equipment or operating hours shall be submitted to DER's Bureau of Air Regulation.

7. Any other operating parameters established during compliance testing and/or inspection that will ensure the proper operation of this facility may be included in the operating permit.

Compliance Determination

8. Compliance with the NO_x, SO₂, CO, PM, PM₁₀, and VOC standards shall be determined (while operating at 95-100% of the permitted maximum heat rate input corresponding to the particular ambient conditions) within 180 days of initial operation of the maximum capability of the unit and annually thereafter, by the following reference methods as described in 40 CFR 60, Appendix A (July, 1991 version) and adopted by reference in F.A.C. Rule 17-2.700.

- Method 1 Sample and Velocity Traverses
- Method 2 Volumetric Flow Rate
- Method 3 Gas Analysis
- Method 5 Determination of Particulate Emissions from
or
Stationary Sources
- Method 17
- Method 9 Visual Determination of the Opacity of Emissions
from Stationary Sources
- Method 8 Determination of Sulfuric Acid Mist and Sulfur
Dioxide Emissions from Stationary Sources (for fuel
oil firing only)
- Method 10 Determination of Carbon Monoxide Emissions from
Stationary Sources
- Method 20 Determination of Nitrogen Oxides, Sulfur Dioxide,
and Diluent Emissions from Stationary Gas Turbines
- Method 25A Determination of Total Gaseous Organic
Concentrations Using a Flame Ionization Analyzer

Other DER approved methods may be used for compliance testing after prior Departmental approval.

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9. Method 5 or Method 17 must be performed on each unit to determine the initial compliance status of particulate matter emissions of the unit. Thereafter, the opacity emissions test may be used unless 10% opacity is exceeded.

10. Compliance with the SO₂ emission limit can also be determined by calculations based on fuel analysis using ASTM D4294 for the sulfur content of liquid fuels and ASTM D3246-81 for sulfur content of gaseous fuel.

11. Trace elements of Beryllium (Be) shall be tested during initial compliance test using EMTIC Interim Test Method. As an alternative, Method 104 may be used; or Be may be determined from fuel sample analysis using either Method 7090 or 7091, and sample extraction using Method 3040 as described in the EPA solid waste regulations SW 846.

12. Mercury (Hg) shall be tested during initial compliance test using EPA Method 101 (40 CFR 61, Appendix B) or fuel sampling analysis using methods acceptable to the Department.

13. During performance tests, to determine compliance with the allowable NO_x standard, measured NO_x emissions at 15 percent oxygen will be adjusted to ISO ambient atmospheric conditions by the following correction factor:

$$NO_x = (NO_x \text{ obs}) \frac{(P_{\text{ref}})^{0.5}}{P_{\text{obs}}} e^{19 (H_{\text{obs}} - 0.00633)} \left(\frac{288^\circ\text{K}}{T_{\text{AMB}}}\right)^{1.53}$$

where:

NO_x = Emissions of NO_x at 15 percent oxygen and ISO standard ambient conditions.

NO_x obs = Measured NO_x emission at 15 percent oxygen, ppmv.

P_{ref} = Reference combustor inlet absolute pressure at 101.3 kilopascals (1 atmosphere) ambient pressure.

P_{obs} = Measured combustor inlet absolute pressure at test ambient pressure.

H_{obs} = Specific humidity of ambient air at test.

e = Transcendental constant (2.718).

T_{AMB} = Temperature of ambient air at test (°K).

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14. Test results will be the average of 3 valid runs. The Central District office will be notified at least 30 days in writing in advance of the compliance test(s). The sources shall operate between 95% and 100% of permitted capacity during the compliance test(s) as adjusted for ambient temperature. Compliance test results shall be submitted to the Central District office no later than 45 days after completion.

15. The permittee shall comply with the following by 1/1/98:

a) For the combined cycle unit (PG7111EA), if the 15 (gas)/42 (oil) ppmv emission rates cannot be met by 1/1/98, SCR will be installed. Hence, the permittee shall install a duct module suitable for future installation of SCR equipment.

b) For the simple cycle unit (LM6000), the manufacturer will attempt to achieve a maximum NO_x emission level of 15 (gas)/42 (oil) ppmv by 1/1/98. Should this level of control not be achieved when the compliance demonstration stack tests are performed, the permittee must provide the Department with expected compliance dates which will be updated annually. After 1/1/98, if the compliance schedule has not been met, the Department may require SCR be installed since the exhaust temperature has an acceptable range for SCR installation.

16. The permittee shall comply with the following requirements:

(a) Install, calibrate, maintain, and operate a continuous emission monitor in each stack to measure and record the nitrogen oxides emissions from each source. The continuous emission monitor must comply with 40 CFR 60, Appendix B, Performance Specification 2 (July 1, 1992);

(b) A continuous monitoring system shall be installed to monitor and record the fuel consumption on each unit. While water injection is being utilized for NO_x control, the water to fuel ratio at which compliance is achieved shall be incorporated into the permit and shall be continuously monitored. The system shall meet the requirements of 40 CFR Part 60, Subpart GG;

(c) In addition, literature on equipment selected shall be submitted as it becomes available. A CT-specific graph of the relationship between NO_x emissions and water injection and also another of ambient temperature and heat inputs to the CT shall be submitted to DER's Central District office and the Bureau of Air Regulation.

17. Sulfur and nitrogen content and lower heating value of the fuel being fired in the combustion turbines shall be determined as specified in 40 CFR 60.334(b). The records of fuel oil usage shall

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be kept by the company for a two-year period for regulatory agency inspection purposes. For sulfur dioxide, periods of excess emissions shall be reported if the fuel being fired in the gas turbine exceeds 0.05 percent sulfur by weight.

Rule Requirements

18. This source shall comply with all applicable provisions of Chapter 403, Florida Statutes, Chapters 17-209 through 17-297, Florida Administrative Code and 40 CFR (July, 1991 version).
19. The sources shall comply with all requirements of 40 CFR 60, Subpart GG, and F.A.C. Rule 17-296.800, Standards of Performance for Stationary Gas Turbines.
20. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting requirements and regulations (F.A.C. Rule 17-210.300(1)).
21. This source shall be in compliance with all applicable provisions of F.A.C. Rules 17-210.650: Circumvention; 17-210.700: Excess Emissions; 17-296.800: Standards of Performance for New Stationary Sources (NSPS); 17-297: Stationary Sources Emission Monitoring; and, 17-4.130: Plant Operation-Problems.
22. If construction does not commence within 18 months of issuance of this permit, then the permittee shall obtain from DER a review and, if necessary, a modification of the control technology and allowable emissions for the unit(s) on which construction has not commenced (40 CFR 52.21(r)(2)).
23. Quarterly excess emission reports, in accordance with the July 1, 1992 version of 40 CFR 60.7 and 60.334 shall be submitted to DER's Central District office.
24. Fugitive dust emissions, during the construction period, shall be minimized by covering or watering dust generation areas.
25. Pursuant to F.A.C. Rule 17-210.300(2), Air Operating Permits, the permittee is required to submit annual reports on the actual operating rates and emissions from this facility. These reports shall include, but are not limited to the following: sulfur, nitrogen contents and the lower heating value of the fuel being fired, fuel usage, hours of operation, air emissions limits, etc. Annual reports shall be sent to the Department's Central District office by March 1 of each calendar year.

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26. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090).

27. An application for an operation permit must be submitted to the Central District office at least 90 days prior to the expiration date of this construction permit. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rules 17-4.055 and 17-4.220).

Issued this 7 day
of April, 1993

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Virginia B. Wetherell
Virginia B. Wetherell
Secretary

**KISSIMMEE UTILITY AUTHORITY - AC49-205703 (PSD-FL-182)
40 MW SIMPLE CYCLE GAS TURBINE**

Table 1 - Allowable Emission Rates

Pollutant	Fuel ^A	Allowable Emission ^C Standard/Limitation	Basis
NO _x	Gas	15 ppmvd @ 15% O ₂ & ISO (22 lbs/hr; 90.86 TPY) ^B	BACT
	Gas	25 ppmvd @ 15% O ₂ & ISO (36 lbs/hr; 148.68 TPY)	BACT
	Oil*	42 ppmvd @ 15% O ₂ & ISO (63 lbs/hr; 15.75 & 31.5 TPY)	BACT
	Oil**	42 ppmvd @ 15% O ₂ & ISO (63 lbs/hr; 275.9 TPY)	
CO	Gas	30 ppmvd (40 lbs/hr; 165.2 TPY)	BACT
	Oil*	63 ppmvd (76 lbs/hr; 19 & 38 TPY)	BACT
	Oil**	63 ppmvd (76 lbs/hr; 332.9 TPY)	
VOC	Gas	1.4 lbs/hr; 5.8 TPY	BACT
	Oil*	3 lbs/hr; 0.75 & 1.5 TPY	BACT
	Oil**	3 lbs/hr; 13.1 TPY	
PM ₁₀	Gas	0.0245 lb/MMBtu	BACT
	Oil	0.0323 lb/MMBtu	BACT
SO ₂	Gas	nil	BACT
	Oil	20 lbs/hr; 5.0 & 10 TPY	BACT
	Oil**	20 lbs/hr; 87.6 TPY	
H ₂ SO ₄	Gas	nil	BACT
	Oil*	2.2 lbs/hr; 0.55 & 1.1 TPY	BACT
	Oil**	2.2 lbs/hr; 9.6 TPY	
Opacity	Gas	10% opacity ^D	BACT
	Oil	10% opacity ^D	BACT
Hg	Oil	3.1 x 10 ⁻⁶ lb/MMBtu	Appl.
As	Oil	4.2 x 10 ⁻⁶ lb/MMBtu	Appl.
Be	Oil	2.5 x 10 ⁻⁶ lb/MMBtu	BACT
Pb	Oil	2.8 x 10 ⁻⁵ lb/MMBtu	Appl.

A) Fuel: Natural Gas: Emissions are based on 8260 hours per year operating time.

Fuel: No. 2 Distillate Fuel Oil (0.05% S):

* Emissions are based on 500 and 1000 hours per year operating time.

** Emissions are based on 8760 hours per year burning oil. Continuous oil burning (8760 hrs/yr) is not allowed unless natural gas is not available.

B) The NO_x maximum limit will be lowered to 15 ppm by 1/1/98 using appropriate combustion technology improvements. Should this level of control not be achieved when the compliance demonstration stack tests are performed, the permittee must provide the Department with the expected compliance dates which will be updated annually. After 1/1/98, if the compliance schedule has not been met, the Department may require SCR be installed since the exhaust temperature has an acceptable range for SCR installation.

C) Emission rates are based on 100% load and at ISO conditions.

D) 10% opacity at full load conditions.

**KISSIMMEE UTILITY AUTHORITY - AC49-205703 (PSD-FL-182)
120 MW COMBINED CYCLE GAS TURBINE**

Table 2 - Allowable Emission Rates

Pollutant	Fuel ^A	Allowable Emission ^C		Basis
		Standard/Limitation		
NO _x	Gas	15 ppmvd @ 15% O ₂ & ISO (53 lbs/hr; 219 TPY) ^B		BACT
	Gas	25 ppmvd @ 15% O ₂ & ISO (98 lbs/hr; 405 TPY)		BACT
	Oil*	42 ppmvd @ 15% O ₂ & ISO (170 lbs/hr; 43 & 85 TPY)		BACT
	Oil**	42 ppmvd @ 15% O ₂ & ISO (170 lbs/hr; 745 TPY)		
CO	Gas	20 ppmvd (54 lbs/hr; 223 TPY)		BACT
	Oil*	20 ppmvd (65 lbs/hr; 16 & 32.5 TPY)		BACT
	Oil**	20 ppmvd (65 lbs/hr; 285 TPY)		
VOC	Gas	2.0 lbs/hr; 8.3 TPY		BACT
	Oil*	5 lbs/hr; 1.3 & 2.5 TPY		BACT
	Oil**	5 lbs/hr; 21.9 TPY		
PM ₁₀	Gas	0.0100 lb/MMBtu		BACT
	Oil	0.0162 lb/MMBtu		BACT
SO ₂	Gas	nil		BACT
	Oil*	52 lbs/hr; 13 & 26 TPY		BACT
	Oil**	52 lbs/hr; 228 TPY		
H ₂ SO ₄	Gas	nil		BACT
	Oil*	5.72 lbs/hr; 1.4 & 2.86 TPY		BACT
	Oil**	5.72 lbs/hr; 25.1 TPY		
Opacity	Gas	10% opacity ^D		BACT
	Oil	10% opacity ^D		BACT
Hg	Oil	3.0 x 10 ⁻⁶ lb/MMBtu		Appl.
As	Oil	4.2 x 10 ⁻⁶ lb/MMBtu		Appl.
Be	Oil	2.5 x 10 ⁻⁶ lb/MMBtu		BACT
Pb	Oil	2.8 x 10 ⁻⁵ lb/MMBtu		Appl.

A) Fuel: Natural Gas: Emissions are based on 8260 hours per year operating time.

Fuel: No. 2 Distillate Fuel Oil (0.05% S):

* Emissions are based on 500 and 1000 hours per year operating time.

** Emissions are based on 8760 hours per year burning oil. Continuous oil burning (8760 hrs/yr) is not allowed unless natural gas is not available.

B) The NO_x maximum limit will be lowered to 15 ppm by 1/1/98 using appropriate combustion technology improvements or SCR.

C) Emission rates are based on 100% load and at ISO conditions.

D) 10% opacity at full load conditions.

Best Available Control Technology (BACT) Determination
 Kissimmee Utility Authority
 Osceola County
 PSD-FL-182

The applicant proposes to install two combustion turbine generators at their facility near Intercession City, Osceola County. These generator systems will consist of: 1) one nominal 80 megawatt (MW) General Electric PG7111EA combined cycle combustion turbine (CCCT), with exhaust through a heat recovery steam generator (HRSG), which will be used to power a nominal 40 MW steam turbine and 2) a 40 MW General Electric LM6000 simple cycle combustion turbine (SCCT).

The PG7111EA combustion turbine will be capable of operating on a combined and a simple cycle mode. The LM6000 will operate on a simple cycle mode. The applicant has requested to burn natural gas or fuel oil No. 2, with a 0.05 percent sulfur content, on a continuous basis (8,760 hrs/year). The applicant has indicated the maximum annual tonnage of regulated air pollutants emitted from the facility based on 100 percent capacity factor, ISO conditions, and type of fuel fired to be as follows:

Pollutant	Emissions (TPY)				PSD Significant Emission Rate (TPY)
	Oil		Gas		
	PG7111EA	LM6000	PG7111EA	LM6000	
NO _x	744.6	275.9	429.2	157.7	40
SO ₂	227.8	87.6	nil	nil	40
PM/PM ₁₀	65.7	52.6	30.7	39.4	25/15
CO	284.7	332.9	236.5	175.2	100
VOC	21.9	13.1	8.8	6.1	40
H ₂ SO ₄	25.1	9.6	nil	nil	7
Be	0.0099	0.0035	---	---	0.0004
Hg	0.012	0.005	---	---	0.1
Pb	0.044	0.141	---	---	0.6

Florida Administrative Code (F.A.C.) Rule 17-2.500(2) (f) (3) requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in the previous table.

Date of Receipt of a BACT Application

June 2, 1992

BACT Determination Requested by the Applicant

<u>Pollutant</u>	<u>Proposed Limits</u>
NO _x	25 ppmvd @ 15% O ₂ (natural gas burning) 42 ppmvd @ 15% O ₂ (for oil firing) PG7111(EA) Control Technology: Low NO _x Burners GE LM6000 Control Technology: Water Injection

SO₂ 0.3% sulfur by weight (but limited to 0.05% sulfur
for modeling purposes)

CO, VOC Combustion Control

PM/PM₁₀ Combustion Control

BACT Determination Procedure

In accordance with Florida Administrative Code Chapter 17-296, Air Pollution, this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that in making the BACT determination the Department shall give consideration to:

- (a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).
- (b) All scientific, engineering, and technical material and other information available to the Department.
- (c) The emission limiting standards or BACT determinations of any other state.
- (d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in question, than the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

The air pollutant emissions from combined cycle power plants can be grouped into categories based upon what control equipment and techniques are available to control emissions from these facilities. Using this approach, the emissions can be classified as follows:

- o Combustion Products (e.g., particulates). Controlled generally by good combustion of clean fuels.
- o Products of Incomplete Combustion (e.g., CO). Control is largely achieved by proper combustion techniques.
- o Acid Gases (e.g., NO_x). Controlled generally by gaseous control devices.

Grouping the pollutants in this manner facilitates the BACT analysis because it enables the equipment available to control the type or group of pollutants emitted and the corresponding energy, economic, and environmental impacts to be examined on a common basis. Although all of the pollutants addressed in the BACT analysis may be subject to a specific emission limiting standard as a result of PSD review, the control of "nonregulated" air pollutants is considered in imposing a more stringent BACT limit on a "regulated" pollutant (i.e., particulates, sulfur dioxide, fluorides, sulfuric acid mist, etc.), if a reduction in "nonregulated" air pollutants can be directly attributed to the control device selected as BACT for the abatement of the "regulated" pollutants.

BACT POLLUTANT ANALYSIS

COMBUSTION PRODUCTS

Particulate Matter (PM/PM₁₀)

The design of this system ensures that particulate emissions will be minimized by combustion control and the use of clean fuels. The particulate emissions from the combustion turbines when burning natural gas and fuel oil will not exceed 15 lbs/hr (oil) and 7 lbs/hr (gas) for the PG7111 and 12 lbs/hr (oil) and 9 lbs/hr (gas) for the LM6000. The Department accepts the applicant's proposed control for particulate matter and heavy metals.

Lead, Mercury, Beryllium (Pb, Hg, Be)

The Department agrees with the applicant's rationale that there are no feasible methods to control lead, mercury, and beryllium; except by limiting the inherent quality of the fuel.

Although the emissions of these toxic pollutants could be controlled by particulate control devices, such as a baghouse or scrubber, the amount of emission reductions would not warrant the added expense. As this is the case, the Department does not believe that the BACT determination would be affected by the emissions of these pollutants.

PRODUCTS OF INCOMPLETE COMBUSTION

Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

The emissions of carbon monoxide exceed the PSD significant emission rate of 100 TPY. The applicant has indicated that the carbon monoxide emissions from the proposed combined cycle turbine with a "quiet combustor" are 10 ppmv for natural gas firing and 20 ppmv for fuel oil firing. However, for a dry low NO_x combustor, the emission limit is 20 ppmvd for both oil and gas. For the simple cycle CT, the CO emissions for firing natural gas and fuel oil are 30 ppmv and 63 ppmv, respectively.

The majority of BACT emissions limitations have been based on combustion controls for carbon monoxide and volatile organic compounds minimization, however, additional control is achievable through the use of catalytic oxidation. Catalytic oxidation is a postcombustion control that has been employed in CO nonattainment areas where regulations have required CO emission levels to be less than those associated with wet injection. These installations have been required to use LAER technology and typically have CO limits in the 10-ppm range (corrected to dry conditions).

In an oxidation catalyst control system, CO emissions are reduced by allowing unburned CO to react with oxygen at the surface of a precious metal catalyst such as platinum. Combustion of CO starts at about 300°F, with efficiencies above 90 percent occurring at temperatures above 600°F. Catalytic oxidation occurs at temperatures 50 percent lower than that of thermal oxidation, which reduces the amount of thermal energy required. For CT/HRSG combinations, the oxidation catalyst can be located directly after the CT or in the HRSG. Catalyst size depends upon the exhaust flow, temperature, and desired efficiency.

Due to the oxidation of sulfur compounds and excessive formation of H₂SO₄ mist emissions, oxidation catalysts are not considered to be technically feasible for gas turbines fired with fuel oil. Catalytic oxidation has not been demonstrated on a continuous basis when using fuel oil.

Use of oxidation catalyst technology would be feasible for a natural gas-fired unit; however, the cost effectiveness of \$4,437 per ton for the LM6000 and \$10,560 per ton for the PG7110EA of CO/VOC removed will have an economic impact on this project.

The Department is in agreement with the applicant's proposal of combustor design and good operating practices as BACT for CO and VOCs for this cogeneration project.

ACID GASES

Nitrogen Oxides (NO_x)

The emissions of nitrogen oxides represent a significant proportion of the total emissions generated by this project, and need to be controlled if deemed appropriate. As such, the applicant presented an extensive analysis of the different available technologies for NO_x control.

The applicant has stated that BACT for nitrogen oxides will be met by using water injection and advanced combustor design to limit emissions to 25 ppmvd (corrected to 15% O₂) when burning natural gas and 42 ppmvd (corrected to 15% O₂) when burning fuel oil.

A review of the EPA's BACT/LAER Clearinghouse indicates that the lowest NO_x emission limit established to date for a combustion turbine is 4.5 ppmvd at 15% oxygen. This level of control was accomplished through the use of water injection and a selective catalytic reduction (SCR) system.

Selective catalytic reduction is a post-combustion method for control of NO_x emissions. The SCR process combines vaporized ammonia with NO_x in the presence of a catalyst to form nitrogen and water. The vaporized ammonia is injected into the exhaust gases prior to passage through the catalyst bed. The SCR process can achieve up to 90% reduction of NO_x with a new catalyst. As the catalyst ages, the maximum NO_x reduction will decrease to approximately 86 percent.

The effect of exhaust gas temperature on NO_x reduction depends on the specific catalyst formulation and reactor design. Generally, SCR units can be designed to achieve effective NO_x control over a 100-300°F operating window within the bounds of 450-800°F, although recently developed zeolite-based catalysts are claimed to be capable of operating at temperatures as high as 950°.

Most commercial SCR systems operate over a temperature range of about 600-750°F. At levels above and below this window, the specific catalyst formulation will not be effective and NO_x reduction will decrease. Operating at high temperatures can permanently damage the catalyst through sintering of surfaces.

Increased water vapor content in the exhaust gas (as would result from water or steam injection in the gas turbine combustor) can shift the operating temperature window of the SCR reactor to slightly higher levels.

As stated by the applicant, the exhaust temperatures of the proposed simple cycle CTs for this site are between 600°F to 800°F.

At temperatures of 1,000°F and above, the zeolite catalyst (reported to operate within 600°F to 950°F) will be irreparably damaged. In this case, application of an SCR system using a zeolite catalyst on a simple-cycle operation appears to be technically feasible.

However, the applicant has rejected using SCR on the simple cycle CT because of economic and environmental impacts.

Although technically feasible, the applicant has also rejected using SCR on the combined cycle because of economic, energy, and environmental impacts. The applicant has identified the following limitations:

- a) Reduced power output.
- b) Emissions of unreacted ammonia (slip).
- c) Disposal of hazardous waste generated (spend catalyst).
- d) Ammonium bisulfate and ammonium sulfate particulate emissions (ammonium salts) due to the reaction of NH_3 with SO_3 present in the exhaust gases.
- e) Cost effectiveness for the application of SCR technology to the Kissimmee Utility project was considered to be \$9,879 per ton of NO_x removed for the PG7111EA and \$13,700 per ton of NO_x removed for the LM6000 when burning natural gas.

Since SCR has been determined to be BACT for several combined cycle facilities, the EPA has clearly stated that there must be unique circumstances to consider the rejection of such control on the basis of economics.

In a recent letter from EPA Region IV to the Department regarding the permitting of a combined cycle facility (Tropicana Products, Inc.), the following statement was made:

"In order to reject a control option on the basis of economic considerations, the applicant must show why the costs associated with the control are significantly higher for this specific project than for other similar projects that have installed this control system or in general for controlling the pollutant."

For fuel oil firing, the cost associated with controlling NO_x emissions must take into account the potential operating problems that can occur with using SCR in the oil firing mode.

A concern associated with the use of SCR on combined cycle projects is the formation of ammonium bisulfate. For the SCR process, ammonium bisulfate can be formed due to the reaction of sulfur in the fuel and the ammonia injected. The ammonium bisulfate formed has a tendency to plug the tubes of the heat recovery steam generator leading to operational problems. As this is the case,

SCR has been judged to be technically infeasible for oil firing in some previous BACT determinations.

The latest information available now indicates that SCR can be used for oil firing provided that adjustments are made in the ammonia to NO_x injection ratio. For natural gas firing operation, NO_x emissions can be controlled with up to a 90 percent efficiency using a 1 to 1 or greater ammonia injection ratio. By lowering the injection ratio for oil firing, testing has indicated that NO_x can be controlled with efficiencies ranging from 60 to 80 percent. When the injection ratio is lowered there is not a problem with ammonium bisulfate formation since essentially all of the ammonia is able to react with the nitrogen oxides present in the combustion gases. Based on this strategy SCR has been both proposed and established as BACT for oil fired combined cycle facilities with NO_x emission limits ranging from 11.7 to 25 ppmvd depending on the efficiency of control established.

The applicant has indicated that the total levelized annual operating cost to install SCR for this project at 100 percent capacity factor and burning natural gas is \$2,944,000 for the PG7111EA and \$1,589,000 for the LM6000. Taking into consideration the total annual cost, a cost/benefit analysis of using SCR can now be developed.

For the PG7111EA combined cycle combustion turbine, based on the information supplied by the applicant, it is estimated that the maximum annual NO_x emissions using low NO_x burner will be 372 tons/year (natural gas) and 700 tons/year (oil firing). Assuming that SCR would reduce the NO_x emissions by 80%, about 74 tons of NO_x (natural gas) and 140 tons of NO_x (oil) would be emitted annually. When this reduction (298 TPY natural gas and 560 TPY oil) is taken into consideration with the total levelized annual operating cost of \$2,944,000 (natural gas) and \$3,424,000 (oil firing); the cost per ton of controlling NO_x is \$9,879 (natural gas) and \$6,114 (oil), respectively. These calculated costs are higher than has previously been approved as BACT.

For the simple cycle combustion turbine, based on the information supplied by the applicant, it is estimated that the maximum annual NO_x emissions using water injection will be 145 tons/year (natural gas) and 250 tons/year (oil firing). Assuming that SCR would reduce the NO_x emissions by 80%, about 29 tons of NO_x (natural gas) and 50 tons of NO_x (oil firing) would be emitted annually. When this reduction (116 TPY natural gas and 200 TPY oil) is taken into consideration with the total levelized annual operating cost of \$1,589,000 (natural gas) and \$1,840,000 (oil firing); the cost per ton of controlling NO_x is \$13,700 (natural gas) and \$9,200 (oil), respectively. These calculated costs are higher than has previously been approved as BACT.

A review of the latest DER BACT determinations show limits of 15 ppmvd (natural gas) using low-NO_x burn technology for combined cycle turbines. General Electric is currently developing programs using both steam/water injection and dry low NO_x combustor to achieve NO_x emission control level of 9 ppm when firing natural gas. Therefore, since this technology will be available by 1997, the Department has accepted the water injection (LM6000), low NO_x burner design (PG7111EA), and the 25 ppmvd (natural gas)/42 ppmvd (oil) at 15% O₂ as BACT for a limited time (up to 1/1/98).

Sulfur Dioxide(SO₂) and Sulfuric Acid Mist (H₂SO₄)

The applicant has stated that sulfur dioxide (SO₂) and sulfuric acid mist (H₂SO₄) emissions when firing fuel oil will be controlled by using fuel oil with a maximum sulfur content of 0.05 % by weight. This will result in an annual emission rate of 18 tons SO₂ per year and 2 tons H₂SO₄ mist per year (operating at 500 hours per year).

In accordance with the "top down" BACT review approach, only two alternatives exist that would result in more stringent SO₂ emissions. These include the use of a lower sulfur content fuel oil or the use of wet lime or limestone-based scrubbers, otherwise known as flue gas desulfurization (FGD).

In developing the NSPS for stationary gas turbines, EPA recognized that FGD technology was inappropriate to apply to these combustion units. EPA acknowledged in the preamble of the proposed NSPS that "Due to the high volumes of exhaust gases, the cost of flue gas desulfurization (FGD) to control SO₂ emissions from stationary gas turbines is considered unreasonable."(23). EPA reinforced this point when, later on in the preamble, they stated that "FGD... would cost about two to three times as much as the gas turbine."(23). The economic impact of applying FGD today would be no different.

Furthermore, the application of FGD would have negative environmental and energy impacts. Sludge would be generated that would have to be disposed of properly, and there would be increased utility (electricity and water) costs associated with the operation of a FGD system. Finally, there is no information in the open literature to indicate that FGD has ever been applied to stationary gas turbines burning distillate oil.

The elimination of flue gas control as a BACT option then leaves the use of low sulfur fuel oil as the next option to be investigated. Kissimmee Utility Authority, as stated above, has

proposed the use of No. 2 fuel oil with a 0.05% sulfur by weight as BACT for this project. The Department accepts their proposal as BACT for this project.

BACT Determination by DER

NO_x Control

The information that the applicant presented and Department calculations indicates that the cost per ton of controlling NO_x for these turbines [\$9,879 (gas) PG7111EA, \$6,114 (oil) PG7111EA, \$13,700 (gas) LM6000, and \$9,200 (oil) LM6000] is high compared to other BACT determinations which require SCR. Based on the information presented by the applicant, the Department believes that the use of SCR for NO_x control is not justifiable as BACT at this time.

A review of the permitting activities for combined cycle proposals across the nation indicates that SCR has been required and most recently proposed for installations with a variety of operating conditions (i.e., natural gas, fuel oil, and various capacity factors). Although, the cost and other concerns expressed by the applicant are valid, the Department, in this case, is willing to accept water injection and low NO_x burner design as BACT for this project for a limited time (up to 12/31/97).

It is the Department's understanding that General Electric is developing programs for the PG7111EA and the LM6000, using either steam/water injection or dry low NO_x combustor technology to achieve a NO_x emission control level of 9 ppm when firing natural gas. Therefore, the Department has determined that the following BACT will apply by 1/1/98.

- a) For the combined cycle unit (PG7111EA), if the 15 (gas)/42 (oil) ppmv emission rates cannot be met by 1/1/98, SCR will be installed. Hence, the permittee shall install a duct module suitable for future installation of SCR equipment.
- b) For the simple cycle unit (LM6000), the manufacturer will attempt to achieve a maximum NO_x emission level of 15 (gas)/42 (oil) ppmv by 1/1/98. Should this level of control not be achieved, the permittee must notify the Department of the expected compliance date by 1/1/97.
- c) For both turbines (PG7111EA and LM6000), when the manufacturer achieves an even lower NO_x emission level than 15 (gas)/42 (oil) ppmv, this level may become a condition of this permit.

SO₂ Control

BACT for sulfur dioxide is the burning of fuel oil No. 2 with 0.05% sulfur content by weight.

VOC and CO Control

Combustion control will be considered as BACT for CO and VOC when firing natural gas.

Other Emissions Control

The emission limitations for PM and PM₁₀, Be, Pb, and Hg are based on previous BACT determinations for similar facilities.

The emission limits for Kissimmee Utility Authority project are thereby established as follows:

120 MW COMBINED CYCLE COMBUSTION TURBINE

Pollutant	Emission Standards/Limitations		Method of Control
	Oil(a)	Gas(b)	
NO _x	42 ppmv	25 ppmv(c) 15 ppmv	Water Injection/ Quiet Combustor or Dry Low NO _x Combustor Water Injection/Dry Low NO _x Combustor
CO	65 lbs/hr	54 lbs/hr	Combustion
PM & PM ₁₀	15 lbs/hr	7 lbs/hr	Combustion
SO ₂	52 lbs/hr	nil	No. 2 Fuel Oil (0.05% S)
H ₂ SO ₄	5.7 lbs/hr	nil	No. 2 Fuel Oil (0.05% S)
VOC	5 lbs/hr	2 lbs/hr	Combustion
Hg	3.0 x 10 ⁻⁶ lb/MMBtu		Fuel Quality
Pb	2.8 x 10 ⁻⁵ lb/MMBtu		Fuel Quality
Be	2.5 x 10 ⁻⁶ lb/MMBtu		Fuel Quality

- (a) No. 2 fuel oil with a maximum of 0.05% sulfur by weight.
 (b) Natural gas/fuel oil 8260/500 hours per year. Natural gas/fuel oil 7760/1000 hours per year. Continuous burning of No. 2 fuel oil (8760 hrs/yr) is not allowed unless natural gas is not available.
 (c) Initial NO_x emission rates for natural gas firing shall not exceed 25 ppmvd at 15% oxygen on a dry basis. The permittee shall achieve NO_x emissions of 15 ppmvd at 15% oxygen at the earliest achievable date based on dry low NO_x combustor

injection technology or any other technology available, but no later than 1/1/98. Should this level of control not be achieved, the permittee shall install SCR.

40 MW SIMPLE CYCLE COMBUSTION TURBINE

Pollutant	Emission Standards/Limitations		Method of Control
	Oil(a)	Gas(b)	
NO _x	42 ppmv	25 ppmv(c) 15 ppmv	Water Injection Dry Low NO _x Combustor
CO	76 lbs/hr	40 lbs/hr	Combustion
PM & PM10	12 lbs/hr	9 lbs/hr	Combustion
SO ₂	20 lbs/hr	nil	No. 2 Fuel Oil (0.05% S)
H ₂ SO ₄	2.2 lbs/hr	nil	No. 2 Fuel Oil (0.05% S)
VOC	3 lbs/hr	1.4 lbs/hr	Combustion
Hg	3.0 x 10 ⁻⁶ lb/MMBtu		Fuel Quality
Pb	2.8 x 10 ⁻⁵ lb/MMBtu		Fuel Quality
Be	2.5 x 10 ⁻⁶ lb/MMBtu		Fuel Quality

- (a) No. 2 fuel oil with a maximum of 0.05% sulfur by weight.
 (b) Natural gas/fuel oil 8260/500 hours per year. Natural gas/fuel oil 7760/1000 hours per year. Continuous firing of fuel oil (8760 hrs/yr) is not allowed unless natural gas is not available.
 (c) Initial NO_x emission rates for natural gas firing shall not exceed 25 ppmvd at 15% oxygen on a dry basis. The permittee shall achieve NO_x emissions of 15 ppmvd at 15% oxygen at the earliest achievable date based on dry low NO_x combustor technology or any other technology available, but no later than 1/1/98. Should this level of control not be achieved when the compliance demonstration stack tests are performed, the permittee must provide the Department with the expected compliance dates which will be updated annually. After 1/1/98, if the compliance schedule has not been met, the Department may require SCR be installed since the exhaust temperature has an acceptable range for SCR installation.

Details of the Analysis May be Obtained by Contacting:

Preston Lewis, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:

C. H. Fancy

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

April 1, 1993
Date

Approved by:

Virginia B. Wetherell

Virginia B. Wetherell, Secretary
Dept. of Environmental Regulation

April 7, 1993
Date

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3. Article Addressed to:
 Mr. A. K. Sharnes
 Director of Power Supply
 Kissimmee Utility Auth.
 1701 W. Cancell St.
 Kissimmee, FL 34741

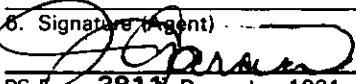
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City - State and ZIP Code		Kiss, FL
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Return Receipt Showing to Whom, Date and Addressee's Address		
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