STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

In the matter of an
Application for Permit by:

Mr. J. S. Crall
Orlando Utilities Commission
500 South Orange Avenue
P.O. Box 3193
Orlando, Florida 32802

DER File No. AC 05-193720
PSD-FL-173
Brevard County

Enclosed is Permit Number AC 05-193720 to construct and operate two 129 MW simple cycle gas turbines (units C & D) . The units will be located at the Orlando Utilities Commission - Indian River Power Plant, south of John F. Kennedy Space Center near the city of Titusville, Brevard County, Florida, issued pursuant to Section(s) 403, Florida Statutes.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the 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 REGULATION

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

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of business on 11-5-91 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) 11-5-91 (Date)

Copies furnished to:
Alan Zahm, Central Dist.
Jewell Harper, EPA
S. M. Day, P.E., B&V

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Mr. J. S. Crall
Orlando Utilities Commission
P.O. Box 3193
Orlando, FL 32802

4a. Article Number
P 832 538 740

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

7. Date of Delivery
ORLANDO, FL DOWNTOWN STA NOV 8 1991 USPS

5. Signature (Addressee)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)

PS Form 3811, October 1990 *U.S. GPO: 1990—273-861 DOMESTIC RETURN RECEIPT

P 832 538 740

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No Insurance Coverage Provided
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UNITED STATES POSTAL SERVICE

Sent to Mr. J. S. Crall, OUC	
Street & No. P. O. Box 3193	
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PS Form 3800, June 1990

Final Determination

Orlando Utilities Commission-Indian River Plant
Brevard County
Titusville, Florida

Two 129 MW Simple Cycle Gas Turbine Systems

Permit Number: AC 05-193720
PSD-FL-173

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

November 1, 1991

Final Determination

The Technical Evaluation and Preliminary Determination for Orlando Utilities Commission to construct and operate two 129 MW simple cycle gas turbines at their Indian River Plant, three kilometers south of John F. Kennedy Space Center near the city of Titusville in Brevard County, Florida, was distributed on September 9, 1991. The Notice of Intent to Issue was published in the Florida Today on September 24, 1991. Copies of the evaluation were available for public inspection at the Department's Tallahassee and Orlando offices.

The U.S. Environmental Protection Agency (EPA) submitted a letter commenting on the Preliminary Determination November 1, 1991, stating that they had "no adverse comment."

The applicant provided comments on the Preliminary Determination October 15, asking that we modify Specific Condition No. 2 to include the 8 and 24 hour acceptable ambient concentrations and delete the annual concentrations for inorganic mercury. The 8 and 24 hour levels, which have been in use, were replaced with better data and only the annual information is specified. An error regarding the annual beryllium emissions was corrected. The applicant also pointed out two other errors in Table 1 which have been corrected.

The final action of the Department will be to issue construction permit AC 05-193720 as proposed in the Technical Evaluation and Preliminary Determination.

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:
Orlando Utilities Commission
500 South Orange Avenue
P.O. Box 3193
Orlando, Florida 32802

Permit Number: AC 05-193720
Expiration Date: Dec. 31, 1992
County: Brevard
Latitude/Longitude: 28°29'32" N
80°46'59" W
Project: Two 129 MW Simple Cycle Gas Turbines

The amendments to existing PSD construction permits AC-05-146750 and AC-05-146751 are issued under the provisions of Chapter 403, Florida Statutes, and 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:

For the construction of two 129 MW simple cycle gas turbines, to be located at the Orlando Utility Commission-Indian River Power Plant near Titusville, Florida. The UTM coordinates are 521.5 km East and 3151.65 km North.

The source 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:

1. Orlando Utilities Commission-Indian River Power Plant's application dated March 7, 1991.
2. Department's letter dated April 5, 1991.
3. Orlando Utilities Commission's (OUC) letter dated May 9, 1991.
4. Department's letter dated June 7, 1991.
5. OUC's letter dated June 17, 1991.
6. Department's letter dated June 19, 1991.
7. OUC's faxed letter dated October 15, 1991.
8. EPA's faxed letter dated November 1, 1991.

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.

GENERAL CONDITIONS:

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.

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.

GENERAL CONDITIONS:

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.

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.

GENERAL CONDITIONS:

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;
- 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

See revision

1. The maximum allowable emissions from this facility shall not exceed the emission rates listed in Table 1.

Deleted-See revision

2. Unless the Department has determined other concentrations are required to protect public health and safety, predicted acceptable ambient air concentrations (AAC) of the following pollutants shall not be exceeded:

SPECIFIC CONDITIONS:

Pollutant	Acceptable Ambient Concentrations ug/m^3 8-hr	24-hr	Annual
Beryllium	0.02	0.005	0.0004
Lead	1.5	0.36	0.09
Inorganic Mercury Compounds all forms of Vapor, as Hg	NA	NA	0.3

3. Visible emissions shall not exceed 20 percent opacity at anytime nor exceed 10% during full load.

See revision

Operating Rates

4. This source is allowed to operate at full load for a maximum of 4,380 hours per year.

5. This source is allowed to use natural gas as the primary fuel and No. 2 distillate oil as the secondary fuel (limited as shown in Specific Condition 6 below).

6. The permitted materials and utilization rates for each simple cycle gas turbine shall not exceed the values as follows:

-- Maximum No. 2 fuel oil consumption shall not exceed either of the following limitations: 10,282 gals/hr; 22,517,580 gals/yr.
-- Maximum annual firing using No. 2 fuel oil shall not exceed 2,190 hours per year.
-- Maximum sulfur (S) content in the oil shall not exceed 0.30 percent by weight.
-- Maximum heat input shall not exceed 1,354 MMBtu/hr (gas) or 1,346 MMBtu/hr (oil). based on LHV
-- Maximum annual firing on any fuel combination shall not exceed 4,380 hours per year.

See revision

7. Any change in the method of operation, equipment or operating hours shall be submitted to the DER's Bureau of Air Regulation and Central District offices.

SPECIFIC CONDITIONS:

See revision

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

Compliance Determination

9. Compliance with the NO_X, SO_2 (oil), CO, and visible emission standards shall be determined by the following reference methods as described in 40 CFR 60, Appendix A (July 1, 1990) and adopted by reference in F.A.C. Rule 17-2.700.

Compliance Determination

- Method 1. Sample and Velocity Traverses
- Method 2. Volumetric Flow Rate
- Method 3. Gas Analysis
- Method 9. Determination of the Opacity of the Emissions from
- Method 10. Determination of the Carbon Monoxide Emission from Stationary Sources
- Method 20. Determination of Nitrogen Oxides, Sulfur Dioxide, and Diluent Emissions from Stationary Gas Turbines.

See revision

10. An initial compliance test shall be performed using both fuels. Annual NO_X compliance tests shall be performed with the fuel(s) used for more than 400 hours in the proceeding 12 month period.

See revision

11. Compliance with the SO_2 emission limit can also be determined by calculations based on fuel analysis using ASTM D2880-71 for the sulfur content of liquid fuels.

12. Compliance with the total volatile organic compound emission limits will be assumed, provided the CO allowable emission rate is achieved; specific VOC compliance testing is not required.

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

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.

SPECIFIC CONDITIONS:

Compliance Determination

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.

See revision

14. Test results will be the average of 3 valid runs. The Central District office will be notified at least 30 days in advance of the compliance test. The source shall operate between 90 percent and 100 percent of permitted capacity during the compliance test. Compliance test results shall be submitted to the Central District office no later than 45 days after completion.

See revision

15. Water injection shall be 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.

See revision

16. To determine compliance with the capacity factor limitations each CT's fuel consumption shall be continuously measured and recorded. The permittee shall maintain daily records of this fuel usage. All records shall be maintained for a minimum of three years after the date of each record and shall be made available to representatives of the Department upon request.

See revision

17. Sulfur, nitrogen content and lower heating value of the fuel being fired in the gas turbine shall also be recorded per fuel oil shipment. These records shall also be kept by the company for at least three years and made available for regulatory agency's inspection.

Deleted-See revision

18. Compliance with the acceptable ambient concentrations for Be, Lead, and Hg emissions shall be demonstrated based on calculations certified by a Professional Engineer registered in Florida, using actual operating conditions. Determination of the ambient concentrations for chemical compounds shall be determined by Department approved dispersion modeling. This compliance determination shall be made available upon request.

Rule Requirements

19. This source shall comply with all applicable provisions of Chapter 403, Florida Statutes and Chapters 17-2 and 17-4, Florida Administrative Code.

SPECIFIC CONDITIONS:

20. This source shall comply with all requirements of 40 CFR 60, Subpart GG and F.A.C. Rule 17-2.660(2)(a), Standards of Performance for Stationary Gas Turbines.

21. 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 17-2.210(1)).

22. This source shall comply with F.A.C. Rule 17-2.700, Stationary Point Source Emission Test Procedures.

23. Pursuant to F.A.C. Rule 17-2.210(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 content and 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.

24. 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).

25. 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 or within 45 days after completion of compliance testing, whichever occurs first. 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. Rule 17-4.220).

Issued this 5th day

of November, 1991

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Carol M. Browner, Secretary

See revision

TABLE 1
ALLOWABLE EMISSION LIMITS
Simple Cycle Combustion Turbine

Pollutant	Standards		Gas Turbine Tons Per Year*		Basis
	Gas Firing/20 F	No. 2 Fuel Oil Firing/20 F	Gas	Oil	
NO_x	25 ppm at 15% oxygen on a dry basis	42 ppmv at 15 percent oxygen on a dry basis	591.5	506	BACT
SO_2	Natural gas as fuel	0.3 percent S by weight	2.1	953	BACT
PM/PM_{10}	0.003 lb/MMBtu	0.08 lb/MMBtu	19.5	237	Performance Data
VOC	-	-	37	112	" "
CO	-	-	313	159	" "
Mercury (Hg)	-	3.0×10^{-6} lbs/MMBtu	-	0.01	Est. by Appl.
Lead (Pb)	-	2.8×10^{-5} lbs/MMBtu	-	0.08	" "
Beryllium (be)	-	2.5×10^{-6} lbs/MMBtu	-	0.01	" "
Sulfuric Acid Mist	Natural gas as fuel	Low sulfur content oil	0.07	28.5	" "

* Emissions rates for both 129 MW turbines are based on a 50 percent capacity factor with a maximum of 25 percent attributed to oil firing.

Best Available Control Technology (BACT) Determination
Orlando Utilities Commission-Indian River Power Plant
Brevard County

The applicant proposes to install combustion turbine Units C and D at their Indian River facility. The generator systems will consist of two nominal 129 megawatt (MW) combustion turbines.

The combustion turbine will be capable of simple cycle operation. The applicant requested that the combustion turbine use either natural gas or distillate oil. The Department's calculations indicate the maximum annual tonnage of regulated air pollutants emitted from the facility based on 25 percent capacity factor for No. 2 fuel oil firing and 50 percent capacity factor for all fuels at peak load and ISO conditions to be as follows:

	Potential Emissions (tons/year)						
	Peak Load/20 F			Baseload/ISO			PSD Significant Emission Rate
Pollutant	Natural Gas 50% CF*	Fuel Oil 25% CF	Combine Fuels 25% CF for oil plus 25% CF for nat. gas	Natural Gas 50% CF	Fuel Oil 25% CF	Combine Fuels 25% CF for oil plus 25% CF for nat. gas	(tons/yr)
NO_x	591.5	506	801.8	534.5	440	707.3	40
SO_2	2.1	953	954.1	2.5	839	840.3	40
PM	19.5	237	246.8	17.5	210	218.8	25
PM_{10}	19.5	237	246.8	17.5	210	218.8	15
CO	313	159	315.5	287	159	302.5	100
VOC	37	112	130.5	39.5	101	120.8	40
H_2SO_4	0.07	28.5	28.5	0.08	25	25	7
Be	0.0	0.01	0.01	0.0	0.01	0.01	0.0004
Hg	0.0	0.01	0.01	0.0	0.01	0.01	0.1
Pb	0.0	0.08	0.08	0.0	0.07	0.07	0.6

* CF = Capacity Factor

Florida Administrative Code 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

March 7, 1991

BACT Determination Requested by the Applicant

Pollutant	Determination
NO_x	25 ppmvd @ 15% O_2 (natural gas burning) 42 ppmvd @ 15% O_2 (diesel oil firing)
SO_2	Firing of natural gas or No. 2 fuel oil with a maximum sulfur content of 0.30%
PM and PM_{10}	Combustion control
H_2SO_4	Firing of No. 2 fuel oil with a maximum sulfur content of 0.30%
Be	Firing of No. 2 fuel oil

BACT Determination Procedure

In accordance with Florida Administrative Code Chapter 17-2, 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, then 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 simple 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:

- Combustion Products (Particulates and Heavy Metals). Controlled generally by good combustion of clean fuels.

- Products of Incomplete Combustion (CO, VOC, Toxic Organic Compounds). Controlled generally by proper combustion techniques.

- Acid gases (SOx, NOx, HCl, Fl). 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 environmenal 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.

Combustion Products

The Orlando Utility Commission's projected emissions of particulate matter, PM10, and beryllium surpass the significant emission rates given in Florida Administrative Code Rule 17-2.500, Table 500-2 for No.2 fuel oil firing only.

A PM/PM10 emissions limitation of 0.08 lb/MMBtu for No. 2 fuel oil firing is reasonable as BACT for the Indian River facility.

In general, the BACT/LAER Clearinghouse does not contain specific emission limits for beryllium from turbines. BACT for these heavy metals is typically represented by the level of particulate control. As this is the case, the emission factor of 0.08 lb/MMBtu for particulate matter PM10 is judged to also represent BACT for beryllium.

Products of Incomplete Combustion

The emissions of carbon monoxide and volatile organic compounds are each above the significant level and therefore require a BACT analysis.

Carbon monoxide and VOC are formed during the incomplete combustion of the fuel. High combustion temperatures, adequate excess air and good fuel/air mixing during combustion will minimize CO and VOC emissions. Therefore, NO_x control methods which use combustion staging and lowering combustion temperature by water injection, can be counterproductive with regard to CO and VOC emissions.

To achieve the proposed NO_x BACT levels requires that these control techniques be used. Therefore, this turbine design will have significantly higher CO and VOC emissions than associated with a standard combustor. At the proposed BACT NO_x emissions of 25/42 ppmvd (gas/oil), the turbine will be capable of maintaining CO and VOC emission rates of 25 ppmvd and 5 ppmvd, respectively while burning natural gas. For fuel oil firing, the CO and VOC emission rates will be 25 ppmvd and 15 ppmvd, respectively.

Based on a review of EPA's BACT/LAER Clearinghouse--A Compilation of Control Technology Determinations (1985 and 1990 editions), a combustion turbine with proper combustion control and an oxidizing catalyst that limits CO emissions to 2 ppmvd represents LAER. An oxidizing catalyst is also LAER technology for VOC emissions but the specific ppmvd emission rate was not specified in the clearinghouse document.

Catalytic reduction is a post-combustion method for controlling CO and VOC emissions. The process uses a precious metal to oxidize CO to CO_2 with the use of a catalyst and VOC hydrocarbons to CO_2 and H_2O. None of the catalyst components are considered toxic. The optimum flue gas temperature range for CO/VOC catalyst operation is between 850°F and 1,100°F. Flue gas from the combustion turbine will typically be between 950°F to 1,100°F. Therefore, a CO/VOC catalyst could be installed at the discharge of the combustion turbine.

The applicant states that the levelized annual cost for the catalyst system is about $3.5 million/year. This system would reduce about 310 tons per year of CO/VOC at a 50% capacity factor. This reduction results in an incremental removal cost of approximately $11,000 per ton of CO/VOC removed. This cost is well above that previously accepted as representative of BACT.

In addition, a CO/VOC catalyst located downstream of the combustion turbine exhaust will create additional back pressure reducing output by approximately 600 KW per turbine.

Other Emissions

The project will emit trace quantities of other pollutants at levels which are below the significant emission levels established for the PSD program. Federal and state regulations do not require that BACT be applied for these pollutants but the effects of the proposed BACT determinations on these pollutants must be considered.

Other Regulated and Hazardous Pollutants

The emission rates for mercury, lead and hazardous pollutants, when firing No. 2 fuel oil, have been developed based on manufacturers' information and on information contained in the EPA publications Toxic Air Pollutant Emission Factors--A Compilation for Selected Air Toxic Compounds and Sources (EPA-450/2-88-006a).

The most reliable method of controlling these emissions are complete combustion and the inherent quality of the fuel. Injection of water into the turbines to control NO_X emissions has a significant effect on controlling these pollutants. Further control has been accomplished by using either a baghouse or scrubber.

Acid Gases

The emission of sulfur dioxide, nitrogen oxides, and sulfuric acid mist represents a significant proportion of the total emissions and need to be controlled, if deemed appropriate. Sulfur dioxide emissions from combustion turbines are directly related to the sulfur content of the fuel being combusted.

The applicant has proposed the use of natural gas and No. 2 fuel oil with a maximum sulfur content of 0.30 percent to control sulfur dioxide emissions. A review of the latest edition (1990) of the BACT/LAER Clearinghouse indicates that sulfur dioxide emissions from combustion turbines have been controlled by limiting fuel oil sulfur content to a range of 0.1 to 0.30 percent, with the average for the facilities listed being approximately 0.24 percent. As this is the case, the applicant's proposal to use No. 2 fuel oil with a maximum sulfur content of 0.30 percent is judged to represent BACT.

The applicant has stated that BACT for nitrogen oxides will be met using wet (water or steam) injection necessary to limit emissions to 42 ppmvd or 25 ppmvd at 15 percent oxygen when burning No. 2 fuel oil or natural gas, respectively.

A review of the EPA's BACT/LAER Clearinghouse indicates that the lowest NOx emission limit established to date for a combustion turbine is 4.5 ppmvd at 15 percent oxygen. This level of control was accomplished through the use of water injection and a selective catalytic reduction (SCR) system contained within the heat recovery steam generator (combined cycle operation). A review of the EPA's BACT/LAER Clearinghouse also indicated that the lowest NOx emission levels established to date for a combustion turbine operating in a simple cycle mode was the use of water or steam injection with an improved low NOx burner design. The OUC Indian River project will operate in the simple cycle mode.

Selective catalytic reduction is a post-combustion method for control of NOx emissions. The SCR process combines vaporized ammonia with NOx 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 percent reduction of NOx with a new catalyst. As the catalyst ages, the maximum NOx reduction will decrease to approximately 86 percent. The optimum temperature range for an SCR is approximately 650 to 750 F. Flue gas from a combustion turbine operating in a simple cycle mode will typically be 950 F to 1,100 F. Therefore, the flue gas would have to be cooled prior to the injection of ammonia and to protect the catalyst from damage due to the high flue gas temperatures. SCR manufacturers are currently experimenting with a catalyst that can withstand the high flue gas temperatures associated with simple cycle operation. However, high temperature catalysts are still in a development stage and have not been demonstrated on full scale projects.

Given the applicant's proposed BACT level for nitrogen oxides control stated above, an evaluation can be made of the cost and associated benefit of using SCR as follows:

The applicant had indicated that the total levelized annual cost (operating plus amortized capital) to install SCR for natural gas firing at 50 percent capacity factor is $3,840,000. For fuel oil firing at 25 percent capacity factor, the total levelized annual cost to install SCR is $2,940,000. Taking into consideration the total levelized annual cost, a cost/benefit analysis of using SCR can now be developed.

Based on the information supplied by the applicant, it is estimated that the maximum annual NOx emissions with wet injection from the Indian River facility will be 707 tons/year while firing natural gas 25% and fuel oil 25% of the year. Assuming that the SCR would reduce the NOx emissions by an additional 80 to 85 percent, the SCR would control approximately 560 tons of NOx annually. When this reduction is taken into consideration with the total levelized annual cost of $3,840,000, the cost per ton of controlling NOx is $6,860. This cost is higher than has previously been approved as BACT.

Environmental Impact Analysis

The predominant environmental impacts associated with this proposal would be related to the use of SCR for NOx control. The use of SCR results in emissions of ammonia, which may increase with increasing levels of NOx control. In addition, some catalysts may contain substances which are listed as hazardous waste, thereby creating an additional environmental burden. Although the use of SCR does have some environmental impacts, the disadvantages normally do not outweigh the benefit which would be provided by reducing nitrogen oxide emissions by 80 percent.

In addition to the criteria pollutants, the impacts of toxic pollutants associated with the combustion of natural gas and No. 2 fuel oil have been evaluated. Beryllium for oil fired operation

exceeds PSD significance levels. Other toxics are expected to be emitted in minimal amounts, with the total emissions combined to be less than 0.1 tons per year.

Although the emissions of the 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 the toxic pollutants associated with the firing of natural gas or No. 2 fuel oil.

Potentially Sensitive Concerns

With regard to controlling NOx emission with SCR, the applicant has identified the following technical limitations:

1. SCR would reduce output of combustion turbines by one percent.

2. SCR could result in the release of unreacted quantities of ammonia to the atmosphere.

3. SCR would require handling of ammonia by plant operators. Since it is a hazardous material, there is concern about safety and productivity of operators.

4. SCR results in contaminated catalyst from flue gas trace elements which could be considered hazardous. Safety of operators and disposal of spent catalyst is a concern.

BACT Determination by DER

Nox Control

A review of permitting activities for simple cycle proposals across the nation indicates that water or steam injection with improved low NOx burner design is the predominant control technology that has been required. The cost and other concerns expressed by the applicant for using additional control measures are valid.

The information that the applicant presented and Department calculations indicate that the incremental cost of controlling NOx ($6,860/ton) when firing natural gas (maximum 25%) and No. 2 fuel oil (maximum 25%) is high compared to other BACT determinations which require SCR. Based on the information presented by the applicant and the studies conducted, the

Department believes that the use of SCR for NOx control is not justifiable at this time as BACT. Therefore, the Department is willing to accept low NOx burner design with the firing of natural gas as the primary fuel.

SO2 Control

For sulfur dioxide, BACT is represented by firing natural gas (max. 50% CF) or No. 2 fuel oil with an average sulfur content not to exceed 0.30 percent, provided that the capacity attributed to oil firing does not exceed 25 percent.

CO/VOC Control

Based on the additional cost of using an oxidation catalyst (cost $11,000/ton of reduction), energy (reduce by 600 KW) and environmental considerations, BACT is represented by good combustion controls to achieve 25 ppmvd for CO and 15 ppmvd VOC firing #2 fuel oil.

Other Emissions Control

The emission limitations for PM and PM10, are based on previous BACT determinations for similar facilities, with the heavy metal beryllium being addressed through the particulate limitation and sulfuric acid mist being addressed through the sulfur dioxide limitation.

The emission limits for the Orlando Utilities Commission project are thereby established as follows:

Pollutant	Emission Limit*	
	Natural Gas Firing	No. 2 Fuel Oil Firing
NOx	25 ppmvd @ 15% O_2	42 ppmvd @ 15% O_2
SO_2	Natural gas as fuel	Sulfur content not to exceed 0.30%, by weight
PM & PM_{10}	0.003 lb/MMBtu	0.08 lb/MMBtu
CO	25 ppmvd	25 ppmvd
VOC	5 ppmvd	15 ppmvd
Sulfuric Acid Mist	Emissions limited by firing natural gas and No. 2 fuel oil with 0.3% sulfur, by weight	
Beryllium	Emissions limited by firing natural gas and No. 2 fuel oil with 0.3% sulfur, by weight	

*Both turbines are limited to a maximum of 50% capacity factor with a maximum of 25% attributed to oil firing.

Details of the Analysis May be Obtained by Contacting:

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

Recommended by:

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

November 1 1991
Date

Approved by:

Carol M. Browner, Secretary
Dept. of Environmental Regulation

Nov. 5 1991
Date

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee

To _____ Location _____
To _____ Location _____
To _____ Location _____
From: _____ Date: _____

Interoffice Memorandum

TO: Carol M. Browner

FROM: Steve Smallwood for

DATE: November 1, 1991

SUBJ: Approval of Construction Permit AC 05-193720/PSD-FL-173
Units C & D
Orlando Utilities Commission-Indian River Plant

Attached for your approval and signature is a permit and accompanying Best Available Control Technology determination prepared by the Bureau of Air Regulation for the above mentioned company to construct and operate two 129 MW simple cycle gas turbines.

No adverse comments were received during the public notice period.

I recommend your approval and signature.

CF/PL/plm

Attachments