STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF PERMIT

In the Matter of application for Permit Modification by:

Mr. Ronald W. Tomlin, Assistant Managing Director
City of Lakeland Electric & Water Utilities
501 East Lemon Street
Lakeland, Florida 33801-5079

DEP File No. 1050004-004AC
Permit No. PSD-FL-245
C.D. McIntosh, Jr. Power Plant, Unit No. 5
Polk County

/

Enclosed is the Final Permit Number PSD-FL-245 to construct a 250 megawatt simple cycle combustion turbine with a once-through heat generator and a 1.05 million gallon fuel oil storage tank at the C.D. McIntosh, Jr. Power Plant, located at 3030 East Lake Parker Drive, Lakeland, Polk County. This permit is issued pursuant to Chapter 403, Florida Statutes.

Any party to this order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, F.S., 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 Legal Office; 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 (thirty) days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

A A Linero, P.E.

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

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF FINAL PERMIT (including the FINAL permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 7/10/98 to the person(s) listed:

Mr. Ronald W. Tomlin, City of Lakeland *
Ms. Farzie Shelton, City of Lakeland
Mr. Brian Beals, EPA
Mr. John Bunyak, NPS
Mr. Bill Thomas, SWD
Mr. Buck Oven, DEP
Mr. Ken Kosky, P.E., Golder Associates
Mr. Joe King, Polk County

Clerk Stamp

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

Charlotte D. Hayes 7/10/98
(Clerk) (Date)

P 265 659 386

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P 265 659 386

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PS Form **3811**, December 1994 Domestic Return Receipt

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

PERMITTEE:

City of Lakeland
Department of Electric & Water Utilities
501 East Lemon Street
Lakeland, Fl 33801-5079

File No.	1050004-004-AC
FID No.	1050004-004
SIC No.	4911
Permit No.	PSD-FL-245
Expires:	June 30, 2002

Authorized Representative:
Ronald W. Tomlin
Assistant Managing Director

PROJECT AND LOCATION:

Permit for the construction of 250 megawatt (MW) simple cycle, gas-fired, stationary combustion turbine (CT), a once-through steam generator, and a 1.05 million gallon storage tank for back-up distillate fuel oil. Conditions are included for possible future conversion to a 350 megawatt combined cycle installation including a heat recovery steam generator provided there are no increases in emissions associated with the conversion. The turbine is designated as Unit No. 5 and will be located at the C.D. McIntosh, Jr., Power Plant, 3030 East Lake Parker Drive, Lakeland, Polk County. UTM coordinates are: Zone 17; 409.0 km E; 3106.2 km N.

STATEMENT OF BASIS:

This construction permit is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). The above named permittee is authorized to modify the facility in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department of Environmental Protection (Department).

Attached appendices and Tables made a part of this permit:

Appendix BD	BACT Determination
Appendix GC	Construction Permit General Conditions

Howard L. Rhodes, Director
Division of Air Resources
Management

SECTION I. FACILITY INFORMATION

SUBSECTION A. FACILITY DESCRIPTION

The existing facility includes: two small diesel powered electric generators; one small gas and distillate-fired combustion turbine; one 90 MW gas and fuel oil-fired steam generator; one 115 MW gas and fuel oil-fired steam generator; and one 364 MW multiple (primarily coal) fuel-fired steam generator. This permit is for the installation of: a 250 MW simple cycle, gas-fired, stationary combustion turbine; a once-through steam generator; a 1.05 million gallon storage tank for back-up (0.05 percent sulfur) distillate fuel oil; and an 85-foot stack. It is possible that in the future the turbine will be converted by the addition of a heat recovery steam generator and a new stack to a 350 MW combined cycle operation without increases in emissions.

Emissions from the McIntosh Unit 5 will be initially controlled by Dry Low NO_X combustors, wet injection when firing fuel oil, use of inherently clean fuels, and good combustion practices. Ultimately the combustors will be replaced and nitrogen oxides emissions reduced by more sophisticated Ultra Low NO_X burners. Otherwise emissions will be reduced by the addition of a selective catalytic reduction (SCR) system.

SUBSECTION B. EMISSION UNITS

This permit addresses the following emission units:

ARMS EMISSION UNIT NO.	SYSTEM	EMISSION UNIT DESCRIPTION
028	Power Generation	250 Megawatt Combustion Turbine and Once Through Steam Generator
029	Fuel Storage	1.05 Million Gallon Fuel Oil Storage Tank

SUBSECTION C. REGULATORY CLASSIFICATION

The facility is classified as a Major or Title V Source of air pollution because emissions of at least one regulated air pollutant, such as particulate matter (PM/PM_{10}), sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), or volatile organic compounds (VOC) exceeds 100 tons per year (TPY).

This facility is within an industry included in the list of the 28 Major Facility Categories per Table 62-212.400-1, F.A.C. Because emissions are greater than 100 TPY for at least one criteria pollutant, the facility is also a Major Facility with respect to Rule 62-212.400, Prevention of Significant Deterioration (PSD). Per Table 62-212.400-2, modifications (such as the construction of Unit 5) at the facility resulting in emissions increases greater than 40 TPY of NO_X or SO_2, 25/15 TPY of PM/PM_{10}, or 3 TPY of fluorides (F) require review per the PSD rules and a determination for Best Available Control Technology (BACT) per Rule 62-212.400, F.A.C.

This facility is also subject to the provisions of Title IV, Acid Rain, Clean Air Act as amended in 1990.

SECTION I. FACILITY INFORMATION

SUBSECTION D. PERMIT SCHEDULE

- 04/22/98 Notice of Intent published in The Ledger
- 04/23/98 Distributed Intent to Issue Permit
- 04/01/98 Application deemed complete
- 12/08/97 Received Application

SUBSECTION E. RELEVANT DOCUMENTS:

The documents listed below are the basis of the permit. They are specifically related to this permitting action, but not all are incorporated into this permit. These documents are on file with the Department.

- Application received on December 8, 1997
- Department letters dated January 5, January 12, March 9, 1998, and April 27, 1998
- Comments and letters from the National Park Service dated January 6, January 12, April 2 and April 15, 1998.
- EPA letters dated February 10 and March 6, 1998.
- City of Lakeland letters dated March 4, March 11, March 31, and May 6, 1998.
- Letters from Westinghouse dated March 25, March 30, and March 31, 1998.
- Department's Intent to Issue and Public Notice Package dated April 22, 1998.
- Department's Final Determination and Best Available Control Technology Determination issued concurrently with this permit.

SECTION II. EMISSION UNIT(S) GENERAL REQUIREMENTS

GENERAL AND ADMINISTRATIVE REQUIREMENTS

1. Regulating Agencies: All documents related to applications for permits to construct, operate or modify an emissions unit should be submitted to the Bureau of Air Regulation (BAR), Florida Department of Environmental Protection (FDEP), at 2600 Blairstone Road, Tallahassee, Florida 32399-2400 and phone number (850)488-1344. All documents related to reports, tests, and notifications should be submitted to the DEP Southwest District office (DEPSW), 3804 Coconut Palm Drive, Tampa, Florida 33619 and phone number 813/744-6100.
2. General Conditions: The owner and operator is subject to and shall operate under the attached General Permit Conditions G.1 through G.15 listed in Appendix GC of this permit. General Permit Conditions are binding and enforceable pursuant to Chapter 403 of the Florida Statutes. [Rule 62-4.160, F.A.C.]
3. Terminology: The terms used in this permit have specific meanings as defined in the corresponding chapters of the Florida Administrative Code.
4. Forms and Application Procedures: The permittee shall use the applicable forms listed in Rule 62-210.900, F.A.C. and follow the application procedures in Chapter 62-4, F.A.C. [Rule 62-210.900, F.A.C.]
5. Modifications: The permittee shall give written notification to the Department when there is any modification to this facility. This notice shall be submitted sufficiently in advance of any critical date involved to allow sufficient time for review, discussion, and revision of plans, if necessary. Such notice shall include, but not be limited to, information describing the precise nature of the change; modifications to any emission control system; production capacity of the facility before and after the change; and the anticipated completion date of the change. [Chapters 62-210 and 62-212]
6. Expiration: Approval to construct shall become invalid if construction is not commenced within 18 months after receipt of such approval, or if construction is discontinued for a period of 18 months or more, or if construction is not completed within a reasonable time. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified. [40 CFR 52.21(r)(2)].
7. BACT Determination: In accordance with paragraph (4) of 40 CFR 52.21(j) the Best Available Control Technology (BACT) determination shall be reviewed and modified as appropriate in the event of a conversion to combined cycle operation. This paragraph states: "For phased construction project, the determination of best available control technology shall be reviewed and modified as appropriate at the latest reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time, the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source."

This reassessment will be conducted for this project only if the conversion to combined cycle operation is accompanied by any increases in heat input limits, hours of operation, oil firing, low or baseload operation, short-term or annual emission limits, annual fuel heat input limits or similar changes. At a minimum, conversion to combined cycle operation will require a modification of this permit to reflect the ultimate facility description, the higher power production rates and review of the actual control equipment design. [40 CFR 52.21(j)(4), Rule 62-4.070 F.A.C.]

8. Application for Title V Permit: An application for a Title V operating permit, pursuant to Chapter 62-213, F.A.C., must be submitted to the DEP's Bureau of Air Regulation, and a copy to the Department Southwest District office (DEPSW). [Chapter 62-213, F.A.C.]

9. New or Additional Conditions: Pursuant to Rule 62-4.080, F.A.C., for good cause shown and after notice and an administrative hearing, if requested, the Department may require the permittee to conform to new or additional conditions. The Department shall allow the permittee a reasonable time to conform to the new or additional conditions, and on application of the permittee, the Department may grant additional time. [Rule 62-4.080, F.A.C.]

10. Annual Reports: Pursuant to Rule 62-210.370(2), F.A.C., Annual Operation Reports, the permittee is required to submit annual reports on the actual operating rates and emissions from this facility. Annual operating reports shall be sent to the DEP's Southwest District office by March 1st of each year.

11. Stack Testing Facilities: Stack sampling facilities shall be installed in accordance with Rule 62-297.310(6), F.A.C.

12. Permit Extension: 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 (Rule 62-4.080, F.A.C.).

13. Quarterly Reports: Quarterly excess emission reports, in accordance with 40 CFR 60.7 (a)(7) (c) (1997 version), shall be submitted to the DEP's Southwest District office.

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

APPLICABLE STANDARDS AND REGULATIONS:

1. Unless otherwise indicated in this permit, the construction and operation of the subject emission unit(s) shall be in accordance with the capacities and specifications stated in the application. The facility is subject to all applicable provisions of Chapter 403, F.S. and Florida Administrative Code Chapters 62-4, 62-103, 62-204, 62-210, 62-212, 62-213, 62-214, 62-296, 62-297; and the applicable requirements of the Code of Federal Regulations Section 40, Parts 60, 72, 73, and 75.
2. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting requirements or regulations. [Rule 62-210.300, F.A.C.]
3. These emission units shall comply with all applicable requirements of 40CFR60, Subpart A, General Provisions including:
   - 40CFR60.7, Notification and Recordkeeping
   - 40CFR60.8, Performance Tests
   - 40CFR60.11, Compliance with Standards and Maintenance Requirements
   - 40CFR60.12, Circumvention
   - 40CFR60.13, Monitoring Requirements
   - 40CFR60.19, General Notification and Reporting requirements
4. ARMS Emission Unit 028, Power Generation, consisting of a 250 megawatt combustion turbine with a once-through steam generator shall comply with all applicable provisions of 40CFR60, Subpart GG, Standards of performance for Stationary Gas Turbines, adopted by reference in Rule 62-204.800(7)(b), F.A.C. The Subpart GG requirement to correct test data to ISO conditions applies. However, such correction is not used for compliance determinations with the BACT standard(s).
5. ARMS Emission Unit 029, Fuel Storage, consisting of a 1.05 million gallon distillate fuel oil storage tank shall comply with all applicable provisions of 40CFR60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels, adopted by reference in Rule 62-204.800, F.A.C.
6. All notifications and reports required by the above specific conditions shall be submitted to the DEP's Southwest District office.

GENERAL OPERATION REQUIREMENTS

7. Fuels: Only pipeline natural gas or maximum 0.05 percent sulfur fuel oil No. 2 or superior grade of distillate fuel oil shall be fired in this unit. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

8. Capacity: The maximum heat input rates, based on the lower heating value (LHV) of each fuel to Unit 5 at ambient conditions of 59°F temperature, 60% relative humidity, 100% load, and 14.7 psi pressure shall not exceed 2,174 million Btu per hour (mmBtu/hr) when firing natural gas, nor 2,236 mmBtu/hr when firing No. 2 or superior grade of distillate fuel oil. These maximum heat input rates will vary depending upon ambient conditions and the combustion turbine characteristics. Manufacturer's curves corrected for site conditions or equations for correction to other ambient conditions shall be provided to the Department of Environmental Protection (DEP) within 45 days of completing the initial compliance testing. [Design, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

9. Unconfined Particulate Emissions: During the construction period, unconfined particulate matter emissions shall be minimized by dust suppressing techniques such as covering and/or application of water or chemicals to the affected areas, as necessary.

10. Plant Operation - Problems: If temporarily unable to comply with any of the conditions of the permit due to breakdown of equipment or destruction by fire, wind or other cause, the owner or operator shall notify the DEP Southwest District office as soon as possible, but at least within (1) working day, excluding weekends and holidays. The notification shall include: pertinent information as to the cause of the problem; the steps being taken to correct the problem and prevent future recurrence; and where applicable, the owner's intent toward reconstruction of destroyed facilities. Such notification does not release the permittee from any liability for failure to comply with the conditions of this permit and the regulations. [Rule 62-4.130, F.A.C.]

11. Operating Procedures: Operating procedures shall include good operating practices and proper training of all operators and supervisors. The good operating practices shall meet the guidelines and procedures as established by the equipment manufacturers. All operators (including supervisors) of air pollution control devices shall be properly trained in plant specific equipment. [Rule 62-4.070(3), F.A.C.]

12. Circumvention: The owner or operator shall not circumvent the air pollution control equipment or allow the emission of air pollutants without this equipment operating properly. [Rules 62-210.650, F.A.C.]

13. Maximum allowable hours of operation for the stationary gas turbine and once-through steam generator are 8760. Fuel usage as heat input, while burning natural gas in the stationary gas turbine, shall not exceed 15.639×10^{12} BTU (LHV) per year (rolled monthly) until the unit achieves the NO_X emission limits (other than the initial ones) given in Specific Condition 21. Thereafter, only the hourly heat input limits given in Specific Condition 8 apply. [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

14. Fuel usage as heat input, while burning fuel oil in the stationary gas turbine, shall not exceed 559×10^{9} BTU (LHV) per year (rolled monthly). [Applicant Request, Rule 62-210.200, F.A.C. (Definitions - Potential Emissions)]

Control Technology

15. Westinghouse Dry Low NO_X (DLN) combustors shall be installed on the stationary combustion turbine to control nitrogen oxides (NO_X) emissions while firing natural gas. [Design, Rule 62-4.070, F.A.C.]

16. The Dry Low NO_X (DLN) combustors shall be replaced with Westinghouse Ultra Low NO_X (ULN) combustors to accomplish further NO_X control in order to achieve the emission limits specified in Specific Condition 20 and 21. A high temperature selective catalytic reduction (Hot SCR) system or a low temperature SCR system shall be installed and in operation (together with DLN or ULN combustors) not later than May 1, 2002 if the emission limits specified in Specific Condition No 20 and 21 are not achievable by ULN combustors by this date. [Design, Rules 62-4.070 and 62-212.400, F.A.C.]

17. The permittee shall design the stationary gas turbine, ducting, possible future heat recovery steam generator, and stack(s) to accommodate installation of SCR equipment and/or oxidation catalyst in the event that the ULN technology fails to achieve the NO_X limits given in Specific Condition No. 20 and 21 or the carbon monoxide (CO) limits given in Specific Condition 22 are not met. [Rule 62-4.070, F.A.C.]

18. A water injection system shall be installed for use when firing No. 2 or superior grade distillate fuel oil for control of NO_X emissions. [Design, Rules 62-4.070 and 62-212.400, F.A.C.]

19. The permittee shall provide manufacturer's emissions performance versus load diagrams for the DLN and ULN systems prior to their installation. DLN and ULN systems shall each be tuned upon initial operation to optimize emissions reductions and shall be maintained to minimize NO_X emissions and CO emissions. Operation of the DLN or ULN systems in the diffusion firing mode shall be minimized when firing natural gas. [Rule 62-4.070, and 62-210.650 F.A.C.]

EMISSION LIMITS AND STANDARDS

20. The following table is a summary of the BACT determination and is followed by the applicable specific conditions. Values for NO_X are corrected to 15% O_2. Values for CO are corrected to 15% O_2 only until May 1, 2002. [Rule 62-212.400, F.A.C.]

Operational Mode	NO_X (ppm)	CO (ppm)	VOC (ppm)	PM/Visibility (% Opacity)	Technology and Comments
Simple Cycle	25 - NG (basis) 237 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	DLN on gas, WI on oil. Applies until 05/1/2002 . Clean fuels, good combustion
Simple Cycle	9 - NG (basis) 85 lb/hr (24-hr avg) 42 - FO (3 hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	ULN on gas, WI on oil. Applies after 05/1/2002 Clean fuels, good combustion
Simple Cycle	9 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Hot SCR. Applies not later than 05/1/2002 if 9 ppm NO_X not achievable by ULN. Clean fuels, good combustion.
Combined Cycle	7.5 - NG (3 hr avg) 15 - FO (3-hr avg)	25 - NG or 10 - Ox Cat 90 - FO	4 - NG 10 - FO	10	Conventional SCR unless simple cycle limits are achieved on or before 05/01/2002. Clean fuels, good combustion

SECTION III. EMISSION UNIT(S) SPECIFIC CONDITIONS

21. Nitrogen Oxides (NO_X) Emissions:

- When NO_X monitoring data is not available, substitution for missing data shall be handled as required by Title IV (40 CFR 75) to calculate any specified average time.
- Until May 1, 2002, the concentration of NO_X in the exhaust gas shall not exceed 237 lb/hr (at ISO conditions) on a 24 hr block average (basis 25 ppm @ 15% O_2, full load) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average as measured by the continuous emission monitoring system (CEMS). In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 25 ppm @15% O_2 nor 237 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- Not later than May 1, 2002, the concentration of NO_X concentrations in the exhaust gas shall not exceed 85 lb/hr (at ISO conditions) on a 24 hr block average (basis 9 ppm @ 15% O_2) when firing natural gas and 42 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3 hr average as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall exceed neither 9 ppm @15% O_2 nor 85 lb/hr (when firing natural gas) and shall exceed neither 42 ppm @15% O_2 nor 413 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- If Hot SCR is installed, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 9 ppmvd at 15% O_2 when firing natural gas. NO_X emissions shall not exceed 9 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of a 3-hr average, as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall not exceed 85 lb/hr (when firing natural gas) and 148 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]
- If conventional SCR is installed in conjunction with conversion to combined cycle operation, achievable short-term NO_X concentrations in the exhaust gas shall be demonstrated at baseload during the first compliance test following installation not to exceed 7.5 ppmvd at 15% O_2 when firing natural gas. If conventional SCR catalyst is installed, NO_X emissions shall not exceed 7.5 ppmvd at 15% O_2 when firing natural gas and 15 ppmvd at 15% O_2 when firing fuel oil on the basis of 3-hr average, as measured by the CEMS. In addition, NO_X emissions calculated as NO_2 (at ISO conditions) shall not exceed 71.1 lb/hr (when firing natural gas) and 148 lb/hr (when firing fuel oil) to be demonstrated by stack test. [Rule 62-212.400, F.A.C.]

22. Carbon Monoxide (CO) emissions: Prior to May 1, 2002, the concentration of CO (@15% O_2 in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Method 10. CO emissions (at ISO conditions) shall not exceed 145 lb/hr (when firing natural gas) and 539 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

    After May 1, 2002, the concentration of CO in the exhaust gas when firing natural gas shall not exceed 25 ppmvd when firing natural gas and 90 ppmvd when firing fuel oil as measured by EPA Method 10. CO emissions (at ISO conditions) shall not exceed 106 lb/hr (when firing natural gas) and 386 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

23. Sulfur Dioxide (SO_2) emissions: SO_2 emissions (at ISO conditions) shall not exceed 7.2 pounds per hour when firing pipeline natural gas and 127 pounds per hour when firing maximum 0.05 percent sulfur No. 2 or superior grade distillate fuel oil as measured by applicable compliance methods described below. Emissions of SO_2 shall not exceed 38.4 tons per year. [Rules 62-4.070 and 62-212.400, F.A.C. to avoid PSD Review]

24. Visible emissions (VE): VE emissions shall not exceed 10 percent opacity when firing natural gas or No. 2 or superior grade of fuel oil.

25. Volatile Organic Compounds (VOC) Emissions: The concentration of VOC in the exhaust gas when firing natural gas shall not exceed 4 ppmvd when firing natural gas and 10 ppmvd when firing fuel oil as assured by EPA Methods 18, and/or 25 A. VOC emissions (at ISO conditions) shall not exceed 10 lb/hr (when firing natural gas) and 25 lb/hr (when firing fuel oil). [Rule 62-212.400, F.A.C.]

EXCESS EMISSIONS

26. Excess emissions resulting from startup, shutdown, malfunction or fuel switching shall be permitted provided that best operational practices are adhered to and the duration of excess emissions shall be minimized. Excess emissions occurrences shall in no case exceed four hours in any 24-hour period for cold startup or two hours in any 24-hour period for other reasons unless specifically authorized by DEP for longer duration.

27. Excess emissions entirely or in part by poor maintenance, poor operation, or any other equipment or process failure that may reasonably be prevented during startup, shutdown or malfunction, shall be prohibited pursuant to Rule 62-210.700, F.A.C.

28. Excess Emissions Report: If excess emissions occur due to malfunction, the owner or operator shall notify DEP's Southwest District office within (1) working day of: the nature, extent, and duration of the excess emissions; the cause of the excess emissions; and the actions taken to correct the problem. In addition, the Department may request a written summary report of the incident. Pursuant to the New Source Performance Standards, excess emissions shall also be reported in accordance with 40 CFR 60.7, Subpart A. [Rules 62-4.130 and 62-210.700(6), F.A.C.]

COMPLIANCE DETERMINATION

29. Compliance with the allowable emission limiting standards shall be determined within 60 days after achieving the maximum production rate, for each fuel, at which this unit will be operated, but not later than 180 days of initial operation of the unit for that fuel, and annually thereafter as indicated in this permit, by using the following reference methods as described in 40 CFR 60, Appendix A (1997 version), and adopted by reference in Chapter 62-204.800, F.A.C. Emission limits compliance dates shall conform to the timetable specified on Specific Condition No. 20.

30. Initial (I) performance tests shall be performed on Unit 5 while firing natural gas as well as while firing fuel oil. Initial tests shall also be conducted after any modifications (and shake down period not to exceed 100 days after re-starting the CT) of air pollution control equipment, including installation of Ultra Low NO_X burners, Hot SCR, or conventional SCR. Annual (A) compliance tests shall be performed during every federal fiscal year (October 1 - September 30) pursuant to Rule 62-297.310(7), F.A.C., on Unit 5 as indicated. The following reference methods shall be used. No other test methods may be used for compliance testing unless prior DEP approval is received in writing.

- EPA Reference Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources" (I, A).
- EPA Reference Method 10, "Determination of Carbon Monoxide Emissions from Stationary Sources" (I, A).
- EPA Reference Method 20, "Determination of Oxides of Nitrogen Oxide, Sulfur Dioxide and Diluent Emissions from Stationary Gas Turbines." Initial test only for compliance with 40CFR60 Subpart GG and (I, A) short-term NO_X BACT limits (Method 7E or RATA test data may be used to demonstrate compliance for annual test requirement)
- EPA Reference Method 18, and/or 25A, "Determination of Volatile Organic Concentrations." Initial test only.

31. Continuous compliance with the NO_X emission limits: Continuous compliance with the NO_X emission limits shall be demonstrated with the CEM system based on the applicable averaging time of 24-hr block average (DLN or ULN technology) or a 3-hr average (if SCR is used). Based on CEMS data, a separate compliance determination is conducted at the end of each operating day (or 3-hr period when applicable) and a new average emission rate is calculated from the arithmetic average of all valid hourly emission rates from the previous operating day (or 3-hr period when applicable). Valid hourly emission rates shall not included periods of startup (including fuel switching), shutdown, or malfunction as defined in Rule 62-210.200 F.A.C., where emissions exceed the applicable NO_X standard. These excess emissions periods shall be reported as required in Condition 28.

A valid hourly emission rate shall be calculated for each hour in which at least two NO_X concentrations are obtained at least 15 minutes apart. [Rules 62-4.070 F.A.C., 62-210.700, F.A.C., and 40 CFR 75]

32. Compliance with the SO_2 and PM/PM_{10} emission limits: Not withstanding the requirements of Rule 62-297.340, F.A.C., the use of pipeline natural gas and maximum 0.05 percent sulfur (by weight) No. 2 or superior grade distillate fuel oil, is the method for determining compliance for SO_2 and PM_{10}. For the purposes of demonstrating compliance with the 40 CFR 60.333 SO_2 standard and the 0.05% S limit, fuel oil analysis using ASTM D2880-71 or D4294 (or equivalent) for the sulfur content of liquid fuels and D1072-80, D3031-81, D4084-82 or D3246-81 (or equivalent) for sulfur content of gaseous fuel shall be utilized in accordance with the EPA-approved custom fuel monitoring schedule. The applicant is responsible for ensuring that the procedures above are used for determination of fuel sulfur content. Analysis may be performed by the owner or operator, a service contractor retained by the owner or operator, the fuel vendor, or any other qualified agency pursuant to 40 CFR 60.335(e) (1997 version).

33. Compliance with CO emission limit: An initial test for CO, shall be conducted concurrently with the initial NO_X test, as required. The initial NO_X and CO test results shall be the average of three valid one-hour runs. Annual compliance testing for CO may be conducted concurrent with the annual RATA testing for NO_X required pursuant to 40 CFR 75 (required for gas only).

34. Compliance with the VOC emission limit: An initial test is required to demonstrate compliance with the BACT VOC emission limit. Thereafter, CO emission limit will be employed as surrogate and no annual testing is required.

35. Testing procedures: Testing of emissions shall be conducted with the combustion turbine operating at permitted capacity. Permitted capacity is defined as 95-100 percent of the maximum heat input rate allowed by the permit, corrected for the average ambient air temperature during the test (with 100 percent represented by a curve depicting heat input vs. ambient temperature). If it is impracticable to test at permitted capacity, the source may be tested at less than permitted capacity. In this case, subsequent operation is limited by adjusting the entire heat input vs. ambient temperature curve downward by an increment equal to the difference between the maximum permitted heat input (corrected for ambient temperature) and 105 percent of the value reached during the test until a new test is conducted. Once the unit is so limited, operation at higher capacities is allowed for no more than 15 consecutive days for the purposes of additional compliance testing to regain the permitted capacity. Test procedures shall meet all applicable requirements (i.e., testing time frequency, minimum compliance duration, etc.) of Chapter 62-204.800 F.A.C.

36. Test Notification: The DEP's Southwest District office shall be notified, in writing, at least 30 days prior to the initial performance tests and at least 15 days before annual compliance test(s).

37. Special Compliance Tests: The DEP may request a special compliance test pursuant to Rule 62-297.310(7), F.A.C., when, after investigation (such as complaints, increased visible

emissions, or questionable maintenance of control equipment), there is reason to believe that any applicable emission standard is being violated.

38. Test Results: Compliance test results shall be submitted to the DEP's Southwest District office no later than 45 days after completion of the last test run.

NOTIFICATION, REPORTING, AND RECORDKEEPING

39. Records: All measurements, records, and other data required to be maintained by the City of Lakeland Department of Electric & Water Utilities shall be recorded in a permanent form and retained for at least five (5) years following the date on which such measurements, records, or data are recorded. These records shall be made available to DEP representatives upon request.

40. Emission Compliance Stack Test Reports: A test report indicating the results of the required compliance tests shall be filed with the DEP SW District Office as soon as practical, but no later than 45 days after the last sampling run is completed. [Rule 62-297.310(8), F.A.C.]. The test report shall provide sufficient detail on the tested emission unit and the procedures used to allow the Department to determine if the test was properly conducted and if the test results were properly computed. At a minimum, the test report shall provide the applicable information listed in Rule 62-297.310(8), F.A.C.

MONITORING REQUIREMENTS

41. Continuous Monitoring System: The permittee shall install, calibrate, maintain, and operate a continuous emission monitor in the stack to measure and record the nitrogen oxides emissions from Unit 5. Periods when NO_X emissions (ppmvd @ 15% oxygen) are above the BACT standards, listed in Specific Condition No 20 and 21, shall be reported to the DEP Southwest District Office pursuant to Rule 62-4.160(8), F.A.C. Following the format of 40 CFR 60.7, periods of startup, shutdown, malfunction, and fuel switching shall be monitored, recorded, and reported as excess emissions when emission levels exceed the BACT standards listed in Specific Condition No. 20 and 21. [Rule 62-204.800 and 40 CFR 60.7 (1997 version)]

42. CEMS in lieu of Water to Fuel Ratio: Subject to EPA approval, the NO_X CEMS shall be used in lieu of the water/fuel monitoring system for reporting excess emissions in accordance with 40 CFR 60.334(c)(1), Subpart GG (1997 version). Subject to EPA approval, the calibration of the water/fuel monitoring device required in 40 CFR 60.335 (c)(2) (1997 version) will be replaced by the 40 CFR 75 certification tests of the NO_X CEMS. Upon request from DEP, the CEMS emission rates for NO_X on Unit 5 shall be corrected to ISO conditions to demonstrate compliance with the NO_X standard established in 40 CFR 60.332.

43. Continuous Monitoring System Reports: The monitoring devices shall comply with the certification and quality assurance, and any other applicable requirements of Rule 62-297.520, F.A.C., 40 CFR 60.13, including certification of each device in accordance with 40 CFR 60, Appendix B, Performance Specifications and 40 CFR 60.7(a)(5) or 40 CFR Part 75.

Quality assurance procedures must conform to all applicable sections of 40 CFR 60, Appendix F or 40CFR75. Data on CEM equipment specifications, manufacturer, type, calibration and maintenance needs, and its proposed location shall be provided to the Department's Southwest District Office (DEPSWD) for review at least 90 days prior to installation.

44. Fuel Oil Monitoring Schedule: The following monitoring schedule for No. 2 or superior grade fuel oil shall be followed: For all bulk shipments of No. 2 or superior grade fuel oil received at the C.D. McIntosh , Jr. Power Plant, an analysis which reports the sulfur content and nitrogen content of the fuel shall be provided by the fuel vendor. The analysis shall also specify the methods by which the analyses were conducted and shall comply with the requirements of 40 CFR 60.335(d).

45. Natural Gas Monitoring Schedule: The following custom monitoring schedule for natural gas is approved (pending EPA concurrence) in lieu of the daily sampling requirements of 40 CFR 60.334 (b)(2):

- Monitoring of natural gas nitrogen content shall not be required.
- Analysis of the sulfur content of natural gas shall be conducted using one of the EPA-approved ASTM reference methods in Specific Condition No. 32 for the measurement of sulfur in gaseous fuels, or an approved alternative method. Once Unit 5 becomes operational, monitoring of the sulfur content of the natural gas shall be conducted twice monthly for six months. If this monitoring shows little variability in the fuel sulfur content, and indicates consistent compliance with 40 CFR 60.333, then fuel sulfur monitoring shall be conducted once per quarter for six quarters and after that, semiannually.
- Should any sulfur analysis indicate noncompliance with 40 CFR 60.333, the City shall notify DEP of such excess emissions and the customized fuel monitoring schedule shall be reexamined. The sulfur content of the natural gas will be monitored weekly during the interim period while the monitoring schedule is reexamined.
- The City shall notify DEP of any change in natural gas supply for reexamination of this monitoring schedule. A substantial change in natural gas quality (i.e., sulfur content variation of greater than 1 grain per 100 cubic foot of natural gas) shall be considered as a change in the natural gas supply. Sulfur content of the natural gas will be monitored weekly by the natural gas supplier during the interim period when this monitoring schedule is being reexamined.
- Records of sampling analysis and natural gas supply pertinent to this monitoring schedule shall be retained by the City for a period of five years, and shall be made available for inspection by the appropriate regulatory personnel.
- The City may obtain the sulfur content of the natural gas from the fuel supplier (Florida Gas Transmission) provided the test methods listed in Specific Condition E.4 are used.

46. Determination of Process Variables:

- The permittee shall operate and maintain equipment and/or instruments necessary to determine process variables, such as process weight input or heat input, when such data is needed in conjunction with emissions data to determine the compliance of the emissions unit with applicable emission limiting standards.
- Equipment and/or instruments used to directly or indirectly determine such process variables, including devices such as belt scales, weigh hoppers, flow meters, and tank scales, shall be calibrated and adjusted to indicate the true value of the parameter being measured with sufficient accuracy to allow the applicable process variable to be determined within 10% of its true value [Rule 62-297.310(5), F.A.C]

G.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.

G.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 or exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

G.3 As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey and 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 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.

G.4 This permit conveys no title to land or water, does not constitute State recognition or acknowledgment 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.

G.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.

G.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.

G.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 and 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.

G.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.

G.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 extend it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

G.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.

G.11 This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 62-4.120 and 62-730.300, 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.

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

G.13 This permit also constitutes:

a) Determination of Best Available Control Technology (X)
b) Determination of Prevention of Significant Deterioration (X); and
c) Compliance with New Source Performance Standards (X).

G.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 or 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:

1. The date, exact place, and time of sampling or measurements;
2. The person responsible for performing the sampling or measurements;
3. The dates analyses were performed;
4. The person responsible for performing the analyses;
5. The analytical techniques or methods used; and
6. The results of such analyses.

G.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.

Memorandum

Florida Department of Environmental Protection

TO: Howard Rhodes

THRU: A. A. Linero 6/22

FROM: Teresa Heron T.H.

DATE: June 22, 1998

SUBJECT: City of Lakeland McIntosh Unit No. 5
250 MW Gas Turbine (PSD-FL-245)

Attached is the final permit package for construction of a 250 MW Westinghouse 501 G simple cycle gas-fired combustion turbine at the City of Lakeland's McIntosh Power Plant. The project includes a once-through steam generator to provide steam for cooling key turbine components and for power augmentation to reach the 250 MW level. A 1.05 million gallon storage tank will be constructed for the back-up distillate fuel that will be used for no more than 250 hours per year.

Westinghouse has provided a schedule to design, test, and implement the Ultra Low NO_X (ULN) technology so that emission limits of 9 ppm can be met by May 1, 2002 at the Lakeland site. This is about three years from start-up. Westinghouse has had some recent failures in trying to meet NO_X limits of 25 ppm by steam injection at a project in Missouri, 9 ppm by SCR at a project in Georgia, and 9-12 ppm at the FPC Hines Facility by Dry Low NO_X. The problem has not been that the NO_X numbers are too low, but rather that Westinghouse did not correctly assess the capabilities of key components in its designs. There are many units throughout the country meeting limits between 3.5 and 9 ppm using both SCR or Dry Low NO_X (GE version) technologies. The location of the Westinghouse combustion experts in Orlando will maximize the chances of success at Lakeland.

If the technology fails to achieve the requirements, the City must install Hot SCR to meet a 9 ppm limit under simple cycle operation. The City has already contracted Sargent and Lundy to evaluate the feasibility of conversion to a 350 MW combined cycle. If the unit is converted to combined cycle operation and achievement of 9 ppm by ULN or Hot SCR is not in-sight, then conventional SCR to meet a 7.5 ppm value will be required. If the unit achieves the 9 ppm value as scheduled under simple cycle operation, they do not have to take a lower limit if and when they convert to combined cycle operation.

We discussed all issues with the City and with EPA and there are no outstanding items. I recommend your approval of the attached Intent to Issue. However, please do not date since we will not actually send it out until the Site Certification is signed. The McIntosh Site Certification Modification Order will not be approved either until we give them what will be the final conditions from this permit.

AAL/th

Attachments

APPENDIX BD
BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION (BACT)

C. D. McIntosh, Jr. Power Plant
City of Lakeland Electric & Water Utilities
PSD-FL-245 and 1050004-004AC
Lakeland, Polk County, Florida

BACKGROUND

The applicant, The City of Lakeland (City), proposes to install a nominal 250 megawatt (MW) (net) new simple cycle combustion turbine at the existing C.D. McIntosh, Jr. Power Plant located at 3030 East Lake Parker Drive in Lakeland, Polk County. The proposed project will result in "significant increases" with respect to Table 62-212.400-2, Florida Administrative Code (F.A.C.) of emissions of particulate matter (PM and PM_{10}), carbon monoxide (CO), volatile organic compounds (VOC), and nitrogen oxides (NO_X). The project is therefore subject to review for the Prevention of Significant Deterioration (PSD) and a determination of Best Available Control Technology (BACT) in accordance with Rules 62-212.400, F.A.C.

The unit to be installed is a 230 MW Westinghouse 501 G combustion turbine and includes a once through steam generator (OTSG) which provides steam for steam cooling of critical components and injection for further cooling and power augmentation to 250 MW. Descriptions of the process, project, air quality effects, and rule applicability are given in the Technical Evaluation and Preliminary Determination dated April 22, 1998, accompanying the Department's Intent to Issue.

DATE OF RECEIPT OF A BACT APPLICATION:

The application was received on December 8, 1997 and included a proposed BACT proposal prepared by the applicant's consultant, Golder Associates Inc.

REVIEW GROUP MEMBERS:

A. A. Linero, P.E., and Teresa Heron, Review Engineer

BACT DETERMINATION REQUESTED BY THE APPLICANT:

POLLUTANT	CONTROL TECHNOLOGY	PROPOSED BACT LIMIT
Particulate Matter	Pipeline Natural Gas No. 2 Distillate Oil Use (250 hr/yr) Combustion Controls	9.1 lb/hr (Gas) 140 lb/hr, 0.05% sulfur (Oil)
Volatile Organic Compounds	As Above	4 ppm (Gas) 10 ppm (Oil)
Visibility	As Above	20 percent
Carbon Monoxide	As Above	50 ppm (Gas, baseload) 90 ppm (Oil, baseload)
Nitrogen Oxides	Dry Low NO_X Burners (Gas) Water Injection (Oil)	25 ppm @ 15% O_2 (Gas, baseload) 42 ppm @ 15% O_2 (Oil, baseload)

The unit, as described above, would emit approximately 852-863 tons per year (TPY) of NO_X, 761-1,264 TPY of CO, 37-94 TPY of VOC, 39 TPY of SO_2, and 41 TPY of PM/PM_{10}. The basis is 7,008 hours of operation including 250 hours of oil firing and 1050 hours at 50% load.

APPENDIX BD
BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION (BACT)

BACT DETERMINATION PROCEDURE:

In accordance with Chapter 62-212, F.A.C., this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department of Environmental Protection (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:

- Any Environmental Protection Agency determination of BACT 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.
- All scientific, engineering, and technical material and other information available to the Department.
- The emission limiting standards or BACT determination of any other state.
- 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 unit in question, the most stringent control available for a similar or identical emission unit or emission unit category. If it is shown that this level of control is technically or economically unfeasible for the emission unit 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.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES:

The minimum basis for a BACT determination is 40 CFR 60, Subpart GG, Standards of Performance for Stationary Gas Turbines (NSPS). Subpart GG was adopted by the Department by reference in Rule 62-204.800, F.A.C. The key emission limits required by Subpart GG are 75 ppm NO_X @ 15% O_2. (assuming 25 percent efficiency) and 150 ppm SO_2 @ 15% O_2.(or <0.8% sulfur in fuel). The BACT proposed by the City is consistent with the NSPS which allows NO_X emissions over 110 ppm for the higher efficiency unit purchased by the City of Lakeland. No National Emission Standard for Hazardous Air Pollutants exists for stationary gas turbines.

DETERMINATIONS BY EPA AND STATES:

Most recent stationary gas turbine BACT determinations made to-date by EPA and the states, including the State of Florida, have been much more stringent than the requirements of the NSPS. The following table is a sample of information on recent BACT and a few Lowest Achievable Emission Rate (LAER) determinations made by EPA and the States for stationary gas turbine projects as large or larger than the one under review. LAER is required in areas where the ambient air (unlike that Florida) does not attain the National Ambient Air Quality Standards (NAAQS).

APPENDIX BD
BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION (BACT)

Project Location	Power Output and Duty	NO_X Limit ppm @ 15% O_2 and Fuel	Technology	Comments
Cataula, GA	1200 MW **SC** PKR	25 - NG 42 - No. 2 FO	DLN WI	4x300 MW **WH 501G** CTs CTs rated 230 MW @ ISO, NG
Mid-GA Cogen, GA	308 MW CC **CON**	9 - NG 20 - No. 2 FO	DLN & SCR	2x119 MW **WH 501**D5A CTs
CCC, VA	398 MW **SC** PKR	42/65 - No. 2 FO	WI	3x132.5 MW CTs 2000 (500 @ Peak) hr/yr/CT
PREPA, PR	248 MW **SC CON**	10 - No. 2 FO	WI & Hot SCR	3x83 MW CTs
Tiger Bay, **FL**	270 MW CC **CON**	15/10 - NG 42 - No. 2 FO	DLN &/or SCR WI	184 MW GE MS7001FA CT DLN/15 ppm or SCR/10 ppm
Hines Polk, **FL**	485 MW CC **CON**	12 - NG 42 - No. 2 FO	DLN WI	2x165 MW **WH 501**FC CTs Canceled GE CTs
Tallahassee, **FL**	260 MW CC **CON**	12 - NG 42 - No. 2 FO	DLN WI	160 MW GE MS 7231FA CT DLN Guarantee is 9 ppm
Eco-Electrica, PR	461 MW CC **CON**	7 - NG 9 - LPG, No. 2 FO	DLN & SCR	2x160 MW **WH 501F** CTs
Sithe/IPP, NY	1012 MW CC **CON**	4.5 - NG	DLN & SCR	4 x160 MW GE 7FA CTs
Hermiston, OR	474 MW CC **CON**	4.5 - NG	SCR	2x160 MW GE 7FA CTs
Berkshire, MA	272 MW CC **CON**	3.5 - NG (LAER) 9.0 - No. 2 FO	DLN & SCR WI & SCR	178 MW ABB GT24 CT

SC = Simple Cycle
CC = Combined Cycle
NG = Natural Gas
CT = Combustion Turbine
CON = Continuous
PKR = Peaking Unit
FO = Fuel Oil
ISO = 59°F
DLN = Dry Low NO_X Combustion
SCR = Selective Catalytic Reduction
LPG = Liquefied Propane Gas
WI = Water or Steam Injection
GE = General Electric
WH = Westinghouse
ABB = Asea Brown Bovari
ppm = parts per million

Factors in Common with City of Lakeland Project are bolded. All determinations are BACT unless denoted as LAER.

Project Location	CO - ppm (or lb/mmBtu)	VOC - ppm (or lb/mmBtu)	PM - lb/mmBtu (or gr/dscf or lb/hr)	Technology and Comments
Cataula, GA	25 - NG @15% O_2 75 - FO@ 15% O_2	0.01 lb/mmBtu	0.005 - NG 0.03 - FO	Clean Fuels Good Combustion
Mid-GA Cogen, GA	10 - NG 30 - FO	6 - NG 30 - FO	18 lb/hr - NG 55 lb/hr - FO	Clean Fuels Good Combustion
CCC, VA	Not PSD	Not PSD	0.0216 - FO	Clean Fuels Good Combustion
PREPA, PR	9 - FO @15% O_2	11 - FO @15% O_2	0.0171 gr/dscf	Clean Fuels Good Combustion
Tiger Bay, FL	0.045 lb/mmBtu-NG 0.053 lb/mmBtu-FO		0.053 - NG 0.009 - FO	Clean Fuels Good Combustion
Hines Polk, FL	25 - NG 30 - FO	7 - NG 7 - FO	0.006 - NG 0.01 - FO	Clean Fuels Good Combustion
Tallahassee, FL	25 - NG 90 - FO			Clean Fuels Good Combustion
Eco-Electrica, PR	33 - NG/LPG @15% O_2 33 - FO @15% O_2	1.5/2.5 - NG/LPG 6 - FO	0.0053 - NG/LPG 0.0390 - FO	Clean Fuels Good Combustion
Sithe/IPP, NY	13 - NG			Clean Fuels Good Combustion
Hermiston, OR	15 - NG			Clean Fuels Good Combustion
Berkshire, MA	4 - NG (LAER) 5 - FO (LAER)	4 - NG 16 - FO	0.0105 - NG 0.0468 - FO	Clean Fuels CO Catalyst

OTHER INFORMATION AVAILABLE TO THE DEPARTMENT:

Besides the information submitted by the applicant and that mentioned above, other information available to the Department consists of:

- Comments from the National Park Service dated January 6 and 12, April 2 and 15, 1998
- Letters from EPA Region IV dated February 10 and March 6, and May 21, 1998
- Decisions by the Environmental Appeals Board
- Papers and letters written by Westinghouse on the development of the 501 G combustion turbine and nitrogen oxides control technologies
- DOE website information on Advanced Turbine Systems Project
- Mitsubishi website
- City of Lakeland Website, City Commission Meeting Minutes
- Alternative Control Techniques Document - NO_X Emissions from Stationary Gas Turbines
- General Electric 39th Turbine State-of-the-Art Technology Seminar Proceedings

REVIEW OF NITROGEN OXIDES CONTROL TECHNOLOGIES:

Much of the discussion in this section is based on a 1993 EPA document on Alternative Control Techniques for NO_X Emissions from Stationary Gas Turbines. Project-specific information is included where applicable.

Nitrogen Oxides Formation

Nitrogen oxides form in the gas turbine combustion process as a result of the dissociation of molecular nitrogen and oxygen to their atomic forms and subsequent recombination into seven different oxides of nitrogen. Thermal NO_X forms in the high temperature area of the gas turbine combustor. Thermal NO_X increases exponentially with increases in flame temperature and linearly with increases in residence time. Flame temperature is dependent upon the ratio of fuel burned in a flame to the amount of fuel that consumes all of the available oxygen.

By maintaining a low fuel ratio (lean combustion), the flame temperature will be lower, thus reducing the potential for NO_X formation. Prompt NO_X is formed in the proximity of the flame front as intermediate combustion products. The contribution of Prompt to overall NO_X is relatively small in lean, near-stoichiometric combustors and increases for leaner fuel mixtures. This provides a practical limit for NO_X control by lean combustion.

Fuel NO_X is formed when fuels containing bound nitrogen are burned. This phenomenon is not important when combusting natural gas. It is not important for the Lakeland project because natural gas will be the primary fuel and low sulfur fuel oil will be used only for 250 hours per year.

Uncontrolled emissions range from about 100 to over 600 parts per million by volume, dry, corrected to 15 percent oxygen (ppm @15% O_2). For large modern turbines, the Department estimates uncontrolled emissions at approximately 200 ppm @15% O_2.

NO_X Control Techniques

Wet Injection

Injection of either water or steam directly into the combustor lowers the flame temperature and thereby reduces thermal NO_X formation. Typical emissions achieved by wet injection are about 25 ppm when firing gas and 42 ppm when firing fuel oil in large combustion turbines. These values often form the basis for further reduction to BACT limits by other techniques. Carbon monoxide (CO) and hydrocarbon (HC) emissions are relatively low for most gas turbines. However steam and (more so) water injection increase emissions of both of these pollutants.

Combustion Controls

The excess air in lean combustion, cools the flame and reduces the rate of thermal NO_X formation. Lean premixing of fuel and air prior to combustion can further reduce NO_X emissions. This is accomplished by minimizing localized fuel-rich pockets (and high temperatures) that can occur when trying to achieve lean mixing within the combustion zones.

The above principle is depicted in Figure 1 for a can-annular combustor operating on gas. For ignition, warm-up, and acceleration to approximately 20 percent load, the first stage serves as the complete combustor. Flame is present only in the first stage, which is operated as lean stable combustion will permit. With increasing load, fuel is introduced into the secondary stage, and combustion takes place in both stages. When the load reaches approximately 40 percent, fuel is cut off to the first stage and the flame in this stage is extinguished. The venturi ensures the flame in the second stage cannot propagate upstream to the first stage. When the fuel in the first-stage flame is extinguished (as verified by internal flame detectors), fuel is again introduced into the first stage, which becomes a premixing zone to deliver a lean, unburned, uniform mixture to the second stage. The second stage acts as the complete combustor in this configuration.

Combustors used in Westinghouse products are shown in Figure 2. These operate according to the same principles as described above. However they have different characteristics and do not reach the so-called fully pre-mixed operation until the load is over 50 percent.

The emission characteristics of General Electric's Dry Low NO_X (DLN 2) combustors are given in Figure 3. NO_X concentrations are higher in the exhaust at lower loads because at lower loads, the combustor do not operate in the lean pre-mix mode. Therefore such a combustor emits NO_X at concentrations of 25 parts per million (ppm) at loads between 40 and 100 percent of capacity, but concentrations as high as 100 ppm at less than 50 percent of capacity. GE has since upgraded its combustors and this description is not precise for its more advanced DLN 2.6

In all but the most recent gas turbine combustor designs, the high temperature combustion gases are cooled to an acceptable temperature with dilution air prior to entering the turbine (expansion) section. The sooner this cooling occurs, the lower the thermal NO_X formation. Cooling is also required to protect the first stage nozzle. When this is accomplished by air cooling, the air is injected into the component and is ejected into the combustion gas stream, causing a further drop in combustion gas temperature. This, in turn, results in a lower achievable thermal efficiency for the unit.

By using steam in a closed loop system, the fluid is circulated through the internal portion of the nozzle component or around the transition piece between the combustor the nozzle and does not enter the exhaust stream. Instead it is normally sent back to the steam generator. The difference between flame temperature and firing temperature into the first stage is minimized and higher.

Another important result of steam cooling is that a higher firing temperature can be attained with no increase in flame temperature. Flame temperatures and NO_X emissions can therefore be maintained at comparatively low levels even at high firing temperatures. At the same time, thermal efficiency should be greater when employing steam cooling. A similar analysis applies to steam cooling around the transition piece between the combustor and first stage nozzle.

The relationship between flame temperature, firing temperature, unit efficiency, and NO_X formation can be appreciated from Figure 4 which is from a General Electric discussion on these principles. In addition to employing pre-mixing and steam cooling, further reductions are accomplished through design optimization of the burners, testing, further evaluation, etc.

At the present time, emissions achieved by combustion controls are low as 9 ppm (and even lower) from gas turbines smaller than about 200 MW (simple cycle). Initial guarantees of 25 ppm by combustion controls are proposed for turbines larger than larger than 200 MW. The guaranteed values are expected to be reduced for the reasons given above. As in the case of wet injection, higher CO and hydrocarbon emissions can occur as a result of employing combustion controls to minimize NO_X.

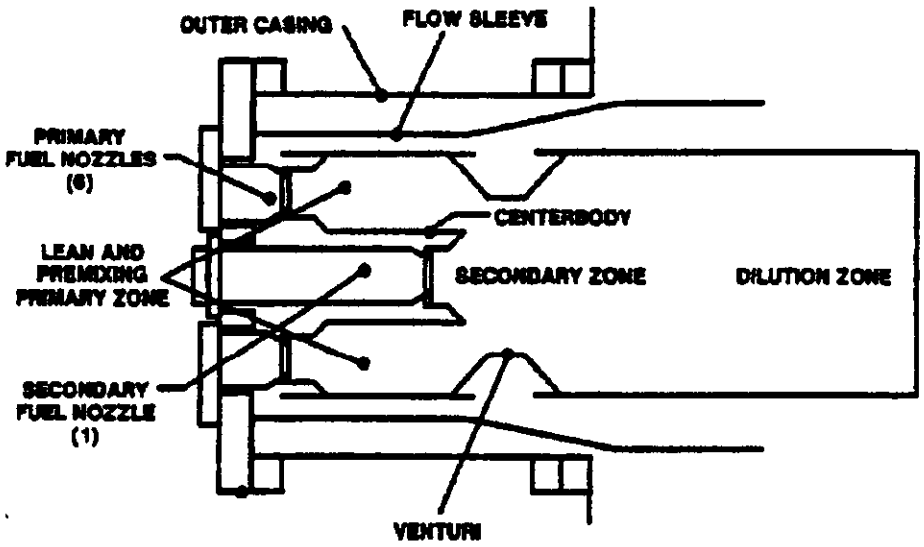
Selective Catalytic Combustion

Selective catalytic reduction (SCR) is an add-on NO_X control technology that is employed in the exhaust stream following the gas turbine. SCR reduces NO_X emissions by injecting ammonia into the flue gas. As of early 1992, over 100 gas turbine installations already used SCR in the United States. No combustion turbines in Florida employ SCR. Virtually all SCR units are used in combination with wet injection or combustion controls.

Ammonia reacts with NO_X in the presence of a catalyst and excess oxygen yielding molecular nitrogen and water. The catalyst used in combined cycle, low temperature applications (conventional SCR), is usually vanadium or titanium oxide and accounts for almost all installations. For high temperature applications (Hot SCR up to 1100 ^{o}F), such as simple cycle turbines, zeolite catalysts are available but used in few applications to-date.

In the past, sulfur was found to poison the catalyst material. Sulfur-resistant catalyst materials are now available, however, and catalyst formulation improvements have proven effective in resisting performance degradation with fuel oil in Europe and Japan, where conventional SCR catalyst life in excess of 4 to 6 years has been achieved, versus 8 to 10 years with natural gas.

In a manner analogous to balancing control of NO_X from the combustor with emissions of CO and hydrocarbon, similar balancing is required when controlling NO_X by SCR. Excessive ammonia use tends to increase emissions of CO, ammonia (slip), and particulate matter (when sulfur bearing fuels are used). Permit limits as low as 3.5 ppm NO_X have been specified for certain conventional SCR applications in ozone non-attainment areas. Recently, Southern Company proposed a 3.5 ppm NO_X limit for a project in an attainment area in Alabama.



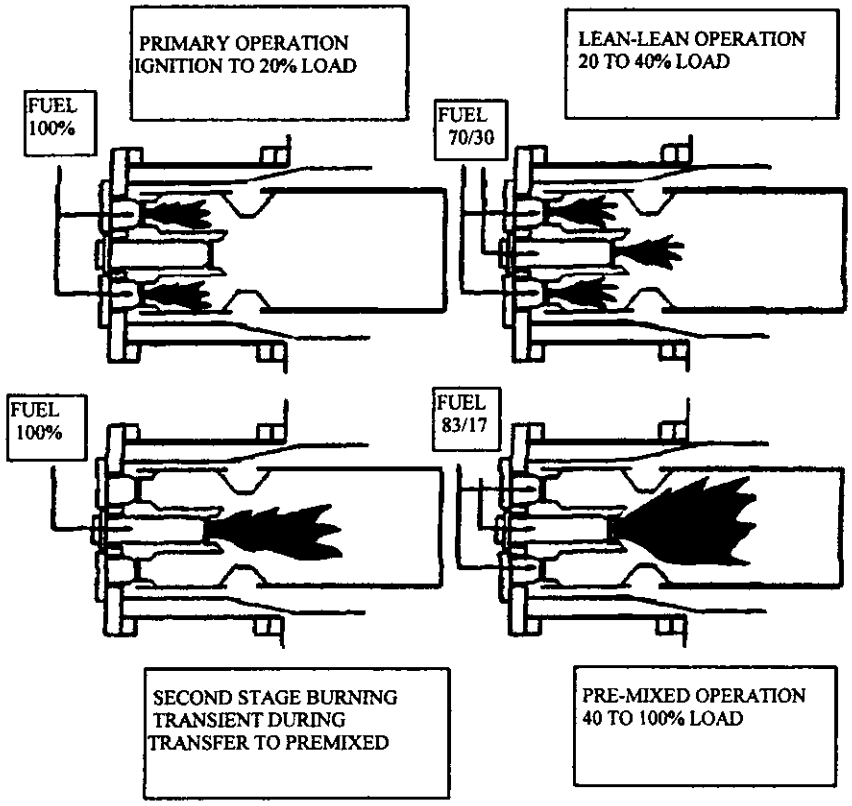
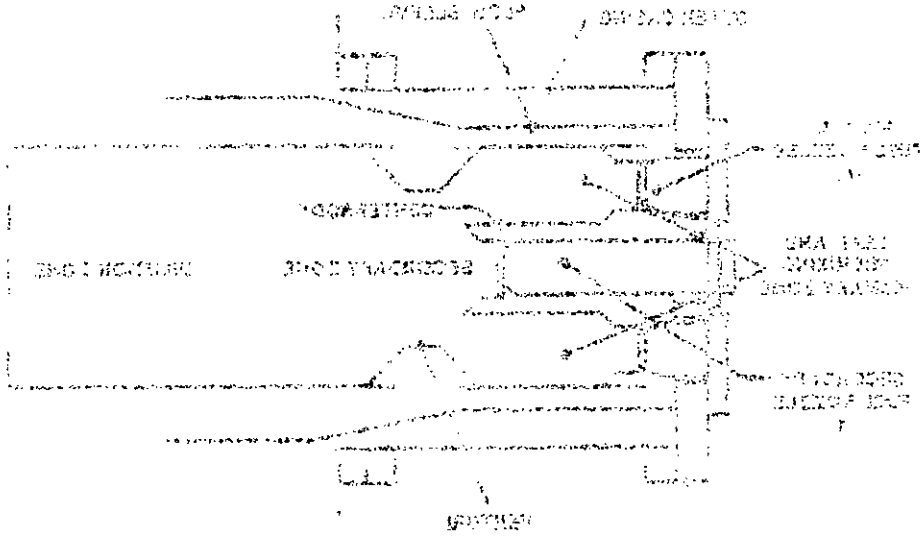
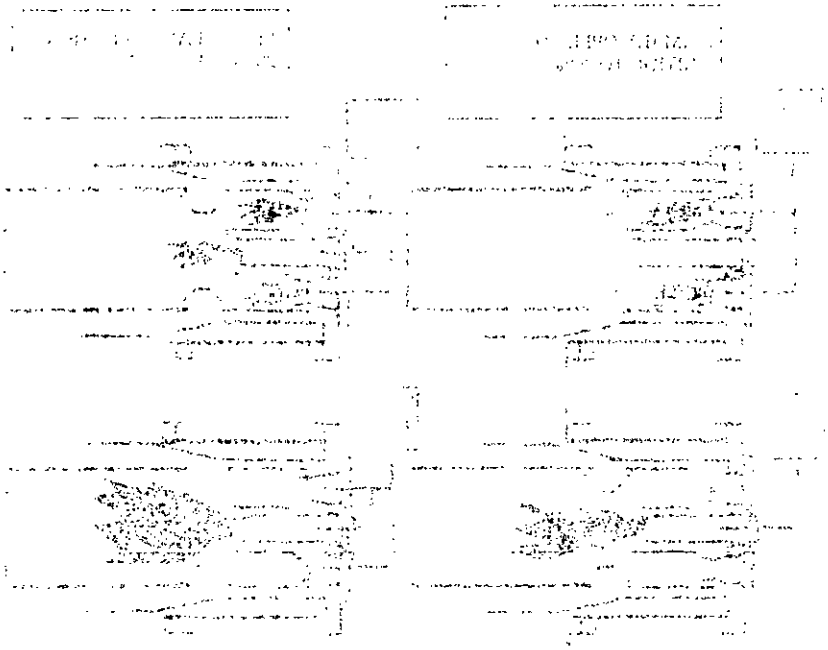
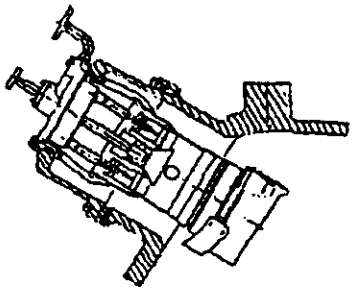


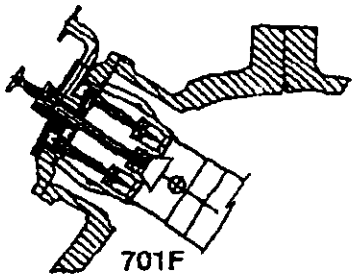
Figure 1 - Cross Sections of a Lean Premixed Can-annular Combustor



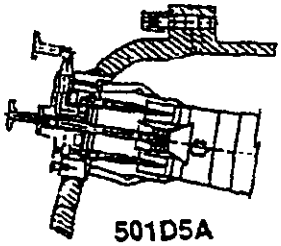




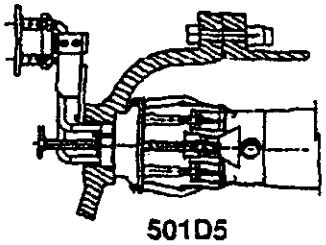
501F



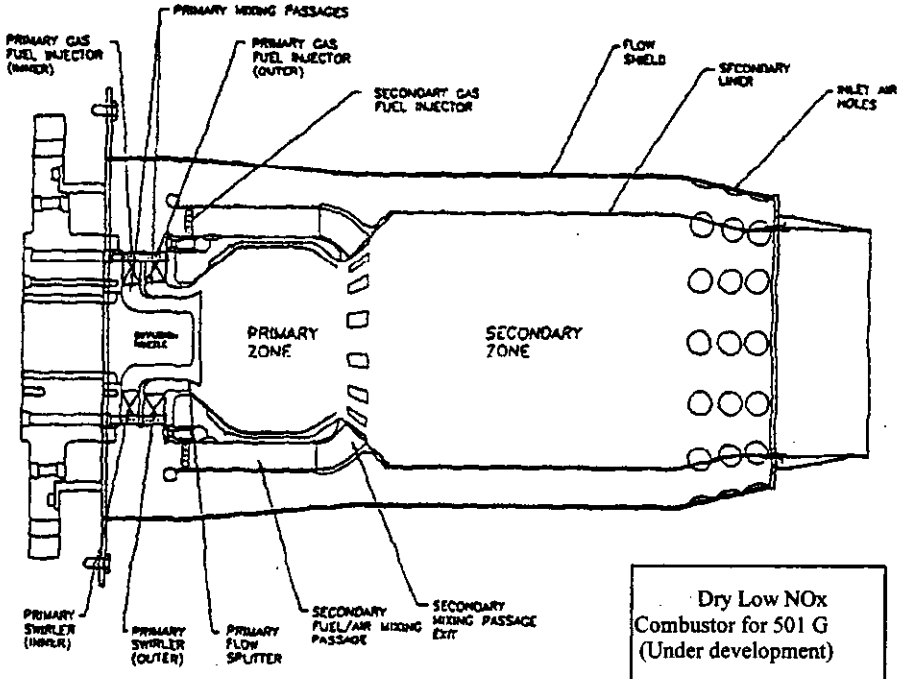
701F



501D5A



501D5



Dry Low NOx Combustor for 501 G (Under development)

Figure 2 - Westinghouse Dry Low NOx Combustors

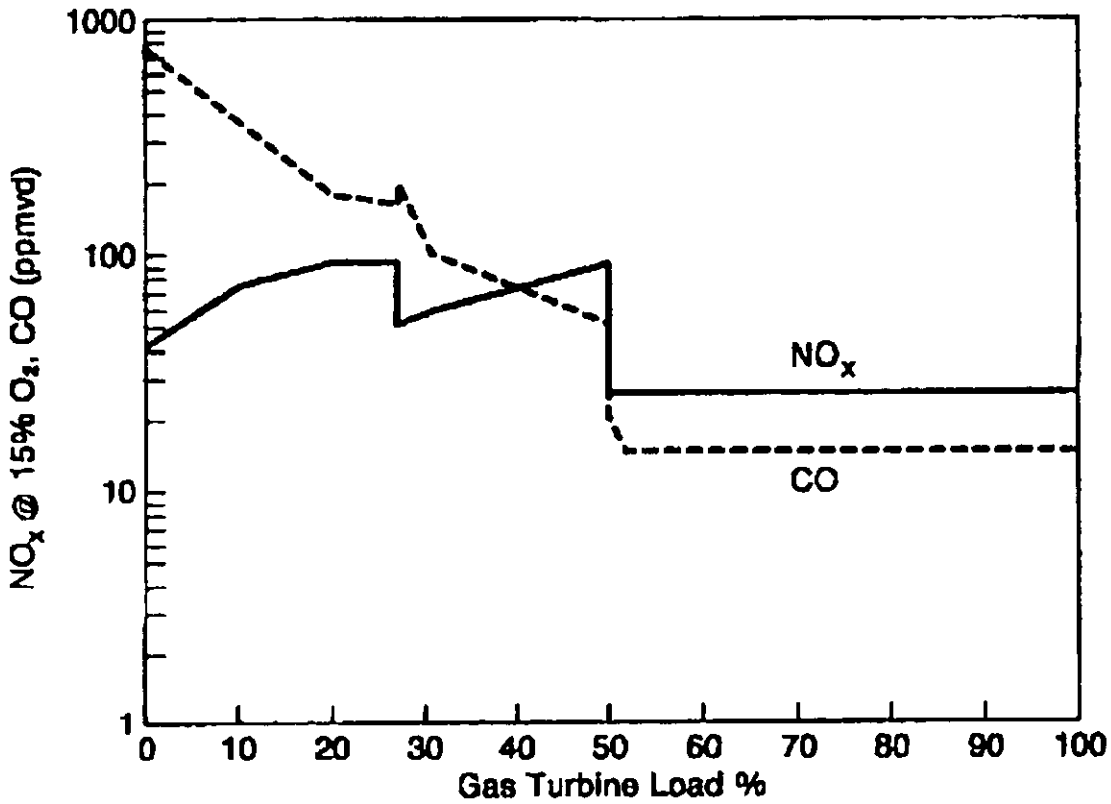


Figure 3 Emissions performance for DLN-2 combustors firing natural gas

Source: General Electric GER-3568E, 1996

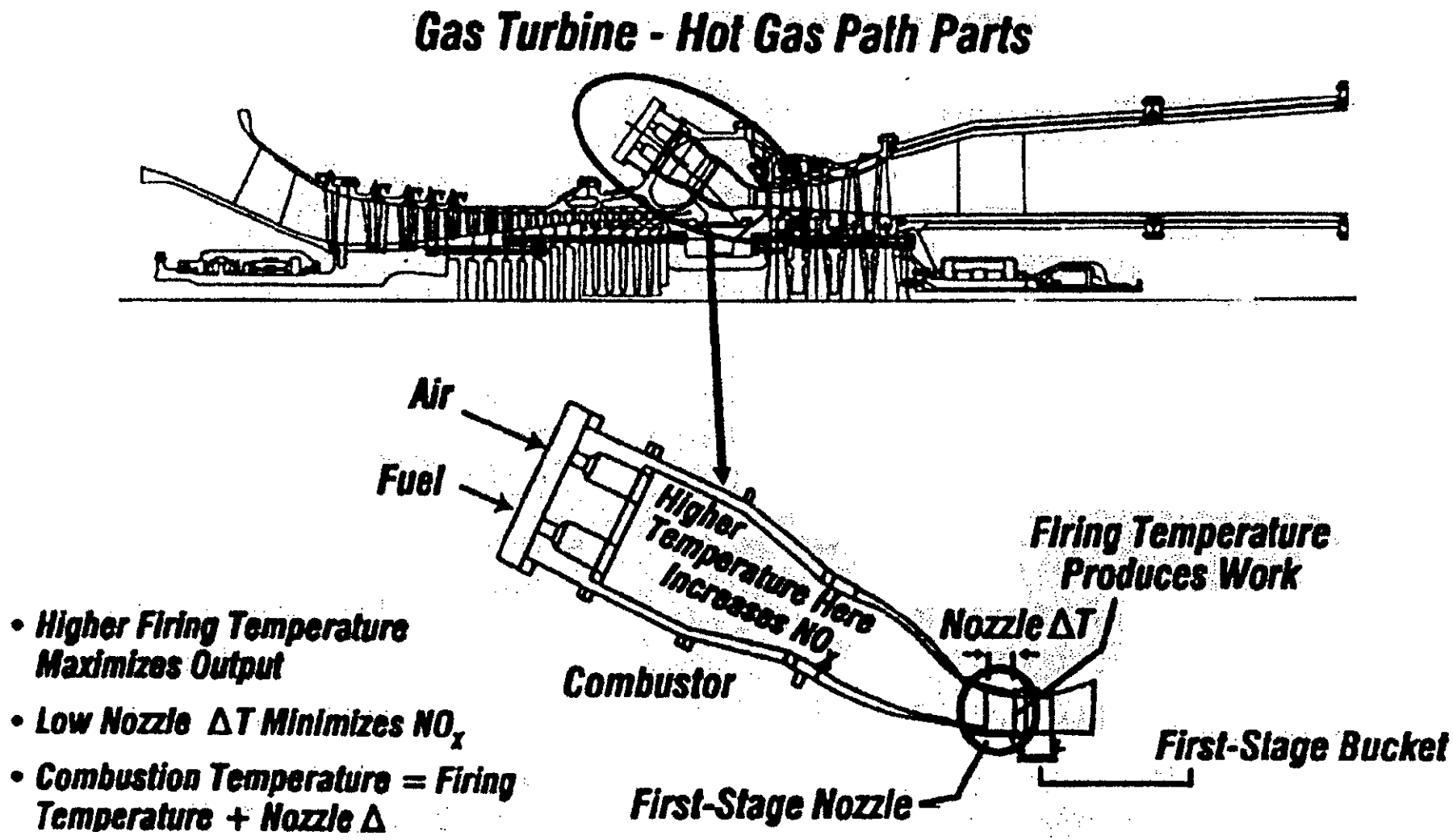


Figure 4. Relationship — combustion temperature to firing temperature

REVIEW OF PARTICULATE MATTER (PM/PM_{10}) CONTROL TECHNOLOGIES:

Particulate matter is generated by various physical and chemical processes during combustion and will be affected by the design and operation of the NO_X controls. The particulate matter emitted from this unit will mainly be less than 10 microns in diameter (PM_{10}).

Natural gas and 0.05 percent sulfur No. 2 (or superior grade) distillate fuel oil will be the only fuels fired and are efficiently combusted in gas turbines. Such fuels are necessary to avoid damaging turbine blades and other components already exposed to very high temperature and pressure. Natural gas is an inherently clean fuel and contains no ash. The fuel oil to be combusted contains a minimal amount of ash and will be used for approximately 250 hours per year making any conceivable add-on control technique for PM/PM_{10} either unnecessary or impractical.

A technology review indicated that the top control option for PM_{10} is a combination of good combustion practices, fuel quality, and filtration of inlet air. The City indicated that the PM_{10} emissions will not exceed 0.01 gr/scf when firing natural gas and pointed out that such a value is equal to a typical specification for baghouse design. Annual emissions of PM_{10} are expected to be approximately 30 tons for natural gas and less than 15 tons for fuel oil.

REVIEW OF CARBON MONOXIDE(CO) CONTROL TECHNOLOGIES

CO is emitted from combustion turbines due to incomplete fuel combustion. Combustion design and catalytic oxidation are the control alternatives that are viable for the project. The most stringent control technology for CO emissions is the use of an oxidation catalyst.

Most installation using catalytic oxidation are located in the Northeast. Besides the Berkshire installation listed above, CO oxidation catalyst has been installed at the 240 MW Brooklyn Navalyard Facility, the 240 MW Masspower facility, the 165 MW Pittsfield Generating Plant in Massachusetts, and the 345 MW Selkirk Generating Plant in New York. Catalytic oxidation was recently installed at a cogeneration plant at Reedy Creek (Walt Disney World), Florida to avoid PSD review which would have been required due to increased operation at low load.

Most combustion turbines incorporate good combustion to minimize emissions of CO. These installations typically achieve emissions between 10 and 30 at full load, even as they achieve relatively low NO_X emissions by SCR or dry low NO_X means. By comparison, the values of 50 and 90 ppm for gas and oil respectively at baseload proposed in the City's application appear high.

REVIEW OF VOLATILE ORGANIC COMPOUND (VOC) CONTROL TECHNOLOGIES

Volatile organic compound (VOC) emissions, like CO emissions, are formed due to incomplete combustion of fuel. There are no viable add-on control techniques as the combustion turbine itself is very efficient at destroying VOC. The limits proposed for this project are 4 and 10 ppm for gas and oil firing respectively.

BACKGROUND ON SELECTED GAS TURBINE

The City has already committed to the purchase of a 230 MW Westinghouse 501 G simple cycle gas turbine.[1] The unit was already under construction by Westinghouse and awaiting sale. The contract for the unit includes NO_X emission guarantees of 25 ppm on gas and 42 ppm on fuel oil.

The choice satisfies the City's immediate power needs and reserve capacity. If it is ultimately converted to combined cycle operation, the power generating capacity will be about 350 MW.[2] A contract was recently awarded to Sargent and Lundy to prepare bid specifications to convert the unit to combined cycle operation at the earliest opportunity.[3]

The conceptual and basic designs for the 501 G were jointly developed by Westinghouse and Mitsubishi Heavy Industries (MHI). Detailed designs were developed separately by the two companies and the units are not identical.[4] The first 501 G started operation in April of 1997 in Japan at the MHI Takasago Machinery Works 330 MW Demonstrator Combined Cycle Plant. The unit has the "highest firing temperature (1500 °C, 2732 °F) ever recorded, and a combined cycle efficiency of over 58 percent."[5] The efficiency is also the highest ever demonstrated for combined cycle turbine. NO_X emissions are controlled by multi-nozzle DLN combustor, followed by a selective catalytic reduction (SCR) system located within the heat recovery steam generator (HRSG).

The first commercial operation (i.e. not within MHI subsidiaries) of a "1500 °C" combined cycle unit will begin trial operation at the Tohoku Electric Higashui Niigata Power Plant in October, 1998.[6] The specific unit will be the "701 G," which is a larger, 50 Hertz version of the 501 G. Commercial operation will begin in July, 1999.

Westinghouse and General Electric continue to work on even larger and more efficient turbines. Westinghouse has already tested the compressor for its planned "H" Class turbine capable of achieving 60 percent efficiency while operating in combined cycle mode.[7] General Electric does not have an entry in the "G" class. However it is conducting trials in Greenville, South Carolina on the MS9001H, which is its 50 Hertz entry into the H Class. GE expects a combined cycle efficiency of 60 percent and generation of over 400 MW. GE plans to make its similar 60 Hertz MS7001H version available in 2001 or 2002.[8]

Westinghouse and General Electric are counting on further advancement and refinement of DLN technology to provide sufficient NO_X control for their turbines. In the case of the 501 G, steam cooling of the transition piece allows the unit the maintain the same NO_X formation potential as the 501 F while achieving a higher turbine inlet (firing) temperature. Examples of Westinghouse combustors are shown in Figure 2. These include their second generation of Dry Low NO_X combustors including their fully pre-mixed Piloted Ring Combustor.[9] Where required by BACT or LAER determinations of certain states, both companies incorporate SCR in combined cycle projects.[10,11]

The approach of progressively refining such technology is a proven one, even on some relatively large units. Basically this was the strategy adopted in Florida throughout the 1990's. Recently GE Frame 7 FA units (160 MW gas turbines with firing temperatures of 2400) met performance guarantees of 9 ppm with "DLN-2.6" burners at Fort St. Vrain, CO and Clark County, WA.[12]

Westinghouse will conduct two phases of testing in 1998 in its effort to develop Ultra Low NO_X (ULN) technology for its "F" Class to meet a NO_X level of 9-12 ppm by mid-2000.[13]

Both Westinghouse and General Electric are partners with the Department of Energy (DOE) in the Advanced Turbine Systems (ATS) Program.[14] The Mission/Vision Statement of ATS is to "develop base-load advanced turbine systems for commercial offering in the year 2000." Among the goals of the Program are 60 percent combined cycle efficiency while achieving NO_X emissions of 9 ppm or less.[15] The cost of producing the prototypes is estimated at $435,000,000 and $300,000,000 for the GE and Westinghouse projects respectively.[16] The goals of the ATS are reflected in the "H" Class units described above.

In simple cycle, continuous duty mode, the Westinghouse 501 G achieves an admirable efficiency of approximately 38 percent.[17] However this efficiency is much lower than what can be realized with the same unit (58 percent) when operating in combined cycle.[18] As discussed above, Sargent and Lundy have been contracted to prepare bid specifications to convert the unit to combined cycle.

The 25 ppm initial NO_X guarantee on natural gas appears high when compared with BACT determinations for continuous-duty or combined cycle units, such as those previously listed. It is also higher than the stated goal of the ATS Program. The simple cycle mode with the flexibility of switching (or not switching) to combined cycle operation, presents constraints in evaluating the feasibility and costs of various emission reduction options otherwise available. For this reason, the Department does not constrain itself to any presumed historical cost-effectiveness criteria or cost estimating procedures such as might apply to a project with a clearly defined staging schedule and final configuration. At the same time, however, the Department has a full appreciation of the goals of the ATS Program and does not want to arbitrarily impede progress toward its goals.

Westinghouse provided a technology update of the Westinghouse family of combustion turbines. It includes a schedule for the 501 G to reach low NO_X levels of 9-12 by Ultra Low NO_X. The structure of the schedule is similar to that described for their 501 F class unit. According to Westinghouse, the experience gained from the 501 F will be employed in development of Ultra LN for the 501 G. Basic design and laboratory testing of Piloted Ring Combustors (a candidate design for Ultra LN) for the 501 G is already underway. Initial field verification will be conducted beginning in mid-1999. Design modification and retesting will occur from mid-1999 through mid 2000. Additional design changes/tests will be carried out from mid-2000. Full commercial application will be implemented from 2001 through 2004.[8]

Westinghouse provided the City with a more specific schedule for the 501 G to be installed at Lakeland.[19] Westinghouse "fully anticipates having a combustion system available that meets the 9-12 NO_X requirement for the McIntosh No. 5 Unit within the next four years." That will occur in early 2002 and is within the general schedule given above. According to the same document, "since McIntosh Unit No. 5 is the demonstration project for the 501 G, there is a high probability that some field verification testing will be performed on the unit."

The proximity of Westinghouse technical staff in Orlando to the project site in Lakeland should enhance the probability of meeting Westinghouse's goal at an early date.

DEPARTMENT BACT DETERMINATION

Following are the BACT limits determined for the Lakeland project assuming full load. Values for NO_X are corrected to 15% O_2. These limits or their equivalents in terms of pounds per hour, as well as the applicable averaging times, are given in the permit Specific Conditions. The rationale for the averaging times is discussed in the Final Determination addressing comments by the City and EPA and which is being issued concurrently with this determination.

Operational Mode	NO_X (ppm)	CO (ppm)	VOC (ppm)	PM/Visibility (% Opacity)	Technology and Comments
250 MW SC CON	25 - NG 42 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	DLN on gas, WI on oil. Applies through April 30, 2002. Clean fuels, good combustion
250 MW SC CON	9 - NG 42 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	ULN on gas, WI on oil. Applies after April 30, 2002. Clean fuels, good combustion
250 MW SC CON	9 - NG 15 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	Hot SCR. Applies after April 30, 2002 if 9 ppm NO_X not achievable by ULN as described above. Clean fuels, good combustion.
350 MW CC CON	7.5 - NG 15 - FO	25 - NG or 10 by Ox Cat 90 - FO	4 - NG 10 - FO	10	Conventional SCR if converted to combined cycle, unless 9 ppm is attained by ULN or Hot SCR as described above. Clean fuels, good combustion

RATIONALE FOR DEPARTMENT'S DETERMINATION

- The initial 25 and 42 ppm NO_X limits are guaranteed by Westinghouse.
- There is a clear plan for achieving emissions of 9-12 ppm at the Lakeland location within 4 years of April, 1998. This will occur in early 2002 - about 3 years after an early-1999 startup.
- The unit will be operated in simple cycle mode while maintaining the flexibility to expand at a future date to combined cycle operation through the addition of a 100 MW heat recovery steam generator. Therefore control options which are feasible for combined cycle units are not immediately applicable at commencement of operation. At project inception, this rules out Low Temperature (conventional) SCR which achieves a 4.5 ppm NO_X BACT limit at the Hermiston and Sithe/IPP projects above.
- The turbine has a very high exhaust temperature of about 1100 °F.[17] This is at the higher limit of the present operational temperature of Hot SCR zeolite catalyst.[20] Therefore the catalyst would have to placed *after* the OTSG. The PREPA simple cycle turbines have exhaust temperatures ranging from 824 to 1024 °F and the Hot SCR catalyst (which must achieve 10 ppm NO_X) is located *between* the turbine and the OTSG.[21]

- Hot SCR is technically feasible for gas.[22] The same evaluation states that the technology has not been demonstrated for oil. However the PREPA units have since been installed.[23] These operate solely on 0.15 percent sulfur fuel oil.[24] The Lakeland unit is proposed to operate only 250 hours per year on fuel oil of 0.05 percent sulfur.
- The levelized costs of NO_X removal by Hot SCR were estimated by the City as $5,236 per ton of NO_X removed. Other Hot and conventional SCR cost estimates submitted by the applicant are not considered in this evaluation because they are based on many conditional assumptions regarding possible ultimate project phasing scenarios which are not typically encountered when applying the methodology used by the applicant. Also the cost estimates do not consider a continuation of the actual downward trend in catalyst prices, progressively improving performance, and typically longer-than-expected life.
- The levelized costs derived in the application for Hot SCR at Lakeland are based on a quote from Engelhard. The vendor based the proposal on design operation on fuel oil with guaranteed NO_X reduction of 70 percent to 12.6 ppm @15% O_2.[25]
- In order to avoid allowing control on fuel oil to become the main design consideration, the Department obtained a budgetary estimate from Engelhard to guarantee reduction of NO_X emissions while operating on gas by 64 percent (from 25 to 9 ppm).[26] The replacement cost of the Hot SCR catalyst designed for gas is $1,600,000 versus the $2,800,000 estimated for the Lakeland project designed for oil. During the very few hours of operation on oil, estimated NO_X emissions from the 501 G controlled by Hot SCR will be approximately 13 ppm @15% O_2.
- The cost effectiveness for NO_X removal given for the PREPA simple cycle project is $2,200 per ton. The main reason for the relatively low levelized cost is that total costs are applied over a reduction of 40 ppm whereas the reduction in the Lakeland case is over a smaller reduction. The cost per ton of NO_X removed by Hot SCR at the PREPA project can be rescaled for the Lakeland project. This would involve a significant increase due lower removal. However there would be decreases due to the natural gas design, application on one large unit versus three smaller ones, and lower ammonia requirements. The resulting costs would be less than $4,000 per ton.
- Using much of the basic capital cost information developed by Lakeland, The National Park Service estimated the cost of NO_X removal by Hot SCR at $3,802 per ton (excluding the energy penalty) for the continuous duty 501 G. A further refinement of the Park Service estimate by including the energy penalty, using the revised catalyst cost data obtained by the Department, and assuming a five year estimated life for the catalyst (per Engelhard) would yield a cost-effectiveness closer to $3,500 per ton of NO_X removed.
- The Department concludes that Hot SCR is both technically and economically feasible now. The probability of success using this technology is at least as high as it is using the Ultra LN technology under development.
- According to Westinghouse, a heat exchange surface is required between the turbine and Hot SCR catalyst to insure an operational temperature less than 1100 °F is maintained. If a future HRSG is installed, Westinghouse indicates that the OTSG (which provides the steam for

cooling and power augmentation) will be removed. This would expose the Hot SCR system (if installed) to unacceptable temperatures. Westinghouse does not believe relocation of catalyst to the HRSG is feasible and thus the Hot SCR system would be written off and possibly replaced by a conventional SCR system in the HRSG.

- The Department notes that the specifications under development by Sargent and Lundy for conversion to combined cycle operation are not yet available to the Department for evaluation. Therefore the Department does not concur that Hot SCR is not feasible based on conceivable future development scenarios.
- According to Westinghouse, the ultimate design of their ATS-based gas turbine has options for "recuperative cycles" working within combined cycles. These cycles can lower the gas temperature entering the steam cycle and appear to provide heat exchange surface to cool the gases and protect the Hot SCR system before the HRSG.
- There are various kinds of recuperative cycles - some of which make the combined cycle less efficient and others that which make it more efficient. According to a paper heralding the arrival of the 501 G, the author writes that "what is more significant is that the 501 G has been designed to incorporate the technology advances planned in the ATS program, such as intercooling and reheat, humidification and *chemical recuperation*, as and when they are good and ready."[2]
- The Department is not aware of actual plans to incorporate recuperation cycles in Westinghouse 501 products, the likely combined cycle efficiency benefits (or penalties), or their applicability to the Lakeland project by the time of conversion to combined cycle operation. The point is that ultimate wasting of Hot SCR equipment installed at startup, is not a foregone conclusion considering that many developments can occur within the time horizon of possible future project expansion scenarios.
- It is possible, and even likely, that Hot SCR catalysts will be improved (similar to refinement of Ultra LN) and can be used to replace the initial catalyst as it degrades. By the time the OTSG is removed for combined cycle conversion (e.g. 3-5 years), replacement catalyst might be able to withstand the higher temperature regime.
- Hot SCR has environmental and energy impacts including increased particulate emissions, undesirable (though unregulated) ammonia emissions, and energy penalties. All factors being equal, Ultra LN is a better control strategy than Hot SCR. A three year period to refine this technology to achieve similar emissions as Hot SCR is reasonable and not unprecedented.
- The Department does not conclude at this time that achieving 9-12 ppm of NO_X in three years by Ultra LN is an overall better strategy than immediately achieving 4.5 - 7.5 ppm by conventional SCR in a combined cycle unit. However, if the 9-12 ppm value can be achieved by ULN within the three years, subsequent installation of conventional SCR during a conversion to combined cycle may not be cost-effective.
- Three years after startup is equal to the longest period of time provided to any previous applicant to achieve Department BACT limits by DLN technologies. With the accumulated knowledge and experience from DLN technologies for smaller units, it should be possible to

achieve the Department's BACT limit for this project within three years after startup (if it achievable by Ultra LN technology on the 501G).

- The approach promotes further progress of the DOE ATS Program and falls within the realm of BACT determinations made by the Department in recent years.
- The Hot SCR scenario has, nevertheless, been included in the Department's determination for implementation in case that the Ultra LN strategy fails to reach the objectives within a reasonable period of time. If the City converts the unit to combined cycle mode in the near future, conventional SCR (with the catalyst in a low temperature regime within a HRSG) becomes immediately feasible, particularly if progress is slow on Ultra LN. Conventional SCR now rather than Ultra LN in three years, would be BACT at this time if the City planned to operate the unit in combined cycle mode at startup.
- BACT for PM_{10} was determined to be good combustion practices consisting of: inlet air filtering; use of clean, low ash, low sulfur fuels; and operation of the unit in accordance with the manufacturer-provided manuals.
- PM_{10} emissions will be very low and difficult to measure at the high temperature exiting the stack in simple cycle operation. Additionally, the higher emission mode will involve fuel oil firing which will occur only approximately 250 hours per year. It is not practical to require running the turbine on oil, simply to conduct tests. Therefore, the Department will set a Visible Emission standard of 10 percent opacity as BACT for both natural gas and fuel oil firing, consistent with the definition of BACT. Examples of installations with similar VE limits include the City of Tallahassee, Florida and the Berkshire, Massachusetts projects in the above table.
- CO emission estimates from the City's project are higher than for any pollutant. However the impact on ambient air quality is lower compared to other pollutants because the allowable concentrations of CO are much greater than for NO_X, SO_2, or PM_{10}.
- The City evaluated the use of an oxidation catalyst designed for 90 percent reduction and having a two year catalyst life. The oxidation catalyst control system was estimated by the City to increase the total capital cost of the project by "about $2,000,000, with an annualized cost of $980,000 per year." The City estimated levelized costs for CO catalyst control at about $800 per ton to control CO emission to 10 ppm. This company operates three of the previously-mentioned facilities where CO catalyst is used. Catalytic CO control appears to be cost-effective for the Lakeland unit..
- In the 501 G Application Overview prepared by Westinghouse and included in the City's application for permit, the combustors have "initial emission levels less than the following:"[17]

Pollutant (ppm)	Natural Gas (no injection)	Distillate Oil (water injection)
Nitrogen Oxides	25	42
Carbon Monoxide	10	90
Unburned Hydrocarbons	5	20

- In an article included in the permit application, the author states "NO_X levels of less than 25 ppm on natural gas, less than 42 ppm on oil, while maintaining CO at less than 10 ppm will be specified for introductory machines."[2]
- Westinghouse tables of "expected performance" in the permit application for the specific unit, however, estimate CO emissions while burning natural gas as 50, 100, and 350 ppm when operating at baseload, 75% load, and 50% load respectively. While operating on oil the estimated values are 90, 125, and 350 ppm at baseload, 75%, and 50% respectively.
- The permit application states that the high emission limits are "a result of uncertainty associated with maintaining low NO_X emissions while keeping emissions of CO as low as possible over the load range of the machine." It also mentions that the Westinghouse Application Overview estimate is 10 ppm for CO and accordingly calculates a much higher alternative cost per ton of removal based on the lower expected starting point prior for catalytic oxidation.
- The Department will set CO limits achievable by good combustion equal to those set for the City of Tallahassee project of 25 ppm on gas and 90 ppm on oil. For reference, the FPC Hines Westinghouse 501 F project is limited to 25 ppm on natural gas and 30 ppm on oil. The Mid-Georgia Cogen Westinghouse 501 D5A project achieved its CO limits of 10 ppm on gas and 30 ppm on fuel oil.
- At the relatively high initial NO_X emission rate of 25 ppm, there should not be technical difficulties in achieving 25 ppm of CO with Dry Low NO_X technology. These values remain as appropriate objectives to meet with the Ultra Low NO_X technology under development. The oil case is relatively insignificant because of the limited firing time.
- It is up to the City to evaluate whether to meet the CO limits by combustion optimization or alternative lower limits achievable by catalytic oxidation. A plan describing how the limits will be met should be submitted prior to construction of the unit.
- VOC emission limits proposed by the City are at the lower end of values determined as BACT. Good Combustion is sufficient to achieve these low levels.

COMPLIANCE PROCEDURES

Pollutant	Compliance Procedure
Visible Emissions	Method 9
Volatile Organic Compounds	Method 18, 25, or 25A (initial tests only)
Carbon Monoxide	Annual Method 10 (can use RATA if at capacity)
NO_X (3 and 24-hr averages)	NO_X CEMS, O_2 or CO_2 diluent monitor, and flow device as needed
NO_X (performance)	Annual Method 20 (can use RATA if at capacity)

APPENDIX BD
BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION (BACT)

DETAILS OF THE ANALYSIS MAY BE OBTAINED BY CONTACTING:

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for C. H. Fancy, P.E., Chief
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7/10/98
Date:

Approved By:

Howard L Rhodes
Howard L. Rhodes, Director
Division of Air Resources Management

7/10/98
Date:

REFERENCES

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FINAL DETERMINATION
LAKELAND ELECTRIC & WATER UTILITIES
MCINTOSH UNIT NO. 5
250 MW SIMPLE CYCLE COMBUSTION TURBINE

The Department distributed a public notice package on April 22, 1998 for the project to construct a 250 megawatt (MW) natural gas and fuel oil-fired combustion turbine with a once-through steam generator, a 1.05 million gallon fuel oil storage tank, and a new 85-foot at the C.D. McIntosh, Jr., Power Plant located on Lakeland, Polk County. The Public Notice of Intent to Issue was published in The Ledger on April 23, 1998.

No comments were received by the Department from the public or the National Park Service pursuant to the Notice. However the Park Service submitted substantial comments on the original application.

The City filed a request to extend the time requirement for filing petitions for an administrative hearing in accordance with Sections 120.569 and 120.57, F.S. The request was granted through June 30 and was withdrawn prior to issuance of the final permit.

Comments were received from the City by letter dated May 6, 1998 and from the EPA by letter dated May 21, 1998. A meeting was held June 18, 1998 between the Department and Lakeland with EPA participation (by teleconference). The City's written comments and the Department's responses (which incorporate EPA's comments and the agreements at the meeting) follow.

The City commented only on the draft permit and not on the Technical Evaluation and Preliminary Determination or the Draft Best Available Control Technology (BACT) Determination. The City's comments are keyed to the draft permit and to the Specific Conditions contained therein.

1. Permit Cover Page. *The City suggests expiration date of permit be extended from December 31, 1999 to December 31, 2003.*

   The Department will extend the date to June 30, 2002. The unit will be actually installed in early 1999 and will likely be tested for compliance with the initial emission limits by mid-1999. The final emission limits must be achieved not later than May 1, 2002. An expiration date of June 30, 2002 will give the City time to test and to file for a modification of the facility Title V Operation Permit. Per Section II, Condition 12, the City, for good cause, may request extension of the construction permit per Rule 62-4.080.

2. Section I, Facility Information. *The City corrected the description of the coal-fired steam generator. The City corrected steam injection to wet injection. The City requested that the proper Emission Unit ID numbers be used.*

   The Department agrees with the corrections and will refer to the new emission units as ARMS emission units Nos. 028 and 029 rather than Nos. 001 and 002 throughout the permit.

3. Section II, Condition No. 7. *The City requests that reassessment of the BACT determination be performed if there is an increase in annual heat input limits rather than hours of operation.*

   The EPA initially recommended denial (Comment 5 of their letter) of this request on the basis that the PSD application requested and was based on 7008 hours of operation at various loads, whereas the requested fuel usage limit is equivalent to 8760 hours of operation at full load. The same BACT limits would apply assuming continuous operation. The lower (than requested) NO_X emission limits set by the Department will keep the ambient concentrations impacts below those modeled in the PSD

analysis. EPA concurred with this rationale. The increased hours can theoretically cause the project to be marginally PSD-significant for SO_2. An annual limit with appropriate recordkeeping will insure it remains less than significant. For reference a PSD modeling analysis was performed and the project complies with BACT for SO_2 which is use of clean pipeline quality natural gas with minimal use of back-up 0.05 percent (or lower) fuel oil. The Department did not actually determine a SO_2-BACT for this project because it was not requested or publicly noticed.

4. *Section III, Specific Condition No. 7 and 8. The City requested to delete the No. 2 designation in reference to the fuel oil. The City suggested that this change would allow the use of No. 2 and better grades of fuel (e.g., jet -A).*

   The Department concurs with the City and modified this condition to clarify that the City may utilize No. 2 or superior grade distillate fuel oils.

5. *Section, III, Specific Condition No. 13. This issue is related to Comment 3 above. The City requested that the annual fuel heat input limits be used instead of the hours of operation. City stated that the potential emissions calculation and basis of the BACT evaluation used this fuel usage. City maintains that this limit in production would be federally enforceable and easily monitored: "the heat input or fuel usage is monitored with the digital control system and is the basis of the fuel cost (a important plant parameter). Typically there are several back-ups for fuel usage". City stated that the amount of natural gas could be included as an alternative as listed on Page 26 of the application [i.e., 16,037 million cubic feet per year at 950 Btu (LHV)/cf].*

   Refer to Comment 3 above. The condition will be modified to reflect only the heat input limits from gas while the limit from fuel oil will be addressed in Specific Condition 14 as discussed below. Therefore Specific Condition 13 will be modified as follows:

   FROM
   Hours of operation for the stationary gas turbine and once-through steam generator shall not exceed 7008 hours per year.

   TO
   Maximum allowable hours of operation for the stationary gas turbine and once-through steam generator are 8760. Fuel usage as heat input, while burning natural gas in the stationary gas turbine, shall not exceed 15.64×10^{12} Btu (LHV) per year (rolled monthly) until the unit achieves the NO_X emission limits (other than the initial ones) given in Specific Condition 21. Thereafter, only the hourly heat input limits given in Specific Condition 8 apply.

6. *Section III, Specific Condition No. 14. Basically this is the same issue as discussed in comment No. 3 above. The City requested that the annual fuel heat input limits be used instead of the hours of operation. City stated that the potential emissions calculation and basis of the BACT evaluation used this fuel usage. City maintains that this limit in production would be federally enforceable and easily monitored: "the heat input or fuel usage is monitored with the digital control system and is the basis of the fuel cost (a important plant parameter). Typically there --are several back-ups for fuel usage". City stated that the amount of natural gas could be included as an alternative as listed on Page 26 of the application [i.e., 42.558 million gallons per year at 18,500 Btu (LHV)/cf].*

   The Department will limit heat input or fuel usage to the equivalent of only 250 hours per year of operation, consistent with the application and associated emissions of sulfur dioxide and other

pollutants. This includes 200 full capacity equivalent hours and 50 partial capacity (50 percent) equivalent hours. Therefore Specific Condition 14 will be modified as follows:

FROM
Hours of operation for the stationary gas turbine and once-through steam generator shall not exceed 250 hours per year while firing distillate fuel oil.

TO
Fuel usage as heat input, while burning fuel oil in the stationary gas turbine, shall not exceed 559×10^9 Btu (LHV) per year (rolled monthly).

7. Section III, Specific Condition No. 16. *The City indicates that the Ultra Low NO_X technology may not be the Piloted Ring Combustors presumed by the Department and also requests that the condition reflect a requirement to install Ultra Low NO_X technology "or equivalent." The City stated that Specific Condition No. 16 as well as Specific Conditions Nos. 20 and 21 require meeting lower NO_X emissions within 36 months of start-up. City points out that the 36 months from startup is not sufficient time since any installation or adjustments of both the DLN and Ultra Low NO_X must be within the period. City maintains that since a lower limit must be demonstrated at a future date, it must accommodate testing for the lower limit. City feels that by designating the Initial Performance Test (IPT), Westinghouse and the City could accommodate the installation of the alternative controls as well as the testing and that the IPT would also provide both the City and the Department with specific future compliance date.*

   The Department agrees that the Piloted Ring Combustors may not represent the Ultra Low NO_X technology to eventually be used at this project. However the designation for the technology described by Westinghouse to meet the BACT limits is clearly Ultra Low NO_X. An "equivalent" technology can not be accepted without additional review. The alternative SCR technologies already approved by the Department are not actually "equivalent" to Ultra Low NO_X because they have higher efficiency at low loads and different emissions characteristics related to, for example, ammonia. The condition will be changed to reflect the comment about the Piloted Ring Combustors.

   Regarding the date to achieve the BACT emission limit, both the Department and EPA disagree with the City that the demonstration should be made 36 months after the Initial Performance Test. As discussed in the BACT determination, correspondence from Westinghouse indicates that the technology will be available for Lakeland in early 2002. The date of the Initial Performance Test is not a fixed date and can be indefinitely delayed by unforeseen circumstances. Westinghouse claims that the technology is already under development irrespective of the Lakeland project. The date proposed here by the Department provides sufficient time to refine a technology already under development. Therefore, this condition will be changed to reflect a "date-certain" of May 1, 2002 rather than based on uncertain start-up or IPT dates. This is consistent with most if not all other permits for combustion turbines employing Dry Low NO_X technologies issued by the Department.

8. Section III, Specific Condition No. 17. *City wants to strike the reference to CO in this condition which requires that the equipment design be capable of accommodating NO_X and CO control catalysts in case the unit fails to meet the corresponding emission limits by Ultra Low NO_X (in conjunction with Clean Fuels and Good Combustion). City states that the Department has already established CO emission limits for which compliance must be demonstrated annually and that it is unnecessary to include a requirement for CO in this condition.*

The Department's intent on this condition is to require from the permittee a design that will accommodate installation of SCR and/or oxidation catalyst to achieve NO_X and CO emission limits in the event that the Ultra Low NO_X in conjunction with Clean Fuels and Good Combustion technology fails to achieve the NO_X or CO limits.

The condition is necessary because Westinghouse and the City did not provide reasonable assurance that the CO limit will be met without oxidation catalyst. This condition will not be modified as requested. Clearly the Department will not require the City to install SCR catalyst if the CO limits are not met or oxidation catalyst if the NO_X limits are not met.

9. Section III, Specific Condition No. 19. *The City states that the condition regarding optimization is not necessary for the following reasons: 1) it is the City's understanding that Dry Low NO_X and Ultra Low NO_X operating parameters are established by Westinghouse and the ability of "tuning" the combustors in the traditional sense is not applicable. 2) that the Distributive Control System that controls the turbine operation will automatically control the gas regulation for the pre-mix and diffusion modes. In addition, the City affirms that they will not have the ability to control these parameters and that the requirement to meet specific emission limits will dictate in part how the turbine is operated.*

On April 27, 1998, the Department requested the combustor emission characteristics with respect to load for both the initial and ultimate combustors and an operational plan to encourage operation at 70-100 percent of full load. This was requested to be provided prior to issuance of the permit. The City, Westinghouse and Golder have not provided this information to-date. Per Figure 3 and the discussion in the Final BACT Determination, the Dry Low NO_X technology may not be fully operable at loads less than 50 percent (or even higher in the case of Westinghouse technology). The purpose was to demonstrate that the unit will be operated whenever possible in the lean pre-mix mode so that the Dry Low NO_X feature is fully engaged while carbon monoxide emissions are also minimized. The information requested in the April 27 letter must be provided to the Department as soon as it is available and prior to startup.

Clearly the combustors will require tuning and optimization during the first three years of operation to meet the prescribed emission limits. The sentence on the diffusion firing (non lean pre-mixed) mode will not be changed. It is also in the City of Tallahassee permit and will likely be used on all future combustion turbine permits employing similar technology. The Department's rule on Circumvention, Rule 62-210.650, F.A.C., prohibits operators from allowing the emission of air pollutants without the proper operation of control equipment. Operating Dry Low NO_X burners in the diffusion mode for extended periods of time amounts to Circumvention. The condition will not be changed. The condition, together with the proposed averaging periods will discourage, though not totally prevent, short periods of operation in the diffusion mode during which NO_X emissions may well reach 50-100 ppm.

10. Section III, Specific Condition No. 20 - Compliance Date and Correction of CO. *The City proposes to revise the table with respect to the time to achieve BACT emission limits. The City proposes the same CO BACT limits as proposed by the Department, but corrected to 15 percent(%) oxygen.*

The time to achieve the BACT limit was addressed in Item 7 above. The uncorrected CO emission limit reflects industry convention and the practice of most agencies. The value is equal to that determined for the City of Tallahassee project and appears to be less stringent than the value set for the FPC Hines project. It is much less stringent than the Hermiston or Sithe/IPP projects which did

not employ oxidation catalysts. If high values are approved, oxidation catalyst (and thus even lower CO limits) becomes feasible based on the application submitted by the City. Various references were cited by the City and the Department regarding claims by Westinghouse that the unit can meet 10 ppm of CO. The Department does not expect this to occur at all times. Therefore the higher levels of 25 ppm on gas and 50 ppm on fuel oil are proposed by the Department. To provide greater flexibility in minimizing the relatively high NO_X emissions until May 1, 2002, the CO limit can be corrected to 15 percent O_2. Thereafter the emissions can not be corrected, otherwise the limit would not represent BACT.

11. *Section III, Specific Condition No. 20 - NO_X Averaging Time. The City believes that compliance with a limit of 9 ppm for a short-term period is not consistent with the Department's recent decisions for the City of Tallahassee. The City states that the BACT evaluation and impact analyses for NO_X use even longer averaging times (i.e., annual) than the 30-day rolling average, and that the 30-day basis is more stringent than the air quality impact of BACT evaluations. The City adds that the 30-day average is a rolling average for which compliance is evaluated each day The City proposes to revise the table with respect to the time to achieve BACT emission limits..*

The requirements of BACT and PSD are not identical. The Department only intended to require a demonstration that the unit can achieve the stated level, which is typical of a performance guarantee. Although the Department did not set a 9 ppm limit for the City of Tallahassee, General Electric did guarantee such a limit for that project. Tallahassee also requested a facility-wide cap on future NO_X emissions (including the new unit) equal to total past actual emissions from the units already on the site. Discussions with EPA indicated that the NO_X (and SO_2) caps might have exempted these pollutants from PSD Review and BACT Requirements.

Based on statistics and probability, if the unit cannot be demonstrated to achieve a short-term guarantee of 9 ppm, it will not likely meet the Department's proposed 30-day, 12 ppm value. The 9 ppm value is a short term emission limit to be demonstrated by a stack emission test. It was the Department's intent (with which EPA disagrees) that continuous compliance will be determined by the longer-term standard.

The Department agrees that NO_X impacts are calculated over even longer averaging times than 30-days. However the Department notes that NO_X is also a pre-cursor of ozone for which short-term standards apply. In fact, during the month of May, 1998, there were various days during which ozone levels approached the National Ambient Air Quality Standard in Polk County and exceeded them in adjacent Hillsborough County. Therefore the City's argument is not sufficient to dissuade the Department from requiring at least a demonstration that a low short-term value can be demonstrated (if not necessarily maintained) for Dry Low NO_X and Ultra Low NO_X technology.

EPA (refer to their Comment 2) objects to the higher 12 ppm emission limit when using a 30-day averaging time proposed by the Department. EPA believes the longer-term limit should be no greater than 9 ppm and points out that typical averaging times used by states other than Florida are short-term such as 1 or 3 hours. Because of the emission characteristics of Dry Low NO_X technology (which is not fully operable at loads less than 50 percent and possibly higher), the unit may, at times, exhibit higher average NO_X emissions than the lowest achievable emission rate that can be demonstrated for the unit.

The Department agrees in general with EPA's assessment that longer averaging times should result in lower average emissions than short-term emission limits. This would occur when using technologies such as SCR that operate throughout the entire operating range. Realistically, the Ultra

Low NO_X unit will probably achieve 9 ppm over most 30-day averaging periods. However, flexibility is needed for situations governed by electrical dispatching priorities, demand, and spinning reserve requirements that can occasionally result in limited operation at lower loads where the lean pre-mixed mode is not fully employed. Such occurrences will be minimal because the City will have to operate the unit at 9 ppm (or lower) to compensate for the periods of diffusion mode operation.

During the initial operation, the limit is 25 ppm NO_X. During that period, the Department proposed a 24-hour limit to discourage any prolonged operation in the diffusion mode. The City requested that this limit also be based on a 30-day basis. Instead, the Department will switch to a pound per hour limit averaged over 24 hours. The limit will be based on 25 ppm at full load, but will allow higher emission concentrations as long as the hourly emission limits are met on a 24-hour basis. This will avoid prolonged periods of high emissions, but still allow for temporary operation in the diffusion mode. It will satisfy the need for low short-term mass limits consistent with the need to minimize ozone pre-cursors while the Ultra Low NO_X technology development is completed. In view of EPA's comments, the Department will add a pound per hour limit averaged over 24 hour equal to continuous operation at full load and at 9 ppm. This condition will be modified accordingly.

12. *Section III, Specific Condition No. 20 - Combined Cycle Operation. The City suggests that the use of Ultra Low NO_X should also list combined cycle.*

Per the table in Specific Condition 20, the intent is to describe the applicable technology for the various modes of operation rather than to describe all the modes of operation that correspond to a particular control technology. It is already clear under the combined cycle operational mode, that Ultra Low NO_X technology will be acceptable if it is achieves the BACT limit before the deadline of 36 months (now May 1, 2002). The Department will make it clearer in the table that, based on specific circumstances, Ultra Low NO_X, Conventional SCR or Hot SCR are appropriate technologies for combined cycle operation.

If SCR is employed, the Department requires compliance with the 9 ppm (Hot SCR) or 7.5 ppm (Conventional SCR) NO_X limits on a 3-hour averaging time. This is consistent with EPA's comments and reflects the ability to match ammonia use to load and NO_X load from the turbine. EPA recommends that the Department set the NO_X emission limit, under the Conventional SCR case, at the time of actual conversion to combined cycle. In Comment 4 in its letter to the Department, EPA suggests that the limit may be less than 7.5. EPA pointed out that an application had been received from Southern Company by the State of Alabama for a combined cycle with Conventional SCR control and a NO_X emission limit of 3.5 ppm.

The Department notes that the lowest NO_X value to-date for such units in Florida, Alabama, Mississippi, or Georgia is 9 ppm. The Department has reviewed the BACT proposal by the Southern Company and concludes that the objective is to propose a BACT limit that is beyond question and to minimize modeling requirements so that it may obtain the permit as soon as possible. The 3.5 value is equal to the Lowest Achievable Emission Rate (LAER) limits cited in the Department's BACT Determination for comparable projects. For example, no cost data were provided because the company used the "top technology."

It is the Department's conclusion that such a low value for a combined cycle unit using Conventional SCR technology with a 3.5 ppm limit, will provide very little additional benefit to the environment. For example, the New Source Performance Standard for such units is about 110 ppm of NO_X for gas combustion. Values of 6-12 ppm (especially when achieved by Dry Low NO_X processes) clearly

represent very clean technology. For example, a combined cycle combustion turbine achieving a 7 ppm limit would emit only about one-fifth as much NO_X on a kilowatt-hour basis as a new coal-fired unit achieving a BACT emission limit of 0.10 pounds of NO_X per million Btu heat input. The additional ammonia injection to achieve and maintain even lower values probably provides only negligible overall benefits considering the increased ammonia emissions and fine particulate matter. Additional restrictions tend to discourage the more efficient combined cycle units that use inherently clean fuels and emit less greenhouse gases (CO_2). Requiring SCR, irrespective of the possible low emissions achieved by Dry Low NO_X, also discourages development of the latter technology.

As discussed in the Final BACT Determination, Sargent and Lundy are already evaluating for the City, options to convert it to combined cycle operation. The Department believes that its proposed limit of 7.5 ppm will represent BACT for this project scenario.

During the teleconference, EPA advised that there should still be at least 70 percent reduction by SCR if it used at all. The City and Department explained that if Ultra Low NO_X technology fails to meet limits, it is most likely that other combustors will be used that emit higher NO_X but are more compatible with optimum unit operation. This relates to minimizing flame instability and flashback. In that case, the SCR technology will likely have to achieve an efficiency of about 80 percent. With this explanation, the issue was resolved.

13. <u>*Section III, Specific Condition No. 21 - NO_X Hourly versus Annual Emission Limits*</u>. *The City repeated many of the same comments already discussed above and proposed specific language implementing those comments. The City also proposes that the pound per hour (lb/hr) limitations be replaced with annual emissions (tonnage). The City states that the basis of the impact evaluation for NO_X is the annual emissions which were demonstrated to achieve the national ambient air quality standards (NAAQS). The City points out that the 30-day rolling concentration average and tons/year limits are consistent with the City of Tallahassee PSD determination recently made by the Department (PSD -FL-239/PA97-36 and the PPSA). The City refers to the 863 tons per year (25 ppmvd @ 15% O_2) that is contained in the application (page 2-9) and to the 436 tons/year based on 12 ppmvd at 15% oxygen for gas firing and the 42 ppmvd at 15% oxygen for oil firing.*

EPA addressed this item in Comment 3 of its letter. According to EPA, "to ensure that the PSD permit is practically enforceable, short-term BACT emission limits need to be provided in the PSD permit as opposed to 'ton/year' limits." The purpose of the annual tonnage limit in the Tallahassee permit was to maintain the cap which was requested by the City of Tallahassee to avoid an emissions increase and (in their view) avoid PSD.

14. <u>*Section III, Specific Condition No. 22 - Correction of CO*</u>. *The City proposes to correct emissions to 15% O_2. The City states that the provision for correcting to 15% O_2 would provide some margin for increased efficiency of the "G" turbine technology. The City adds that more efficient turbines have lower O_2 with less emissions per MW generated (as described in the application and subsequent information transmitted to the Department and that the use of the oxygen correction would be equivalent of adjusting the "G" turbine performance to the "F" class turbine. The City refers to the CO emission limits contained and approved by the Department for the City of Tallahassee's "F" class turbines. The City believes that there is no appropriate reason for adding lb/hr or tons/year limits for CO and that the environmental impacts are extremely low even with much higher emissions. The City refers to the recent City of Tallahassee PSD approval that did not contain lb/hr or ton/year limits for CO.*

Refer to Comment 10 above. During the initial period of operation, the correction will be allowed to provide flexibility in minimizing NO_X emissions. The reason is not to adjust for greater efficiency of the "G Class" versus the "F Class" technology. During the initial operation the efficiency will be 38 percent while the Tallahassee and FPC Hines Combined Cycle Units will achieve 56 percent efficiency. After conversion to combined cycle, the efficiency of the City's unit will reach a theoretical maximum of 58 percent. As previously mentioned, continuation of the corrected CO limit would not constitute BACT and, per the application, might make the use of oxidation catalyst and an even lower CO value appear cost-effective.

For reference, the CO limits set for the Tallahassee project applied to both full load and partial load conditions.

15 Section III, Specific Condition No. 23 - SO_2, Hourly Emission Limits. *The City states that with the use of clean fuels and not having a BACT determination, it is unnecessary to establish SO_2 lb/hr limits. The City adds that the modeling demonstrates that compliance with NAAQS is readily achieved and refers to the City of Tallahassee permit approval without hourly limits.*

The City of Tallahassee sulfur dioxide limits are based on an emission cap limit for the facility (Unit 8, Unit 7, GT1, GT2 and auxiliary boiler). The short term emission limit for the McIntosh's emission unit 5 is to provide reasonable assurance that the TPY limit will not be exceeded and to ensure that the PSD permit is practically enforceable (refer to EPA's letter of May 21, 1998, page 3, item 3). The Department agrees with the City that a BACT analysis was not conducted for this pollutant. This condition will not be changed. Refer to comment 3.

16 Section III, Specific Condition No. 24 - Opacity. *The City states that the Westinghouse guarantees provide for 10 percent or less opacity for gas and 20 percent or less opacity for oil and that these levels are consistent with other permits using such fuels (e.g., Hardee Unit 3 using Westinghouse 501F turbines). The City points to the fact that the use of oil is limited to only 250 hours/year and that it is very infrequent.*

The very low particulate emissions and VOC emissions expected from the combustion turbine under any development any operational scenario, suggest the expectation of low opacity. Because the Department does not require particulate testing, it is important to set opacity limits representative of the low emissions for the other mentioned parameters. The Department set a 10 percent opacity limit for the City of Tallahassee project and the FPC Hines project that has a Westinghouse 501F unit.

It is the Department's function to set BACT emission limits rather than by manufacturer's guarantee. Westinghouse's contractual guarantees to the City did not represent BACT for NO_X either and the Department provided additional time to allow the company to develop the technology to come into compliance with BACT. Since the unit will operate a fairly short time on fuel oil, there is not a great deal of risk to the City. Ten percent opacity is the Department's BACT determination for operation on oil. There is no reason to expect a 20% opacity plume from a clean unit.

17. Section III, Specific Condition No. 25 - VOC limitations. *The City states that since there is no PSD applicability for VOC at these emission limits (i.e., emissions are 37 tons/year; see page 2-9 in application), there should be no lb/hr or tons/year emission limits. The City adds that there is no NAAQS and the ppmvd levels provide sufficient basis.*

For the BACT analysis, the Department based its determination on the BACT limits proposed by the City on the application submitted on December 8, 1997. Refer to Page 4-12 of the application. However, the Department agrees with the City that by imposing these emissions limits, annual TPY will be under the PSD threshold. It is better to have the limits in the permit from the BACT Determination. The estimate is very close to the PSD threshold and could easily be exceeded based on the level of accuracy of the estimate. It is still better to include the BACT permit conditions so that a new BACT determination for VOC will not be necessary should the City increase usage of the unit in the future resulting in total VOC emissions greater than 40 tons per year.

18. *Section III, Specific Condition Nos. 29 and 30 - Initial Performance Test. The City proposed that the initial performance test (IPT) shall be conducted after installation or modification of equipment used to achieve the emission limits specified in Conditions 20 and 21 and that the IPT shall be conducted within the time periods specified in Condition 29.* The City's rationale is that this *condition should be constructed around the time periods in Conditions 20 and 21 and allow a similar period for performing initial performance tests. The City states that the term "shake down" has no regulatory meaning and 100 days seems arbitrary.*

    Refer to Item 7, Specific Condition No. 16 above. Implementing the request creates uncertainty about the achievement of the BACT emission limits. It would mean that installation of any equipment at any time would restart the clock on an IPT. The date-certain requirement now proposed by the Department makes more sense. An initial performance test must be carried out within the requirements of the New Source Performance Standards. Compliance with the final limits must be demonstrated by May 1, 2002.

19. *Section III, Specific Condition No. 26 and 31. In Specific Condition 26, the City stated that in accordance with the NSPS, excess emission resulting from startup, shutdown, malfunction or fuel switching is not limited to any specific period or duration. The City affirms that this statement is also consistent with the EPA's comments (and FDEP agreement) on proposed Title V permits for the FPL's facilities. In condition 31, the City proposed that an operating day shall consist of at least 18 hours of operation and that periods of allowable excess emissions as provided for in Conditions 26, 27 and 28 shall be excluded from the 30 day average [Rule 62-4.070, F.A.C., 40CFR75]. The City believes that the periods of allowable excess emissions as provided for in Conditions 26, 27, and 28 shall be excluded from the 30 day average. The City feels that this wording clarifies the intent of the condition and that it also provides a definition of operating day similar to the NSPS.*

    This emission unit (s) shall comply with all applicable rule requirements including the Department's excess emission rule. These conditions, as written, are supported by EPA in its comments of May 21, 1998. These conditions will not be modified as requested.

20. *Section III, Specific Condition No. 33. The City proposes suggested wording for clarification (IPT instead of initial test).*

    Please see responses to Comments 7 and 18 above.

21. *Section III, Specific Condition No. 34. The City states that the VOC emission limits established by the Department would result in emissions below the PSD significant emission rates and therefore BACT is not applicable. The City suggests that this should also be addressed in the BACT determination.*

Refer to Comment 17 above regarding Specific Condition No. 25.

22. *Section III, Specific Condition No. 41. The City proposes to add the "30 -days rolling average" wording through this condition. The City proposes that periods of startup, shutdown, malfunction, and fuel switching shall be excluded from the 30 day averages but monitored, recorded, and reported as excess emissions when emission levels cause the 30 day average to exceed the BACT standards following the format of 40 CFR 60.7 (1997 version).*

    Refer to Comment 19. This condition will be modified to reflect a 24-hr and 3-hr averaging time instead of the 30-day rolling average.

23. *Section III, Specific Condition No. 42. The City states that the NSPS NO_X emission limits are at least 4 times higher than the BACT emission limits and that the potential for requiring some correction to ISO conditions is unnecessary and, if required, would add unnecessary costs and reporting complications.*

    The City is correct to affirm that, for this unit, the NSPS NO_X emissions limits are at least 4 times higher than the BACT. However, the requirement for ISO correction is an NSPS requirement with which all Subpart GG turbines need to comply. Therefore, this condition will not be modified as requested. The Department position is further affirmed by EPA's comments.

24. *Section III, Specific Condition No. 43. The City proposed to add the 40 CFR Part 75 wording to this condition as a basis for equipment and performance specifications.*

    The Department agrees with the City and this condition will be modified as requested.

25. *Section III, Specific Condition No. 46. The City adds language to this condition that was cut off from the original text.*

    The Department agrees with the City and adds the remainder text to this condition: "process variable to be determined within 10% of its true value [Rule 62-297.310(5), F.A.C.]."

CONCLUSION

The Final action of the Department is to issue the permit with the changes described upon withdrawal by the City of its request for extension of time to file for a petition and issuance of the Site Certification Modification Order.