A-Linero

Florida Gas Transmission Company

P.O. Box 945100, Maitland, Florida 32751 (407) 875-5800

January 21, 1999

Mr. Ed Middleswart
Air Administrator
Northwest District
Florida Department of Environmental Protection
160 Governmental Center
Pensacola, Florida 32501-5794

Reference: File No. 1130037-002-AC
Facility: 1130037
Compressor Station No. 12, Santa Rosa County
File No. 0390029-002-AC
Facility: 0390029
Compressor Station No. 14, Gadsden County

Dear Mr. Middleswart:

Subject: Additional information Requested at Meeting on 14 January 2000

Thanks to Mr. Bob Kriegel for taking time to meet with us to discuss FGT's air permit applications for Compressor Stations No. 12 and 14. At the meeting, several additional items were identified that would assist Mr. Kriegel in his review of these applications. The items that were identified are listed below.

1. A letter from Solar turbines guaranteeing emission rates.

2. A test protocol that shows how emission rates will be confirmed.

3. A table of performance test results from other Solar turbines owned by FGT.

4. A copy of the custom fuel monitoring schedule that has been approved by the Florida DEP and the U.S. EPA.

5. A description of the turbine parameters that will be monitored in order to demonstrate compliance with horsepower and emission limitations.

6. A copy of a construction permit previously issued by the DEP for a Solar turbine at one of FGT's Florida compressor Stations.

Each of the above is attached. The following are notes on the attachments.

1. Attachment A - Solar Guarantee Letter

Solar Turbines has provided a memo guaranteeing an emission rate of 25 ppmvd NOx at 15 % O_2 for the Mars 90 model turbine at 10,350 hp. Maximum emission rates are listed. This is the turbine model proposed for Compressor Stations Nos. 12, 14 and 24.

2. Attachment B – Emissions Test Plan

This document is a test plan used for previous performance testing of a Solar turbine at a FGT compressor station in Florida. It is the protocol currently being used for emissions testing of existing FGT turbines. It is based on U.S. EPA approved Methods (40 CFR 60 Appendix A) and meets the requirements for performance testing under 40 CFR 60 Subpart GG. A brief discussion on the determination of load range for testing purposes on Solar turbines equipped with SoLoNOx is included.

3. Attachment C – Table of Emissions Test Results

This table was developed from the emissions performance tests performed on existing Solar turbines at FGT compressor stations. It lists test results and permitted emission rates. All permitted emission rates are based on predicted maximum emission rates provided by Solar. All of these results are in the public record.

4. Attachment D – Custom Fuel Monitoring Schedule

This attachment consists of correspondence concerning a FGT request for a custom fuel-monitoring schedule for Solar turbines at FGT compressor stations in Florida

5. Attachment E – Description Of Turbine Parameters To Be Monitored

This is a brief description of the control system and a list of parameters related to turbine horsepower and emissions that will be monitored by the turbine control system. Examples of control screen displays are provided. Turbines must be operated in a fairly narrow range of their operating parameters. Excursions outside of these ranges result in alarms being sounded and, in some cases, automatic shutdown of the turbine in order to prevent damage to the turbine.

6. Attachment F – Previous Construction Permit for A FGT Turbine in Florida

This is a copy of the construction permit, for the turbine at FGT Compressor Station No. 21, which is located in Palm Beach County, Florida. This permit is a state construction permit and was issued by the DEP in Tallahassee for the FGT Phase III Expansion Project. The Phase III Expansion Project involved six permits in Florida, including two PSD permits. Four of these permits were for turbines including one PSD permit. The permit writer was Ms. Theresa Heron.

FGT trusts that this additional set of information meets your needs. If you have any questions or need additional information, please call me at (407) 838-7119.

Sincerely,

David Parham/wrs

David H. Parham, P.E.
Senior Environmental Engineer

Attachments

ENV2316

CC: Jordan Hunter, FGT w/o attachments
Glenn Sellars, FGT
Arnold Eisenstein, Enron
Frank Diemont, Enron
Clay Roesler, FGT
Alvaro Linero, FDEP - Tallahassee
V. Duane Pierce, Ph.D., AQMcs, LLC
Compressor Station No. 12
Compressor Station No. 14
Project file

Attachment A

Solar Guarantee Letter

Solar Turbines
A Caterpillar Company

13105 Northwest Freeway, Suite 400
Houston, Texas 77040
Phone: 713-895-2370
Fax: 713-895-4270

FACSIMILE COVER SHEET

DATE: January 17, 2000

TO: Frank Diemont, Enron Engineering & Construction
Fax: 713-646-6004

CC: Jon Wheeler, Solar, San Diego

FROM: Corrine M. Casadonte, Solar Turbines, Houston
Phone: 713-895-2395
Fax: 713-895-4270

TOTAL NUMBER OF PAGES 1
IF YOU DO NOT RECEIVE ALL PAGES, PLEASE CALL 713-895-2370.

SUBJECT: Florida Gas Transmission Phase IV expansion
Turbine emissions

Frank,

The guaranteed emission level for the new turbines of FGT Phase IV stations 12A, 14A, and 24, is 25 PPMvd NOx at 15 % O2.
Based on full load operation at ISO condition, the following are the maximum emission figures on a ton per year basis:

Driver	Full load	NOx	CO	UHC
Mars 90	10,350 hp	38.56	46.95	13.446

Please advise if there is additional information you require.

Regards,

Corrine M. Casadonte

Corrine M. Casadonte
Sales Engineer, Oil & Gas Sales

Attachment B

Emissions Test Plan

TEST PROTOCOL
on
EXHAUST EMISSIONS

from a
NATURAL GAS FUELED TURBINE

at
COMPRESSOR STATION NO. 11

in
MOUNT VERNON, MOBILE COUNTY, ALABAMA

Prepared for
Florida Gas Transmission Company

June, 1999

Cubix Job No. 5385

Prepared by

TABLE OF CONTENTS

OVERVIEW

Exhaust emissions from a natural gas fueled turbine engine will be tested to determine the concentration and quantity of pollutants being emitted to the atmosphere. This recently installed turbine engine replaces an identical turbine engine which was previously in service at this facility. This unit is in service at Florida Gas Transmission Company's (an ENRON/SONAT affiliate) Compressor Station No. 11 located in Mount Vernon, Alabama. The testing will be conducted by Cubix Corporation.

The tests will be conducted in accordance with the conditions stated for the turbine set forth by the State of Alabama, Department Environmental Management (ADEM) Permit Number 503-3028-X005. The testing will satisfy the specific monitoring requirements for stack testing as set forth in the permit. Additionally, the testing will satisfy testing requirements set forth by US EPA, 40 CFR 60, Subpart GG, "Standards of Performance for Stationary Gas Turbines". Table 1 provides the pertinent background data for this project.

Testing will be performed to measure nitrogen oxides (NO_X), oxygen (O_2), and carbon dioxide (CO_2) at four load conditions over the normal operational range of the turbine. In addition, carbon monoxide (CO) shall be measured while operating the turbine at the maximum test load, no less than 90% of normal maximum load. Normal maximum load for this unit is defined as 12,600 brake horsepower (bhp) at ISO day conditions: 59°F, 60% relative humidity, and an atmospheric pressure of 101.3 kPa. Sulfur dioxide (SO_2) emissions will be calculated from total fuel sulfur content. Exhaust flow rates used to determine mass emissions from the unit will be determined by fuel flow rates, natural gas "F-factors", and diluent gas concentrations using stoichiometric calculations.

TABLE 1
Background Data

Sources:	A natural gas fueled turbine engine is equipped with gas compressors (Solar Mars T13000S Turbine). This unit is designated by FGT as Unit No. 1108.
Locations:	FGT Compressor Station No. 11 in Mount Vernon, Mobile County, Alabama.
Applicable Permits and Regulations:	ADEM Permit No. 503-3028-X005 (may soon be updated to ADEM Permit No. 503-3028-X006) and 40 CFR 60, Subpart GG.
Emissions Test Coordinator:	Florida Gas Transmission Company (FGT) 601 South Lake Destiny Drive Maitland, Florida 32751 Attn: Clayton Roesler. D.E.S. (407) 875-5865 TEL (407) 875-5896 FAX
Test Contractor:	Cubix Corporation, SE Regional Office 4536 NW 20th Drive Gainesville, Florida 32605 Attn: Leonard Brenner (352) 378-0332 TEL (352) 378-0354 FAX
Proposed Test Schedule:	June 29, 1999: Set up, QA/QC 14:00-18:00 June 30, 1999: Test Unit No. 1108, 07:00-19:00

TEST MEASUREMENTS

Exhaust emissions testing will be conducted on one natural gas fueled turbine engine. Cubix will measure emissions of NO_X, CO, O_2, and CO_2. SO_2 emissions will be calculated from the fuel sulfur analysis as provided by FGT. The emissions testing will follow the applicable test methods described in the Environmental Protection Agency's (EPA) Code of Federal Regulations, Title 40, Part 60, Appendix A. The specific test methods to be used for exhaust analysis are listed as follows:

Exhaust Analyses

* EPA Method 1 for O_2-traverse point layouts
* EPA Method 3a for CO_2 concentrations
* EPA Method 10 for CO concentrations
* EPA Method 20 for NO_X and O_2 concentrations
* EPA Method 19 for stoichiometric volumetric flow rates

Fuel Analyses

* Current pipeline fuel total sulfur analysis or analyze fuel gas per ASTM D-3246 for sulfur content to determine exhaust gas SO_2 concentrations.

More detailed descriptions of each test method with any required test method adaptations, as they will be applied to the emission tests, are outlined below.

Test Matrix

Three (3) reduced-load tests will be performed during which NO_X, O_2, and CO_2 emissions will be measured. Each reduced-load test shall consist of three (3) runs, the duration of each run being between 16 and 24 minutes (depending on the sample system response time). During the first test run at low load, an initial O_2-traverse will be conducted using the required number of sampling points (30) as specified in EPA Method 20. If, as is expected, there is no stratification observed, then eight (8) random points shall be sampled in the following two test runs. If O_2 stratification is observed, sampling will be conducted at eight sample points of

lowest observed O_2 concentration from the first run, and an additional fourth test run will be conducted. After completion of low load tests, two equally spaced (between low load and full load) load conditions shall be tested.

Finally, a compliance test consisting of three one-hour test runs will be conducted on the turbine unit to ensure reproducibility of the data. The compliance test will be performed at maximum load. Testing at full load shall consist of measurements of NO_X, CO, O_2, and CO_2 emissions. Testing may not exactly follow this order, i.e., low load may be followed by full load followed by mid load tests.

Exhaust Gas Sampling and Analyses

The stack gas analyses for NO_X, O_2, CO, and CO_2 will be performed by continuous instrumental monitors. Table 2 lists the instruments, detection principles, and applicable ranges of those instruments. Proposed analytical instrumental ranges are in bold outline format. All instruments will be housed in an environmentally controlled, trailer-mounted mobile laboratory. Data from these analyzers will be recorded on two 3-pen strip chart recorders (Soltec 1243) operating at a speed of 30-cm/hr. Calibration gases for these instruments will be provided in aluminum cylinders with the concentrations certified by the vendor .

The sampling and analysis system to be used for measurement of the above-mentioned gaseous concentrations is depicted in Figure 1. Stack gas enters the system through a stainless steel probe equipped with a glass wool filter. The sample then passes through a heat-traced Teflon® sample line into the heated manifold. The bulk of the gas stream then passes into a stainless steel minimum-contact condenser, which dries the sample without removing any of the emissions of interest. This sample integrity is verified by sample system bias checks. The dry sample is then delivered back to the sample manifold, which is composed of Teflon® and stainless steel, where it is partitioned to the appropriate analyzers through glass and stainless steel rotameters. The purpose of the rotameters is to ensure that the sample pressure and flow rate are equal to those used for the calibration gases.

CO_2 concentrations will be determined using the instrumental analysis procedures of EPA Method 3a. O_2 concentrations will be determined using the instrumental analysis procedures of EPA Method 20. The CO_2 analyzer uses the principals of infrared absorption; the O_2 analyzer operates on a micro-fuel cell which burns oxygen. Instrumental analyses will be used in lieu of Orsat or Fyrite® procedures due to the greater accuracy and precision afforded by the instruments.

NO_X measurements will be made using EPA Method 20. Instead of a 300 ppm analyzer span, a more stringent analyzer span is proposed for these tests, please see Table 2. The NO_X analyzer operates on the principle of chemiluminescence. As required, the NO_X analyzer is equipped with a NO to NO_2 converter to allow for measurement of all forms of nitrogen oxides, as per EPA's definition. NO_X mass emission rates will be calculated as if all the NO_X were in the form of NO_2. This approach corresponds to EPA's convention, however, it tends to overestimate the actual NO_X mass emission rates since the majority of NO_X is in the form of NO which has less mass per unit volume (i.e., lbs. of emissions per ppmv concentration) than NO_2.

EPA Method 10 will be used for measurement of CO concentrations. A continuous nondispersive infrared (NDIR) analyzer will be used for this analysis. This analyzer is equipped with a gas correlation filter which removes most interference from H_2O, CO_2, and other combustion products.

FGT monitors their pipeline grade natural gas for sulfur content. The natural gas is the same as is used to fuel the turbine engines. SO_2 concentrations shall be determined using a current analysis of total sulfur content in the fuel gas. Based upon turbine fuel consumption rates and fuel sulfur content, SO_2 concentrations and emissions shall be determined for each test run. An example of a fuel gas sulfur content analysis in the FGT pipeline which passes through Compressor Station No. 11 is in Table 3.

EPA Method 19 shall be used to determine volumetric flow rates and mass emission rates for the turbine unit. Volumetric flow shall be calculated each run from natural gas O_2 and CO_2 "F-factors", turbine fuel consumption rates, natural gas heat values, and diluent gas concentrations (exhaust O_2 and CO_2 measurements).

Sampling traverse points shall be determined in accordance with EPA Methods 1 and 20, as modified, following the required traverse point layouts and the results of the O_2-traverse and stratification test. The stack is square in cross section, and measures 7' 6" on a side. Stack and sample port configurations meet the requirements of EPA Method 20: six sample ports are installed in the turbine exhaust stack. Cubix will test using a 5×6 matrix (5 sample points in each of the 6 sample ports). This will provide a total of 30 sample points. The stack configuration for the Solar Mars turbine at this facility is depicted in Figure 2.

Unit Operation Documentation

To document the operational status of the unit during the tests, as well as to allow Cubix to calculate stack flow rates, it will be necessary for FGT operators to provide data for each test run. It is recommended that this data be collected at least once during each test run or every 30 minutes for extended test runs. Data to be provided includes the following:

1) Mean turbine exhaust temperature
2) Fuel flow rate
3) Air compressor inlet temperature
4) Compressor suction and discharge pressures
5) Compressor suction and discharge temperatures
6) Compressor Throughput
7) Air compressor discharge pressure
8) Power turbine speed
9) Gas producer speed
10) Gas Compressor Horsepower (bhp)

Miscellaneous Measurements

Additional measurements to be made by Cubix during each test run include atmospheric pressure (via aneroid aircraft barometer), ambient temperature, and relative humidity as obtained from a sling psychrometer (i.e., wet and dry ambient temperatures). These measurements will be made during each test run.

QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities will be undertaken before, during, and following the testing project. This section of the test plan describes each of those activities.

Each instrument's response will be checked and adjusted in the field prior to the collection of data via multi-point calibration. The instrument's linearity will be checked by first calibrating its zero and span responses with zero-grade nitrogen or air and an upscale calibration gas in the range of the expected concentrations. The instrument response will then be challenged with at least one other calibration gas of known concentration (as dependent on methodology requirements). If the instrument's response does not agree with the calibration gases within ±2 percent of span range, corrective action will be taken prior to beginning the tests.

Interference response tests on the instruments have been conducted by the instrument vendors and/or Cubix Corporation on the NO_X, O_2, and CO analyzers. The sum of the interference responses for the stipulated combustion products is less than 2 percent of the applicable full scale span value. The instruments to be used for the tests meet the performance specifications for EPA Methods 3a, 10, and 20.

The sampling and analysis system response times will be determined as required by EPA Method 20. Zero gas will be introduced to the sample system at the calibration valve. When readings stabilize, the valve will be switched to monitor the stack exhaust gas until a stable reading is obtained. The upscale response time is the amount of time required for the analyzer to read the correct stack concentration. The test is repeated for the downscale response time starting with a high level calibration gas. Both upscale and downscale response time tests shall be conducted in triplicate. Response time tests will be performed for both NO_X and O_2.

The residence time of the sampling and measurement system has been estimated using the pump flow rate and the sampling system volume. The pump's rated flow rate is 0.8 SCFM at 5 psig. The sampling system volume using a typical Cubix sample system has been calculated to be approximately 0.139 SCF. Therefore, the minimum sample residence time is less than 11 seconds.

Each time the sampling system is set up, a leak check will be conducted prior to testing. The sampling system leak check will demonstrate that a vacuum greater than 10" Hg can be held for at least 1 minute with a decline of less than 1" Hg. A leak test will also be conducted before a sample system is dismantled (i.e., after a test series) to ensure that no sample dilution occurred due to leakage to ambient air during the tests.

The absence of leaks in the sampling system will also be verified by a sample system bias check. The sampling system's integrity will be tested by comparing the responses of each analyzer to calibration gases introduced via two paths. First, a calibration gas will be directly introduced into the analyzer. The second path, the bias check, will consist of introducing a calibration gas into the sample system through the sample conditioning system. Any difference in the instrument responses by these two methods is attributed to sampling system bias. The sample system bias checks will be conducted prior to and following each test run. The sample system bias checks will be used to demonstrate that no degradation of the sample occurs in the sample system due to absorption, leakage, or contamination.

Each test run will be bracketed by zero and span bias checks. After each test run, a zero gas and a calibration gas in the range of the span value of the instrument will be introduced to each analyzer to determine the calibration drift during the run. All run results shall be corrected for drift using 40 CFR 60, Appendix A, Method 6C, Eq. 6C-1. If the instrument calibration drifts more than the regulation permits, that run will be repeated.

The efficiency of the NO_2 to NO converter in the NO_X analyzer will be checked by having the analyzer sample a mixture of NO in N_2 calibration standard and air from a Tedlar® bag. When this bag is mixed and exposed to sunlight, NO is oxidized to NO_2. If the NO_X instrument's converter is 100% efficient, then the NO_X response will not decrease as the NO in the bag is converted to NO_2. The criterion for acceptability is a demonstrated NO_X converter efficiency greater than 90%; this shall be proven through a decrease of total NO_X in the Tedlar® bag of $\leq 2\%$ over a 30 minute period.

The control gases used to calibrate the instruments are analyzed and certified by the compressed gas vendors to ±1% analytical accuracy. EPA Protocol No. 1 gases, traceable to the National Institute of Standards and Technology, Standard Reference Materials (SRM's), will be used where applicable.

TEST REPORT AND CALCULATIONS

Test Report

A final test report will be prepared following the completion of the tests. A report will be submitted within 30 days of the test completion date. The contents of the report will include the following sections:

Introduction: This section will include background data for the tests (i.e., names, addresses, dates, units tested, parameters measured, etc.)

Summary of Results: This section will include tabular summaries of the emission rates for NO_X and CO (ppmv, NO_X ppmv @ 15% O_2, NO_X ppmv @ 15% O_2 and ISO day conditions, lbs/hr, and tons/yr), O_2 (% volume), CO_2 (% volume), and SO_2 (ppmv @ 15% O_2, lbs/hr, and tons/yr). The permit limits will also be reported for each applicable parameter.

Each tabular summary will also include sections for operational data, fuel data, and ambient conditions. The stack volumetric flow rate as determined from both O_2 and CO_2 based "F-factors" will also be included. The times and dates of each test run will be noted at the head of each column in the tabular summary.

Preceding the tabular summaries, a *Summary of Results* will include text that provides any necessary commentary or explanation of the test results.

Process Description: A brief description of the unit tested is provided in this section of the report. Included will be rated operating conditions and stack configuration descriptions. Any applicable model and serial numbers of the unit will also be included.

Analytical Techniques: This section of the report describes the test methods and procedures that were used. This section will closely resemble the *Test Measurements* section of this test plan.

Quality Assurance Activities: Closely matching the section of this test plan of the same title, this portion of the test report will describe the many QA activities

conducted during the tests. The text of this section will be supported by documentation included in the Quality Assurance and Calibration Certifications sections of the *Appendices*.

Appendices: The supporting documentation will be divided into the following sections:

Appendix A: Field Data Sheets (stack diagrams, sign-in sheets, etc.)

Appendix B: Example Calculations (examples of all formulas used for presentation of results in *Summary of Results*.)

Appendix C: Fuel Data (results of fuel analyses and Cubix's F-factor and heating value calculation templates)

Appendix D: Operational Data (operational data worksheets supplied by the operator which document the operational status of each unit during each test run; Cubix will mark the test run designations and times of each test run on these worksheets and provide an average for each run, if necessary)

Appendix E: Quality Assurance Activities (documentation of the various QA activities conducted for the tests including system response time tests, NO_X converter efficiency check strip chart and data sheet, sample system bias checks strip charts and data sheets, interference response checks, etc.)

Appendix F: Calibration Certifications (calibration data for calibration gases, thermometers, altimeter, etc.)

Appendix G: Strip Chart Records (documentation of the analyzer output from the continuous emission monitors used to measure exhaust gas concentrations)

Appendix H: Permit and Permit Amendments (ADEM operating permit and any amendments to said permit applicable to the testing)

Calculations

Emission calculations will be performed by customized spread sheet programs installed on a laptop computer. Example calculations will also be performed using a hand held calculator in order to verify the computer spreadsheet calculations.

SOLAR MARS OPERATIONAL LOAD RANGE SELECTION

New Solar turbines equipped with SoLoNox™ technology are designed to operate over a load range from approximately 50 to 105% of rated full load. Full load is generally expressed as Horsepower at a given temperature, pressure, site elevation, and relative humidity. Many permit applications reference full load with respect to ISO conditions, designated by the EPA as 59° air inlet temperature, 29.92" Hg at sea level, and 60% relative humidity. Ambient temperature causes the most pronounced effect on Horsepower output at full load. Turbines develop more Horsepower at low ambient temperatures and less at high ambient temperatures.

In order to demonstrate compliance over a set of load conditions to meet the requirements of 40 CFR 60, Subpart GG "Standards of Performance for Stationary Gas Turbines" an operational range at current pipeline conditions and ambient temperature must be determined. Typically, Cubix Corporation has the turbine brought to full load to determine the maximum achievable Horsepower. This followed by bringing the turbine down to the lowest achievable Horsepower. The performance test is then conducted at the low load, full load, and two loads approximately equally spaced in between.

Sometimes, the lowest achievable Horsepower is not 50% of rated full load. This is generally caused by pipeline conditions that restrict the operational range. The turbine is restricted in operation by the natural gas compressor. If the control by-pass opens, natural gas is recycled through the compressor. This causes a rapid elevation in discharge temperature. Since there is a safety rating for maximum discharge temperature, turbine shut down results. Maintaining the surge margin above 25% prevents the by-pass from opening. Depending upon current pipeline conditions during the test and the configuration of the natural gas compressor, low load may vary between 50% to 90% of full load.

Attachment C

Table of Emissions Test Results

FGT Solar Turbine Performance Test Results

NOx								
Turbine		Location			lb/hr		tpy	
Model	Unit	State	County	Date	Permit	Test	Permit	Test
Taurus 60S	2101	FL	Palm Beach	2/7/95	8.92	5.82	39.1	25.5
Taurus 60S	2102	FL	Palm Beach	2/6/95	8.92	6.36	39.1	27.9
Taurus 60S	2601	FL	Citrus	3/21/95	8.92	5.53	39.1	24.2
Taurus 60S	2601	FL	Citrus	8/28/96	8.92	6.75	39.1	29.5
Taurus 60S	7501	LA	St. Landry	12/15/94	9.20	5.29	40.3	23.2
Mars 90S	1108	AL	Mobile	2/21/95	16.11	7.16	70.6	31.4
Mars 90S	1107	AL	Mobile	2/20/95	16.11	10.68	70.6	46.8
Mars 90S	1507	FL	Taylor	2/10/95	16.14	5.81	70.7	25.5

CO								
Turbine		Location			lb/hr		tpy	
Model	Unit	State	County	Date	Permit	Test	Permit	Test
Taurus 60S	2101	FL	Palm Beach	2/7/95	6.46	2.10	28.3	9.2
Taurus 60S	2102	FL	Palm Beach	2/6/95	6.46	0.32	28.3	1.4
Taurus 60S	2601	FL	Citrus	3/21/95	6.46	0.84	28.3	3.7
Taurus 60S	2601	FL	Citrus	8/28/96	6.46	0.57	28.3	2.5
Taurus 60S	7501	LA	St. Landry	12/15/94	6.46	2.16	28.3	9.5
Mars 90S	1108	AL	Mobile	2/21/95	11.67	0.66	51.1	2.9
Mars 90S	1107	AL	Mobile	2/20/95	11.67	0.26	51.1	1.1
Mars 90S	1507	FL	Taylor	2/10/95	11.71	4.32	51.3	18.9

THC/VOC								
Turbine		Location			lb/hr		tpy	
Model	Unit	State	County	Date	Permit*	Test**	Permit	Test
Taurus 60S	2101	FL	Palm Beach	2/7/95	0.37	0.09	1.6	0.4
Taurus 60S	2102	FL	Palm Beach	2/6/95	0.37	0.20	1.6	0.9
Taurus 60S	2601	FL	Citrus	3/21/95	0.37	0.039	1.6	0.2
Taurus 60S	2601	FL	Citrus	8/28/96	NA	NA	NA	NA
Taurus 60S	7501	LA	St. Landry	12/15/94	NA	NA	NA	NA
Mars 90S	1108	AL	Mobile	2/21/95	NA	NA	NA	NA
Mars 90S	1107	AL	Mobile	2/20/95	NA	NA	NA	NA
Mars 90S	1507	FL	Taylor	2/10/95	0.67	0.29	2.9	1.3

Attachment D

Custom Fuel Monitoring Schedule

Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

December 23, 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. R. Douglas Neeley, Chief
Air and Radiation Technology Branch
Air, Pesticides and Toxics Management Division
100 Alabama Street S.W.
Atlanta, Georgia 30303-3104

Re: Florida Gas Transmission Company
Custom Fuel Monitoring Schedule - Compressor Stations

Dear Mr. Neely:

The Florida Department of Environmental Protection requests approval of custom fuel monitoring schedules for the above mentioned company. The proposed schedules and supporting data needed for approval of the request have been enclosed for your review. The requests are for combustion turbines located at FGT Compressor Stations 30, 26, and 15, located in Duval, Citrus, and Taylor Counties, respectively. These units are subject to 40 CFR 60 Subpart GG. Pursuant to 40 CFR 60.334(b) (2), the U.S. EPA Administrator has approval authority for the custom fuel monitoring schedule. Station 15 was also subjected to PSD review.

The Department recommends approval of FGT's request and notes that FGT is the main gas supplier in Florida. Other requesters for custom fuel monitoring schedules typically rely on FGT's data in complying with their own monitoring requirements. We are advising all applicants to submit their requests through the Department.

It is the Department understanding that this request was previously sent to EPA by Florida Gas Transmission (FGT) sometime in June or July 1996. However, we have no record of any actions taken on the request, which is why it is being re-submitted.

If you have any questions regarding this matter, please call me or Teresa Heron of this Department at (850) 488-1344 or Clayton Roesler of FGT at (407)875-5865.

Sincerely,

A. A. Linero 12/23

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/th/t

Enclosures

cc: Clayton Roesler, FGT

Sent to Duane Pierce 10/14/98
File: Air Permit Comm.
4/55 15, 21, 26, 30

Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

September 11, 1998

RECEIVED
SEP 18 1998
TECH. SERVICES

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. R. Douglas Neeley, Chief
Air and Radiation Technology Branch
U. S. Environmental Protection Agency - Region 4
61 Forsyth Street
Atlanta, Georgia 30303

Re: Florida Gas Transmission Company
Custom Fuel Monitoring Schedule - Compressor Stations

Dear Mr. Neeley:

We request action on our attached letter dated December 23, 1997 regarding a custom fuel monitoring schedule for Florida Gas Transmission Company (FGT). We need to update the Department's ARMS database and to close out that permitting action.

It is possible that this one "fell through the cracks" since in some cases the applicants requested these actions directly from EPA. Also, we might have mailed it to your old address. In any case, applicants are now processing them through the state. We in-turn send them to EPA with the appropriate documentation for your review and approval (or denial). Most recent ones have been handled promptly.

If you have any questions regarding this matter, please call me or Teresa Heron at (850) 488-1344 or Clayton Roesler of Florida Gas Transmission Company at (407)875-5865.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/th

Enclosures

cc: Clayton Roesler, FGT

1230034-002-AC

Florida Gas Transmission Company
P. O. Box 945100 Maitland, Florida 32794-5100 (407) 875-5800

April 12, 1996

CERTIFIED

Ms. Rita Felton
Florida Department of Environmental Protection
Northeast District
7825 Baymeadows Way, Suite B-200
Jacksonville, FL 32256-7577

Dear Ms. Felton:

Re: Florida Gas Transmission Company - Station 15
Turbine Compressor 1507, Air Permit No. AC62-229319

Florida Gas Transmission Company (FGT) requests approval for a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in the natural gas fuel for each of the referenced turbine units.

Pursuant to Specific Condition 13, FGT requests approval of a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in its fuel gas. The permitted gas turbine burns only highly regulated pipeline quality natural gas that contains negligible amounts of nitrogen and sulfur. The initial compliance tests (attached) show the nitrogen and sulfur concentrations in the gas to be much less than the respective permit limits. The nitrogen and sulfur content of the fuel gas, supplied through FGT's pipeline, has historically been and will remain relatively constant at levels far below those of regulatory interest.

If you have any questions or would like to arrange a meeting to discuss these changes, please call me at (407) 875-5816.

Sincerely,

Allan Weatherford
Division Environmental Specialist

c Glenn Sellars
Roy Smith
Norman Tedder

0170035-001-AC

Florida Gas Transmission Company
P. O. Box 945100 Maitland, Florida 32794-5100 (407) 875-5800

April 12, 1996

Mr. Clair Fancy
Florida Department of Environmental Protection
Northwest District Branch Office
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Re: Air Permit No. AC09-229441
Florida Gas Transmission Company - Station 26
Citrus County, Lecanto, Florida

Florida Gas Transmission Company (FGT) requests that certain modifications be made to the above referenced construction permit and also requests approval for a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in the natural gas.

The permitted unit is a minor source at a minor facility. Changes are requested to eliminate requirements that exceed those specified by rule without significantly impacting reasonable compliance oversight.

Specifically, FGT requests the following changes to the referenced permit:

Change Specific Condition 1 so that all emissions limiting standards are omitted except for NOx and SO2 standards. The standards should be consistent with the standards that are applicable to the source in NSPS (40CFR61) and should be expressed in the units defined in the standard rather than in pounds per hour (lbs/hr) or tons per year (TPY).

Change Specific Condition 2 to read: "Visible emissions shall not exceed 20% opacity."

Revise Specific Condition 8 so that the test requirements are limited to:
-Annual Testing: for visible emissions by Method 9
-Prior to Renewal Testing: for Nox by Methods 1,2,3A, and 20
NOTE: The initial tests, as currently specified in the permit, were completed and showed compliance with all permit limits. FGT is requesting the change to affect only the "annual" and "prior to renewal" testing requirements.

Additionally, pursuant to Specific Condition 13, FGT requests approval of a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in its fuel gas (a copy of this request has also been sent to Hillsborough County EPC for their consideration). The permitted gas turbine burns only highly regulated pipeline quality natural gas that contains negligible amounts of nitrogen and sulfur. The initial compliance tests (attached) show the nitrogen and sulfur concentrations in the gas to be much less than the respective permit limits. The nitrogen and sulfur content of the fuel gas, supplied through FGT's pipeline, has historically been and will remain relatively constant at levels far below those of regulatory interest.

If you have any questions or would like to arrange a meeting to discuss these changes, please call me at (407) 875-5816.

Sincerely,

Allan Weatherford
Division Environmental Specialist

c Charlie Thompson
Roy Smith
Mark Winder
John Ludlow
Eric Peterson, Hillsborough County EPC

Florida Gas Transmission Company

P. O. Box 945100 Maitland, Florida 32794-5100 (407) 875-5800

CERTIFIED

RECEIVED

APR 16 1996

BUREAU OF
AIR REGULATION

April 12, 1996

Mr. Clair Fancy
Florida Department of Environmental Protection
Northwest District Branch Office
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Re: Florida Gas Transmission Company - Station 30
Air Permit No. AC29-228821

Florida Gas Transmission Company (FGT) requests that certain modifications be made to the above referenced construction permit and also requests approval for a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in the natural gas.

The permitted unit is a minor source at a minor facility. Changes are requested to eliminate requirements that exceed those specified by rule without significantly impacting reasonable compliance oversight.

Specifically, FGT requests the following changes to the referenced permit:

Change Specific Condition 1 so that all emissions limiting standards are omitted except for NOx and SO2 standards. The standards should be consistent with the standards that are applicable to the source in NSPS (40CFR61) and should be expressed in the units defined in the standard rather than in pounds per hour (lbs/hr) or tons per year (TPY).

Change Specific Condition 2 to read: "Visible emissions shall not exceed 20% opacity."

Revise Specific Condition 8 so that the test requirements are limited to:
-Annual Testing: for visible emissions by Method 9
-Initial and Prior to Renewal Testing: for Nox by Methods 1,2,3A, and 20
NOTE: The initial tests, as currently specified in the permit, were completed and showed compliance with all permit limits. FGT is requesting the change to affect only the "annual" and "prior to renewal" testing requirements.

Additionally, pursuant to Specific Condition 13, FGT requests approval of a custom monitoring schedule for sampling and analyzing nitrogen and sulfur in its fuel gas (a copy of this request has also been sent to Hillsborough County EPC for their consideration). The permitted gas turbine burns only highly regulated pipeline quality natural gas that contains negligible amounts of nitrogen and sulfur. The initial compliance tests (attached) show the nitrogen and sulfur concentrations in the gas to be much less than the respective permit limits. The nitrogen and sulfur content of the fuel gas, supplied through FGT's pipeline, has historically been and will remain relatively constant at levels far below those of regulatory interest.

If you have any questions or would like to arrange a meeting to discuss these changes, please call me at (407) 875-5816.

Sincerely,

Allan Weatherford
Division Environmental Specialist

c Charlie Thompson
Roy Smith
Curt Gavin
Ray Glass
Eric Peterson, Hillsborough County EPC

TABLE 2
Summary of Results
Unit No. 1507

Florida Gas Transmission Company
Compressor Station No. 15
6 miles N of Perry on C-361 in Taylor County, FL
Solar Mars Model 90S
Technicians: CDC, LJB, DLD

Test Number	15C-4	15C-5	15C-6		
Date	8/29/95	8/29/95	8/29/95		
Start Time	8:50	9:13	10:37		FDEP
Stop Time	9:00	10:21	11:50		Permit
Turbine/Compressor Operation				*Averages*	Limits
Power Turbine Speed (NPT, %)	94.6	94.2	93.3	*94.0*	
Gas Producer Speed (NGP, %)	100.9	100.8	100.5	*100.7*	
Estimated Horsepower (Solar Compressor Shaft, bhp)	11301	11326	11254	*11294*	11261*
Engine Compressor Discharge Pressure (PCD, psig)	180.6	179.4	176.3	*178.8*	
Combustor Air Inlet Temperature (T-1, °F)	84.0	85.9	88.5	*86.1*	
Power Turbine Exhaust Temperature (T-5, °F)	1290	1290	1291	*1290*	
Gas Compressor Suction Pressure (psig)	765.3	768.9	779.5	*771.2*	
Gas Compressor Suction Temperature (°F)	72.9	72.3	72.0	*72.4*	
Gas Compressor Discharge Pressure (psig)	1059.0	1065.8	1071.4	*1065.4*	
Gas Compressor Discharge Temperature (°F)	128.1	128.3	127.7	*128.0*	
Compressor Flow (MMSCFD)	580.3	574.0	572.2	*575.5*	
Turbine Fuel Data (Residue Gas)					
Fuel Heating Value (Btu/SCF, HHV)	1034	1034	1034	*1034*	
Fuel Specific Gravity	0.5840	0.5840	0.5840	*0.5840*	
O2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	8674	8674	8674	*8674*	
CO2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	1024	1024	1024	*1024*	
Total Sulfur in Fuel (grains Sulfur/100 SCF fuel)	0.059	0.059	0.059	*0.059*	10
Fuel Flow (MMSCFH)	0.0921	0.0915	0.0920	*0.0919*	0.1265
Heat Input (MMBtu/hr)	95.29	94.67	95.16	*95.04*	131.59
Ambient Conditions					
Atmospheric Presuure ("Hg)	29.82	29.84	29.86	*29.84*	
Temperature (°F): Dry bulb	79	80	82	*80*	
(°F): Wet bulb	74	76	72	*74*	
Humidity (lbs moisture/lb of air)	0.0166	0.0180	0.0138	*0.0161*	
Measured Emissions					
NOx (ppmv, dry basis)	23.9	24.0	23.4	*23.8*	
NOx (ppmv @ 15% O2)	27.5	27.7	27.2	*27.5*	42.0
NOx (ppmv @ 15% O2, ISO Day)	31.2	32.0	28.8	*30.7*	81.2†
CO (ppmv, dry basis)	0.9	1.1	1.3	*1.1*	
O2 (% volume, dry basis)	15.78	15.79	15.82	*15.80*	
CO2 (% volume, dry basis)	2.92	2.97	2.96	*2.95*	
Visible Emissions (% opacity)	0	0	0	*0*	10
Fo (fuel factor, range = 1.600-1.834 for NG)	1.75	1.72	1.72	*1.73*	
Stack Volumetric Flow Rates					
Via Pitot Tube Traverse (SCFH, dry basis)	4.17E+06	4.02E+06	3.80E+06	*4.00E+06*	
Via O2 "F-factor" (SCFH, dry basis)	3.37E+06	3.36E+06	3.40E+06	*3.38E+06*	
Via CO2 "F-factor" (SCFH, dry basis)	3.34E+06	3.26E+06	3.29E+06	*3.30E+06*	
Calculated Emission Rates (via pitot tube)					
NOx (lbs/hr)	11.9	11.5	10.6	*11.3*	16.14
CO (lbs/hr)	0.27	0.32	0.36	*0.32*	11.71
SO2 (lbs/hr, Based on fuel flow and fuel sulfur)	0.016	0.015	0.016	*0.015*	3.61
NOx (tons/yr)	52.2	50.5	46.5	*49.7*	70.70
CO (tons/yr)	1.2	1.4	1.6	*1.4*	51.30
SO2 (tons/yr, Based on fuel flow and fuel sulfur)	0.068	0.068	0.068	*0.068*	15.83
NOx (g/bhp-hr)	0.48	0.46	0.43	*0.46*	0.58
CO (g/bhp-hr)	0.011	0.013	0.014	*0.013*	0.42

* 100% of permitted output at ambient temperature of 80°F
† EPA NSPS Performance Standard

Gas Fuel F Factor & Heating Value Calculation

Client: Florida Gas Transmission Company
mple ID: pipeline natural gas (residue gas), St. 15
ime: 16:02
Date: 8/28/95

CALCULATION OF DENSITY AND HEATING VALUE @ 60°F and 30 in Hg

Component	% Volume	Molecular Wt.	Density (lb/ft3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross Heating Value (Btu/SCF)	Volume Fract. Btu
Hydrogen		2.016	0.0053	0.00000	0.0000	61100	0.00	325.0	0
Oxygen		32.000	0.0846	0.00000	0.0000	0	0.00	0.0	0
Nitrogen	0.3630	28.016	0.0744	0.00027	0.6045	0	0.00	0.0	0
CO2	0.7530	44.010	0.1170	0.00088	1.9719	0	0.00	0.0	0
CO		28.010	0.0740	0.00000	0.0000	4347	0.00	322.0	0
Methane	95.8760	16.041	0.0424	0.04065	90.9870	23879	21726.77	1013.0	971.224
Ethane	2.3070	30.067	0.0803	0.00185	4.1464	22320	925.47	1792.0	41.3414
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane	0.3970	44.092	0.1196	0.00047	1.0627	21661	230.20	2590.0	10.2823
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
Isobutane	0.0970	58.118	0.1582	0.00015	0.3435	21308	73.19	3363.0	3.26211
n-butane	0.0800	58.118	0.1582	0.00013	0.2833	21257	60.21	3370.0	2.696
Isobutene		56.102	0.1480	0.00000	0.0000	20840	0.00	3068.0	0
Isopentane	0.0340	72.144	0.1904	0.00006	0.1449	21091	30.56	4008.0	1.36272
n-pentane	0.0210	72.144	0.1904	0.00004	0.0895	21052	18.84	4016.0	0.84336
n-hexane	0.0720	86.169	0.2274	0.00016	0.3665	20940	76.74	4762.0	3.42864
H2S		34.076	0.0911	0.00000	0.0000	7100	0.00	647.0	0
total	100.00	Average Density		0.04468	100.0000	Gross Heating Value		Gross Heating Value	
		Specific Gravity		0.58403		Btu/lb	23142	Btu/SCF	1034.4

CALCULATION OF F FACTORS

Component	Mol. Wt.	C Factor	H Factor	% volume	Fract. Wt.	Weight Percents Carbon	Hydrogen	Nitrogen	Oxygen
Hydrogen	2.016	0	1	0.00	0.0000		0		
Oxygen	32.000	0	0	0.00	0.0000				0
Nitrogen	28.016	0	0	0.36	10.1698			0.602268295	
CO2	44.010	0.272273	0	0.75	33.1395	0.534352898			1.42678
CO	28.010	0.42587	0	0.00	0.0000	0			0
Methane	16.041	0.75	0.25	95.88	1537.9469	68.3093034	22.7697678		
Ethane	30.067	0.8	0.2	2.31	69.3646	3.286282746	0.82157069		
Ethylene	28.051	0.85714	0.14286	0.00	0.0000	0	0		
Propane	44.092	0.81818	0.181818	0.40	17.5045	0.848157315	0.18847963		
Propene	42.077	0.85714	0.14286	0.00	0.0000	0	0		
Isobutane	58.118	0.82759	0.17247	0.10	5.6374	0.276296178	0.0575802		
n-butane	58.118	0.82759	0.17247	0.08	4.6494	0.227873136	0.04748883		
Isobutene	56.102	0.85714	0.14286	0.00	0.0000	0	0		
Isopentane	72.144	0.83333	0.16667	0.03	2.4529	0.121052399	0.02421106		
n-pentane	72.144	0.83333	0.16667	0.02	1.5150	0.074767658	0.01495389		
n-hexane	86.169	0.83721	0.16279	0.07	6.2042	0.307606285	0.05981203		
H2S	34.076	0	0.0586923	0.00	0.0000	0	0		
Totals				100.00000	1688.5843	73.98569201	23.98	0.602268295	1.42678

CALCULATED VALUES		
O2 F Factor (dry)	8674	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet)	10654	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	1980	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	18.59	volume % water in flue gas @ 0% excess air
CO2 F Factor	1024	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air
Carbon Dioxide	11.81	volume % CO2 in flue gas @ 0% O2
Predicted Fo Factor	1.77	EPA Method 3a Fo value
Fuel VOC % (non-C1)	6.57%	non-methane fuel VOC content
Fuel VOC % (non-C1,C2)	2.36%	non-methane non-ethane fuel VOC content

Attachment E

Description Of Turbine Parameters To Be Monitored

ENRON/NNG

USER'S MANUAL FOR THE

OWATONNA

TURBINE PERFORMANCE

MONITORING

AND

STATION CONTROL

OPERATOR INTERFACE

5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

DISPLAY SCREENS

MAIN MENU

The Main Menu is displayed when the system is first started up. It provides a general overview for the system and access to the other screens. Select a screen by moving the mouse over a button at the bottom of the screen and pressing the left mouse button.

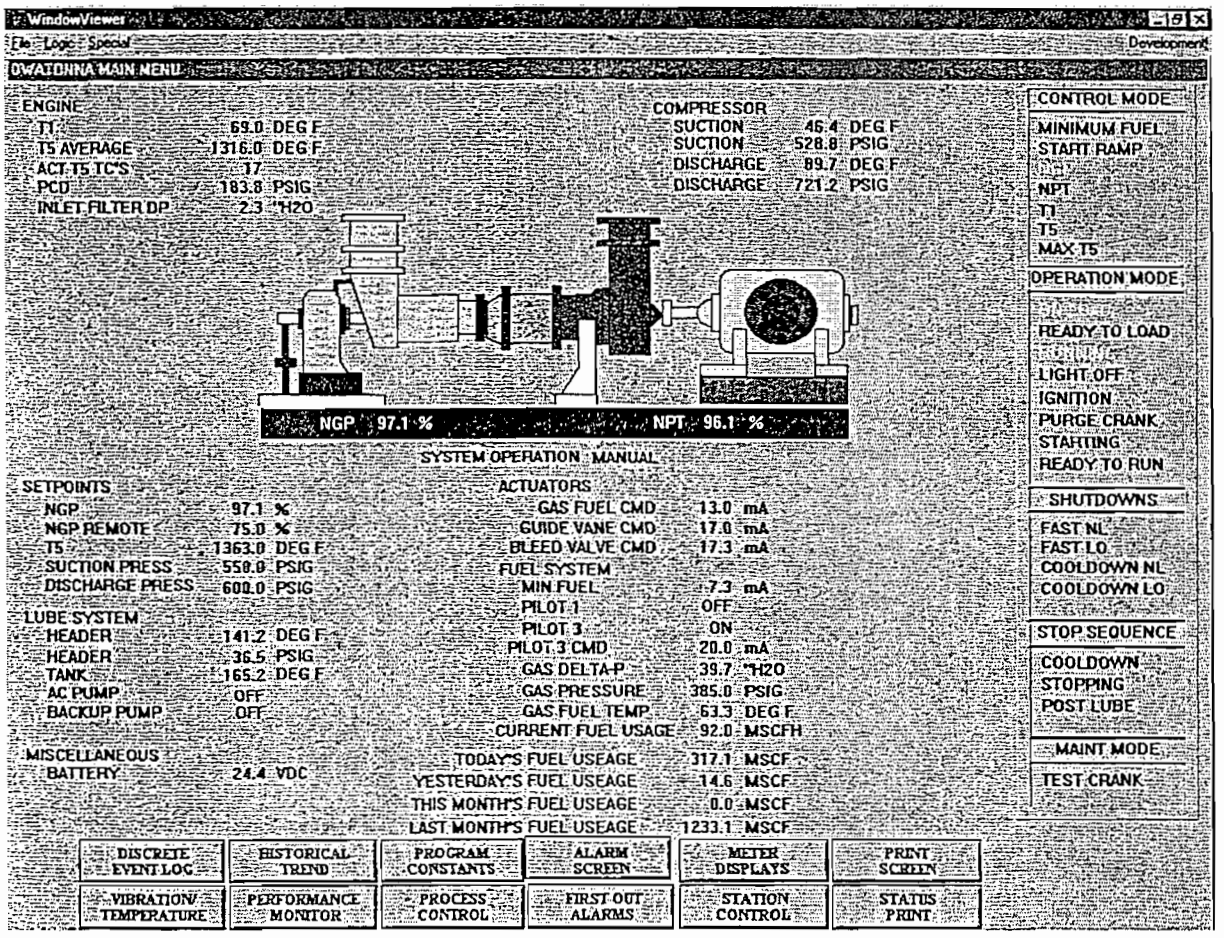

Figure 4: Main Menu Screen

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

VIBRATION/TEMPERATURE SUMMARY

The Vibration/Temp Summary screen is selected from the Main Menu by pressing the appropriate button on the bottom of the screen. The screen displays all of the temperatures and vibration sensors being monitored in the turbine PLC. Press the Close button on the bottom left side of the screen or press the Escape key on the keyboard to return to the Main Menu.

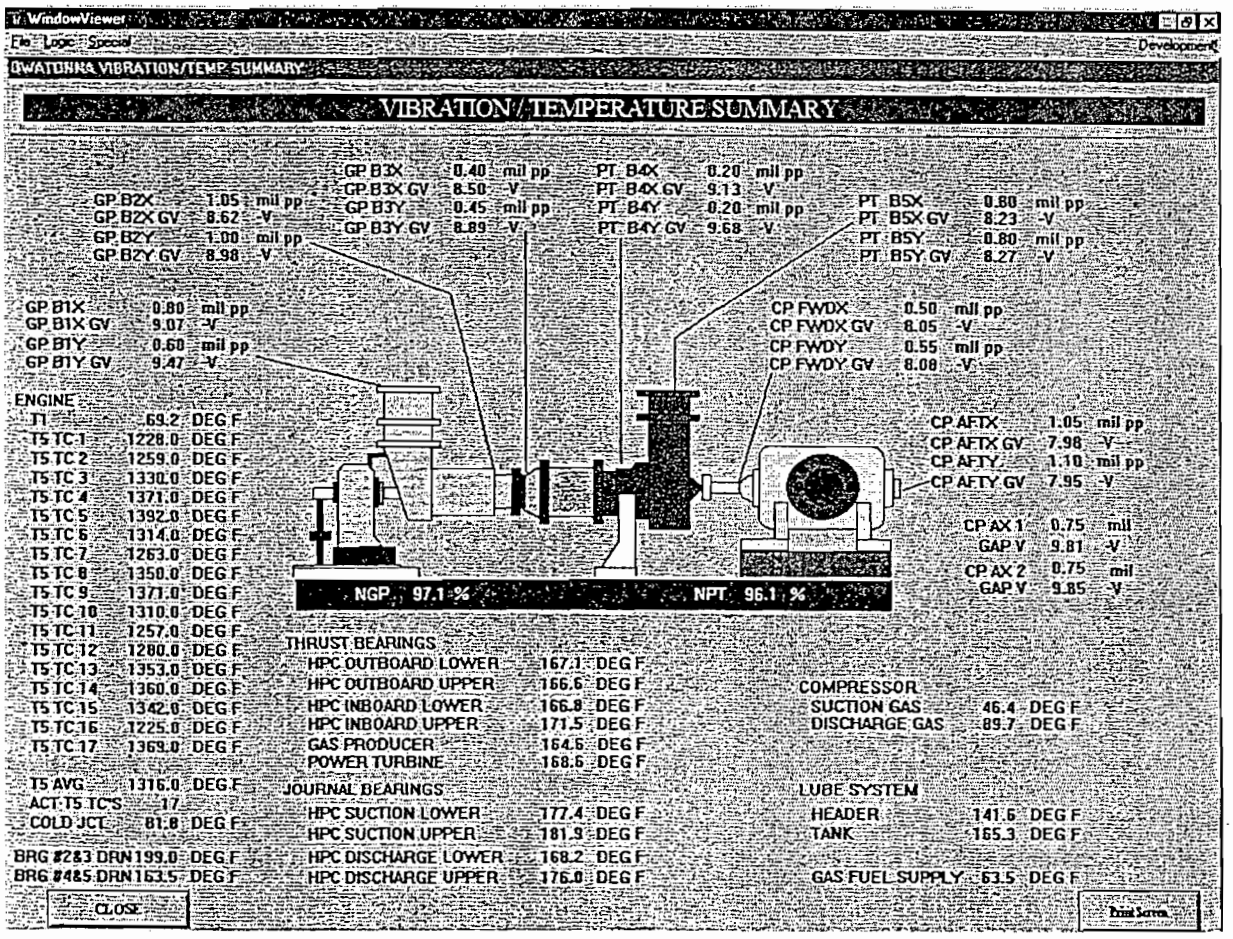

Figure 6: Vibration/Temp Summary Screen

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

PERFORMANCE MONITOR

The Performance Monitor screen is selected from the Main Menu by pressing the appropriate button on the bottom of the screen. The screen lists turbine performance parameters calculated in the Visual Basic applications. It also has access to the three performance related graphs: Engine performance, Compressor performance, and Surge control. Press the Close button on the bottom of the screen or press the Escape key on the keyboard to return to the Main Menu. The screen can be printed by pressing the Print Screen button on the bottom left of the screen.

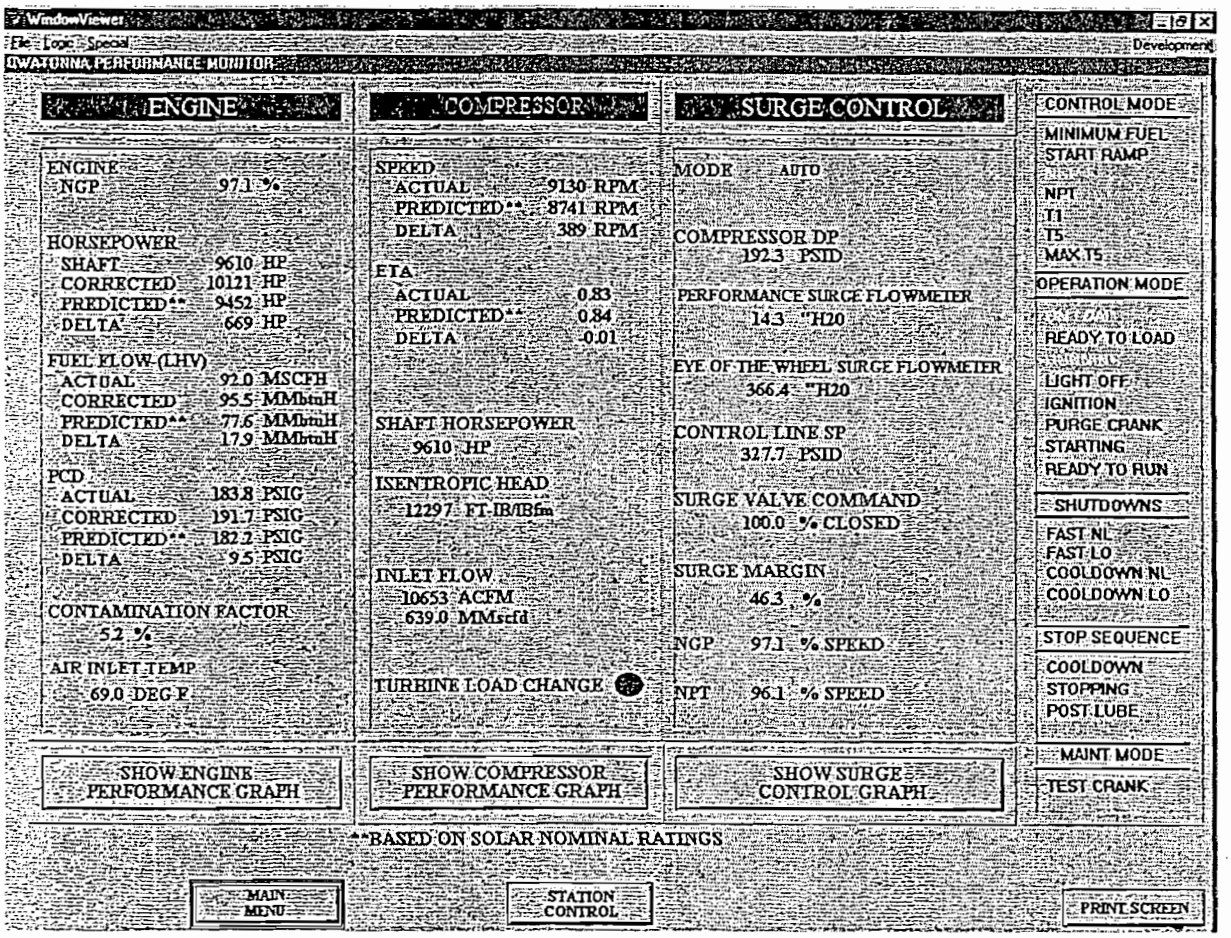

Figure 9: Performance Monitor Screen

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

ENGINE PERFORMANCE GRAPH

The Engine Performance graph is selected from the Performance Monitor screen by pressing the appropriate button. The screen displays the Solar Predictive values for fuel usage (Wf), engine compressor discharge pressure (PCD), and the Full load line for horsepower. A yellow cross moves on the screen showing the current operating point. The horizontal movement is controlled by the T1 Inlet Air Temp and the vertical position is controlled by the predicted Engine Horsepower returned from the performance calculations. Press the Close button on the bottom left of the screen or press the Escape key on the keyboard to return to the Performance Monitor screen. The screen can be printed by pressing the Print Screen button on the bottom left of the screen.

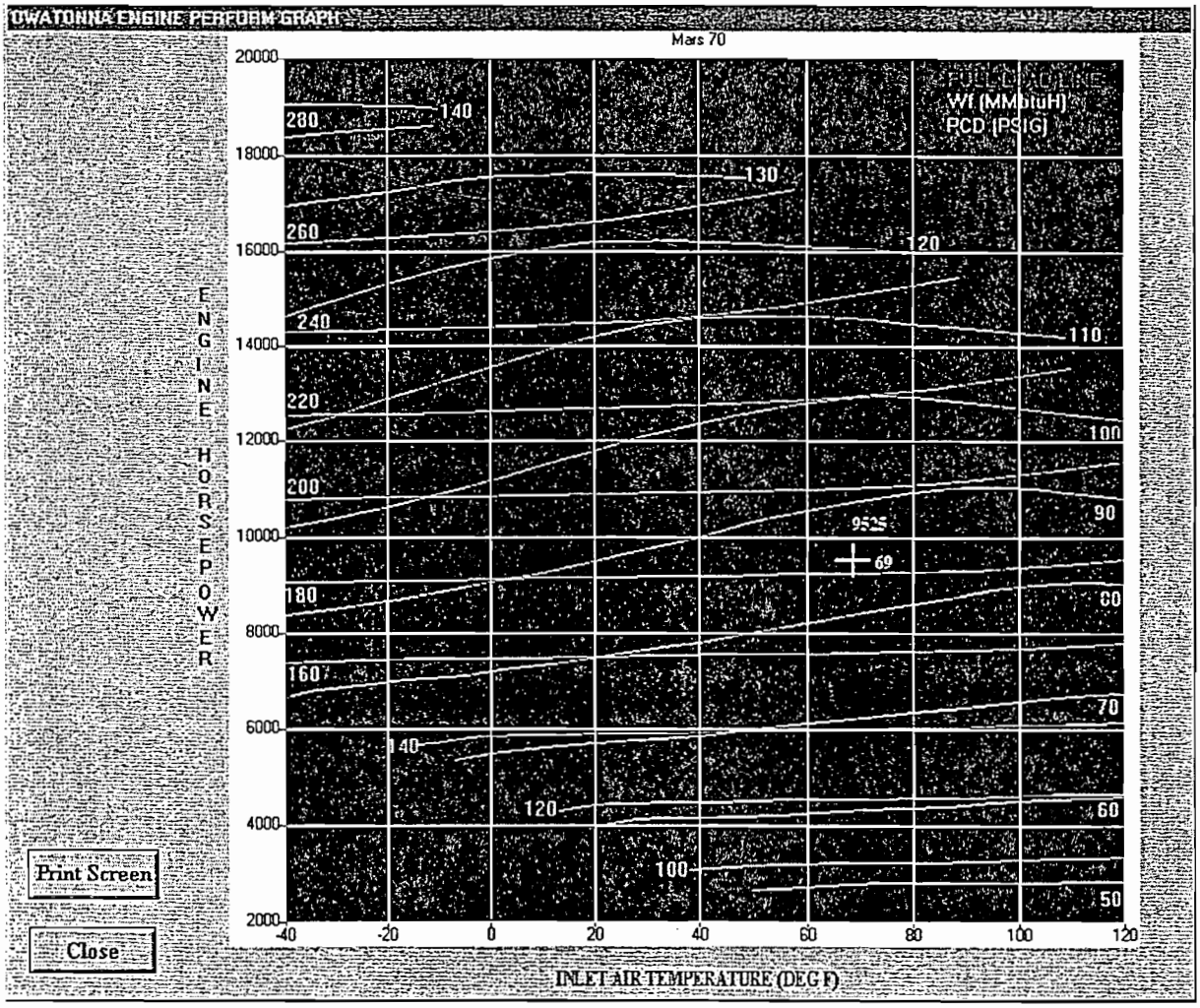

Figure 10: Engine Performance Graph

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

COMPRESSOR PERFORMANCE GRAPH

The Compressor Performance graph is selected from the Performance Monitor screen by pressing the appropriate button. The screen displays the Solar predictive values for the compressor efficiency (ETA) and RPM . A yellow cross moves on the screen showing the current operating point. The horizontal movement is controlled by the calculated value of compressor flow in ACFM. The vertical movement is controlled by the calculated value of Isentropic Head. Press the Close button on the bottom left of the screen or press the Escape key on the keyboard to return to the Performance Monitor screen. The screen can be printed by pressing the Print Screen button on the bottom left of the screen.

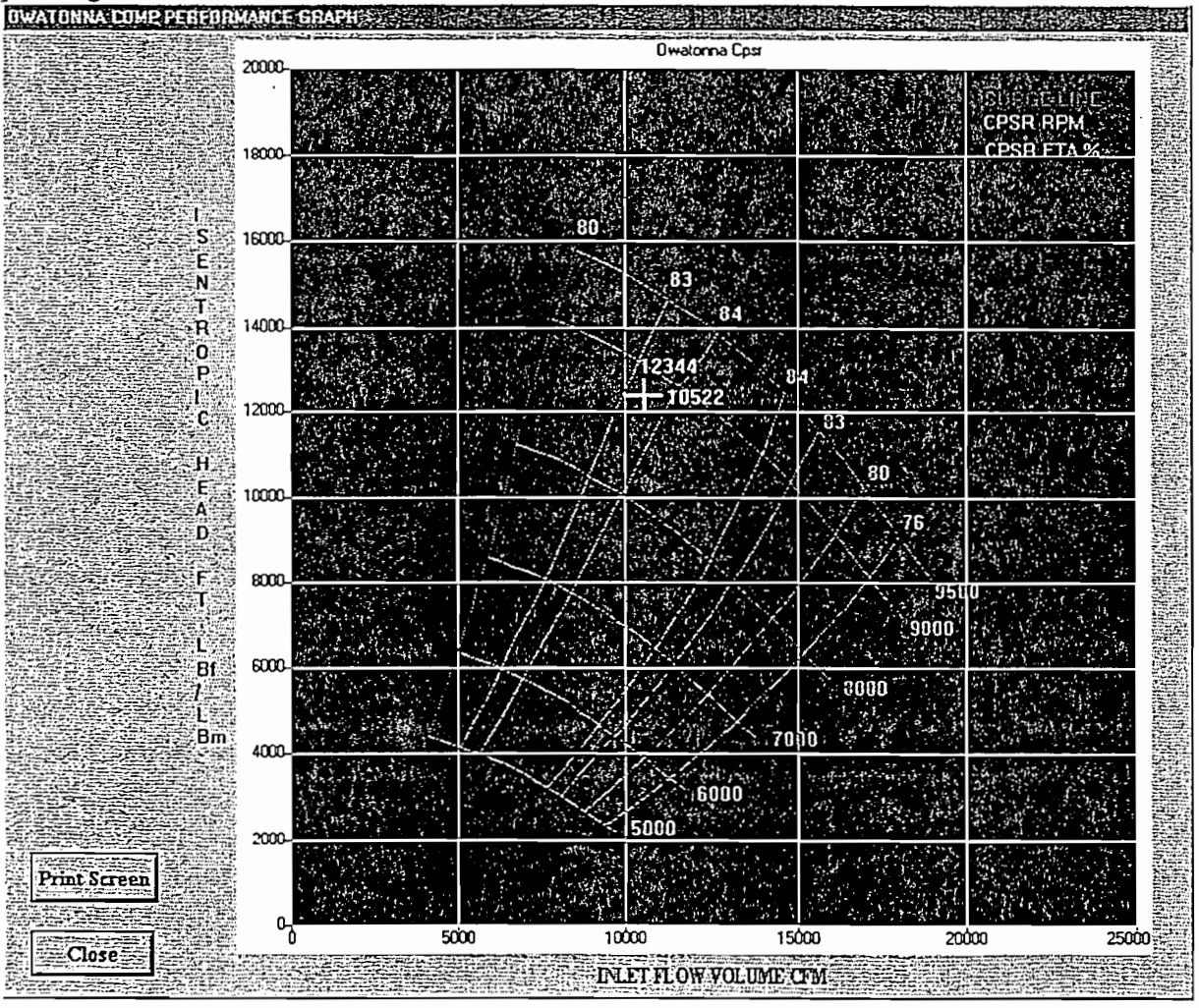

Figure 11: Compressor Performance Graph

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

STATION CONTROL

The Station Control screen is selected from the Main Menu by pressing the appropriate button on the bottom of the screen. The screen displays the status of the turbine unit valves, allows the operator to control the station yard valves, and display line pressures, and reset alarms.

Press the Close button on the bottom of the screen or press the Escape key on the keyboard to return to the Main Menu. The screen can be printed by pressing the Print Screen button on the bottom left of the screen.

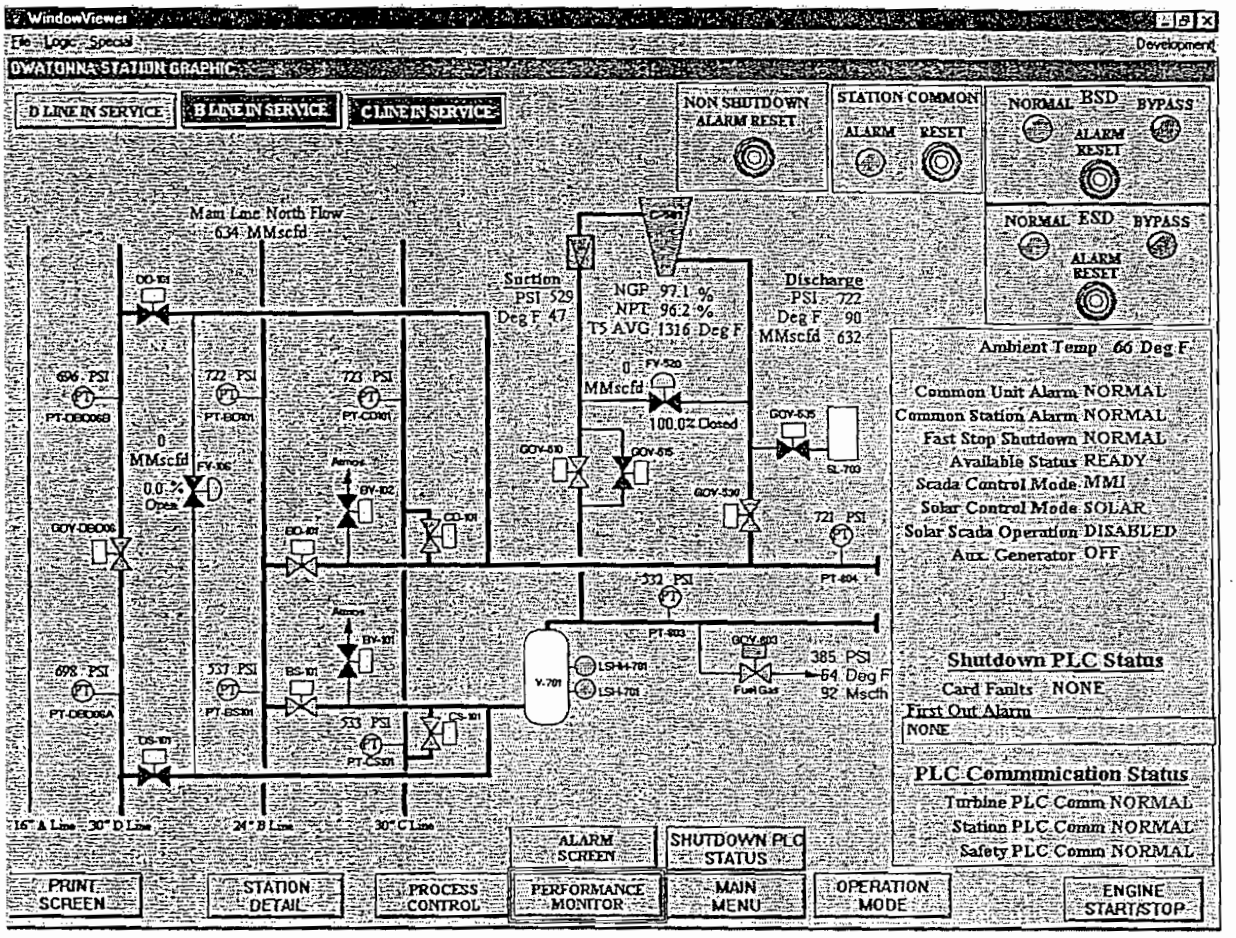

Figure 18: Station Graphic Screen

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

SHUTDOWN PLC STATUS

The Shutdown PLC status screen is selected from the Station Graphic screen by pressing the appropriate button on the bottom of the screen. The screen displays the status of the ESD/BSD shutdown PLC. All ESD/BSD points are monitored with normally closed circuits. The Input Cards have two statuses for each input: a card fault and an alarm or shutdown indicator. Approximately every 15 seconds the shutdown PLC will remove the power driving the inputs. A card fault exists when the PLC senses an input even though the DC power driving it has been removed. This could be caused by a bad card or faulty wiring. An alarm exists if the input goes low anytime the PLC is not checking the input card status. An output card fault exists if any of the outputs fail to go low when required by the logic. This will generate a Output Card fault which stops the watchdog circuit from resetting which will de-energize the Master Control relay and remove all power from the entire ESD/BSD system.

Press the Station Graphic button on the bottom of the screen or press the Escape key on the keyboard to return to the Station Graphic screen. The screen can be printed by pressing the Print Screen button on the bottom left of the screen.

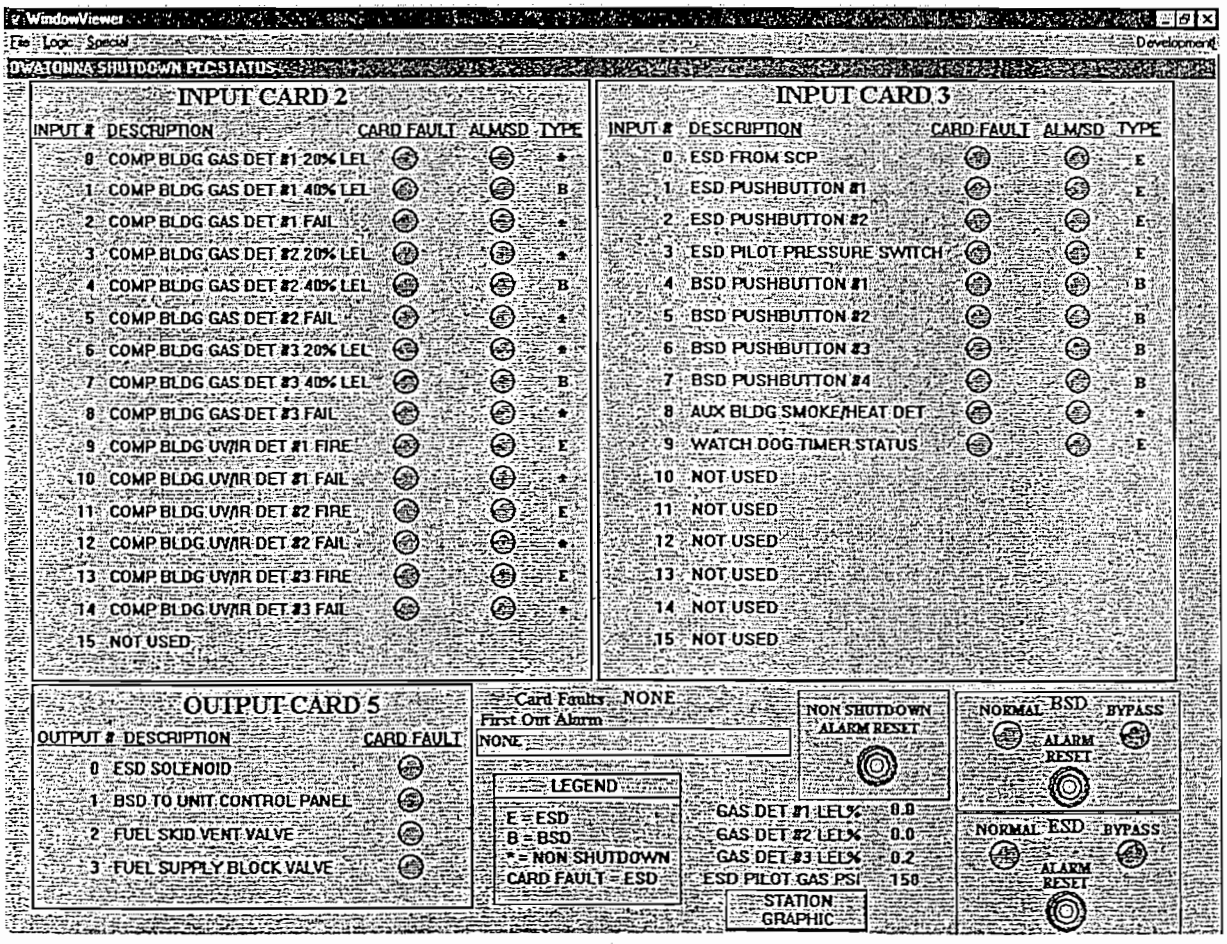

Figure 19: Shutdown PLC Status Screen

1998 Wunderlich Malec Engineering Systems, Inc.
5501 Feltl Road Minnetonka, MN 55343
Phone 612-933-3222 Fax 612-933-0608

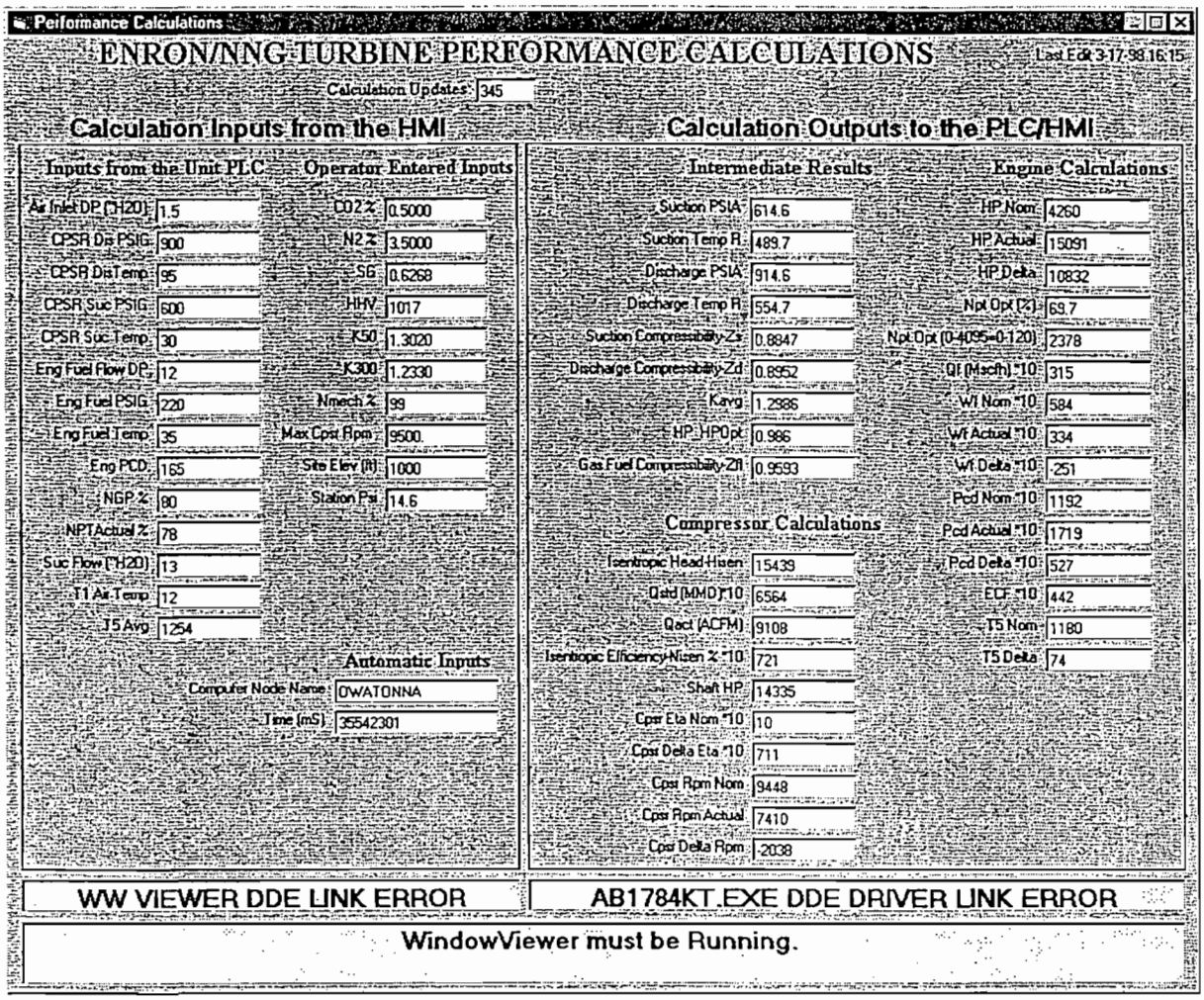

Figure 25: PerformanceCalcs.exe Form

The program form does not normally need to be viewed unless the operator suspects something is wrong.

Things to look for when a problem is suspected:

1. Is the Calculation Updates field on the top middle of the form incrementing in value approximately every 10 seconds? If it is then Wonderware is communicating with the VB application. If not try closing PerformanceCalcs.exe and starting it up again. If that didn't fix the problem then shutdown WindowViewer and restart.

2. Do any of the input text boxes on the left side of the screen have a red background? If so it means the value of the field is zero or invalid. Is zero a normal value for the input? If not, then it may mean that there is a hardware failure or DDE link failure.

3. Is there an error message on the bottom portion of the form? If so, it is more than likely a DDE link failure message. Try closing PerformanceCalcs.exe and starting it up again. If that didn't fix the problem then shutdown WindowViewer and restart.

Attachment F

Previous Construction Permit for FGT Turbine in Florida

Florida Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

PERMITTEE:
Florida Gas Transmission Company
P.O. Box 1188
Houston, Texas 77251-1188

Permit Number: AC 50-229440
Expiration Date: June 30, 1995
County: Palm Beach
Latitude/Longitude: 26°44'49N
80°08'0"W
Project: Natural Gas Turbine Engines No. 2101, 2102 and Supporting Equipment

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-210, 212, 272, 275, 296, and 297; and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of two natural gas fired turbine engines and supporting equipment to be located within the limits of the city of West Palm Beach, adjacent to the Florida Turnpike in Palm Beach County, Florida. The UTM coordinates are Zone 17, 586.031 km East and 2957.102 km North.

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

Attachments are listed below:

1. DEP Form 17-1.202(1) Application to Operate/Construct Air Pollution Sources.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

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

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

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

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

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

GENERAL CONDITIONS:

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

a. Have access to and copy any records that must be kept under the conditions of the permit;

b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

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

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

a. a description of and cause of non-compliance; and

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

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

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

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.

GENERAL CONDITIONS:

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-730.300, 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.

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

13. This permit also constitutes:

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

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

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

GENERAL CONDITIONS:

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

SPECIFIC CONDITIONS:

Emission Limits

1. The maximum allowable emissions* from each gas turbine shall not exceed the emission rates as follows:

Pollutant	lbs/hr	tons/yr	Emission Factor
Nitrogen Oxides*	8.92	39.05	0.62 g/bhp-hr
Carbon Monoxide	6.46	28.29	0.45 g/bhp-hr
Volatile Organic Compounds (non-methane)	0.37	1.62	0.026 g/bhp-hr
Particulate Matter (TSP)	0.35	1.51	5 lbs/MMscf
Particulate Matter (PM_{10})	0.35	1.51	5 lbs/MMscf
Sulfur Dioxide	1.97	8.62	10 gr S/100scf

**NOx Emission Standard of 42 ppmvd at 15% O_2 shall not be exceeded
*Based on 100% load conditions.

2. Visible emissions shall not exceed 10% opacity.

Operating Rates

3. Each source is allowed to operate continuously (8760 hours per year). The emergency electrical generator is allowed to operate not more than 400 hours per year.

4. Each source is allowed to use natural gas only.

5. The permitted operating parameters and utilization rates for each natural gas turbine engine shall not exceed the values stated in the application. The parameters include, but are not limited to:

- Maximum natural gas consumption shall not exceed 0.0684 MMcf/hr (based on a fuel heating value of 1040 BTU/CF).
- Maximum heat input shall not exceed 71.52 MMBtu/hr

6. Any change in the method of operation, equipment or operating hours shall be submitted to the DEP's Bureau of Air Regulation, Southeast District and the Air Pollution Control Section of the Palm Beach County Public Health Unit (PBCPHU) offices.

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

SPECIFIC CONDITIONS:

Compliance Determination

8. Compliance with the allowable emission limits shall be determined within 60 days after achieving the maximum production rate at which this facility will be operated, but not later than 180 days after initial start-up and annually thereafter except as provided in Specific Condition 10, below, by the following reference methods as described in 40 CFR 60, Appendix A (July 1992 version) and adopted by reference in Chapter 17-297, F.A.C.

- Method 1 Sample and Velocity Traverses
- Method 2 Volumetric Flow Rate
- Method 3 or 3A Gas Analysis
- Method 9 Determination of the Opacity of the Emissions from Stationary Sources
- Method 10 Determination of the Carbon Monoxide Emissions from Stationary Sources
- Method 20 Determination of Nitrogen Oxides, Sulfur Dioxide and Diluent Emissions from Gas Turbines
- Method 18 Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
- Method 25A Determination of Total Gaseous Organic Concentrations Using a Flame Ionization Analyzer

9. Other DEP approved methods may be used for compliance testing after prior Department approval. Compliance with the SO_2 emission limit can be determined by calculations based on fuel analysis using ASTM D1072-80, D3031-81, D4084-82, or D3246-81 for sulfur content of gaseous fuels.

10. Initial compliance with the volatile organic compound (VOC) emissions limits will be demonstrated by EPA Method 25A or Method 18 Thereafter, except as provided in Rule 17-297.340(2), compliance with the VOC emission limits will be assumed, provided the CO allowable emission rate is achieved.

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

$$NO_X = (NO_{X\ obs}) \left(\frac{P_{ref}}{P_{obs}}\right)^{0.5} e^{19\,(H_{obs} - 0.00633)} \left(\frac{288°K}{T_{AMB}}\right)^{1.53}$$

where:

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

$NO_{X\ obs}$ = Measured NO_X emission at 15 percent oxygen, ppmv.

SPECIFIC CONDITIONS:

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

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

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

e = Transcendental constant (2.718).

T_{AMB} = Temperature of ambient air at test.

12. Stack sampling facilities shall be required and shall comply with the requirements of F.A.C. Rule 17-297.345. Test results will be the average of 3 valid runs. The Southeast District and the PBCPHU offices will be notified at least 30 days in writing in advance of the compliance test(s). The source shall operate between 90% and 100% of maximum capacity for the ambient conditions experienced during compliance test(s). Compliance test results shall be submitted to the Southeast District and the PBCPHU offices no later than 45 days after completion.

13. Sulfur and nitrogen content and the lower heating value of the fuel being fired in the combustion turbine shall be determined as specified in 40 CFR 60.334(b). Any request for a future custom monitoring schedule shall be made in writing and directed to the Southeast District and the PBCPHU offices. Any custom schedule approved by DEP pursuant to 40 CFR 60.334(b) will be recognized as enforceable provisions of the permit, provided that the holder of this permit demonstrates that the provisions of the schedule will be adequate to assure continuous compliance.

14. The permittee shall annually perform a visual inspection of the turbine compressor engine, filters, associated piping system for rust spots, cracks, leaks and odors. Also ensure that safety valves and the stack are in proper order and working properly. The permittee shall document the findings and corrective action taken.

15. When the Department, after investigation, has good reason (such as odor complaints, increased visible emissions, excess emissions, etc.), to conclude that any applicable emission standard contained in this permit is being violated, it may require the owner or operator of the facility to conduct compliance tests which identify the nature and quantity of air pollutant emissions from the facility and to provide a report of said tests to the Department (F.A.C. Rule 17-297.340(2)).

SPECIFIC CONDITIONS:

Rule Requirements

16. This source shall comply with all applicable provisions of Chapter 403, Florida Statutes, Chapters 17-210, 212, 275, 296, 297 and 17-4, Florida Administrative Code and 40 CFR 60 (July, 1992 version).

17. This source shall comply with all requirements of 40 CFR 60, Subpart GG and F.A.C. Rule 17-296.800,(2)(a), Standards of Performance for Stationary Gas Turbines.

18. Issuance of this permit does not relieve the facility owner or operator from compliance with any applicable federal, state, or local permitting requirements and regulations (F.A.C. Rule 17-210.300(1)).

19. No person shall cause, suffer, allow, or permit the discharge of air pollutants which cause or contribute to an objectionable odor pursuant to F.A.C. Rule 17-296.320(2). Objectionable odor is defined as any odor present in the outdoor atmosphere which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonable interferes with the comfortable use and enjoyment of life or property, or which creates a nuisance pursuant to F.A.C. Rule 17-296.200(123).

20. This source shall be in compliance with all applicable provisions of F.A.C. Rules 17-210.650: Circumvention; 17-210.700: Excess Emissions; 17-296.800: Standards of Performance for New Stationary Sources (NSPS); Chapter 17-297: Stationary Sources-Emissions Monitoring; Chapter 17-296: Stationary Source-Emission Standards and, 17-4.130: Plant Operation-Problems.

21. Fugitive dust emissions, during the construction period, shall be minimized by covering or watering dust generation areas.

22. Pursuant to F.A.C. Rule 17-210.300(2), Air Operating Permits, the permittee is required to submit annual reports on the actual operating rates and emissions from this facility. These reports shall include, but are not limited to the following: sulfur and nitrogen content, lower heating value of the fuel being fired, fuel usage, turbine inlet and outlet temperature, RPM, hours of operation, air emissions limits, etc. Annual reports shall be sent to the Department's Southeast District and the Air Pollution Control Section of the Palm Beach County Public Health Unit (PBCPHU) offices by March 1 of each calendar year.

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

SPECIFIC CONDITIONS:

24. An application for an operation permit must be submitted to the Southeast District and the Air Pollution Control Section of the Palm Beach County Public Health Unit (PBCPHU) offices at least 90 days prior to the expiration date of this construction permit. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rules 17-4.055 and 17-4.220).

Issued this 23 day
of September, 1993

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Howard L. Rhodes

Howard L. Rhodes, Director
Division of Air Resources Management