Florida Power
CORPORATION

November 15, 1995

Mr. Clair H. Fancy
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road, MS 5505
Tallahassee, FL 32399-2400

Re: University of Florida Cogeneration Facility - Alachua County
AC01-204652 and PSD-FL-181
Request to Amend Construction Permit

Dear Clair:

This correspondence is submitted to provide information requested in the Department's letter dated May 22, 1995, concerning Florida Power Corporation's (FPC's) request to amend the air construction and prevention of significant deterioration (PSD) permit application for the University of Florida cogeneration facility.

The Department's responses to FPC's request to the custom fuel monitoring schedule and Specific Condition No. 2 are acceptable. At this time, the Department's response to FPC's request to amend Specific Condition No. 3 is acknowledged. FPC still has considerable concerns regarding the issue of simultaneous testing and may pursue alternative(s) to accommodate our concerns as suggested in the Department's response.

Specific Condition No. 8

The Department's response cited that portion of the BACT determination that indicated PSD review for NO_x was not required by assuring that a significant net emissions increase did not occur for the project. The "netting out" of PSD is appropriate under the Department's rules in Chapter 62-212 F.A.C. It must be recognized, however, that the criterion for PSD review is based on whether the project had a significant net emissions increase as defined in Rule 62-212.500(2)(e)2, F.A.C. The **emissions rates** for determining a significant net emission increase are in tons/year and were regulated in the permit based on annual fuel usage (refer to Specific Condition No. 3 of the permit).

As discussed in FPC's request to amend the permit, the increase in heat input and maximum NO_x emissions is for an operating condition that would occur only for short durations. This condition occurs at a turbine inlet temperature of 45°F. The manufacturer's curve for fuel use as a function of turbine inlet temperature is attached. This manufacturer's curve was developed from data supplied by General Electric Company and adjusted for actual machine performance. As can be seen from this graph, the maximum heat input and emissions occur at 45°F. The actual performance during the initial compliance test is also presented on the graph. The actual heat input during the test was 97 percent of the maximum heat input for the turbine inlet temperature that was measured during the test [i.e., actual of 344.6 x 10^3 standard cubic feet (kscf)/hr versus a maximum of 355 kscf].

ENVIRONMENTAL SERVICES DEPARTMENT
H2G • 3201 Thirty-fourth Street South • P.O. Box 14042 • St. Petersburg, Florida 33733 • (813) 866-5151
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To determine compliance with the lb/hr and ton/yr limits, the control system accounts for hourly and cumulative NO_x emissions using the following equation:

$$NO_x \text{ (lb/hr)} = 8.47830 - 17.33488 \times \text{SF Ratio} + 0.00014 \times \text{FF}$$

where: SF Ratio = Steam-to-Fuel Ratio
FF = Fuel Flow (kscf)

This equation was developed using multiple regression analysis and had an R-squared value of 0.98709. This R-squared value indicates that over 98 percent of the variability in the NO_x emissions is accounted for in this equation. The ideal R-squared value is 1.0. The equation will be used until the CEM is installed and certified as required under 40 CFR Part 75.

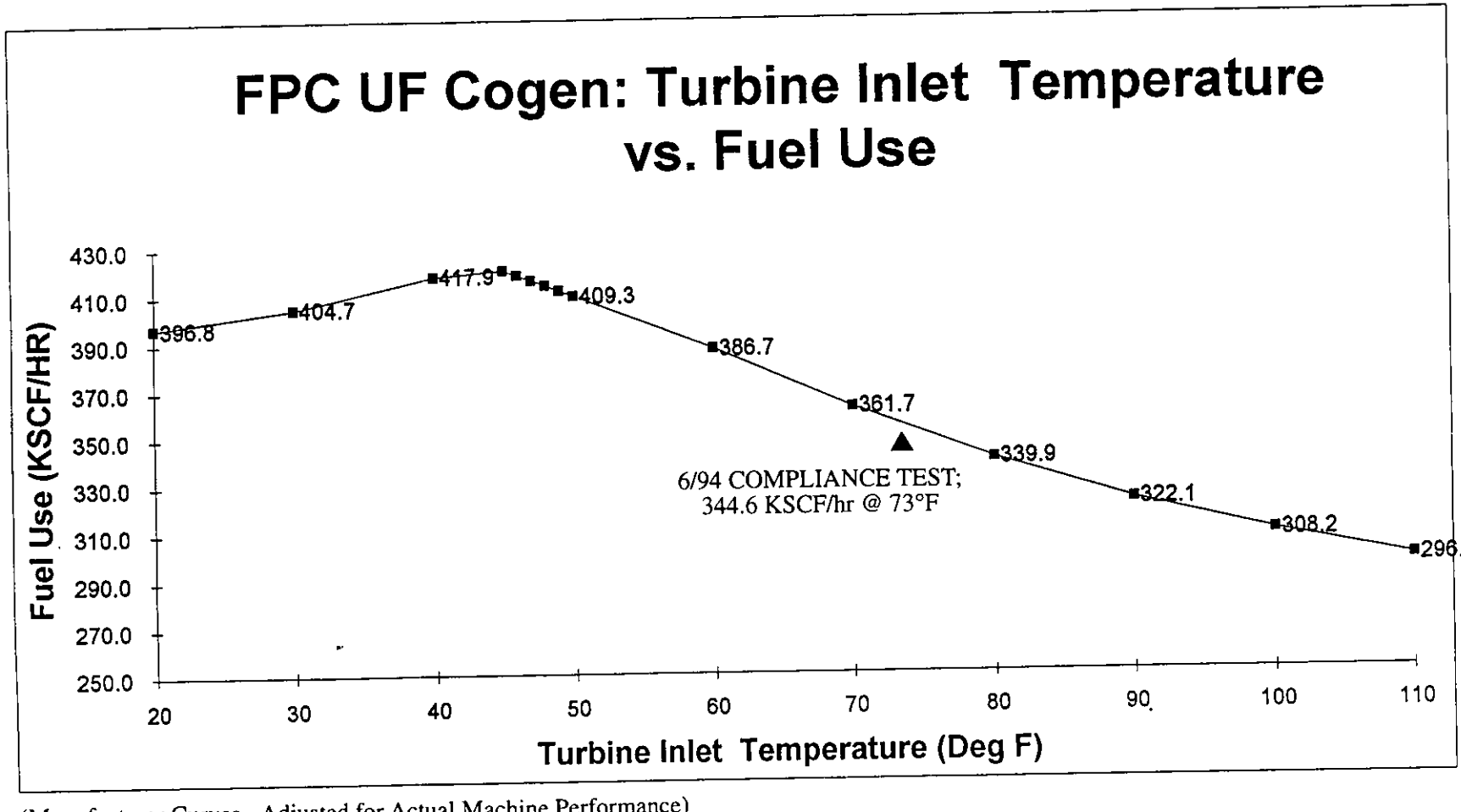
Please call me at (813) 866-5158 if you should have any questions.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

Attachment

cc: Martin Costello, FDEP
Kennard Kosky, KBN
Robert Leetch, FDEP NE District



(Manufacturer Curves - Adjusted for Actual Machine Performance)

File

Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

September 13, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Scott H. Osbourn
Senior Environmental Engineer
Florida Power Corporation
3201 Thirty-fourth Street South
St. Petersburg, Florida 33733

Re: Extension of Permits No. AC 01-204652, University of Florida Cogeneration Facility
AC 49-203114, Intercession City Facility

Dear Mr. Osbourn:

On August 30 the Department received your application letters, dated August 25, requesting an extension of the expiration date of the above referenced permits. The attached proposed rule language will, if adopted, extend the air construction permit by law. It is anticipated that the rule will be adopted in early September. If the rule is adopted within 90 days of receipt of your application, the Department will not be required to respond further. However, we will inform you upon adoption of the proposed rule.

If the rule, for any reason, is not adopted within 90 days of receipt of your application we will act upon your request in a timely manner. Please note that your air construction permit is valid until the Department acts upon your request.

Should you have any questions please contact me at (904) 488-1344.

Sincerely,

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

AAL/kw

cc: C. Collins, CD
E. Frey, NED
P. Reynolds, NED GBO
K. Kosky, KBN

NOTICE OF CHANGE IN PROPOSED RULE

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DOCKET NO: 95-38R

CHAPTER TITLE: CHAPTER NO.:

Operation Permits for Major Sources of Air Pollution 62-213

RULE TITLE: RULE NO.:

Permit Applications 62-213.420

The Department has made a change to the proposed rule which appeared in the Florida Administrative Weekly, Volume 21, Number 30, dated July 28, 1995, page 4958, so that the following section(s) will read as set forth below:

62-213.420 Permit Applications

(1)(a)1.a. Acid Rain Sources will submit applications for the entire source by June 15, 1996 ~~January 1, 1996~~. The Acid Rain Part of each such application, however, shall be submitted no later than January 1, 1996.

b.(ii) June 15, 1996 ~~February 1, 1996~~, otherwise.

c. All other sources subject to the permitting requirements of this chapter will submit applications by June 15, 1996 ~~February 1, 1996~~.

2. Except as provided at Rule 62-213.420(1)(a)4., F.A.C., ~~except for sources that are subject to the Florida Electrical Power Plant Siting Act (FEPPSA),~~ a source that commences operation after January 1, 1996, must file an application for an operation permit under this chapter ninety days before expiration of the source's construction permit, but no later than 180 days after commencing operation. Except as provided at Rule 62-213.420(1)(a)4., F.A.C., a~~A~~ source that has applied for an Electrical Power Plant Siting Certification prior to January 1, 1996, but has not but has not been issued the certification as of that date, or a source that has been issued an Electrical Power Plant Siting Certification prior to January 1, 1996, but has not commenced operation by that date, shall file an application for an operation permit under this c~~C~~hapter ~~no later than~~ 180 days after commencing operation. Sources subject to the FEPPSA that apply for Electrical Power Plant Siting Certification subsequent to January 1, 1996, may, at their option, ~~shall~~ apply for a permit under the provisions of this chapter at the same time the Florida Power Plant Siting Certification application is submitted.

4. The expiration dates of all air construction permits for Title V sources that expire between September 1, 1995, and November 1, 1996 ~~September 1, 1996~~, are hereby extended to the later of November 1, 1996, or 240 days after commencing operation ~~September 1, 1996~~. Facilities with such air construction permits which have not commenced operation on January 1, 1996, shall apply

for a permit under the provisions of this chapter on the later of September 1, 1996, or 180 days after commencing operation.
Specific Authority: 403.061, 403.087, F.S.
Law Implemented: 403.061, 403.0872, F.S.
History: New 11-28-93; Amended 4-62-94; Formerly 17-213.420; Amended 11-23-94, 4-2-95,_____.

NAME OF PERSON ORIGINATING PROPOSED RULE: Howard L. Rhodes, Director, Division of Air Resources Management
NAME OF SUPERVISOR OR PERSON WHO APPROVED THE PROPOSED RULE: Virginia B. Wetherell, Secretary
DATE PROPOSED RULE APPROVED: July 17, 1995

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

3. Article Addressed to:
Mr. Scott H. Osbourn
Senior Environmental Engineer
Florida Power Corporation
3201 Thirty-fourth Street South
St. Petersburg, Florida 33733

4a. Article Number
Z 127 632 515

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

7. Date of Delivery
9/14/93

5. Signature (Addressee)
W. W Lewis

6. Signature (Agent)

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

PS Form **3811**, December 1991 ☆U.S. GPO: 1993—352-714 **DOMESTIC RETURN RECEIPT**

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Receipt for Certified Mail
No Insurance Coverage Provided
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UNITED STATES POSTAL SERVICE

Sent to: Mr. Scott H. Osbourn	
Street and No.: Senior Environmental Eng	
P.O., State and ZIP Code: 3201 34th St. S St. Petersburg Fl 33733	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date: AC01-204652 AC49-203114 Title V extension	

PS Form **3800**, March 1993

Florida Power
CORPORATION

RECEIVED
AUG 30 1995
Bureau of
Air Regulation

August 25, 1995

Mr. Al Linero
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Florida Power Corporation
University of Florida Cogeneration Facility
Permit Extension to Accommodate Title V

Dear Mr. Linero:

Due to the extensions of time for submitting Title V applications and the modification request we have under review, the above-referenced facility construction permit (AC 01-204652) and backup boiler operating permits (AO 01-214826, -214828, -214829, -214830, and -214831) require an extension to accommodate the Title V application due date. The Title V permit application for this source is currently due on January 1, 1996, and DEP has indicated that the application submittal deadline may be extended further, until June 15, 1996. As a consequence, an extension of the construction and operating permits referenced above till September 15, 1996 is requested. An extension till September 15, 1996 will allow for any future delays in the Title V application due dates.

If you should have any questions concerning the above, please feel free to contact me at (813) 866-5158.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

cc: Clair Fancy, FDEP
Ernest Frey, FDEP NE District
Patricia Reynolds, FDEP NE District GBO
Ken Kosky, KBN

ENVIRONMENTAL SERVICES DEPARTMENT
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FLORIDA

Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

file

May 22, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. W. Jeffrey Pardue, Director
Environmental Service Department
Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

Dear Mr. Pardue:

RE: University of Florida Cogeneration Facility Alachua County
AC01-204652 and PSD-Fl-181
Request for Amendment of Construction Permit

The Department is in receipt of your March 31 letter requesting to incorporate the EPA approved custom fuel monitoring schedule and to amend Specific Conditions No. 2, No. 3, and No. 8 of the above mentioned permit. This permit was issued under a stipulated settlement (OGC case No. 91-1113). The Department has evaluated your request and determines the following:

CUSTOM FUEL MONITORING SCHEDULE:

FPC'S REQUEST:

To incorporate the EPA approved custom fuel monitoring schedule for sulfur in natural gas.

DEPARTMENT'S RESPONSE:

The Department will amend the permit to incorporate the fuel monitoring schedule. The attached EPA custom fuel monitoring schedule shall be part of this permit.

SPECIFIC CONDITION NO.2

FPC'S REQUEST:

To delete reference to boiler No. 2 with no increases in the current cap for typ of NO_X for boilers No. 4 and 5.

DEPARTMENT'S RESPONSE:

Based on discussion with Company personnel, we understand FPC will withdraw this request and will use a rental boiler and the emergency order if needed. The Department's Office of General Counsel will review the draft order.

SPECIFIC CONDITION No.3

FPC'S REQUEST:

An Alternate to the NSPS testing requirements for the Subpart Db duct burner was proposed which involved combining the NO_x emission limits from the turbine and the duct burner. You provided a draft letter from the Department to EPA which proposed to demonstrate compliance with the duct burner NSPS NO_x emission standards (0.2 lb/MMBtu) without conducting a Method 20 upstream of the duct burner.

DEPARTMENT'S RESPONSE:

o Subpart Db establishes NO_x emission limits for the gas fired duct burner (0.2 lb/MMBtu pursuant to 40 CFR 60.44b) and Method 20 is specified upstream and down stream of the duct burner to demonstrate compliance (40 CFR 60.46b).

o 40 CFR 60.8(e)(1) requires the owner or operator of an affected facility to provide or cause to be provided, performance testing facilities including sampling ports adequate for test methods applicable to such facility.

o The requested alternate testing procedure must be reviewed pursuant to Rule 62-297.620, F.A.C., Exceptions and Approval of Alternate Procedures and Requirements (attached). FPC should provide the information required in Rule 62-297.620, F.A.C.

o The Department intends to deny the request to combine the emission limits from the turbine and duct burner unless and until an approved alternate sampling procedure is obtained from the Department's Emissions Monitoring Section. These are separate NSPS emissions units (Subpart GG and Subpart Db) and current NSPS regulations require that compliance be demonstrated for each emissions unit. The draft letter to EPA will not be sent. We understand that a second (revised) draft letter to EPA will be sent by FPC to the Department for review.

o The Department intends to amend AC01-203652/PSD-FL-181 to require NO_X and CO testing prior to obtaining the operating permit. Compliance testing on the duct burner will not be required annually since this emissions unit emits less than 100 tpy of NO_X or CO and there are significant difficulties with conducting the required Method 20 upstream of the duct burner. This will allow additional time for FPC to resolve the duct burner compliance test issues.

SPECIFIC CONDITION No. 8

FPC'S REQUEST:

To increase heat input rate from the turbine by 10% and corresponding increases in lb/hr of NO_X with no increases in tpy. FPC indicated that tpy NO_X limits would be demonstrated using the water-to-fuel monitor until 1996 when a NO_X CEMS would be used in place of the water/fuel monitor. The NO_X CEMS will be installed to meet the requirements of 40 CFR Part 75.

DEPARTMENT'S RESPONSE:

o The revised BACT determination for PSD-FL-181 established BACT for CO only. NO_X was not triggered for PSD review. There were 134.9 tpy of NO_X offsets listed from shutting down units 1, 2, and 3. The net increase in emissions totaled 39.7 tpy, just 0.3 tpy below the significance level for PSD review. From that BACT determination:

> "The application indicates that emissions of other pollutants will not be subject to a BACT determination. The applicant narrowly escaped PSD review for NO_X **by lowering firing rates**, and since increased firing rates may be requested at some time in the future, the Department will require that retrofit costs associated with the applicant's decision not to make initial provisions for future installation of advanced catalytic control shall not be considered in any cost analysis required for any future requested increase in capacity".

o BACT for similar combustion turbines when PSD-FL-181 was under review was 15 ppmvd @ 15% oxygen for gas firing to be obtained by 1997 or 1998. These emission levels were thought to be achievable using dry low NO_X combustor technology or SCR. This BACT, 15 ppmvd @ 15% oxygen, has been demonstrated currently using dry low NO_X burners. The NO_X standard in PSD-FL-181 was set at 25 ppmvd @ 15% oxygen for natural gas.

o The requested increase in lb/hr of NO_X emissions constitutes a modification. If approved, the Department would reissue the construction permit and public notice this action.

o The following information is requested to help the Department resolve this request. Please describe how FPC determined that increased heat rates, and corresponding increased NO_X emission rates, are achievable based on the initial performance test. Provide manufactures curves and example calculations. Please describe how tpy of NO_X are monitored for each emissions unit. State if any F factors will be used when the NO_X CEMS system is used for NO_X tpy monitoring. Supply example calculations and state all assumptions for these calculations. Describe fuel and process monitoring associated with the NO_X monitoring.

Submit any written inquiries or additional information to me at the above address. If you have any questions or need clarification on any of these items, please call Martin Costello at (904)488-1344.

Sincerely,

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

CHF/mc/h

attachments: Mr. Pardue's letter of March 31, 1995
EPA's custom fuel monitoring schedule guidance
Rule 62-297.620, F.A.C.

cc: Robert Leetch, NED
John Reynolds
Mike Harley
Morton Benjamin
Martin Costello

62-297.620 Exceptions and Approval of Alternate Procedures and Requirements.

(1) The owner or operator of any emissions unit subject to the provisions of this chapter may request in writing a determination by the Secretary or his/her designee that any requirement of this chapter (except for any continuous monitoring requirements) relating to emissions test procedures, methodology, equipment, or test facilities shall not apply to such emissions unit and shall request approval of an alternate procedures or requirements.

(2) The request shall set forth the following information, at a minimum:

(a) Specific emissions unit and permit number, if any, for which exception is requested.

(b) The specific provision(s) of this chapter from which an exception is sought.

(c) The basis for the exception, including but not limited to any hardship which would result from compliance with the provisions of this chapter.

(d) The alternate procedure(s) or requirement(s) for which approval is sought and a demonstration that such alternate procedure(s) or requirement(s) shall be adequate to demonstrate compliance with applicable emission limiting standards contained in the rules of the Department or any permit issued pursuant to those rules.

(3) The Secretary or his/her designee shall specify by order each alternate procedure or requirement approved for an individual emissions unit source in accordance with this section or shall issue an order denying the request for such approval. The Department's order shall be final agency action, reviewable in accordance with Section 120.57, Florida Statutes.

(4) In the case of an emissions unit which has the potential to emit less than 100 tons per year of particulate matter and is equipped with a baghouse, the Secretary or the appropriate Director of District Management may waive any particulate matter compliance test requirements for such emissions unit specified in any otherwise applicable rule, and specify an alternative standard of 5% opacity. The waiver of compliance test requirements for a particulate emissions unit equipped with a baghouse, and the substitution of the visible emissions standard, shall be specified in the permit issued to the emissions unit.

If the Department has reason to believe that the particulate weight emission standard applicable to such an emissions unit is not being met, it shall require that compliance be demonstrated by the test method specified in the applicable rule.

Specific Authority: 403.061, F.S.
Law Implemented: 403.021, 403.031, 403.061, 403.087, F.S.
History: Formerly 17-2.700(3); Amended 6-29-93; Formerly 17-297.620; Amended 11-23-94.

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- The Return Receipt will show to whom the article was delivered and the date delivered.

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Consult postmaster for fee.

3. Article Addressed to:
Mr. W. Jeffrey Pardue Director
Environmental Service Dept.
Fla. Power Corp.
P O Box 14042
St. Pete, Fl 33733

4a. Article Number
Z 311 902 897

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

7. Date of Delivery MAY 30 1995

5. Signature (Addressee)
M. Williams

6. Signature (Agent)

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

PS Form **3811**, December 1991 ☆U.S. GPO: 1993—352-714 **DOMESTIC RETURN RECEIPT**

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P.O., State and ZIP Code: St. Pete, Fl

Postage	$
Certified Fee	
Special Delivery Fee	
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Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date	5-26-95

AC01-204652
PSD-FL-181

PS Form **3800**, March 1993

Florida Power
CORPORATION

March 31, 1995

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Re: UF Cogeneration Facility
AC01-204652; PSD-FL-181; Alachua County
Request for Amendment of Construction Permit

This correspondence and attached application are submitted to request some minor changes to the construction permit issued for the University of Florida (UF) Cogeneration Facility. The source is a nominal 43-megawatt (MW) cogeneration facility located adjacent to the University of Florida Central Heating Plant in Gainesville, Alachua County, Florida. The cogeneration facility consists of one combustion turbine (CT) exhausting through a heat recovery steam generator (HRSG). The primary fuel for the CT is natural gas with a maximum fuel input of 367.9 thousand cubic feet per hour (Mcf/hr). Distillate fuel oil is used for the CT only as backup. The transition duct from the CT to the HRSG was permitted with duct burners (DBs) having a maximum fuel (natural gas) input of 197.7 Mcf/hr.

The construction permit was issued August 17, 1992, and expires October 1, 1995. Initial compliance tests were performed on June 3 and 4, 1994, and test results indicate that compliance was demonstrated for all units. However, detailed review of these tests and an inspection of the facility revealed some areas where changes to permit conditions are necessary. Changes to Specific Conditions 2, 3 and 8 are requested. Please be advised, however, that this request for amendments does not constitute any change in total emissions from the facility. The initial tests for the facility demonstrated that the CT and DBs can achieve the basis of the nitrogen oxides (NO_x) emission limit. This is an extremely low emission rate given the energy efficiency of the CT.

Further, in response to New Source Performance Standard (NSPS) requirement 40 CFR 60.334(b), Florida Power Corporation (FPC) has requested a customized fuel monitoring schedule. The EPA has indicated concurrence with FPC's approach and the Department has indicated that this request would require a permit amendment. All pertinent correspondence on this issue from FPC, the Department and EPA Region IV is presented in Attachment 1 to this letter.

The following paragraphs present a discussion of the amendments requested for each of the specific conditions. Attachment 2 contains a mark-up of these conditions with the revisions requested.

ENVIRONMENTAL SERVICES DEPARTMENT
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Specific Condition 2

This condition sets forth the emission limits for the facility (see attached Specific Condition). As discussed in the construction permit application, the CT selected for this project is the most efficient of all CTs and is the newest aircraft-derivative CT available from General Electric (i.e., the LM 6000). Indeed, when the application was submitted, there were no operating data on this machine while achieving the performance and emission guarantees proposed for this project. The initial testing of the CT indicated several areas where performance has been higher than expected. The maximum fuel flow rate of the CT is slightly higher than that initially specified by the manufacturer (GE). Accordingly, an increase in the short-term [pounds per hour (lb/hr)] NOx emission rate for the CT to 39.6 lb/hr is requested based on a requested increase in heat input (see Specific Condition 3). The basis for the limit is still 25 parts per million by volume, dry (ppmvd) corrected to 15 percent O_2.

Specific Condition 3

It is requested that the heat input be increased based on the performance tests. The maximum fuel usage rate to the turbine when firing natural gas in the current permit is 367.9 Mcf/hr. The maximum operating condition is at 45°F with a fuel input of 420.3 Mcf/hr and is based on GE data and the test results. During the compliance tests, the CT averaged 97 percent of the maximum heat input based on CT inlet temperature conditions. The requested maximum heat input corresponds to the maximum emission limit requested (See discussion for Specific Condition 2 above).

Specific Condition 8

It is requested that this condition be amended to delete the reference to boiler no. 2. FPC proposes to continue operation of boiler no. 2, which is equipped to fire natural gas as its primary fuel. FPC proposes that the same fuel use restrictions apply to this boiler as currently apply to boilers 4 and 5. Therefore, there would be no increase in emissions since the facility will demonstrate compliance with its annual emissions limits in tons per year.

Also, as a result of discussions between FPC and the Department, a draft Emergency Order has been prepared for the Department's review. This order would allow a back-up boiler to be used in an emergency (e.g., in the event that the cogeneration facility and the backup boilers become inoperable) in order to meet the steam demands required for the University of Florida and Shands Hospital.

Finally, a draft letter is enclosed regarding an alternative approach for demonstrating compliance with the NSPS for cogeneration or combined cycle systems with duct firing. This letter represents the understanding reached between FPC and the Department and is meant for the Department's use in obtaining concurrence from the EPA. Please contact Mr. Scott Osbourn if you should have any questions at (813) 866-5158. As always, your consideration in this matter is appreciated.

Sincerely,

W. Jeffrey Pardue, C.E.P.
Director, Environmental Services Department

Attachments

ATTACHMENT A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 14 1987

OFFICE OF AIR AND RADIATION

MEMORANDUM

SUBJECT: Authority for Approval of Custom Fuel Monitoring Schedules Under NSPS Subpart GG

FROM: John B. Rasnic, Chief
Compliance Monitoring Branch

TO: Air Compliance Branch Chiefs
Regions II, III, IV, V, VI and IX

Air Programs Branch Chiefs
Regions I-X

The NSPS for Stationary Gas Turbines (Subpart GG) at 40 CFR 60.334(b)(2) allows for the development of custom fuel monitoring schedules as an alternative to daily monitoring of the sulfur and nitrogen content of fuel fired in the turbines. Regional offices have been forwarding custom fuel monitoring schedules to the Stationary Source Compliance Division (SSCD) for consideration since it was understood that authority for approval of these schedules was not delegated to the Regions. However, in consultation with the Emission Standards and Engineering Division, it has been determined that the Regional Offices do have the authority to approve Subpart GG custom fuel monitoring schedules. Therefore it is no longer necessary to forward these requests to Headquarters for approval.

Over the past few years, SSCD has issued over twenty custom schedules for sources using pipeline quality natural gas. In order to maintain national consistency, we recommend that any schedules Regional Offices issue for natural gas be no less stringent than the following: sulfur monitoring should

be bimonthly, followed by quarterly, then semiannual, given at least six months of data demonstrating little variability in sulfur content and compliance with (60.33) at each monitoring frequency; nitrogen monitoring can be waived for pipeline quality natural gas, since there is no fuel-bound nitrogen and since the free nitrogen does not contribute appreciably to NO_x emissions. Please see the attached sample custom schedule for details. Given the increasing trend in the use of pipeline quality natural gas, we are investigating the possibility of amending Subpart Da to allow for less frequent sulfur monitoring and a waiver of nitrogen monitoring requirements where natural gas is used.

Where sources using oil request custom fuel monitoring schedules, Regional offices are encouraged to contact ESCD for consultation on the appropriate fuel monitoring schedule. However, Regions are not required to send the request/trail to OAQPS for approval.

If you have any questions, please contact Sally K. Farrell at FTS 382-2675.

Attachment

cc: John Cronshaw
George Walsh
Robert Ajax
Earl Salo

Enclosure

Conditions for Custom Fuel Sampling Schedule for Stationary Gas Turbine

1. Monitoring of fuel nitrogen content shall not be required while natural gas is the only fuel fired in the gas turbine.

2. Sulfur Monitoring

   a. Analysis for fuel sulfur content of the natural gas shall be conducted using one of the approved ASTM reference methods for the measurement of sulfur in gaseous fuels, or an approved alternative method. The reference methods are: ASTM D1072-80; ASTM D3031-81; ASTM D3246-81; and ASTM D4084-82 as referenced in 40 CFR 60.335(b)(2).

   b. Effective the date of this custom schedule, sulfur monitoring 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 sulfur monitoring shall be conducted once per quarter for six quarters.

   c. If after the monitoring required in item 2(b) above, or herein, the sulfur content of the fuel shows little variability and, calculated as sulfur dioxide, represents consistent compliance with the sulfur dioxide emission limits specified under 40 CFR 60.333, sample analysis shall be conducted twice per annum. This monitoring shall be conducted during the first and third quarters of each calendar year.

   d. Should any sulfur analysis as required in items 2(b) or 2(c) above indicate noncompliance with 40 CFR 60.333, the owner or operator shall notify the State Air Control Board) of such excess emissions and the custom schedule shall be re-examined by the Environmental Protection Agency. Sulfur monitoring shall be conducted weekly during the interim period when this custom schedule is being re-examined.

3. If there is a change in fuel supply, the owner or operator must notify the State of such change for re-examination of this custom schedule. A substantial change in fuel quality shall be considered as a change in fuel supply. Sulfur monitoring shall be conducted weekly during the interim period when this custom schedule is being re-examined.

4. Records of sample analysis and fuel supply pertinent to this custom schedule shall be retained for a period of three years, and be available for inspection by personnel of federal, state, and local air pollution control agencies.

TOTAL

March 23, 1995

Jewell A. Harper, Chief
Air Enforcement Branch
U.S. Environmental Protection Agency, Region IV
345 Courtland Street, N.E.
Atlanta, GA 30365

DRAFT

proposed by FPC

Dear Ms. Harper:

RE: Demonstrating Compliance with NSPS
Combustion Turbines and Duct Burners
University of Florida Cogeneration Facility PSD-FL-181

The Florida Department of Environmental Protection (FDEP) has been approached by Florida Power Corporation (FPC), which owns and operates the University of Florida Cogeneration facility, regarding an alternative approach for demonstrating compliance with the NSPS for combined cycle systems with duct firing. The UF facility has a nominal 43 megawatt (MW) combustion turbine (CT) firing primarily natural gas that exhausts through a heat recovery steam generator (HRSG). In the transition duct between the CT and HRSG, there are duct burners (DB) with a maximum heat input capability greater than 100 million (MM) Btu/hr while firing only natural gas. An air construction/Prevention of Significant Deterioration (PSD) permit was issued in August, 1992 and the facility become operational in 1994. The only exhaust point is through a stack connected to the HRSG. The NSPS applicable to the UF facility include Subpart GG (for the combustion turbine) and Subpart Db (for the duct burners). The only pollutant at issue is NOx emissions. The NSPS for the combustion turbine is 75 parts per million volume-dry conditions (ppmvd) corrected to 15 percent oxygen and adjusted for heat rate; the NSPS for the duct burners is 0.2 lb/MMBtu heat input.

As you are aware, the UF facility like so many other cogeneration facilities that have been recently permitted in Florida, have emission limitations established that are substantially lower than NSPS levels. For example, the UF facility has a CT lb/hr emission limit based on 25 ppmvd corrected to 15 percent oxygen and a DB lb/hr limit based on 0.1 lb/MMBtu. The CT limit is about 5 times lower than the NSPS while the DB limit is one half of the NSPS.

In order to demonstrate compliance with the NSPS for this facility, there is an implied requirement in Subpart Db and Method 20 to perform simultaneous sampling of the turbine exhaust and the exhaust stack to determine compliance with NSPS. This requirement can be difficult, if not impossible to perform and introduce costly testing procedures. It is this Department's position that the simultaneous testing requirement is unnecessary and that the source should be presumed in compliance with the NSPS, if the source can demonstrate that its combined CT/DB NOx emissions using EPA Method 20 at the single exhaust stack are less than the emissions that would be allowed under either Subpart GG or Db. The following information obtained for the UF Cogeneration facility demonstrates this conclusion.

CT: the applicable NSPS under Subpart GG (i.e., 75 ppmvd @ 15% O_2; corrected for heat rate) during conditions of the initial compliance test would produce an emission rate of 92 lb/hr.

DB: the applicable NSPS under Subpart Db (i.e., 0.2 lb/MMBtu) during the conditions of the initial compliance test would produce an emission rate of 42 lb/hr (for 210.2 MMBtu/hr heat input).

CT/DB: the combined NOx emissions during the initial compliance test were 29.3 lb/hr while both the CT and DB were operating. The CT NOx emissions were 21.6 ppmvd @ 15% O_2 (ISO) and the DB emissions were 0.05 lb/MMBtu. The combined applicable NSPS would be 134 lb/hr.

As noted above, since the testing demonstrated, using Method 20, that the combined NOx emissions (i.e., 29.3 lb/hr) were less than either Subpart GG or Db emissions limits, compliance with the NSPS requirements should be considered met. Therefore, the implied requirement in Subpart Db and Method 20 to perform simultaneous sampling of the turbine exhaust and the exhaust stack to determine compliance with NSPS is not necessary.

It is also the Department's position that if the combined CT/DB NOx emission limits established in the permit are met during annual compliance testing, the simultaneous testing to demonstrate continued compliance with NSPS would not be required for this source.

The Department would appreciate the Region's concurrence with this approach. A written response is respectfully required as this approach may apply to other cogeneration facilities and its implementation would assist the Department in evaluating compliance with these projects. Please call me at (904) 488-1344 if you have any questions.

Sincerely,

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

cc: Scott Osbourn, FPC
Ken Kosky, KBN
John Reynolds, BAR
Martin Costello, BAR
Mort Benjamin, FDEP

ATTACHMENT 1

Customized Fuel Monitoring Schedule

ATTACHMENT 2

Proposed Changes to Permit Conditions

PERMITTEE:
Florida Power Corporation

Permit Number: AC 01-204652
PSD-FL-181
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

2. Emissions from this facility shall not exceed the limits listed below:

Pollutant	Source	Fuel	Basis of Limit	lbs/hr	tons/yr
NOx	Turbine	Gas	EBM*:25 ppmvd @ 15% O2	~~35.0~~ 39.6	142.7
	Turbine	Oil	EBM*:42 ppmvd @ 15% O2	66.3	7.3
	D.Burner	Gas	EBM*:0.1 lb/MMBTU FOR D.B.	~~18.7~~ 58.3	~~24.6~~ 167.3+
SO2	Turbine	Oil	BACT:0.5% Sulfur Max.	-	-
	Boiler 4	Oil	BACT:0.5% Sulfur Max.	-	-
	Boiler 5	Oil	BACT:0.5% Sulfur Max.	-	-
VE	Turbine	Gas/Oil	Equivalent of mass EBM*	10%/20% opacity**	
	D.Burner	Gas	" " "	10% opacity	
	Boiler 4	Gas/Oil	" " "	10%/20% opacity**	
	Boiler 5	Gas/Oil	" " "	10%/20% opacity**	
CO	Turbine	Gas	BACT:42 ppmvd	38.8	158.0
	Turbine	Oil	EBA***:75 ppmvd	70.5	7.7
	D.Burner	Gas	BACT:0.15 lb/MMBTU****	~~28.1~~ 66.9	~~36.9~~ 194.9+

PROPOSED CHANGES

*EBM: Established by manufacturer
**Except for one 6-minute period per hour of not more than 27% opacity
***EBA: Established by applicant
****BACT limit proposed by applicant in Table A-2 of application FOR D.B.
+ TOTAL CONTRIBUTION FROM TURBINE AND DUCT BURNER

3. Fuel consumption rates and hours of operation for the turbine and duct burner shall not exceed those listed below:

PROPOSED CHANGE

	Natural Gas			No. 2 Fuel Oil		
	M ft3/hr*	MM ft3/yr	hrs/yr*	M gal/hr*	M gal/yr	hrs/yr*
Turbine	~~367.9~~ 420.3	2997.2**	8146.8**	2.9	635.1	219.0**
Duct Burner	197.7	519.5	2628.0	0	0	0

*Based on maximum firing rates. Units may run at lower rates for more hours within annual fuel limits.

**An additional 1.9 hours/yr operation on natural gas will be allowed for each 1.0 hour/yr that fuel oil is not burned (up to 219 x 1.9 hours/yr), in which case, the emission limits in Specific Condition No. 2 shall be adjusted accordingly.

PERMITTEE:
Florida Power Corporation

Permit Number: AC 01-204652
PSD-FL-181
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

If test results from the turbine and duct burner show that it is unlikely that NO_x limits can be met, a revised BACT determination for NO_x shall also be considered. The Department may revise the BACT determination to require installation of such technology if so indicated by the revised BACT cost/benefit analysis. If the permittee has elected not to provide for future addition of such technology in the initial construction and later applies for a permit modification to increase capacity, the retrofit costs associated with not making provisions for such technology (initially) shall not be considered by the Department in the retrofit cost analysis required for the future expansion.

8. Boilers Nos. 1, 2, and 3 shall permanently cease operation upon receipt of the operation permit for the cogeneration facility.

9. 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).

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

Issued this 17th day
of August, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Carol M. Browner, Secretary

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ORDER
GRANTING TEMPORARY
USE OF EMERGENCY BACKUP BOILER
CAPABILITY TO MEET COMMITMENT
FOR UNINTERRUPTIBLE STEAM DEMAND

Florida Power Corporation (FPC) having requested issuance of an order to permit use of an Emergency Backup Boiler at its University of Florida Cogeneration Site and the Department having been fully advised in the premises, the Secretary finds as follows:

FINDINGS OF FACT

1. FPC has a commitment to the University of Florida, including Shands Hospital, to provide an uninterruptible supply of steam.

2. In the unlikely event that the cogeneration facility and either Backup Boiler 4 or 5 (or both) become inoperable, an emergency backup steam supply source will be required. This is because Backup Boilers 4 and 5 are both necessary to provide replacement steam for loss of the cogeneration facility and cannot supply all steam potentially necessary if required to serve as backups for each other.

CONDITIONS OF USE OF EMERGENCY BACKUP BOILER

1. In accordance with the Florida Statutes, Chapter 120.59 pertaining to Orders, the Secretary is authorized to grant exceptions from air construction permits and can allow the use of an Emergency Backup Boiler in order that Florida Power Corporation (FPC) may meet its commitment for uninterruptible steam demand when the primary sources of steam supply are inoperable.

2. In the event that FPC is unable to meet steam demand to the University of Florida due to the inoperability of any of the primary sources of steam supply (i.e., the cogeneration facility and Backup Boilers 4 and 5), the Secretary authorizes FPC to operate an additional boiler as an Emergency Backup.

3. The use of such an Emergency Backup shall not result in an increase in permitted air emissions over the limits prescribed by the Department in Permit No. AC01-204652 (PSD-FL-181).

ORDER

Subject to the Conditions of Use of Emergency Backup Boiler cited above, the Secretary hereby grants approval to FPC for use of an Emergency Backup Boiler at its University of Florida Cogeneration site. DONE AND ENTERED THIS _____ day of_____, 199__, in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

_____
VIRGINIA WETHERELL
Secretary

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301
Telephone: (904) 488-4805

File: u\:UFORDER

Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

December 5, 1994

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. W. Jeffrey Pardue, C.E.P.
Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

RE: UF Cogeneration Project
AC01-204652, PSD-FL-181
Request for Permit Amendment

Dear Mr. Pardue:

The Bureau of Air Regulation has reviewed the above referenced request and determined that it will require a new permit as discussed in the December 1 meeting. The customized fuel monitoring request can be processed separately, but the $250 processing fee must be submitted as indicated in our letter dated May 11, 1994. If you have any questions, please call Patty Adams at (904)488-1344.

Sincerely,

Patricia G. Adams

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

CHF/pa

cc: John Reynolds

your RETURN ADDRESS completed on the reverse side?

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

I also wish to receive the following services (for an extra fee):

1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Mr. W. Jeffrey Parude, C.E.P.
Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

4a. Article Number
P 872 562 687

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

7. Date of Delivery
DEC 9 1994

5. Signature (Addressee)
Brian Gilbert

6. Signature (Agent)

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

PS Form 3811, December 1991 ☆U.S. GPO: 1992—323-402 **DOMESTIC RETURN RECEIPT**

Thank you for using Return Receipt Service.

P 872 562 687

Receipt for Certified Mail
No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

UNITED STATES POSTAL SERVICE

Sent to: Mr. W. Jeffrey Pardue	
Street and No.: P. O. Box 14042	
P.O. State and ZIP Code: St. Petersburg, FL 33733	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date: Mailed: 12/07/94 AC01-204652, PSD-FL-181	

PS Form 3800, JUNE 1991

Florida Power
CORPORATION

RECEIVED
NOV 30 1994
Bureau of
Air Regulation

November 28, 1994

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

Re: UF Cogeneration Project
AC01-204652; PSD-FL-181; Alachua County
Request for Amendment of Construction Permit

This correspondence is submitted to request some minor changes to the construction permit issued for the University of Florida (UF) cogeneration facility. The source is a nominal 43-megawatt (MW) cogeneration facility located adjacent to the University of Florida Central Heating Plant in Gainesville, Alachua County, Florida. The cogeneration facility consists of one combustion turbine (CT) exhausting through a heat recovery steam generator (HRSG). The primary fuel for the CT is natural gas with a maximum fuel input of 367.9 thousand cubic feet per hour (Mcf/hr). Distillate fuel oil is used for the CT only as backup. The transition duct from the CT to the HRSG was permitted with duct burners (DBs) having a maximum fuel (natural gas) input of 197.7 Mcf/hr.

The construction permit was issued August 17, 1992, and expires December 31, 1994. Initial compliance tests were performed on June 3 and 4, 1994, and test results indicate that compliance was demonstrated for all units. However, detailed review of these tests and an inspection of the facility revealed some areas where changes to permit conditions are necessary. Changes to Specific Conditions 2, 3 and 8 are requested. Further, in response to New Source Performance Standard requirement 40 CFR 60.334(b), FPC has requested a customized fuel monitoring schedule. The EPA has indicated concurrence with FPC's approach and the Department has indicated that this request would require a permit amendment. All pertinent correspondence on this issue from FPC, the Department and EPA Region IV is presented in Attachment 1 to this letter.

Please be advised, however, that this request for amendments does not constitute any change in total emissions from the facility. The initial tests for the facility demonstrated that the CT and DBs can achieve the basis of the nitrogen oxides (NO_x) emission limit. This is an extremely low emission rate given the energy efficiency of the CT.

The following paragraphs present a discussion of the amendments requested for each of the specific conditions. Attachment 2 contains a mark-up of these conditions with the revisions requested.

ENVIRONMENTAL SERVICES DEPARTMENT
H2G • 3201 Thirty-fourth Street South • P.O. Box 14042 • St. Petersburg, Florida 33733 • (813) 866-5151
A Florida Progress Company

Specific Condition 2

This condition sets forth the emission limits for the facility (see attached Specific Condition). As discussed in the construction permit application, the CT selected for this project is the most efficient of all CTs and is the newest aircraft-derivative CT available from General Electric (i.e., the LM 6000). Indeed, when the application was submitted, there were no operating data on this machine while achieving the performance and emission guarantees proposed for this project. The initial testing of the CT indicated several areas where performance has been higher than expected. The maximum fuel flow rate of the CT is slightly higher than that initially specified by the manufacturer (GE).

Based on the initial tests and final configuration of the facility, the following changes are requested.

1. CT Emissions of NO_x - Increase short-term [pounds per hour (lb/hr)] CT emission rate to 39.6 lb/hr based on a requested increase in heat input (see discussion for Specific Condition 3). The basis for the limit is still 25 parts per million by volume, dry (ppmvd) corrected to 15 percent O_2.

2. Specify CT/DB Emission Limits - It is requested that the Department consider changing the specification of individual limits for DBs to emission limits applicable to the CT/DBs operating together. As noted above, there will be no increase in annual emissions or in the basis upon which the hourly rate is determined (i.e., 0.1 lb/MMBtu) with this requested change to the permit. The reasons for this request are fourfold.

   First, the large volume flow rate of the CT could produce erroneous results when trying to determine compliance with a DB only emissions limit. The combination of large flow rate and smaller emission contribution from the DBs can produce substantial apparent errors when none exist.

   Secondly, determining the emission status of the facility will be much easier for both the operators and FDEP by having specific limits for the CT and CT/DB combination. Since the facility will install a continuous emission monitoring (CEM) system for NO_x, and this system will be reporting total NO_x downstream of both units, determining the emission status would be directly evident.

   Third, the DBs cannot be operated without the CT; therefore, it is logical to specify emission limits for the combination rather than separately.

   Finally, the original compliance testing was performed using simultaneous testing at the CT exhaust and the stack to determine compliance with NSPS Subpart Db requirements. Since the emissions from the DB were very low compared with the NSPS limit (i.e., 0.04 lb/MMBtu from the test compared with the NSPS limit of 0.2 lb/MMBtu) and there is no explicit applicable NSPS requirement to perform annual testing for NSPS purposes, a separate DB emission limit and implicit testing are unnecessary. If, for example, the emissions from the DB approached the NSPS limit, a combined limit would be exceeded. A combined limit would be 58.3 lb/hr; if the DB were at NSPS levels, then its contribution would be 64 percent of the total leaving only a 36 percent contribution from the CT. This is equivalent to a CT contribution of 20.9 lb/hr, which is not technically possible with steam injection. The combined limit also would demonstrate compliance with the basis of the BACT determination. Therefore, the emissions cannot exceed the original emission basis of 25 ppmvd at 15 percent O_2 for the CT and 0.1 pound per million British thermal units (lb/MMBtu) for the DBs.

   Also, please note that many of the emission limits for the facility, including NO_x, were not established as BACT. Since the facility is replacing, to a large extent, the steam generated by the old University of Florida steam plant, emission offsets were credited to the new cogeneration plant, thus netting out of PSD review.

3. Emergency Steam Demands - The steam demands of the University of Florida necessitate that the facility, which includes Boilers 4 and 5, provide an uninterrupted steam supply. This uninterrupted steam is required for Shands Hospital. In the unlikely event that the cogeneration facility and Boilers 4 and/or 5 become inoperable, an emergency backup source is required. This is because Boilers 4 and 5 are both necessary to provide replacement steam for loss of the cogeneration facility (i.e., they are not backups for each other). It is requested that the permit allow provisions to accommodate this emergency backup condition. This could be accomplished by either allowing the continued operation of one of the three boilers currently scheduled for retirement or by allowing the use of a rented boiler, when needed. The same fuel use restrictions would apply to this boiler as Boilers 4 and 5; there would be no increase in emissions since the facility must demonstrate compliance with its annual emissions limits in tons per year.

Specific Condition 3

It is requested that the heat input be increased based on the performance tests. The maximum fuel usage rate to the turbine when firing natural gas in the current permit is 367.9 Mcf/hr. The maximum operating condition is at 45°F with a fuel input of 420.3 Mcf/hr and is based on GE data and the test results. During the compliance tests, the CT averaged 97 percent of the maximum heat input based on CT inlet temperature conditions. The requested maximum heat input corresponds to the maximum emission limit requested (See discussion for Specific Condition 2, Item 1 above).

Specific Condition 8

It is requested that this condition be amended to reflect continued operation of one of these three boilers, if necessary.

Please contact Mr. Scott Osbourn if you should have any questions, at (813) 866-5158. As always, your consideration in this matter is appreciated.

Sincerely,

J. Michael Kennedy for

W. Jeffrey Pardue, C.E.P.
Director, Environmental Services Department

/mrb
Attachments

ATTACHMENT 1

Customized Fuel Monitoring Schedule

ATTACHMENT 2

Proposed Changes to Permit Conditions

PERMITTEE:
Florida Power Corporation

Permit Number: AC 01-204652
PSD-FL-181
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

2. Emissions from this facility shall not exceed the limits listed below:

Pollutant	Source	Fuel	Basis of Limit	lbs/hr	tons/yr
NOx	Turbine	Gas	EBM*:25 ppmvd @ 15% O2	~~35.0~~ 39.6	142.7
	Turbine	Oil	EBM*:42 ppmvd @ 15% O2	66.3	7.3
Turbine / D.Burner	D.Burner	Gas	EBM*:0.1 lb/MMBTU FOR D.B.	~~18.7~~ 58.3 (combined TOT 29.3 lb/hr)	~~24.6~~ 167.3 +
SO2	Turbine (2)	Oil	BACT:0.5% Sulfur Max.	-	-
	Boiler (4)	Oil	BACT:0.5% Sulfur Max.	-	-
	Boiler 5	Oil	BACT:0.5% Sulfur Max.	-	-
VE	Turbine	Gas/Oil	Equivalent of mass EBM*	10%/20% opacity**	
	D.Burner (2)	Gas	" " "	10% opacity	
	Boiler (4)	Gas/Oil	" " "	10%/20% opacity**	
	Boiler 5	Gas/Oil	" " "	10%/20% opacity**	
CO	Turbine	Gas	BACT:42 ppmvd (10 lb/hr)	38.8	158.0
	Turbine	Oil	EBA***:75 ppmvd	70.5	7.7
	D.Burner	Gas	BACT:0.15 lb/MMBTU****	~~28.1~~ 66.9	~~36.9~~ 194.9 +

*EBM: Established by manufacturer
**Except for one 6-minute period per hour of not more than 27% opacity
***EBA: Established by applicant
****BACT limit proposed by applicant in Table A-2 of application FOR D.B.
+ TOTAL CONTRIBUTION FROM TURBINE AND DUCT BURNER

3. Fuel consumption rates and hours of operation for the turbine and duct burner shall not exceed those listed below:

PROPOSED CHANGE

	Natural Gas			No. 2 Fuel Oil		
	M ft3/hr*	MM ft3/yr	hrs/yr*	M gal/hr*	M gal/yr	hrs/yr*
Turbine	(420.3) ~~367.9~~	2997.2**	8146.8**	2.9	635.1	219.0**
Duct Burner	197.7	519.5	2628.0	0	0	0

↳ Tested @ 202 MCF/h

*Based on maximum firing rates. Units may run at lower rates for more hours within annual fuel limits.

**An additional 1.9 hours/yr operation on natural gas will be allowed for each 1.0 hour/yr that fuel oil is not burned (up to 219 x 1.9 hours/yr), in which case, the emission limits in Specific Condition No. 2 shall be adjusted accordingly.

210 mm BTU/hr
208 mm BTU/hr

$\frac{29 \text{ lb/hr}}{210 \text{ mm BTU/hr}} = .14 \text{ lb/mm BTU}$

PERMITTEE:
Florida Power Corporation

Permit Number: AC 01-204652
PSD-FL-181
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

If test results from the turbine and duct burner show that it is unlikely that NO_x limits can be met, a revised BACT determination for NO_x shall also be considered. The Department may revise the BACT determination to require installation of such technology if so indicated by the revised BACT cost/benefit analysis. If the permittee has elected not to provide for future addition of such technology in the initial construction and later applies for a permit modification to increase capacity, the retrofit costs associated with not making provisions for such technology (initially) shall not be considered by the Department in the retrofit cost analysis required for the future expansion.

8. Boilers Nos. 1, 2, and 3 shall permanently cease operation upon receipt of the operation permit for the cogeneration facility.

9. 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).

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

Issued this 17th day
of August, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Carol M. Browner, Secretary

Florida Power
CORPORATION

David L. Miller
Senior Vice President
Corporate Services

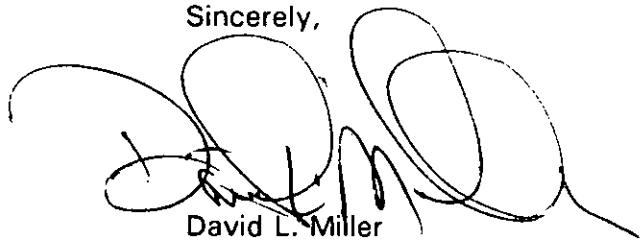
October 21, 1994

TO WHOM IT MAY CONCERN

Subject: Letter of Authorization

Please be advised that W. Jeffrey Pardue, Director, Environmental Services Department, Sharon K. Momberg, Manager of Waste Management Programs, Kent D. Hedrick, Manager of Water Programs, J. Michael Kennedy, Manager of Air Programs, and Patricia Quets, Environmental Project Manager, are authorized to represent Florida Power Corporation in matters relating to necessary permits and reporting documentation required from regulatory authorities in the areas of air, water, power plant site certifications and transmission line certifications, or hazardous and solid materials issues.

Sincerely,



David L. Miller

DLM:bb

Department of Environmental Protection

Lawton Chiles
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Virginia B. Wetherell
Secretary

CERTIFIED - RETURN RECEIPT

August 4, 1994

RECEIVED
AUG 15 1994
Environmental Svcs Department

Mr. W. Jeffery Pardue, C.E.P.
Florida Power Corporation
P.O.Box 14042 (H2G)
St. Petersburg, Florida 33733

Dear Mr. Pardue:

Alachua County - AP
Florida Power Corp. at UF

Emission Unit	Permit No.	ID No.
Cogen GT Plant	AC01-204652	31JAX01000101

This permit is extended to 06-02-95 to coordinate this emissions unit with the submittal of the Title V source (facility) permit application which shall be submitted by 04-02-95 per FAC Rule 17-213.420(1)(a)1.a.

Since this extension is in lieu of processing an operation permit application for a short-term operation permit, the testing required by this permit shall be performed initially and annually thereafter.

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

If there are any questions, please contact Johnny Cole at (904) 448-4310, Ext. 236.

Sincerely,

Ernest E. Frey, P.E.
Director of District Management

EEF:RJC

Florida Department of

Memorandum — Environmental Protection

Pasty
File
FPC
Univ of FL

TO: Chris Kirts

FROM: Mike Harley

DATE: June 29, 1994

SUBJECT: Emission Test Report for Florida Power Corporation's Combined Cycle System at the University of Florida

The Emissions Monitoring Section received a copy of the test report for the compliance test of Florida Power Corporation's (FPC) combined cycle unit at the University of Florida. Martin Costello [Emissions Monitoring Section] was one of the Department representatives who witnessed the emission testing on Friday, June 3, 1994. We have reviewed the test report and note the following deviations:

(1) The sampling site prior to the duct burner did not include a sufficient number of ports to permit sampling in accordance with EPA Method 20. This is a substantial deviation from EPA Method 20 requiring prior approval of an alternate sampling procedure pursuant to Rule 17-297.620, F.A.C. It is also a violation of 40 CFR 60.8(e).

(2) The test runs at the sampling site prior to the duct burner were conducted with a multipoint probe which had a sealed end and holes drilled along the length of the probe. This is a substantial deviation from EPA Method 20 requiring prior approval of an alternate sampling procedure pursuant to Rule 17-297.620, F.A.C. EPA Method 20 requires the use of an open ended tube of sufficient length to traverse the sample points and the collection of an individual sample at each traverse point.

(3) EPA Method 20 requires the collection of diluent samples at each traverse point for an equal period of time in order to identify any points where stratification may occur within the duct. EPA Method 20 then requires the collection of NOx samples for an equal period of time at the eight traverse points where the pollutant is least dilute. The use of the multipoint probe and single sampling port did not permit sampling at each traverse point. Further, there is no assurance that an equal sample aliquot was collected at each of the sample points. Again this is a substantial deviation from EPA Method 20 requiring prior approval of an alternate sampling procedure pursuant to Rule 17-297.620, F.A.C.

An owner or operator who wishes to deviate from the applicable source testing requirements is required to file a formal request for approval of an alternate sampling procedure pursuant to Rule 17-297.620, F.A.C. The request should be submitted to the Division of Air Resources Management in Tallahassee and will be reviewed by the Emissions Monitoring Section. In the case of a source subject to the NSPS, the EPA would need to review and concur with the request before it could be approved. The required procedures remain in effect until the Department formally acts to approve the request.

It would be appropriate to reject the test results and consider an enforcement action for the 40 CFR 60.8(e) violation. A copy of a recent EPA letter concerning another combined cycle system is enclosed for your information. If you have any questions, please call me or Martin Costello (904) 488-1344.

cc: C. Fancy
J. Pennington
J. Brown
M. Benjamin

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JUN 15 1994

RECEIVED

JUN 21 1994

Environmental Svcs
Department

4APT-AEB

Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of
Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Approval of NSPS Custom Fuel Monitoring Schedules for:
Florida Power Corporation (FPC), University of Florida
Cogeneration Project, PSD-FL-181

Dear Mr. Fancy:

This is to acknowledge a letter from Mr. Scott H. Osbourn of FPC dated April 5, 1994, requesting approval of customized fuel monitoring schedules for the above referenced project. This letter was addressed to you and a copy was sent to the U.S. Environmental Protection Agency (EPA). Since the authority for implementing §60.334(b) of 40 CFR Part 60, Subpart GG has not been delegated to the State of Florida, we have reviewed FPC's custom fuel monitoring schedule.

Based on our review we have determined that the proposed schedule is acceptable, because it conforms to custom fuel monitoring guidance memo issued by EPA headquarters on August 14, 1987. A copy of this memo was included in FPC's request as attachment.

If you have any questions regarding this letter, please contact Mr. Mirza P. Baig of my staff at 404/347-5014.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, & Toxics
Management Division

cc: Scott H. Osbourn, FPC

Patty file

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JUN 15 1994

RECEIVED

JUN 20 1994

Bureau of
Air Regulation

4APT-AEB

Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of
Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Approval of NSPS Custom Fuel Monitoring Schedules for:
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Cogeneration Project, PSD-FL-181

Dear Mr. Fancy:

This is to acknowledge a letter from Mr. Scott H. Osbourn of FPC dated April 5, 1994, requesting approval of customized fuel monitoring schedules for the above referenced project. This letter was addressed to you and a copy was sent to the U.S. Environmental Protection Agency (EPA). Since the authority for implementing §60.334(b) of 40 CFR Part 60, Subpart GG has not been delegated to the State of Florida, we have reviewed FPC's custom fuel monitoring schedule.

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Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, & Toxics
Management Division

cc: Scott H. Osbourn, FPC

RECEIVED

JUL 05 1994

Emissions Monitoring

Florida Department of
Environmental Protection

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

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

May 11, 1994

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Scott H. Osbourn
Senior Environmental Engineer
Florida Power Corporation
P. O. Box 14042
St. Petersburg, FL 33733

Dear Mr. Osbourn:

RE: Florida Power Corporation
University of Florida Cogeneration Project
AC 01-204652, PSD-FL-181
Customized Fuel Monitoring Schedule

The Bureau of Air Regulation has reviewed your April 5, 1994, letter concerning the above referenced request and determined that it will require a permit amendment. As soon as the processing fee of $250 is received, we will begin processing your request. If you have any questions, please call Patty Adams at (904)488-1344.

Sincerely,

Patty Adams

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

CHF/pa

Is your RETURN ADDRESS completed on the reverse side?

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

RECEIVED
MAY 19 1994
Bureau of
Air Regulation

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

Consult postmaster for fee.

3. Article Addressed to:
Mr. Scott H. Osbourn
Senior Environmental Engineer
Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

4a. Article Number
P 872 563 635

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

7. Date of Delivery
MAY 16 1994

5. Signature (Addressee)

6. Signature (Agent)

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

PS Form 3811, December 1991 ☆U.S. GPO: 1992—323-402 **DOMESTIC RETURN RECEIPT**

Thank you for using Return Receipt Service.

P 872 563 635

Receipt for Certified Mail
No Insurance Coverage Provided
Do not use for International Mail
(See Reverse)

UNITED STATES POSTAL SERVICE

Sent to: Mr. Scott Osbourn	
Street and No. P. O. Box 14042	
P.O., State and ZIP Code St. Petersburg, FL 33733	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, and Addressee's Address	
TOTAL Postage & Fees	$
Postmark or Date Mailed: 5/13/94 AC 01-204652, PSD-FL-181	

PS Form 3800, JUNE 1991

Florida Power
CORPORATION

April 5, 1994

RECEIVED
APR 11 1994
Bureau of
Air Regulation

Mr. C. H. Fancy, Chief
Bureau of Air Permitting
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399

Dear Mr. Fancy:

Re: Florida Power Corporation (FPC)
University of Florida Cogeneration Project
AC 01-204652; PSD-FL-181
Customized Fuel Monitoring Schedule

The FPC University of Florida Cogeneration Project has been permitted under the above-referenced PSD permit. This unit consists of an advanced combustion turbine with a heat recovery steam generator (HRSG). The combustion turbine is subject to New Source Performance Standards (NSPS-40 CFR 60, Subpart GG). 40 CFR 60.334(b) requires the owner/operator of any combustion turbine to monitor the sulfur and nitrogen content of the fuel as follows: 1) If the turbine fuel is supplied by a bulk storage tank, then the sulfur and nitrogen content are to be determined whenever new fuel is transferred into the bulk storage tank, and 2) If the turbine fuel is supplied without an intermediate bulk storage tank then daily monitoring of the sulfur and nitrogen content of the fuel is required.

Since the natural gas used by the combustion turbine does not pass through an intermediate bulk storage tank, FPC is hereby requesting a customized fuel monitoring schedule as allowed by 40 CFR 60.334(b)(2). While firing natural gas, FPC requests the following customized fuel monitoring schedule which was developed based on an EPA guidance memorandum (Attachment A):

1. Monitoring of natural gas nitrogen content shall not be required in accordance with page 2 of the EPA guidance memorandum attached.

2. Sulfur Monitoring

   a. Analysis for sulfur content of the natural gas shall be conducted using one of the EPA approved ASTM reference methods for the measurement of sulfur in gaseous fuels, or an approved alternate method. The reference methods are: ASTM D1072-80; ASTM D3031-81; ASTM D3245-81; and ASTM D4048-82 as referenced in 40 CFR 60.335(b)(2).

ENVIRONMENTAL SERVICES DEPARTMENT
H2G • 3201 Thirty-fourth Street South • P.O. Box 14042 • St. Petersburg, Florida 33733 • (813) 866-5151
A Florida Progress Company

b. Effective on the approval date of the customized fuel monitoring schedule, sulfur monitoring shall be conducted twice a month for six months. If this monitoring shows little variability in the sulfur content and indicates consistent compliance with 40 CFR 60.333, then sulfur monitoring shall be conducted once per quarter for six quarters.

c. If the monitoring required by 2(b), above, of the sulfur content of the natural gas shows little variability and the calculated sulfur dioxide emissions represent consistent compliance with the sulfur dioxide emission limits specified under 40 CFR 60.333, sample analysis shall be conducted twice per year. This monitoring shall be conducted during the first and third quarters of each calendar year.

d. Should any sulfur analysis as required by items 2(b) or 2(c) above indicate noncompliance with 40 CFR 60.333, FPC will notify the Department of Environmental Protection of such excess emission 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 this monitoring schedule is being reexamined.

3. FPC will notify the Department of Environmental Protection of any change in natural gas supply for reexamination of this monitoring schedule. A substantial change in natural gas quality (i.e., sulfur content varying greater than 10 grains/1000 cf gas) shall be considered as a change in natural gas supply. Sulfur content of the natural gas will be monitored weekly during the interim period when this monitoring schedule is being reexamined.

4. Records of sampling analysis and natural gas supply pertinent to this monitoring schedule shall be retained by FPC for a period of three years, and be available for inspection by appropriate regulatory personnel.

5. FPC will obtain the sulfur content of the natural gas from Florida Gas Transmission Company at its Brooker Lab.

Data from natural gas at the Brooker Lab site is considered representative of the sulfur content of the natural gas at the University of Florida site since there is no additional entry point for sulfur or other elements/compounds which may affect the quality of the natural gas.

If you or your staff have any questions about this request, please call me at (813) 866-5158.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

Attachments

cc/attach: Mike Harley, FDEP
David McNeal, Region IV, EPA
G. Reynolds
G. Cale, NE West

APPENDIX A

ATTACHMENT A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 14 1987

OFFICE OF AIR AND RADIATION

MEMORANDUM

SUBJECT: Authority for Approval of Custom Fuel Monitoring Schedules Under NSPS Subpart GG

FROM: John B. Rasnic, Chief
Compliance Monitoring Branch

TO: Air Compliance Branch Chiefs
Regions II, III, IV, V, VI and IX

Air Programs Branch Chiefs
Regions I-X

The NSPS for Stationary Gas Turbines (Subpart GG) at 40 CFR 60.334(b)(2) allows for the development of custom fuel monitoring schedules as an alternative to daily monitoring of the sulfur and nitrogen content of fuel fired in the turbines. Regional offices have been forwarding custom fuel monitoring schedules to the Stationary Source Compliance Division (SSCD) for consideration since it was understood that authority for approval of these schedules was not delegated to the Regions. However, in consultation with the Emission Standards and Engineering Division, it has been determined that the Regional Offices do have the authority to approve Subpart GG custom fuel monitoring schedules. Therefore it is no longer necessary to forward these requests to Headquarters for approval.

Over the past few years, SSCD has issued over twenty custom schedules for sources using pipeline quality natural gas. In order to maintain national consistency, we recommend that any schedules Regional Offices issue for natural gas be no less stringent than the following: sulfur monitoring should

be bimonthly, followed by quarterly, then semiannual, given at least six months of data demonstrating little variability in sulfur content and compliance with §60.333 at each monitoring frequency; nitrogen monitoring can be waived for pipeline quality natural gas, since there is no fuel-bound nitrogen and since the free nitrogen does not contribute appreciably to NO_x emissions. Please see the attached sample custom schedule for details. Given the increasing trend in the use of pipeline quality natural gas, we are investigating the possibility of amending Subpart GG to allow for less frequent sulfur monitoring and a waiver of nitrogen monitoring requirements where natural gas is used.

Where sources using oil request custom fuel monitoring schedules, Regional offices are encouraged to contact SSCD for consultation on the appropriate fuel monitoring schedule. However, Regions are not required to send the request itself to OSCD for approval.

If you have any questions, please contact Sally K. Farrell at FTS 382-2675.

Attachment

cc: John Crenshaw
George Walsh
Robert Ajax
Earl Salo

Enclosure

Conditions for Custom Fuel Sampling Schedule for Stationary Gas Turbines

1. Monitoring of fuel nitrogen content shall not be required while natural gas is the only fuel fired in the gas turbine.

2. Sulfur Monitoring

   a. Analysis for fuel sulfur content of the natural gas shall be conducted using one of the approved ASTM reference methods for the measurement of sulfur in gaseous fuels, or an approved alternative method. The reference methods are: ASTM D1072-80; ASTM D3031-81; ASTM D3246-81; and ASTM D4084-82 as referenced in 40 CFR 60.335(b)(2).

   b. Effective the date of this custom schedule, sulfur monitoring 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 sulfur monitoring shall be conducted once per quarter for six quarters.

   c. If after the monitoring required in item 2(b) above, or herein, the sulfur content of the fuel shows little variability and, calculated as sulfur dioxide, represents consistent compliance with the sulfur dioxide emission limits specified under 40 CFR 60.333, sample analysis shall be conducted twice per annum. This monitoring shall be conducted during the first and third quarters of each calendar year.

   d. Should any sulfur analysis as required in items 2(b) or 2(c) above indicate noncompliance with 40 CFR 60.333, the owner or operator shall notify the State Air Control Board) of such excess emissions and the custom schedule shall be re-examined by the Environmental Protection Agency. Sulfur monitoring shall be conducted weekly during the interim period when this custom schedule is being re-examined.

3. If there is a change in fuel supply, the owner or operator must notify the State of such change for re-examination of this custom schedule. A substantial change in fuel quality shall be considered as a change in fuel supply. Sulfur monitoring shall be conducted weekly during the interim period when this custom schedule is being re-examined.

4. Records of sample analysis and fuel supply pertinent to this custom schedule shall be retained for a period of three years, and be available for inspection by personnel of federal, state, and local air pollution control agencies.

TOTAL P

Florida Power
CORPORATION

March 25, 1994

Mr. Chris Kirts
Air Program Manager
Northeast District
7825 Bay Meadows Way, Suite B200
Jacksonville, Florida 32256

Dear Mr. Kirts:

Re: Compliance Test Notification for the University of Florida Cogeneration Project
DEP Permit No. AC 01-204652

As required by 40 CFR 60.8, Florida Power Corporation (FPC) is providing the Department of Environmental Protection (DEP) notification of the commencement of compliance testing of the new cogeneration facility at FPC's University of Florida electric generating station. The testing is scheduled to begin on April 25, 1994. If you recall, in a letter dated December 31, 1993, FPC had previously provided notification that testing was to have begun by January 31, 1994. The combustion turbine was damaged during initial startup and debugging and was shipped back to the factory for repair. The April 25, 1994 proposed test date assumes that the refurbished turbine will be received onsite for installation by April 4, 1994.

If you should have any questions concerning this notification, please feel free to contact me at (813) 866-5158.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

cc: John Brown, DEP Tallahassee
Mike Harley, DEP Tallahassee
Mort Benjamin, DEP- Northeast District
Patricia Reynolds, Gainesville Air Programs
J. Harper, EPA

ENVIRONMENTAL SERVICES DEPARTMENT
H2G • 3201 Thirty-fourth Street South • P.O. Box 14042 • St. Petersburg, Florida 33733 • (813) 866-5151
A Florida Progress Company

Patty
File w/Permit

Florida Power
CORPORATION

Certified Mail P 627 945 297

December 31, 1993

Mr. Chris Kirts
Air Program Manager, Northeast District
7825 Bay Meadows Way, Suite B200
Jacksonville, Florida 32256

Dear Mr. Kirts:

Re: Compliance Test Notification for the University of Florida Cogeneration Project
DEP Permit No. AC 01-204652

As required by 40 CFR 60.8, Florida Power Corporation (FPC) is providing the Department of Environmental Protection (DEP) notification of the commencement of compliance testing of the new cogeneration facility at FPC's University of Florida electric generating station. The testing is scheduled to begin on January 31, 1994.

A copy of the proposed test plan was received by your office on December 29, 1993. FPC is also submitting a copy of the proposed test plan to Mr. Mike Harley, of the DEP in Tallahassee, with his copy of this letter. Based upon discussions with Messrs. Mort Benjamin and Stan Mazur of your staff on December 30, 1993, FPC will attempt to schedule a pre-test meeting at your office within the next two weeks.

if you should have any questions or concerns, please feel free to contact me at (813) 866-5158.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

RECEIVED
JAN 03 1994
Bureau of
Air Regulation

cc: John Brown, DEP Tallahassee
Mike Harley, DEP Tallahassee w/Enclosure

Florida
Power
CORPORATION

Certified Mail P 627 945 298

December 31, 1993

Mr. Chris Kirts
Air Program Manager, Northeast District
7825 Bay Meadows Way, Suite B200
Jacksonville, Florida 32256

Dear Mr. Kirts:

Re: Compliance Test Notification for the University of Florida Cogeneration Project
DEP Permit No. AC 01-204652

As required by 40 CFR 60, Florida Power Corporation (FPC) is providing the Department of Environmental Protection (DEP) notification of the initial startup of the new cogeneration facility at FPC's University of Florida electric generating station. The initial startup occurred on December 17, 1993.

If you should have any questions or concerns, please feel free to contact me at (813) 866-5158.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

cc: John Brown, DEP Tallahassee

Florida
Power
CORPORATION

Certified Mail P 627 945 297

December 31, 1993

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Air Program Manager, Northeast District
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Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

cc: John Brown, DEP Tallahassee
Mike Harley, DEP Tallahassee w/Enclosure

per David McNeal
EPA Region IV

CODE	REFERENCE	QUESTION	AFFECTED REGULATION	DETER-MINATION	DISCUSSION
A-41	Memo to R-IV (E. Reich to T. Gibbs) 23 August 77	Is the basis of the existing facility or the basis of the entire stationary source used in the calculation of the annual asset guideline repair allowance, which is referred to in the definition of capital expenditure in Section 60.2(bb)?	60.2 (bb)		To determine whether or not a modification has occurred due to an increase in production rate, compare the amount of money spent for physical or operational change to the existing facility to the product of the existing facility's basis and the annual asset guideline repair allowance for the existing facility. If more than one existing facility is located in the same stationary source and there is an increase in emissions from both facilities, use the basis and repair allowance of each separate existing facility for determining whether or not a modification has occurred.
A-42	Memo to R-IV (E. Reich to J. Wu) 29 Sept. 77	What procedure should be followed when an affected facility has not been performance tested in the 180 day period following startup due to shutdowns caused by equipment malfunction?	60.8(a)		Consider issuing a 113(a) order requiring the owner or operator to notify the Administrator upon restartup (by telephone; to be followed by confimation in writing) and also requiring a performance test as soon as practicable thereafter but no later than 30 days after restartup. If the facility is unable to operate at the maximum production rate for the initial performance test, a subsequent performance test may be required when the facility achieves maximum production in order to assure compliance with the standard.
A-43	Memo to R-IV (E. Reich to F. Phillips) 30 Sept. 77	Same as A-39			See A-39
A-44	Memo to R-VII (E. Reich to E. Stephenson) 28 December 77	Is a steam generator whose capital cost of reconstruction is only 43% of the cost of a comparable new steam generator subject to NSPS due to reconstruction?	60.15	No	If the fixed capital cost (including all labor costs) of reconstructing the affected facility (as defined in the applicable subpart) is less than 50% of the cost of an entirely new affected facility, then the affected facility is not subject to NSPS.

FLORIDA POWER CORPORATION
UNIVERSITY OF FLORIDA COGENERATION SITE
FAX COVER SHEET

P. O. BOX 140660
GAINESVILLE, FL. 32614-0660

PHONE NO. (813) 384-7575
FAX NO. (813) 384-7576

TO: Mike Harley DATE: 1-10-94

FROM:
Bob Anderson

Number of Pages 2
(Including Cover Sheet)

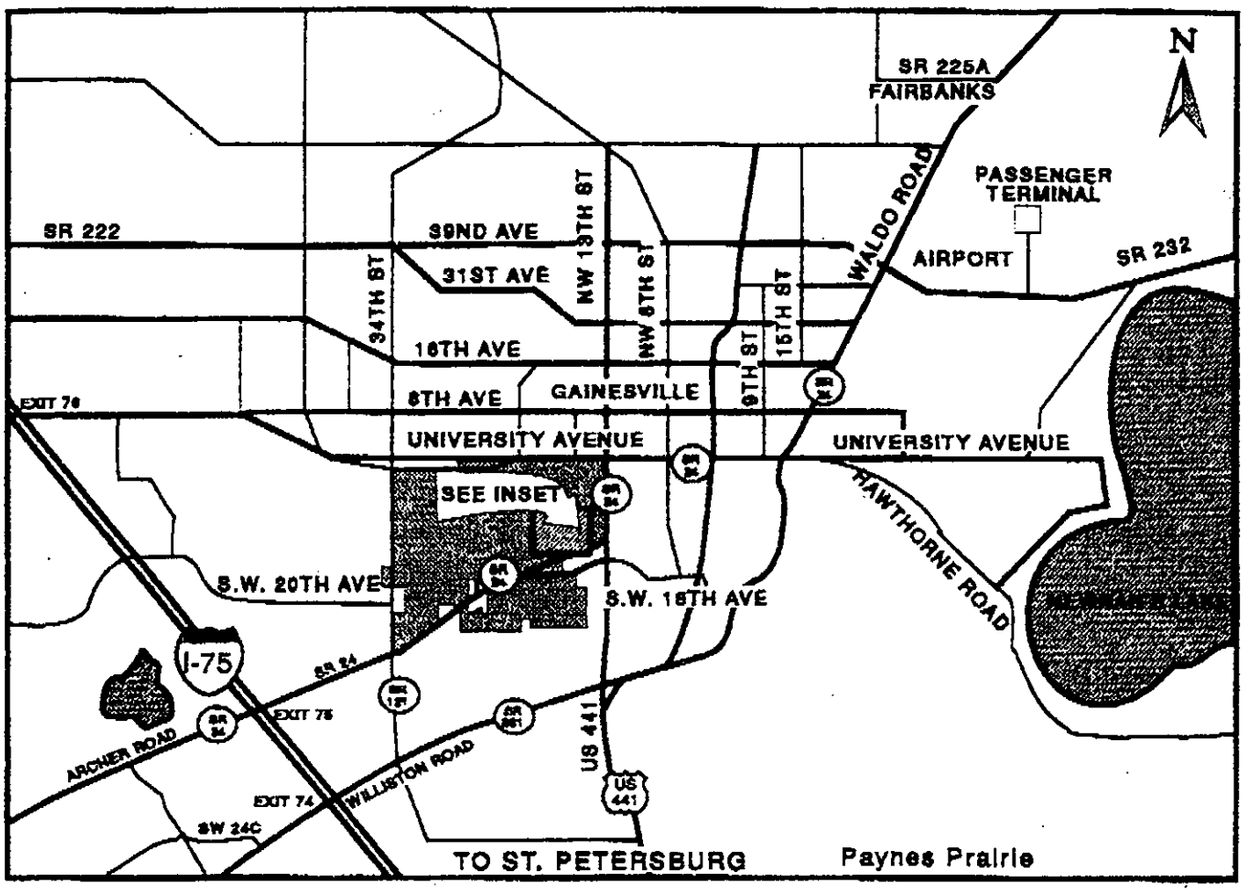
COMMENTS:

Operating Days
Bob Anderson
Scott Osborne
(904) 374-2208

Testing Mtg
Mike & Mike C.

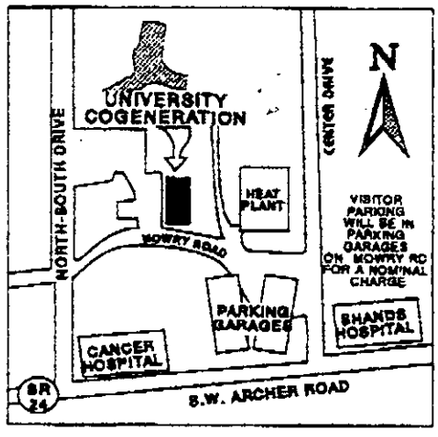
U. OF F. COGENERATION PLANT

FLORIDA POWER CORPORATION



Location:	Mowry Road, Gainesville, Fl
Mail Address:	P.O. Box 140660 Gainesville, FL 32614-0660
Nearest Airport:	Gainesville, FL
Driving from GOC:	North on I-75 to Gainesville. Take exit 75 (Archer Rd). Go east 7 traffic lights. Take left on North-South Drive. Go one block to Mowry Rd. Turn right and plant will be on left approx. one block.
Driving from airport:	Go west on Rt. 232 (NE 39th Ave.) Turn left on Rt. 441and follow until it merges with Rt. 24. Stay on Rt. 24 past Shands Hospital. Turn right on North-South Drive. Take first right onto Mowry Road and plant will be on left approx. one block.

Telephone:	Mail Code:	Microwave:
(904) 374-2208	GV44	226-7575



Subpart GG

NO_x standard: $\%NO_x @ 15\% O_2 = 0.0075 \frac{(14.4)}{HR_{up\ to\ 14.4\ kJ/W\text{-}hr}} + F_N$

SO_2 standard: $\%SO_2 @ 15\% O_2 = 15$ (Dry Basis)

TESTING: Nitrogen Content in Fuel — Approved Method Accurate w/ ± 5%

NO_x → ISO equation NO_x % by volume @ 15% $O_2 = NO_{x\ observed\ (\&\ Corrected?)} \cdot \left[P_r/P_o\right]^{0.5} \cdot e^{19(H_o - .0063)} \left[\frac{288^{\circ}K}{T_a}\right]^{1.5}$

Measure ... 1) Combustor inlet P
2) Humidity ratio (T_w & T_a)
3) Ambient Temp
4) O_2 Concentration in stack

Graph: Develope curve @ ISO corrected Loads: 30, 50, 75, 100

Method 20 FOR NO_x, O_2, SO_2 (ASTM D 1072-80
3031-81
4084-82-
7246-81

CEM SPANS: NO_x – 300 ppm
O_2 – 21%

Please Fax to Scott Osborne

↓

(813) 866 4926

Scott Osborne

Fax (813) 866-4926 —?

Martin Costello

→ NE District Mort. & Stan
Bob Anderson

Ken Kolki _ KBN - Engineer of Record.

Nox Cap.

MESSAGE CONFIRMATION

FEB-08-'94 TUE 10:34

TERM ID: P-9999

TEL NO:

NO.	DATE	ST. TIME	TOTAL TIME	ID	DEPT CODE	OK	NG
622	02-08	10:32	00°01'21	813 866 4926		02	00

Scott Osborn.

FPL's Alternative

Kent Hedric → EPA to Allow Combined Emissions Limit on Both Burners?

6-8 wks to Rebuild

Dec 17 Clock starts 180 Day.

Call EPA for Determination on 180 Day Clock → Stops when Unit Down?

Feb 16 Wed.

TEST PLAN

for

EXHAUST EMISSION MEASUREMENTS

from one

GENERAL ELECTRIC COMBUSTION GAS TURBINE WITH SUPPLEMENTAL FIRED DUCT BURNERS

at the

UNIVERSITY OF FLORIDA FACILITY

GAINESVILLE, FLORIDA

Prepared For

Florida Power Corporation

December 1993

Prepared by

Cubix Corporation

9225 Lockhart Hwy., Austin, Texas 78747
(512) 243-0202 FAX (512) 243-0222

TABLE OF CONTENTS

OVERVIEW

Exhaust emissions from one General Electric (GE) combustion turbine (CT) with supplementally fired heat recovery steam generator (HRSG) are to be tested to determine the quantity of emissions being vented to the atmosphere. The turbine to be tested is in service at the University of Florida facility in Gainesville, Florida, Alachua County. The purpose of this testing is to verify that the turbine demonstrates compliance with the applicable limits set forth by the Florida Department of Environmental Protection (FDEP), air quality permit number AC 01-204652 and PSD-FL-181. The testing will be conducted by Cubix Corporation of Austin, Texas. Table 1 provides background data pertinent to these tests.

The cogeneration unit consists of a GE Model LM 6000 combustion gas turbine (including an inlet air cooler) and a heat recovery steam boiler with supplementary firing duct burners. The turbine and duct burners are fired on pipeline grade natural gas only. The turbine is rated at 43.3 MW when firing natural gas.

NOx emissions from the turbine are controlled by steam injection. Testing will be conducted on the turbine at each of four separate load conditions to verify the steam injection rates at each load. In order to allow the determination of emissions by the duct burner only, two test conditions are required. The first condition tested would be with the combustion turbine (CT) operating at a stabilized full load with the duct burners off. The second condition tested would required the CT (at the same full load rate) and the duct burner to be fired. The NOx emissions from the duct burners would be calculated by subtracting the average NOx emission from the CT only test from the average NOx emission from the CT and duct burner joint fired test.

TABLE 1
Background Data

Sources	One GE Model LM 6000 gas combustion turbine with a supplementary firing HRSG. This turbine also has inlet air cooling capabilities.
Location:	University of Florida Mowry Road, Building No. 82 Gainesville, Florida
Applicable Permits and Regulations	FDEP Permit # AC 01-204652 PSD-FL-181, EPA 40 CFR 60 Subparts Db and GG
Emissions Test Coordinator:	Florida Power Corporation 3201 34th Street South St. Petersburg, Florida 33711 Attn: Albert Morneault, P.E. (813) 866-5162
Test Contractor:	Cubix Corporation 9225 Lockhart Highway Austin, Texas 78747 Attn: Rick J. Krenzke (512) 243-0202 TEL (512) 243-0222 FAX
Test Dates:	To be specified in transmittal letter.
Test Schedule:	To be specified in transmittal letter.

TEST MEASUREMENTS

Exhaust emission testing will be conducted on one GE Model LM 6000 gas combustion turbine with a supplementally fired heat recovery steam generator. Emission measurements will be made for NOx, CO, O_2, CO_2, and opacity on the turbine. Testing will also be performed on the joint firing of the turbine and duct burner to determine the contribution of NOx and CO from the duct burner. All measurements will be conducted while firing natural gas. Compliance tests will be run at 96% to 100% of the maximum capacity achievable for the average inlet air temperature observed during the compliance tests. The turbine manufactures capacity (MW) vs. inlet air temperature curves will be included in the compliance test report. Daily samples of the natural gas will be collected and analyzed for composition, total sulfur, heating value, and specific gravity. The emission 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 and the fuel analyses will follow analytical procedures set forth by American Society of Testing and Materials (ASTM). The specific test methods to be used are listed as follows:

should be as Fired

Exhaust Analyses

* EPA Method 1 for traverse point layout for the O_2 traverse points established by EPA Method 20.
* EPA Method 3a for O_2 and CO_2 concentrations.
* EPA Method 3b for F_o calculations.
* EPA Method 9 for opacity observations.
* EPA Method 10 for CO concentrations.
* EPA Method 19 for mass emission, and stack flow rate calculations.
* EPA Method 20 for NOx and O_2 concentrations.

Fuel Analyses

* ASTM D 1945 for natural gas composition analysis.
* ASTM D 3588 for natural gas specific gravity and heating value (gross and net).
* ASTM D 3246 for total sulfur content of natural gas.

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

Test Matrix

The test matrix to be used during these tests is depicted in detail in Table 2. Table 2 shows that testing will begin with measurement of the turbine only emissions. The first item during the turbine only tests will be the initial O_2 traverse during which O_2 and CO_2 are measured. Although the actual time of this test run will depend on the stack size, sample port configuration, and the results of Cubix's sample system response time test, it is anticipated that this procedure will require 88-minutes of sampling . This is based on the stack size requiring a 44 point traverse and Cubix's sample system response time being 1-minute or less. EPA Method 20 requires that the sample time at each traverse point be 1-minute plus the average sample system response time. This will result in a 44 point traverse for 2-minutes per point. The sample location for these tests will be from the exhaust stack of the CT/HRSG and the duct burners will be turned off. The O_2 traverse will be performed at the lowest load tested with steam injection. Appendix F contains a site-plan, stack drawing, and traverse point layout for this unit.

Following the initial O_2 traverse, turbine only emissions will be measured at four separate loads including minimum and maximum firing rates. The four load points will be determined in accordance with 40 CFR 60, Subpart GG, §60.335 (c) (2). These tests are required to satisfy the provisions of EPA Subpart GG and will be conducted from the CT/HRSG stack. Three test runs will be conducted at each of the four loads. Again, Cubix's sample system response time results will determine the actual test run times, but it is anticipated that each test run will consist of 24-minutes (i.e. eight traverse points for 3-minutes per point). NOx, O_2, CO_2, and CO emissions shall be measured instrumentally and SO_2 emissions shall be calculated using the results of the daily fuel analysis. Opacity tests will be conducted during both the CT and the joint fired tests for the time stipulated in 40 CFR 60.11.

Following the turbine only tests at full load, the duct burners shall be turned on to maximum firing rate and the joint fire emissions shall be measured. To satisfy the stipulations of EPA Subpart Db, it is necessary to determine the duct burner contribution to the NOx emissions. The FDEP permit also requires the measurement of the CO emission contribution by the duct burners. With the duct burners firing at maximum, and the turbine operating at the same full load (same MW) as tested prior to the joint firing tests, emissions of NOx and CO will again be measured in the CT/HRSG stack of the unit. In the event that the steam flow cannot be maintained, the CT and duct burner operation may have to be adjusted.

Mass emission rates of the turbine and the duct burners will be calculated by EPA Method 19 procedures. The emission rate from the turbine only are

based on the fuel flow to the turbine, the fuel analysis and exhaust measurements made in the exhaust stack with the turbine only firing. Likewise, the emission rate of the joint firing of the turbine and duct burner are based on the fuel flow to both units, fuel analysis and exhaust measurements make in the CT/HRSG stack. The contribution of the duct burners will be determined by subtracting the turbine only emissions from the joint fired emissions. The contribution from the duct burners will be expressed in lbs/hr and lb/MMBtu for comparison with the permit limits and the NSPS allowable.

Exhaust Gas Sampling and Analyses

The stack gas analyses for NOx, CO, CO_2 and O_2 will be performed by continuous instrumental monitors. Table 3 lists the instruments, detection principles, and applicable ranges of those instruments. All instruments will be housed in an environmentally controlled, trailer-mounted, mobile laboratory. Data from these analyzers will be recorded on two 25-cm width, 3-pen strip chart recorders (Soltec 1243) operating at a speed of 30-cm/hr. A computer data logging system will also be provided to allow for convenient visual checking of emission concentrations. Calibration gases for these instruments will be provided in aluminum cylinders with the concentrations certified by the vendor (See *Quality Assurance Activities*).

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 with a glass wool filter. The sample is transported via 3/8-inch heat-traced Teflon® tubing to a specially designed stainless steel minimum-contact condenser which dries the sample without removing NOx. The sample is then passed to ground level through 3/8-inch Teflon® via a stainless steel/Teflon® diaphragm pump and into the sample manifold. From the manifold, the sample is partitioned to the analyzers through glass and stainless steel rotometers. The purpose of the rotometers is to ensure that the sample pressure and flow rate are equal to that used for the calibration gases.

Cubix will use a special alloy probe (Haynes Alloy 214) for the sampling of gaseous components. This material has a high yield strength at the elevated temperatures that could be present at these locations and therefore resists bending and warping in the stack.

The tables of EPA Method 1 will be used to locate the traverse points as required for the Method 20 O_2 traverse. It is expected that the size and configuration of the combined cycle exhaust stack will require that 44 traverse points be used for the initial O_2 traverse. Appendix F of this test plan has

been reserved for stack diagrams and sample traverse point layout schemes .

K-type thermocouples and digital thermometer will be used to measure the stack temperature at each traverse point. This equipment will also be used to measure the stack temperature during all test runs.

The instrumental analysis procedures of EPA Method 3a will be used for determination of O_2 and CO_2 concentrations. The CO_2 analyzer that will be used is based on the principle of infrared absorption; and, the O_2 analyzer operates on a paramagnetic cell. Instrumental analyses will be used in lieu of an Orsat or a Fyrite procedure due to the greater accuracy and precision provided by the instruments.

A calculation technique contained in EPA Method 3b will be used to verify the measured concentrations of O_2 and CO_2. The F_o calculation of Method 3b will be performed using the measured O_2 and CO_2 concentrations and compared to the expected value published in EPA Method 3b.

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 any interference from H_2O, CO_2, or other combustion products.

NOx and O_2 measurements (as required by Subpart GG) will be made using EPA Method 20. The NOx analyzer to be used operates on the principle of chemiluminescence and the O_2 analyzer uses a paramagnetic cell as a detection principle. As required, the NOx analyzer is equipped with an NO_2 to NO converter to allow for measurement of all forms of NOx as per EPA's definition. NOx mass emission rates will be calculated as if all the NOx were in the form of NO_2. This approach corresponds to EPA's convention, however, it tends to overestimate the actual NOx mass emission rates since the majority of NOx is in the form of NO which has less mass per unit volume (i.e. lbs. of emissions per ppmv concentration) than NO_2.

As required by Method 20, an initial O_2 traverse will be conducted on the unit while at low load. All subsequent tests will be conducted at the eight points of lowest O_2 concentration. Sampling at each traverse point will be conducted for a minimum of 1 minute plus the average sample system response time. The sample system response time will be conducted prior to testing (see *Quality Assurance Activities*); and, based on previous tests, it is expected to be approximately 1 minute. Therefore, Cubix expects to sample for at least 2-minutes per point, making each test run a minimum of 16-minutes in duration (Cubix suggests 24 minute test runs).

Opacity Tests

During these compliance tests, visible emission tests will be performed by FPC certified personnel. To comply with 40 CFR 60.11, three one hour opacity readings will be made while firing turbine only. One 1-hour run will be made at full load, one 1-hour run will be made at the lowest load tested and a final run at an intermediate load. Likewise, while performing the joint firing tests, one 1-hour run will be performed at full load turbine and full fired duct burners. Two more 1-hour runs will be conducted at reduced loads of the duct burner as steam load will allow. Opacity observations shall be made using the procedures of EPA Method 9. FDEP certified personnel (via EPA procedures) shall be used for these opacity observations.

Exhaust Flow Measurements

The stoichiometric calculations of EPA Method 19 will be used to calculate a volumetric flow rate out the exhaust stack. This calculation requires knowledge of the F-factors and heating value of the fuel (as obtained from the fuel composition analysis), and the combustion air rate (as obtained from the diluent concentrations in the stack). Since fuel analyses will not be made until after testing, typical or published values will be used to calculate the volumetric flow rates in presentation of preliminary results. The final emission test report will use the calculated values for F-factors and heating values of each fuel (daily). This strategy will apply to all mass emission rate calculations including the duct burner emission calculations.

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, Florida Power Corp. will provide data for each test run. The data that will be recorded at 5-minute intervals, and includes:

1) Mean turbine exhaust temperature
2) Steam injection rate
3) Fuel flow
4) Steam/fuel ratio
5) Compressor inlet temperatures
6) Specific humidity
7) Inlet guide vane angle
8) Generator output (MW)
9) Compressor discharge pressure
10) Duct burner fuel flow
11) Stack temperature

Fuel Analyses

The natural gas analyses will consist of measurements of total sulfur and composition. The ASTM methods to be used for this fuel analyses are as follows:

ASTM D 3588 for Heating Value
ASTM D 3588 for Specific Gravity
ASTM D 3246 for Total Sulfur
ASTM D 1945 for Composition of Gas

One natural gas sample will be taken daily, and will be collected in Teflon® lined stainless steel sample "bombs". The total sulfur analyses of the fuel will be used in conjunction with the fuel flow data to indirectly calculate the total SOx (i.e. SO_2) mass emission rates.

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 sling psychrometry (i.e. wet and dry ambient temperatures).

Table 2:
Test Matrix

Unit #	Load*	Duct Burner	Parameters	Runs	O2 Traverse
LM 6000	Low	off	NOx, ~~CO~~, O2, VE**	3	44 pt
LM 6000	Low Int.	off	NOx, ~~CO~~, O2, VE**	3	no
LM 6000	Int.	off	NOx, ~~CO~~, O2, VE**	3	no
LM 6000	Full	off	NOx, ~~CO~~, O2, VE**	3	no
LM 6000	Full***	100%***	NOx, CO, O2, VE**	3	no

Using Ambient Curve ?

* Loads will be determined by FPC and will range from minimum load (for O_2 traverse) to full load. Full load depends on the inlet air temperature on the day of the compliance test.

** Three one hour VE runs will be conducted on the turbine only and on the joint firing of the turbine and duct burner (total of 6 one hour runs). One run will be at the lowest load, one run at an intermediate load and one at the highest load. See "Opacity Tests" on page 7 of this workplan.

*** This full load condition is dependent on how much steam flow can be dumped. Load for the CT and duct burners may have to be adjusted.

Analytical Instrumentation

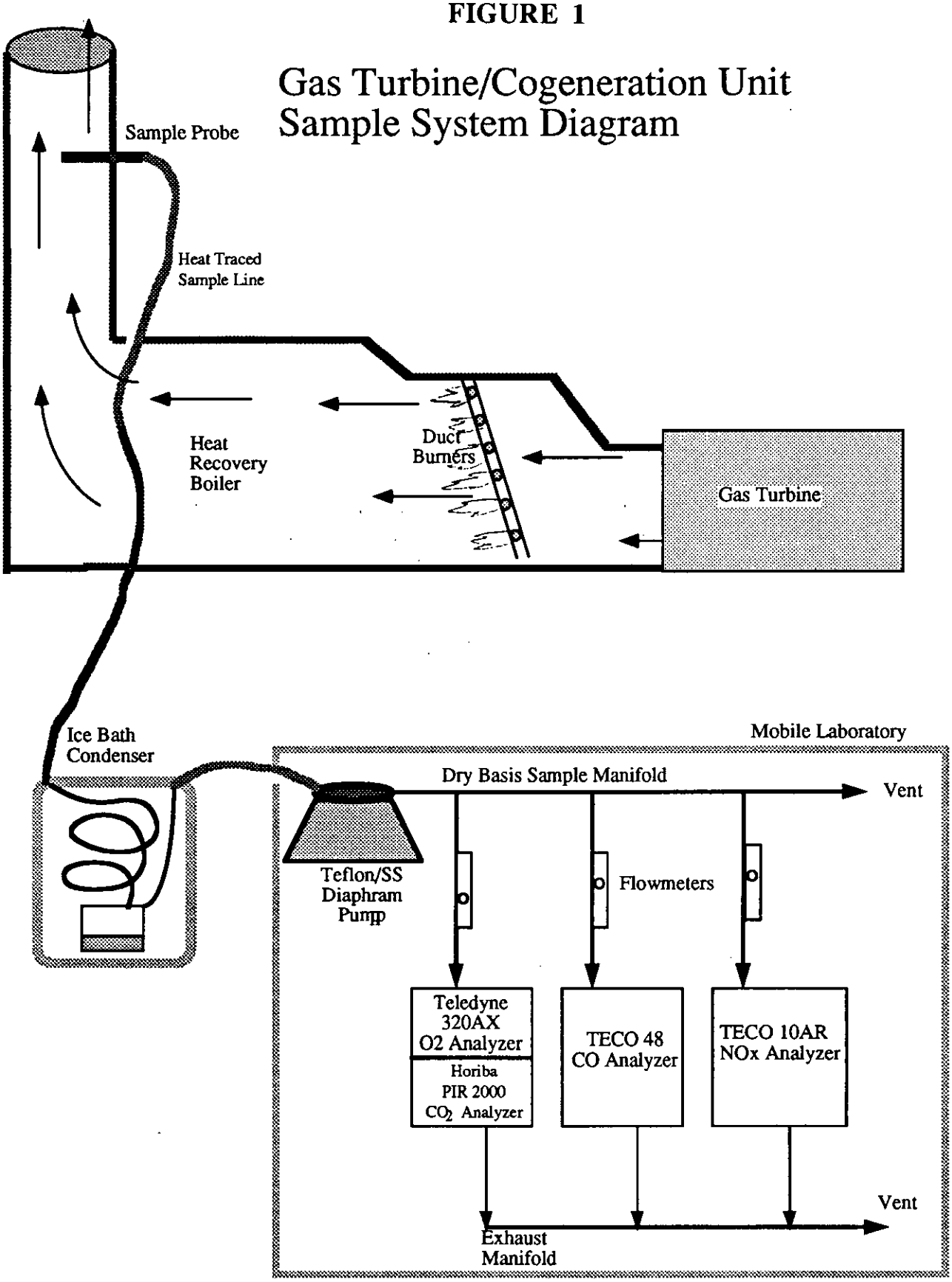
Parameter	Model and Manufacturer	Common Use Ranges	Sensitivity	Response Time (sec.)	Detection Principle
NOx	TECO 10AR	0-10 ppm 0-100 ppm 0-200 ppm 0-500 ppm 0-1,000 ppm 0-5,000 ppm	0.1ppm	1.7	Thermal reduction of NO_2 to NO. Chemiluminescence of reaction of NO with O_3. Detection by PMT. Inherently linear for listed ranges.
CO	TECO 48	0-10 ppm 0-20 ppm 0-50 ppm 0-100 ppm 0-200 ppm 0-500 ppm 0-1000 ppm	0.1ppm	10	Infrared absorption, gas filter correlation detector, micro-processor based linearization
CO_2	Servomex 1410 B	0-4% 0-20%	0.02%	30	Infrared absorption, analog linearization.
O_2	Servomex 1420 B	0-10% 0-25 %	0.1%	15	Paramagnetic cell, inherently linear.

NOTE: Higher ranges available by sample dilution.
Other ranges available via signal attenuation.

TABLE 3
ANALYTICAL INSTRUMENTATION

FIGURE 1

Gas Turbine/Cogeneration Unit Sample System Diagram



QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities will be undertaken prior to, following, and during this testing project. This section of the test plan combined with the example documentation in Appendices C and D 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 adjusting its zero and span responses to zero nitrogen 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. If the instrument's response does not agree with the calibration gases within ± 2 percent of range, corrective action will be taken prior to beginning the tests.

Each test run will be bracketed by a zero and span check. 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 analyzer drift during the run. If the analyzer drifts more than 2% during a test run, that run will be repeated. Appendix C contains an example of a quality assurance worksheet that will be prepared by Cubix to summarize the multi-point linearity check and all zero and span checks.

Interference response tests on the instruments have been conducted by the instrument vendors and/or Cubix Corporation on the NOx, O_2, CO_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. Results of these interference response tests are contained in Appendix C.

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.

The NOx and O_2 sampling and analysis system will be checked for response time according to the procedures outlined in EPA Method 20. An example data sheet that presents the data from a previous response time check

is included in Appendix C. During this check, the average NOx analyzer's response times were 53.6 seconds upscale and 49.9 seconds downscale. The O_2 analyzer's response times were 55.8 seconds upscale and 32.8 seconds downscale.

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 (probably >20 in 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 ambient air leakage 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. The first path will be delivered into the analyzer via the zero/span calibration manifold. The second path will consist of introducing a calibration gas into the sample system at the sample probe. Any difference in the instrument responses by these two methods is attributed to sampling system bias or leakage. The sample system bias checks will be conducted as frequently as the leak checks (i.e. after setting up a sample system and prior to dismantling a sample system). The sample system bias checks will demonstrate that no degradation of the sample occurs in the sample system due to absorption, leakage, or contamination.

The efficiency of the NO_2 to NO converter in the NOx analyzer will be checked by having the analyzer sample a mixture of NO in N_2 standard gas and zero air from a Tedlar® bag. When this bag is mixed and exposed to sunlight, the NO is oxidized to NO_2 over a 30 minute period. If the NOx instrument's converter is 100% efficient, then the NOx response will not decrease as the NO in the bag is converted to NO_2. The criterion for acceptability is a demonstrated NOx converter efficiency greater than 95%. Strip chart excerpts from previous NOx converter efficiency checks, as well as sample system bias checks, are provided in Appendix G. An example of an Instrumental Quality Assurance Worksheet which summarizes the results of these activities is also included in Appendix C.

The control gases used to calibrate the instruments will be analyzed and certified by the compressed gas vendors to $\pm 1\%$ accuracy. EPA Protocol No. 1 will be used for the NOx gases to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). Examples of calibration gas certifications for a typical turbine test are included in Appendix D.

TEST REPORT AND CALCULATIONS

Test Report

A formal test report documenting the results of the testing program will be prepared after the field testing. 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 mass emission rates for NOx (ppmvd, ppmvd at 15% O_2, lbs/MMBtu, and lbs/hr), CO (ppmvd, lbs/MMBtu, and lbs/hr), SO2 (lbs/hr) and recorded visible emission results. During the joint fire tests, the duct burner contribution of NOx and CO emissions will be reported in terms of lbs/MMBtu. 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 mass emission rates will be calculated from the stack flow rate determined by the O_2 F-factor. The times and dates of each test run will be noted at the head of each column in the tabular summary. The joint fire tests will be reported separately from the turbine only tests. Appendix A of this test plan is reserved for examples of the tabular summaries for both the turbine and joint-fired tests.

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

Process Description: A brief description of the units 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 the documents included in the Quality Assurance and Calibration Certifications sections of the Appendix.

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

Appendix A: Field Data Sheets: Stack diagrams, sign-in sheets, templates, preliminary water injection tests, etc...

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

Appendix C: Fuel Data: Results of all fuel analyses and Cubix's F-factor and heating value calculation templates.

Appendix D: Operational Data: Computer print-outs 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 print-outs and provide the average operational parameters for each run.

Appendix E: Quality Assurance Activities: Documentation of the various QA Activities conducted for the tests including system response time tests, NOx 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: Copies of all strip chart recordings made during the tests (if desired).

Appendix H. Opacity Observations: Copies of all opacity field data sheets

Calculations

Emission calculations will be performed by customized spread sheet programs installed on a Macintosh computer. Appendix A of this test plan provides examples of the computer spread sheets Cubix will build for this project. Appendix B shows example calculations of mass emission rates from a turbine only test run and a joint fired test run.

APPENDIX A: EXAMPLE TABLES AND SPREADSHEETS

Example of Natural Gas Fired Test Template

XXXXXXXX												
XXXXX												
Solar Taurus Turbine W HRSG												
Date												
Turbine #	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2	TCP-2
Test Number	**C-16**	**C-17**	**C-18**	**C-19**	**C-20**	**C-21**	**C-22**	**C-23**	**C-24**	**C-25**	**C-26**	**C-27**
Start Time	847	935	1015	1117	1201	1244	1329	1413	1455	1538	1620	1706
Stop Time	923	1007	1048	1149	1233	1316	1401	1445	1527	1610	1652	1738
Turbine Operational Data												
Power (KW)	2690	2675	2672	3407	3411	3413	3090	3098	3102	2900	2924	2920
Power Turbine Speed (%x14951=rpm)	100	100	100	100	100	100	100	100	100	100	100	100
T-5 Combustor Temp. (°F)	1207	1203	1202	1400	1400	1400	1400	1330	1329	1283	1284	1281
T-1 Air Inlet Temp. (°F)	62.7	62.7	63.0	69.1	69.5	69.3	69.4	69.7	70.1	70.1	69.0	67.8
Compressor Discharge (psig)	116.0	116.5	116.0	122.0	122.0	122.0	118.0	118.0	118.0	116.0	116.0	116.0
Fuel Flow (SCFM)	712	708	705	844	846	843	790	788	794	753	757	751.3
Fuel Flow (SCFH)	42720	42480	42300	50640	50760	50580	47400	47280	47640	45180	45420	45078
Heat Input (MMBtu/hr)	4.40E+07	4.38E+07	4.36E+07	5.22E+07	5.23E+07	5.21E+07	4.89E+07	4.87E+07	4.91E+07	4.66E+07	4.68E+07	4.65E+07
H2O Flow (gal/min)	1.800	1.800	1.800	2.720	2.700	2.630	2.600	2.230	2.260	2.020	2.040	2.020
H2O-to-fuel Ratio (lb/lb)	0.457	0.457	0.460	0.567	0.570	0.569	0.523	0.521	0.522	0.495	0.495	0.490
Fuel Specific Gravity	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591
Fuel Heating Value (Btu/SCF)	1031	1031	1031	1031	1031	1031	1031	1031	1031	1031	1031	1031
Turbine Sensor Relative Hum. (%)	56.1	56.3	55.8	54.9	52.07	49.4	48.8	48.3	47.6	46.5	45.8	45.9
Turbine Sensor Pbar (in. Hg)	26.4	26.4	26.4	26.5	26.5	26.5	26.4	26.4	26.4	26.4	26.4	26.4
Steam Flow (KPH)	15.63	16.41	16.28	21.11	22.09	20.28	17.79	17.75	17.53	16.8	16.8	16.83
Ambient Conditions												
Barometer (in. Hg)	26.22	26.22	26.22	26.25	26.25	26.25	26.25	26.25	26.15	26.15	26.15	26.15
Temperature (°F dry)	85	85	87	94	96	99	101	102	103	101	107	104
Temperature (°F wet)	60	60	61	67	66	67	68	76	69	68	69	68
Humidity (lbs/lb of air)	0.0066	0.0066	0.0068	0.0096	0.0083	0.0084	0.0087	0.0154	0.0091	0.0088	0.0082	0.0081
Measured Emissions												
NOx (ppmv)	23.4	24.0	24.0	26.0	25.0	26.0	26.0	26.0	25.0	25.0	25.0	23.6
NOx (ppm @ 15% O2)	**32.3**	**33.3**	**33.2**	**28.4**	**27.3**	**28.4**	**30.7**	**31.0**	**29.8**	**31.7**	**31.7**	**29.9**
CO (ppmv)	36.5	39.0	38.0	7.0	7.0	6.5	11.0	12.0	12.0	17.0	17.0	20.0
CO (ppmv @15% O2)	**50.4**	**54.1**	**52.5**	**7.6**	**7.6**	**7.1**	**13.0**	**14.3**	**14.3**	**21.6**	**21.6**	**25.4**
O2 (%)	16.63	16.65	16.63	15.50	15.50	15.50	15.90	15.95	15.95	16.25	16.25	16.25
CO2 (%)	2.40	2.40	2.50	3.10	3.10	3.10	2.84	2.80	2.80	2.76	2.80	2.76
Stack Flow Rates (SCFH)												
O2 Stoichiometry	1.87E+06	1.86E+06	1.85E+06	1.75E+06	1.75E+06	1.75E+06	1.77E+06	1.78E+06	1.79E+06	1.81E+06	1.82E+06	1.81E+06
Fuel Fo Factor	1.78	1.77	1.71	1.74	1.74	1.74	1.76	1.77	1.77	1.68	1.66	1.68
Mass Emissions - "F" factor												
NOx (lbs/hr)	5.21	5.34	5.29	5.43	5.23	5.42	5.49	5.53	5.36	5.41	5.44	5.09
CO (lbs/hr)	4.94	5.28	5.10	0.89	0.89	0.82	1.41	1.55	1.56	2.24	2.25	2.62

Testing by Cubix Corporation, Austin, Texas

Example Turbine Template

	A	B	C	D
1	**XXXXXXXXX**			
2	XXXXXX Cogen Facility			
3	GE Frame 7			
4				
5	Date			
6	Test Series	GTO-3	GTO-3	GTO-3
7	Fuel Type	NG	NG	NG
8	**Test Number**	**C-9**	**C-10**	**C-11**
9	Start Time	1020	1240	1329
10	Stop Time	1221	1315	1401
11	**Turbine Operation**			
12	Power (MW)	79.5	78.50	78.5
13	Power Turbine Speed (rpm)	3600	3600	3600
14	Exhaust Temp. (TTXC-°F)	993	994	994
15	Compressor Discharge (psig)	159	159	159
16	Inlet Guide Vanes (degrees)	82	82	82
17	Fuel Flow (lbs/sec)	10.476	10.375	10.422
18	Steam Flow (lbs/sec)	9.677	9.670	9.654
19	Fuel Specific Gravity	0.604	0.604	0.604
20	Fuel Heating Value (Btu/SCF or Btu/lb)	1033	1033	1033
21	Fuel Flow (SCF/hr)	830095	822092	825816
22	**Ambient Conditions**			
23	Barometer (in. Hg)	27.91	27.91	27.91
24	Temperature (°F dry)	49	60	63
25	Temperature (°F wet)	43	59	59
26	Humidity (lbs/lb of air)	0.0048	0.0110	0.0103
27	**Measured Emissions**			
28	NOx (ppmv)	37.5	37	37.0
29	NOx (ppm @ 15% O2)	37.5	37.0	37.4
30	CO (ppmv)	0.7	0.6	0.6
31	O2 (%)	15.00	15.00	15.06
32	CO2 (%)	3.45	3.45	3.45
33	**Stack Flow Rates (SCFH)**			
34	O2 Stoichiometry	2.63E+07	2.61E+07	2.65E+07
35	Pitot Tube-Stack	2.63E+07	2.64E+07	2.58E+07
36	**Mass Emissions (O2 Stoich)**			
37	NOx (lbs/hr)	117.86	115.17	116.88
38	CO (lbs/hr)	1.34	1.14	1.15
39	**Mass Emissions (Pitot-Stack)**			
40	NOx (lbs/hr)	117.95	116.43	114.02
41	CO (lbs/hr)	1.34	1.15	1.12

Testing by Cubix Corporation, Austin, Texas

Example Joint Fire Turbine Template

	A	B	C	D
1	XXXXXXX			
2	XXXXXX			
3	Solar Taurus Turbines W HRSG			
4				
5	Date			
6	Turbine #	TCP-3	TCP-3	TCP-3
7	**Test Number**	**C-13**	**C-14**	**C-15**
8	Start Time	1412	1530	1650
9	Stop Time	1510	1620	1740
10	**Turbine Operation - From Solar Instrumentation**			
11	Power (KW)	3472	3475	3465
12	Power Turbine Speed (%x14951=rpm)	100	100	100
13	T-5 Combustor Temp. (°F)	1400	1400	1400
14	T-1 Air Inlet Temp. (°F)	65.2	64.6	63.9
15	Compressor Discharge (psig)	124	124	124
16	H2O Flow (gal/min)	2.74	2.70	2.70
17	H2O-to-fuel Ratio (lb/lb)	0.592	0.586	0.599
18	Turbine Sensor Relative Hum. (%)	74.9	70.2	67.4
19	Turbine Sensor Pbar (in. Hg)	26.4	26.3	26.3
20	**Ambient Conditions - Collected by Cubix**			
21	Barometer (in. Hg)	26.10	26.05	26.05
22	Temperature (°F dry)	98	100	101
23	Temperature (°F wet)	79	81	82
24	Humidity (lbs/lb of air)	0.0194	0.0211	0.0219
25	**Fuel Flow Data**			
26	Turbine NG Fuel Flow (SCFM)	839.4	840.0	841.3
27	Turbine NG Fuel Flow (SCFH)	50364	50400	50478
28	Turbine NG Fuel Flow (MMBtu/Hr)	51.9	52.0	52.0
29	Fuel Heating Value (Btu/SCF)	1031	1031	1031
30	Fuel Specific Gravity	0.591	0.591	0.591
31	Fuel O2 "F" Factor (DSCF/MMBtu)	8652	8652	8652
32	Duct Burner Fuel Flow (SCFM)	164.4	166.0	165.3
33	Duct Burner Fuel Flow (SCFH)	9864	9960	9918
34	Duct Burner Firing Rate (MMBtu/Hr)	10.2	10.3	10.2
35	**Turbine Only Measured Emissions**			
36	NOx (ppmv)	28.0	28.0	29.0
37	**NOx (ppm @ 15% O2)**	**30.6**	**30.6**	**31.7**
38	CO (ppmv)	4.0	5.0	5.0
39	**CO (ppmv @15% O2)**	**4.4**	**5.5**	**5.5**
40	O2 (%)	15.50	15.50	15.50
41	CO2 (%)	3.10	3.06	3.04
42	continued on next page			
43	**Test Number**	**C-13**	**C-14**	**C-15**
44	**Turbine Only Flow Rates (SCFH)**			
45	O2 Stoichiometry	1.74E+06	1.74E+06	1.74E+06
46	Fuel Fo Factor	1.74	1.76	1.78
47	**Turbine Only Mass Emissions - "F" factor**			
48	NOx (lbs/hr)	5.81	5.82	6.03
49	NOx (lb/MMBtu)	0.11	0.11	0.12
50	CO (lbs/hr)	0.50	0.63	0.63
51	CO (lbs/MMBtu)	0.01	0.01	0.01
52	**Joint Fired Measured Emissions**			
53	NOx (ppmv)	32.0	32.0	33.0
54	**NOx (ppmv @ 15% O2)**	**28.2**	**28.4**	**29.3**
55	CO (ppmv)	6.0	7.0	7.0
56	**CO (ppmv @ 15% O2)**	**5.3**	**6.2**	**6.2**
57	O2 (%)	14.20	14.25	14.25
58	CO2 (%)	3.80	3.70	3.72
59	**Joint Fire Flow Rates (SCFH)**			
60	O2 Stoichiometry	1.68E+06	1.69E+06	1.69E+06
61	Pitot Tube Flow	1.75E+06	1.82E+06	1.77E+06
62	**Joint Fired Mass Emissions - "F" factor**			
63	NOx (lbs/hr)	6.40	6.47	6.67
64	NOx (lb/MMBtu)	0.63	0.63	0.65
65	CO (lbs/hr)	0.73	0.86	0.86
66	CO (lbs/MMBtu)	0.07	0.08	0.08
67	**Joint Fired Mass Emissions - Pitot**			
68	NOx (lbs/hr)	**6.67**	**6.97**	**6.98**
69	NOx (lb/MMBtu)	0.66	0.68	0.68
70	CO (lbs/hr)	**0.76**	**0.93**	**0.90**
71	CO (lbs/MMBtu)	0.07	0.09	0.09
72	**Duct Burner Contribution**			
73	NOx (lbs/hr)	0.59	0.65	0.64
74	NOx (lb/MMBtu)	**0.06**	**0.06**	**0.06**
75	CO (lbs/hr)	0.23	0.23	0.23
76	CO (lbs/MMBtu)	**0.02**	**0.02**	**0.02**
77	**Method 19**			
78	NOx (lb/MMBtu)	0.06	0.07	0.07
79	CO (lbs/MMBtu)	0.02	0.02	0.02

Testing by Cubix Corporation, Austin, Texas

Example Joint Fired Template

	A	B	C	D
1	XXXXXXXX			
2	GTO3 Joint Firing Tests			
3	Date			
4	**Test Number**	**C-12**	**C-13**	**C-14**
5	Start Time	1738	1838	1926
6	Stop Time	1830	1918	1956
7	**Unit Operation**			
8	Power (MW)	76.9	76.5	76.5
9	Average Turbine Exhaust Temperature (°F)	997	996	997
10	Steam Injection (lbs/sec.)	8.990	9.047	9.055
11	Steam/Fuel Ratio (lb/lb)	0.88	0.88	0.88
12	**Turbine NG Fuel Flow (lbs/sec)**	10.244	10.251	10.233
13	Turbine Fuel Flow (MMBtu/hr)	822.50	823.06	821.62
14	Fuel Heating Value (Btu/lb)	22303	22303	22303
15	Fuel O2 F Factor	8666	8666	8666
16	Fuel CO2 F Factor	1032	1032	1032
17	**HRSG Duct Burner Fuel Flow (lb/hr)**	5928	5928.0	5928.0
18	Fuel Heating Value (Btu/lb)	21746	21746	21746
19	Fuel O2 F Factor	8666	8666	8666
20	Fuel CO2 F Factor	1032	1032	1032
21	Duct Burner Firing Rate (MMBtu/hr)	129	129	129
22	**Ambient Conditions**			
23	Barometer (in. Hg)	27.91	27.91	27.91
24	Temperature (°F dry)	63	64	61
25	Temperature (°F wet)	60	61	59
26	Humidity (lbs/lb of air)	0.0110	0.0114	0.0108
27	**Turbine Measured Emissions (dry basis)**			
28	NOx (ppmv)	40.4	40.0	41.1
29	NOx (ppmv @ 15% O2)	40.4	40.0	41.1
30	CO (ppmv)	0.6	0.6	0.6
31	O2 (%)	15.00	15.00	15.00
32	CO2 (%)	3.53	3.51	3.52
33	**Turbine Duct Flow Rates (DSCFH)**			
34	EPA Fo Factor	1.67	1.68	1.68
35	O2 Stoichiometry	2.52E+07	2.53E+07	2.52E+07
36	CO2 Stoichiometry	2.40E+07	2.42E+07	2.41E+07
37	**Turbine Mass Emissions (O2 F Fact.)**			
38	NOx (lbs/hr)	121.80	120.67	123.77
39	NOx (lbs/MMBtu)	0.15	0.15	0.15
40	CO (lbs/hr)	1.10	1.10	1.10
41	CO (lbs/MMBtu)	0.0013	0.0013	0.0013
42	**Turbine Mass Emissions (CO2 F Fact.)**			
43	NOx (lbs/hr)	115.99	115.58	118.21
44	**Joint Fire Measured Emissions (dry basis)**			
45	NOx (ppmv)	41.5	41.3	42
46	CO (ppmv)	3.6	2.9	3.5
47	O2 (%)	13.50	13.7	13.86
48	CO2 (%)	4.28	4.31	4.21
49	**Joint Fire Stack Flow Rates (DSCFH)**			
50	EPA Fo Factor	1.73	1.67	1.67
51	O2 Stoichiometry	2.33E+07	2.39E+07	2.45E+07
52	CO2 Stoichiometry	2.29E+07	2.28E+07	2.33E+07
53	**Joint Fire Mass Emissions (O2 F Fact.)**			
54	NOx (lbs/hr)	115.39	118.09	122.63
55	NOx (lbs/MMBtu)	0.12	0.12	0.13
56	CO (lbs/hr)	6.09	5.04	6.21
57	CO (lbs/MMBtu)	0.006	0.005	0.007
58	**Joint Fire Mass Emissions (CO2 F Fact.)**			
59	NOx (lbs/hr)	113.67	112.40	116.85
60	***Duct Burner Contribution (O2 F Fact.)***			
61	NOx (lbs/hr) via O2 F Factor	-6.41	-2.58	-1.14
62	NOx (lbs/hr) via CO2 F Factor	-2.32	-3.17	-1.36
63	**NOx (lbs/MMBtu O2 F factor)**	**-0.050**	**-0.020**	**-0.009**
64	**NOx (lbs/MMBtu CO2 F factor)**	**-0.018**	**-0.025**	**-0.011**
65	CO (lbs/hr)	4.99	3.94	5.12
66	CO (lbs/MMBtu)	0.039	0.031	0.040
67	**Method 19**			
68	NOx (lbs/MMBtu)	-0.050	-0.020	-0.009
69	CO (lbs/MMBtu)	0.039	0.031	0.040

O2 F Factor Calculation : Example - Natural Gas

Client: XXXXXXXXX
Sample ID: Natural gas fired turbine
Time: XXXXX
Date: XXXXXX

CALCULATION OF DENSITY AND HEATING VALUE

Componen	% 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	0.0000	2.016	0.0053	0.00000	0.0000	61100	0.00	325	0
Oxygen	0.0000	32.000	0.0846	0.00000	0.0000	0	0.00	0	
Nitrogen	1.7400	28.016	0.0744	0.00129	2.8623	0	0.00	0	0
CO2	0.4700	44.01	0.117	0.00055	1.2158	0	0.00	0	0
CO	0.0000	28.01	0.074	0.00000	0.0000	4347	0.00	322	0
Methane	93.9100	16.041	0.0424	0.03982	88.0370	23879	21022.35	1013	951.308
Ethane	3.0900	30.067	0.0803	0.00248	5.4861	22320	1224.49	1792	55.3728
Ethylene	0.0000	28.051	0.0746	0.00000	0.0000	21644	0.00	1614	0
Propane	0.5500	44.092	0.1196	0.00066	1.4544	21661	315.04	2590	14.245
propylene	0.0000	42.077	0.111	0.00000	0.0000	21041	0.00	2336	0
Isobutane	0.0600	58.118	0.1582	0.00009	0.2099	21308	44.72	3363	2.0178
n-butane	0.0900	58.118	0.1582	0.00014	0.3148	21257	66.92	4016	3.6144
Isobutene	0.0000	56.102	0.148	0.00000	0.0000	20840	0.00	3068	0
Isopentane	0.0200	72.144	0.1904	0.00004	0.0842	21091	17.76	4008	0.8016
n-pentane	0.0200	72.144	0.1904	0.00004	0.0842	21052	17.72	3993	0.7986
n-hexane	0.0500	86.169	0.2274	0.00011	0.2514	20940	52.64	4762	2.381
H2S		34.076	0.0911	0.00000	0.0000	7100	0.00	647	0
total	100.00	Average Density		0.04523	100.0000	Gross Heating Value		Gross Heating Value	
		Specific Gravity		0.59122		Btu/lb	22762	Btu/SCF	1031

CALCULATION OF F FACTORS

Componen	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	0		
Oxygen	32	0	0	0.00	0.0000				0
Nitrogen	28.016	0	0	1.74	48.7478	0	0	2.85257	
CO2	44.01	0.272273	0	0.47	20.6847	0.32955963	0		0.87996
CO	28.01	0.42587	0	0.00	0.0000	0	0		0
Methane	16.041	0.75	0.25	93.91	1506.4103	66.1126772	22.037559		
Ethane	30.067	0.8	0.2	3.09	92.9070	4.349294	1.0873235		
Ethylene	28.051	0.85714	0.14286	0.00	0.0000	0	0		
Propane	44.092	0.81818	0.18182	0.55	24.2506	1.16105167	0.2580118		
Propene	42.077	0.85714	0.14286	0.00	0.0000	0	0		
Isobutane	58.118	0.82759	0.17247	0.06	3.4871	0.16887188	0.035193		
n-butane	58.118	0.82759	0.17247	0.09	5.2306	0.25330782	0.0527894		
Isobutene	56.102	0.85714	0.14286	0.00	0.0000	0	0		
Isopentane	72.144	0.83333	0.16667	0.02	1.4429	0.07036026	0.0140724		
n-pentane	72.144	0.83333	0.16667	0.02	1.4429	0.07036026	0.0140724		
n-hexane	86.169	0.83721	0.16279	0.05	4.3085	0.21107445	0.041042		
H2S	34.08	0	0	0.00	0.0000	0	0		
Totals				100.00	1708.9124	72.7265572	23.54	2.85257	0.87996

CALCULATED VALUES		
O2 F Factor (dry)	**8653**	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet)	**10649**	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**1996**	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**18.7**	volume % water in flue gas @ 0% excess air
CO2 F Factor	**1026**	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air

APPENDIX B:
EXAMPLE CALCULATIONS

Turbine Exhaust
Concentration Standards
(40CFR60 Subpart GG and Appendix A, Method 20)

Date:	XXXXX
Plant:	XXXXXXXX Corporation
Stack:	Solar Taurus Turbine TCP-3
Technician:	RK, TS, LI

Calculate NO_x Emission Concentration Standard

For turbines having fuel flows at peak load between 10 and 100 MMBtu/hr:

$$\text{ppmv } NO_x \text{ Standard} = \left\{ 150 \times \left(\frac{13658 \left(\frac{\text{Btu}}{\text{Kw-hr}}\right)}{Y} \right) + F \right\}$$

where:

Y = Measured or manufacturer's rated efficiency in terms of lower heating value of fuel in $\left(\frac{\text{Btu}}{\text{Kw-hr}}\right)$ at actual peak load. (10,180 Btu/Hp-hr = 14.4 Kilojoules/Watt-hr = 13,658 Btu/Kw-hr). "Y" can not be greater than these values.

F = Adjustment to NO_x concentration standard (ppm) according to fuel bound nitrogen content (excluding gaseous N_2).

Y (actual value) = 13284 $\left(\frac{\text{Btu}}{\text{Kw-hr}}\right)$ based on Run C-8 at full load.

$$\text{ppmv } NO_x \text{ Standard} = \left\{ 150 \times \left(\frac{13658 \left(\frac{\text{Btu}}{\text{Kw-hr}}\right)}{13284 \left(\frac{\text{Btu}}{\text{Kw-hr}}\right)} \right) + 0 \right\} = \mathbf{154.2 \ ppmv}$$

NO_x Adjustment to 15% O_2 and NO_x (EPA Corrected)

Date:	XXXXX	
Plant:	XXXXXXXXX	
Stack:	Solar Taurus Turbine TCP-3	
Technician:	RK, TS, LI	
Example Test Run:	C-13	
Measured Concentrations:	NO_x (ppmv)	28.0
	O_2 (%)	15.5

Calculation to Adjust NO_x to 15% O_2

$$NO_x \text{ @ } 15\% \ O_2 = NO_x \text{ measured (ppmv)} \times \left(\frac{5.9}{20.9 - O_2\% \text{ measured}}\right)$$

$$= 28.0 \times \left(\frac{5.9}{20.9 - 15.5\%}\right) = \mathbf{30.6 \text{ ppmv @ } 15\% \ O_2}$$

O_2 Based F Factor Emission Calculations for Natural Gas

Date:	XXXXX
Plant:	XXXXXXXXXX
Stack:	Solar Taurus Turbine TCP-3
Technician:	RK, TS, SB
Example Test Run:	C-13

Measured Concentrations:		
	NO_x (ppmv)	28.0
	O_2 (%)	15.5

Fuel Flow = 50364 $\left(\frac{SCF}{hr}\right)$

Gross Heating Value = 1031 $\left(\frac{Btu}{SCF}\right)$

F_1 Factor = 8652 $\left(\frac{DSCF}{MMBtu}\right)$

Heat Flow Rate Calculation

$$Z_1 \left(\frac{MMBtu}{hr}\right) = \text{Fuel Flow} \left(\frac{SCF}{hr}\right) \times \text{Gross Heating Value} \left(\frac{Btu}{SCF}\right) \times 10^{-6}$$

$$= 50364 \left(\frac{SCF}{hr}\right) \times 1031 \left(\frac{Btu}{SCF}\right) \times 10^{-6}$$

$$= \mathbf{51.96} \left(\frac{\mathbf{MMBtu}}{\mathbf{hr}}\right)$$

Stack Gas Flow Calculation

$$Qd \left(\frac{DSCF}{hr}\right) = \left\{\frac{Z_1 \times F_1 \times 20.9}{20.9 - O_2\%}\right\} = \left\{\frac{52.98 \left(\frac{MMBtu}{hr}\right) \times 8652 \left(\frac{DSCF}{MMBtu}\right) \times 20.9}{20.9 - 15.50\%}\right\}$$

$$= \mathbf{1{,}738{,}793} \left(\frac{\mathbf{DSCF}}{\mathbf{hr}}\right)$$

Emissions in $\left(\frac{lbs}{hr}\right)$ Calculation via O_2 Stoichiometry

$$\left(\frac{lbs}{hr}\right) = \left\{ \text{Conc. (ppmv)} \times 10^{-6} \times \text{M.W.} \left(\frac{lbs}{lb\text{•}mole}\right) \times 385.15^{-1} \left(\frac{lb\text{•}mole}{DSCF}\right) \times Qd \left(\frac{DSCF}{hr}\right) \right\}$$

$$NOx \left(\frac{lbs}{hr}\right) = \left\{ 28.0 \text{ ppmv} \times 10^{-6} \times 46 \left(\frac{lbs}{lb\text{•}mole}\right) \times 385.15^{-1} \left(\frac{lb\text{•}mole}{DSCF}\right) \times 1.74 \times 10^{6} \left(\frac{DSCF}{hr}\right) \right\}$$

$$= \mathbf{5.81} \left(\frac{lbs}{hr}\right)$$

Duct Burner contribution to Emissions

Refers to Test Run C-13

Ebo = Duct Burner contribution (lb/MMBtu)
Qft = fuel flow to turbine = 50,364 SCF/hr
BTUt = heating value of turbine fuel = 1031 BTU/SCF
Hg = heat input to turbine = Qft x BTUt = 51.9 MMBTU/h
Qfb = fuel flow to boiler = 9864 SCF/hr
BTUb = heating value of boiler fuel = 1031 BTU/SCF
Hb = heat input to boiler = Qfb x BTUb = 10.2 MMBTU/hr
Eg = pollutant rate from turbine = 5.81 lbs/hr = 0.11 lbs/MMBTU
Eco = pollutant rate from joint fire =6.4 lbs/hr= .63 lbs/MMBTU

Ebo = (Eco - Eg)/Hb

= (6.4 lb/hr - 5.81 lb/hr)/10.2 MMBtu/hr
= .058 lbs/MMBTU of NOx

*CO emissions calculated using same formula with appropriate CO emissions.

Calculations for Gaseous Emissions QA

Certified Gas Input

Concentration (% or ppmv) = concentration of gas from vendor certification

$$\text{Target (\% Chart)} = \left\{\left(\frac{\text{Concentration} \times 100}{\text{Full Scale}}\right) + \text{zero offset}\right\}$$

$$\text{For 160.9 ppmv } NO_X\text{, Target (\% Chart)} = \left\{\left(\frac{160.9 \times 100}{200}\right) + 2.0\right\} = 82.45$$

Initial Calibration and Linearity Check

Initial (% chart) = observed reading when calibration gas is analyzed

Difference (% chart) = Initial (% chart) – Target (% chart)

For 160.9 NO_X, Difference (% chart) = 83.00 – 82.45 = 0.55

Test Run C-1

$$\text{Average ppmv calculated from strip chart} = (\text{observed} - \text{zero offset}) \times \left\{\frac{\text{Full Scale}}{100}\right\}$$

$$= (14.0 - 2) \times \left\{\frac{200}{100}\right\} = \mathbf{24.0\ ppmv}$$

Calibration Check Run 403.8 ppmv NO_X C-1

Drift (% chart) = Final (% chart) – Target (% chart)

= 83.0 (% chart) – 82.45 (% chart) = 0.55 (% chart)

*The drift is considered to be acceptable within 2% of chart.

APPENDIX C: EXAMPLE QUALITY ASSURANCE ACTIVITIES

Instrumental Analysis
Quality Assurance Data

Date: [redacted]
Plant: [redacted]
Technician: TS

NOx Analyzer: NO2 to NO Converter Efficiency Test

	NOx Concentration (ppm)	% Decrease from Initial Concentration	NO Concentration (ppm)
Initial Concentration	85.0	0.0	66.0
10 minute Concentration	85.6	-0.3	61.0
20 minute Concentration	86.0	-0.2	59.0
30 minute Concentration	86.4	-0.2	56.0

Full Scale: 200

Sample System Bias Check

Parameter	Calibration Gas Concentration (ppm)	Full Scale Span (ppm)	Direct Calibration Response (ppm)	Sample System Response (ppm)	Sample System Bias (% of Span)
NOx	160.9	200	161.0	162.2	0.65
NOx	160.9	200	161.0	161.4	0.25
NOx	160.9	200	160.2	160.8	-0.05
NOx	160.9	200	161.4	161.0	0.05
NOx	160.9	200	161.0	161.2	0.15
NOx	160.9	200	161.6	162.0	0.55

Sample System Leak Check

Run #	in. of mercury (Intial)	in. of mercury (Final)
multipoint	21.0	21.0
C-3	20.0	20.0
C-6	21.0	21.0
C-7	20.5	20.5
C-9	21.5	21.5
C-16	20.5	20.5
C-19	22.0	22.0
C-28	21.0	21.0
C-30 (S.S. A)	21.0	21.0
C-30 (S.S. B)	22.0	22.0

Quality Assurance Worksheet: [redacted]

	CERTIFIED GAS INPUT		INITIAL CALIBRATION & LINEARITY CHECK		TEST RUN C-1	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-2	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)	Initial (% Chart)	Difference (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)
NOx					Avg. ppm			Avg. ppm		
zero	0.00	2.0	2.0	0.0	24.0	2.0	0.0	25.0	2.0	0.0
low	19.70	11.9	11.5	-0.4	% Chart			% Chart		
mid	41.13	22.6	22.0	-0.6	14.0			14.5		
high	160.90	82.5	83.0	0.5		82.8	0.3		83.0	0.5
full scale	200.00				200.0			200.0		
O2					Avg.%			Avg.%		
zero	0.00	10.0	10.0	0.0	16.63	10.0	0.0	16.63	10.0	0.0
low	4.03	26.1	25.2	-0.9	% Chart			% Chart		
mid	7.90	41.6	42.0	0.4						
high	18.10	82.4	82.6	0.2	76.5	82.4	0.0	76.5	82.2	-0.2
full scale	25.00				25.0			25.0		
CO					Avg. ppm			Avg. ppm		
zero	0.00	5.0	5.0	0.0	47.0	5.0	0.0	44.0	5.0	0.0
low	40.17	13.0	12.8	-0.2						
mid	79.71	20.9	20.0	-0.9	% Chart	84.7	0.0	% Chart	84.8	0.1
high	404.00	85.8	85.2	-0.6	52.0			49.0		
full scale	500.00				100.0			100.0		
CO2					Avg.%			Avg.%		
zero	0.00	2.0	2.0	0.0	2.40	1.5	-0.5	2.50	2.2	0.2
low	3.22	18.1	18.0	-0.1	% Chart	18.2	0.1	% Chart	17.8	-0.3
mid	8.07	42.4	42.0	-0.4						
high	18.05	92.3	92.0	-0.3	14.0			14.5		
full scale	20.00				20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet [redacted]/TCP-3

	CERTIFIED GAS INPUT		TEST RUN C-3	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-4	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-5	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	2.0	25.0	2.0	0.0	27.0	2.0	0.0	27.0	2.5	0.5
low	19.70	11.9	% Chart			% Chart			% Chart		
mid	41.13	22.6	14.5			15.5			15.5		
high	160.90	82.5		82.5	0.0		82.2	-0.3		82.2	-0.3
full scale	200.00		200.0			200.0			200.0		
O2			Avg.%			Avg.%			Avg.%		
zero	0.00	10.0	16.65	10.0	0.0	16.18	10.0	0.0	16.18	10.0	0.0
low	4.03	26.1	% Chart			% Chart			% Chart		
mid	7.90	41.6									
high	18.10	82.4	76.6	82.3	-0.1	74.7	82.4	0.0	74.7	82.5	0.1
full scale	25.00		25.0			25.0			25.0		
CO			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	5.0	47.0	5.0	0.0	20.0	5.0	0.0	19.5	5.0	0.0
low	40.17	13.0									
mid	79.71	20.9	% Chart	84.7	0.0	% Chart	84.8	0.1	% Chart	84.8	0.1
high	404.00	85.8	52.0			25.0			24.5		
full scale	500.00		100.0			100.0			100.0		
CO2			Avg.%			Avg.%			Avg.%		
zero	0.00	2.0	2.50	2.2	0.2	2.70	1.8	-0.2	2.70	2.1	0.1
low	3.22	18.1	% Chart	17.5	-0.6	% Chart	17.8	-0.3	% Chart	18.1	0.0
mid	8.07	42.4									
high	18.05	92.3	14.5			15.5			15.5		
full scale	20.00		20.0			20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet: [redacted] TCP-3

	CERTIFIED GAS INPUT		TEST	ZERO and SPAN CALIBRATION CHECK		TEST	ZERO and SPAN CALIBRATION CHECK		TEST	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)	RUN C-6	Final (% Chart)	Drift (% Chart)	RUN C-7	Final (% Chart)	Drift (% Chart)	RUN C-8	Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	2.0	27.0	2.4	0.4	30.0	2.2	0.2	30.0	2.0	0.0
low	19.70	11.9	% Chart			% Chart			% Chart		
mid	41.13	22.6	15.5			17.0			17.0		
high	160.90	82.5		82.8	0.3		82.9	0.5		84.0	1.6
full scale	200.00		200.0			200.0			200.0		
O2			Avg.%			Avg.%			Avg.%		
zero	0.00	10.0	16.18	10.0	0.0	15.50	10.0	0.0	15.50	10.1	0.1
low	4.03	26.1	% Chart			% Chart			% Chart		
mid	7.90	41.6									
high	18.10	82.4	74.7	82.3	-0.1	72.0	82.6	0.2	72.0	82.4	0.0
full scale	25.00		25.0			25.0			25.0		
CO			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	5.0	20.0	5.2	0.2	19.5	5.0	0.0	6.5	5.0	0.0
low	40.17	13.0									
mid	79.71	20.9	% Chart	84.6	-0.1	% Chart	84.5	-0.2	% Chart	84.7	0.0
high	404.00	85.8	25.0			24.5			11.5		
full scale	500.00		100.0			100.0			100.0		
CO2			Avg.%			Avg.%			Avg.%		
zero	0.00	2.0	2.70	2.0	0.0	3.16	2.4	0.4	2.90	2.0	0.0
low	3.22	18.1	% Chart	18	-0.1	% Chart	17.4	-0.7	% Chart	17	-1.1
mid	8.07	42.4									
high	18.05	92.3	15.5			17.8			16.5		
full scale	20.00		20.0			20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet: [redacted] TCP-3

	CERTIFIED GAS INPUT		TEST	ZERO and SPAN CALIBRATION CHECK		TEST	ZERO and SPAN CALIBRATION CHECK		TEST	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)	RUN C-9	Final (% Chart)	Drift (% Chart)	RUN C-10	Final (% Chart)	Drift (% Chart)	RUN C-11	Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	2.0	31.0	2.1	0.1	28.0	2.0	0.0	28.0	2.2	0.2
low	19.70	11.9	% Chart			% Chart			% Chart		
mid	41.13	22.6	17.5			16.0			16.0		
high	160.90	82.5		83.0	0.5		82.8	0.3		83.2	0.8
full scale	200.00		200.0			200.0			200.0		
O2			Avg.%			Avg.%			Avg.%		
zero	0.00	10.0	15.50	10.1	0.1	16.00	10.1	0.1	16.00	10.1	0.1
low	4.03	26.1	% Chart			% Chart			% Chart		
mid	7.90	41.6									
high	18.10	82.4	72.0	82.4	0.0	74.0	82.3	-0.1	74.0	82	-0.4
full scale	25.00		25.0			25.0			25.0		
CO			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	5.0	6.0	5.0	0.0	15.0	5.0	0.0	14.0	5.0	0.0
low	40.17	13.0									
mid	79.71	20.9	% Chart	84.5	-0.2	% Chart	84.3	-0.4	% Chart	84.4	-0.3
high	404.00	85.8	11.0			20.0			19.0		
full scale	500.00		100.0			100.0			100.0		
CO2			Avg.%			Avg.%			Avg.%		
zero	0.00	2.0	2.90	2.0	0.0	2.80	2.0	0.0	2.80	2.2	0.2
low	3.22	18.1	% Chart	17	-1.1	% Chart	18	-0.1	% Chart	17.5	-0.6
mid	8.07	42.4									
high	18.05	92.3	16.5			16.0			16.0		
full scale	20.00		20.0			20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet [redacted]/TCP-3

	CERTIFIED GAS INPUT		TEST RUN C-12	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-13 (TO)	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-13 (JF)	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	2.0	27.6	2.1	0.1	28.0	2.1	0.1	32.0	2.1	0.1
low	19.70	11.9	% Chart			% Chart			% Chart		
mid	41.13	22.6	15.8			16.0			18.0		
high	160.90	82.5		83.0	0.5		83.2	0.8		83.2	0.8
full scale	200.00		200.0			200.0			200.0		
O2			Avg.%			Avg.%			Avg.%		
zero	0.00	10.0	16.00	10.0	0.0	15.50	10.0	0.0	14.20	10.0	0.0
low	4.03	26.1	% Chart			% Chart			% Chart		
mid	7.90	41.6									
high	18.10	82.4	74.0	82	-0.4	72.0	82.3	-0.1	66.8	82.3	-0.1
full scale	25.00		25.0			25.0			25.0		
CO			Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.00	5.0	14.5	5.0	0.0	4.0	5.1	0.1	6.0	5.1	0.1
low	40.17	13.0									
mid	79.71	20.9	% Chart	84.4	-0.3	% Chart	84.5	-0.2	% Chart	84.5	-0.2
high	404.00	85.8	19.5			9.0			11.0		
full scale	500.00		100.0			100.0			100.0		
CO2			Avg.%			Avg.%			Avg.%		
zero	0.00	2.0	2.80	2.0	0.0	3.10	2.5	0.5	3.80	2.5	0.5
low	3.22	18.1	% Chart	18	-0.1	% Chart	17.5	-0.6	% Chart	17.5	-0.6
mid	8.07	42.4									
high	18.05	92.3	16.0			17.5			27.3		
full scale	20.00		20.0			20.0			15.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet: [redacted] TCP-3

	CERTIFIED GAS INPUT		TEST RUN C-14 (TO)	ZERO and SPAN CALIBRATION CHECK		TEST RUN C-14 (JF)	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm		
zero	0.00	2.0	28.0	2.2	0.2	32.0	2.2	0.2
low	19.70	11.9	% Chart			% Chart		
mid	41.13	22.6	16.0			18.0		
high	160.90	82.5		83.0	0.5		83.0	0.5
full scale	200.00		200.0			200.0		
O2			Avg.%			Avg.%		
zero	0.00	10.0	15.50	10.0	0.0	14.25	10.0	0.0
low	4.03	26.1	% Chart			% Chart		
mid	7.90	41.6						
high	18.10	82.4	72.0	82.0	-0.4	67.0	82.0	-0.4
full scale	25.00		25.0			25.0		
CO			Avg. ppm			Avg. ppm		
zero	0.00	5.0	5.0	5.1	0.1	7.0	5.1	0.1
low	40.17	13.0						
mid	79.71	20.9	% Chart	84.6	-0.1	% Chart	84.6	-0.1
high	404.00	85.8	10.0			12.0		
full scale	500.00		100.0			100.0		
CO2			Avg.%			Avg.%		
zero	0.00	2.0	3.06	2.1	0.1	3.70	2.1	0.1
low	3.22	18.1	% Chart	18	-0.1	% Chart	18	-0.1
mid	8.07	42.4						
high	18.05	92.3	17.3			20.5		
full scale	20.00		20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Quality Assurance Worksheet: [redacted] TCP-3

	CERTIFIED GAS INPUT		TEST	ZERO and SPAN CALIBRATION CHECK		TEST	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)	RUN C-15 (TO)	Final (% Chart)	Drift (% Chart)	RUN C-15 (JF)	Final (% Chart)	Drift (% Chart)
NOx			Avg. ppm			Avg. ppm		
zero	0.00	2.0	29.0	2.0	0.0	33.0	2.2	0.2
low	19.70	11.9	% Chart			% Chart		
mid	41.13	22.6	16.5			18.5		
high	160.90	82.5		82.6	0.1		82.6	0.1
full scale	200.00		200.0			200.0		
O2			Avg.%			Avg.%		
zero	0.00	10.0	15.55	10.0	0.0	14.25	10.0	0.0
low	4.03	26.1	% Chart			% Chart		
mid	7.90	41.6						
high	18.10	82.4	72.2	82.4	0.0	67.0	82.4	0.0
full scale	25.00		25.0			25.0		
CO			Avg. ppm			Avg. ppm		
zero	0.00	5.0	5.0	5.1	0.1	7.0	5.1	0.1
low	40.17	13.0						
mid	79.71	20.9	% Chart	84.6	-0.1	% Chart	84.4	-0.3
high	404.00	85.8	10.0			12.0		
full scale	500.00		100.0			100.0		
CO2			Avg.%			Avg.%		
zero	0.00	2.0	3.04	2.0	0.0	3.72	2.0	0.0
low	3.22	18.1	% Chart	17.9	-0.2	% Chart	17.9	-0.2
mid	8.07	42.4						
high	18.05	92.3	17.2			20.6		
full scale	20.00		20.0			20.0		

Testing by CUBIX CORPORATION of Austin, Texas

Thermo Electron CORPORATION

Richard A. Curran
Regional Sales Manager

Environmental Instruments Division

108 South Street
Hopkinton, Massachusetts 01748
(617) 435-5321

INTERFERENCE RESPONSE TEST

DATE OF TEST JAN 18, 1980

ANALYZER TYPE 10AR RANGE 0-25PPM SERIAL NO. 10AR-014B-80

TEST GAS TYPE	CONCENTRATION PPM	ANALYZER OUTPUT RESPONSE	% OF SPAN
CO	500	< .1 PPM	< .1%
CO_2	201	< .1 PPM	< .1%
CO_2	10%	< .1 PPM	< .1%
O_2	20.9%	< .1 PPM	< .1%

Continous Emission Analyzer Interference Response Tests

Date: 7/8/88
Technician: KRB / MM

Analyzer Type: Thermo Environmental
Analyzer Model: Model 48 Gas Filter Correlation Analyzer
Serial Number: 48-23576-210
Analyzer Test Range: 0-20 ppmv

Test Gas		Analyzer Response		Response Ratio	
Type Gas	Concentration	Concentration (PPMv)	% of Range		
Air	CO Free	0.0	N/A		
CO_2/O_2	4% / 18%	0.0		0.000	PPMv/%
CO_2/O_2	12% / 8%	-0.2		-0.017 / -0.025	PPMv/%
CO_2/O_2	21% / 3%	-0.3		-0.014 / -0.100	PPMv/%
Air	Dry	0.4		CO Impurity?	
NOx	176 ppmv	0.4		0.002	PPMv/PPMv
NOx	3030 ppmv	0.4		0.0001	PPMv/PPMv
SO_2	401 ppmv	-0.2		0.0005	PPMv/PPMv
Propane	240 ppmv	0.4		0.002	PPMv/PPMv

all interferences are negligable

Response Time Data Sheet

Date: 6-30-92
Location: _
Technician: RK, LI, TS
Sample Manifold: 3.0 psig
Pump Model: G-3 Dia-Pump
Sample Line Length 100' ft.
Heat Trace Length 90' ft.
Condenser Design: Aglon #5

Analyzer Type:	NO_x	O_2	
Make/Model:	TECO 10 AR	Servomex 1400	
Range:	0-200 ppm	0-20%	
Span Gas:	Stack gas (TCP-3)	Stack Gas (TCP-3)	

Upscale Response:

Trial 1	.84 min	.91 min	
Trial 2	.86 min	.93 min	
Trial 3	.89 min	.93 min	
Average	.86 min.	.92 min	

Downscale Response:

Trial 1	.89 min	.93 min	
Trial 2	.86 min	.96 min	
Trial 3	.89 min	.98 min	
Average	.88 min	.96 min	

Comments:

APPENDIX D: EXAMPLE CALIBRATION CERTIFICATIONS

RECEIVED DEC 17 1992

Matheson Gas Products
World Leader in Specialty Gases & Equipment

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

CUSTOMER: WILSON OXYGEN AND SUPPLY

REFERENCE #: 109-16269

CYLINDER #: SX-25924

PROTOCOL: 1

CYLINDER PRESSURE: 1800

LAST ANALYSIS DATE: 12/14/92

EXPIRATION DATE: 06/14/94

REPLICATE CONCENTRATIONS

COMPONENT : NITRIC OXIDE	DATE: 12/07/92	DATE: 12/14/92
MEAN CONC : 6.82 PPM	6.86 PPM	6.83PPM
	6.89 PPM	6.78PPM
	6.79 PPM	6.72PPM
COMPONENT : NITROGEN DIOXIDE	DATE: / /	DATE: / /
MEAN CONC : 0.25 PPM		
COMPONENT :	DATE: / /	DATE: / /
MEAN CONC :		

BALANCE GAS: NITROGEN

ACCEPTED BY

WILSON OXYGEN

REFERENCE STANDARDS

SRM # : 2628A

CYLINDER # : CLM-4176

CONCENTRATION: 9.75 PPM

1650 Enterprise Parkway
P.O. Box 358
Twinsburg, Ohio 44087
Phone: (216) 425-4406
Toll Free: (800) 426-9427

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

10-Aug-92
BIG THREE INDUSTRIES

P.O. NO.: 128072992
AUSTIN, TX

CERTIFICATION OF CYLINDER # CC-115214

COMPONENT:	MEAN CONCENTRATION:
NITRIC OXIDE	19.3 +/- 1.3 ppm
Total NOx	19.9 ppm
NITROGEN	BALANCE

Cylinder pressure:	1800 psig
Expiration date:	10-Feb-94

This mixture was prepared and analyzed following EPA Revised Traceability Protocol No.1, Section 3.0.4, per Procedure G1. The concentration of the Nitric Oxide was determined by direct comparison with NIST SRM 1683b, Sample No.:45-12-P, S/N CLM-2231, 47.6 +/- 0.7 ppm Nitric Oxide in Nitrogen, dated October 31, 1991. The analysis was performed on a Beckman 951A chemiluminescent-type analyzer measuring the reaction of Nitric Oxide with Ozone. S/N 00100508, 0-100 ppm range. The last multipoint calibration was done on August 3, 1992.

Authorized signature

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (213) 492-5300 • Fax (213) 492-5349

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

10-Aug-92
BIG THREE INDUSTRIES

P.O. NO.: 128072992
AUSTIN, TX

CERTIFICATION OF CYLINDER # CC-115228

COMPONENT:	MEAN CONCENTRATION:
NITRIC OXIDE	41.2 +/- 1.3 ppm
Total NOx	42.6 ppm
NITROGEN	BALANCE

Cylinder pressure:	1800 psig
Expiration date:	10-Feb-94

This mixture was prepared and analyzed following EPA Revised Traceability Protocol No.1, Section 3.0.4, per Procedure G1. The concentration of the Nitric Oxide was determined by direct comparison with NIST SRM 1683b, Sample No.:45-12-P, S/N CLM-2231, 47.6 +/- 0.7 ppm Nitric Oxide in Nitrogen, dated October 31, 1991. The analysis was performed on a Beckman 951A chemiluminescent-type analyzer measuring the reaction of Nitric Oxide with Ozone. S/N 00100508, 0-100 ppm range. The last multipoint calibration was done on August 3, 1992.

Authorized signature

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (213) 492-5300 • Fax (213) 492-5349

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CUBIX CORPORATION

9225 LOCKHART HWY
AUSTIN TX 78747

Assay Laboratory
Scott Specialty Gases, Inc.

1290 Combermere
Troy, MI 48083

Purchase Order JOHN WETHEROLD
Scott Project # 550913

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure # G1, Section Number 3.0.4

Cylinder Number ALM005440
Cylinder Pressure 1900 psig

Certification Date 5-17-93
Previous Certification Dates None

General Exp. Date 5-17-95
Acid Rain Exp. Date 11-17-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Nitric Oxide	80.10 ppm	±1% NIST Directly Traceable
Total Oxides of Nitrogen	80.80 ppm	Reference Value Only

Balance Gas: Nitrogen

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
SRM 1684B	1-6-94	CIM002155	95.10 ppm NO in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
NO: Horiba/OPE-235/483814	4-12-93	Chemiluminescence

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components: Nitric Oxide

First Triad Analysis

Date: 5-10-93 Response Units: mv

Z1=0.00	R1=95.10	T1=80.00
R2=95.10	Z2=0.00	T2=80.00
Z3=0.00	T3=80.00	R3=95.10

Avg. Conc. of Cust. Cyl. 80.00 ppm

Second Triad Analysis

Date: 5-17-93 Response Units: mv

Z1=0.00	R1=95.10	T1=80.20
R2=95.10	Z2=0.00	T2=80.20
Z3=0.00	T3=80.20	R3=95.10

Avg. Conc. of Cust. Cyl. 80.20 ppm

Calibration Curve

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

r=0.99999	SRM 1684B
Constants:	A=-0.000967384
B=1.000115	C=0
D=0	E=0

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

F. P. Doran

Analyst Frank P. Doran

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (313) 589-2950 FAX: (313) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CUBIX CORPORATION
9225 LOCKHART HWY
AUSTIN, TX, 78747

Assay Laboratory
Scott Specialty Gases, Inc.
1290 Combermere
Troy, MI 48083

Purchase Order 93401
Scott Project # 553985

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure # G1, Section Number 3.0.4

Cylinder Number	ALM038818	**Certification Date**	8-9-93	**General Exp. Date**	8-9-95
Cylinder Pressure	1900 psig	**Previous Certification Dates**	None	**Acid Rain Exp. Date**	8-9-95

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Nitric Oxide	160.4 ppm	±1% NIST Directly Traceable
Total Oxides of Nitrogen	160.4 ppm	Reference Value Only
Balance Gas: Nitrogen		

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM	3-5-97	ALM024135	244.7 PPM NO/N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
NO: Beckman/951A/270-082899B	6-21-93	Chemiluminescence

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components: Nitric Oxide

First Triad Analysis

Date: 8-2-93 Response Units: mv

Z1=0.00	R1=97.80	T1=64.10
R2=97.80	Z2=0.00	T2=64.10
Z3=0.00	T3=64.10	R3=97.80

Avg. Conc. of Cust. Cyl. 160.4 ppm

Second Triad Analysis

Date: 8-9-93 Response Units: mv

Z1=0.00	R1=97.80	T1=64.10
R2=97.80	Z2=0.00	T2=64.10
Z3=0.00	T3=64.10	R3=97.80

Avg. Conc. of Cust. Cyl. 160.4 ppm

Calibration Curve

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

r=0.99999	SRM 1685
Constants:	A=0.008456338
B=2.502916	C=0
D=0	E=0

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Concentration=$A+Bx+Cx^2+Dx^3+Ex^4$

Special Notes
If this product is used for Acid Rain Rule Compliance, the *Acid Rain Expiration Date* noted above applies per 40 CFR Part 75, Appendix H. Otherwise, the *General Expiration Date* applies.

Tim Sanderson
Analyst Tim Sanderson

Scott Specialty Gases, Inc.
1290 COMBERMERE STREET TROY, MI 48083 PHONE: (313) 589-2950 FAX NO: (313) 589-2134

CUBIX CORPORATION
9225 LOCKHART HWY
AUSTIN TX 78747

Date: 2/3/92

Our Project No.: 052883

Your P.O. No.: 910471

Gentlemen:

Thank you for choosing Scott for your Specialty gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. ALM018473 Analytical Accuracy +/-1%

Component	Concentration
CARBON MONOXIDE	79.71ppm
METHANE	79.64ppm
BALANCE	AIR
ACUBLEND MASTER GAS	

Cyl. No. AAL20862 Analytical Accuracy +/-1%

Component	Concentration
CARBON MONOXIDE	8.066ppm
METHANE	7.998ppm
BALANCE	AIR
ACUBLEND MASTER GAS	

Cyl. No. ALM016314 Analytical Accuracy +/-1%

Component	Concentration
CARBON MONOXIDE	40.17ppm
METHANE	39.77ppm
BALANCE	AIR
ACUBLEND MASTER GAS	

Cyl. No. _____ Analytical Accuracy _____

Component	Concentration

Analyst _____ Approved _____

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases, Inc.

Shipped From: 3714 LAPAS DRIVE
HOUSTON TX 77023
Phone: 713-644-4820 Fax: 713-644-0244

CERTIFICATE OF ANALYSIS

CUBIX CORPORATION

9225 LOCKHART HWY

AUSTIN TX 78747

PROJECT #: 04-19430
PO#: 82373
ITEM #: 04024211 1AL
DATE: 9/01/92

CYLINDER #: ALM003153 ANALYTICAL ACCURACY: +/- 1%

COMPONENT	REQUESTED GAS CONC	MOLES	ANALYSIS (MOLES)	MOLES
CARBON MONOXIDE	15.	PPM	15.0	PPM
METHANE	15.	PPM	14.8	PPM
AIR		BAL		BAL

ANALYTICAL METHOD: GRAV.MASTER GAS

ANALYST: _____ APPROVED BY: _____

ANALYST SUPERVISOR

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

ALPHAGAZ

SPECIALTY GAS DIVISION

P.O. Box 1026
11426 Fairmont Pkwy.
La Porte, Texas 77571

Phone (713) 474-8400
Fax (713) 474-8419
USA (800) 248-1427

25 August 1992

Customer: BIG 3 AUSTIN

P.O. Number : 1280729928
AGZ Document: #1425283

Valve Type ..: CGA 590

CERTIFICATION OF CYLINDER # CC79058

Component	MOLE %
METHANE	2.1 PPM
CARBON MONOXIDE	2.8 PPM
AIR	BALANCE

Re-certification date: 25 August 1993

Prepared By: Mary Payne

Scott Specialty Gases, Inc.

3714 LAPAS DRIVE, HOUSTON, TX 77023-0000
PHONE: 713-644-4820 FAX: 713-644-0244

10/14/91

CUBIX CORPORATION
9225 LOCKHART HWY

AUSTIN TX 78747-0000

PROJECT #: 04-13615
PO #: 910471

CYLINDER #: AAL13947

ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION		ANALYSIS (MOLES)	U/M
CARBON DIOXIDE	3.2	PCT	3.22	PCT
OXYGEN	18.0	PCT	18.10	PCT
NITROGEN	BALANCE		BALANCE	

NOTES:

ANALYTICAL METHOD: ACUBLEND MASTER

DATE OF ANALYSIS: 10/14/91

ANALYST: _____ ANALYST

APPROVED BY: John Lempe SUPERVISOR

Scott Specialty Gases, Inc.

3714 LAPAS DRIVE, HOUSTON, TX 77023-0000
PHONE: 713-644-4820 FAX:713-644-0244

10/14/91

CUBIX CORPORATION
9225 LOCKHART HWY

PROJECT #: 04-13615
PO #: 910471

AUSTIN TX 78747-0000

CYLINDER #: AAL268

ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION	ANALYSIS 1 (MOLES) U/M
ARBON DIOXIDE	8.0 PCT	8.07 PCT
GEN	8.0 PCT	7.90 PCT
ROGEN	BALANCE	BALANCE

NOTES:

ANALYTICAL METHOD: ACUBLEND MASTER

DATE OF ANALYSIS: 10/14/91

ANALYST: _____ ANALYST

APPROVED BY: John Lempe SUPERVISOR

Scott Specialty Gases, Inc.

3714 LAPAS DRIVE, HOUSTON, TX 77023-0000
PHONE: 713-644-4820 FAX:713-644-0244

10/14/91

CUBIX CORPORATION
9225 LOCKHART HWY

AUSTIN TX 78747-0000

PROJECT #: 04-13615
PO #: 910471

CYLINDER #: AAL20488

ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION	ANALYSIS 1 (MOLES) U/M
CARBON DIOXIDE	18.0 PCT	18.05 PCT
OXYGEN	4.0 PCT	4.03 PCT
NITROGEN	BALANCE	BALANCE

NOTES:

ANALYTICAL METHOD: ACUBLEND MASTER

DATE OF ANALYSIS: 10/14/91

ANALYST: John D. McCulloch
ANALYST

APPROVED BY: John Lempe
SUPERVISOR

APPENDIX E:
PROPOSED TEST SCHEDULE

TEST SCHEDULE NOT DETERMINED YET

APPENDIX F:
PLOT PLAN, STACK DIAGRAM
STACK TRAVERSE LAY-OUTS

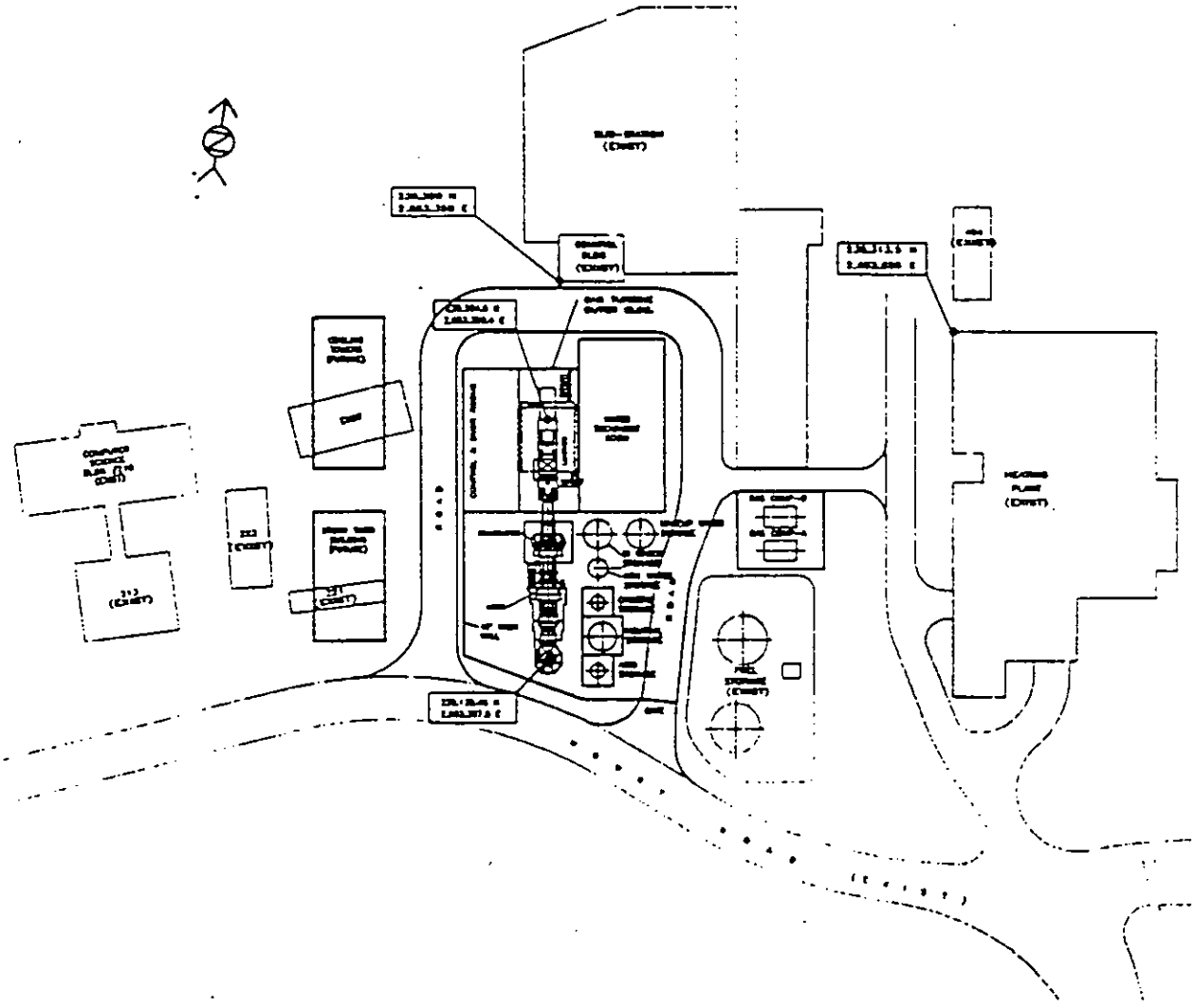
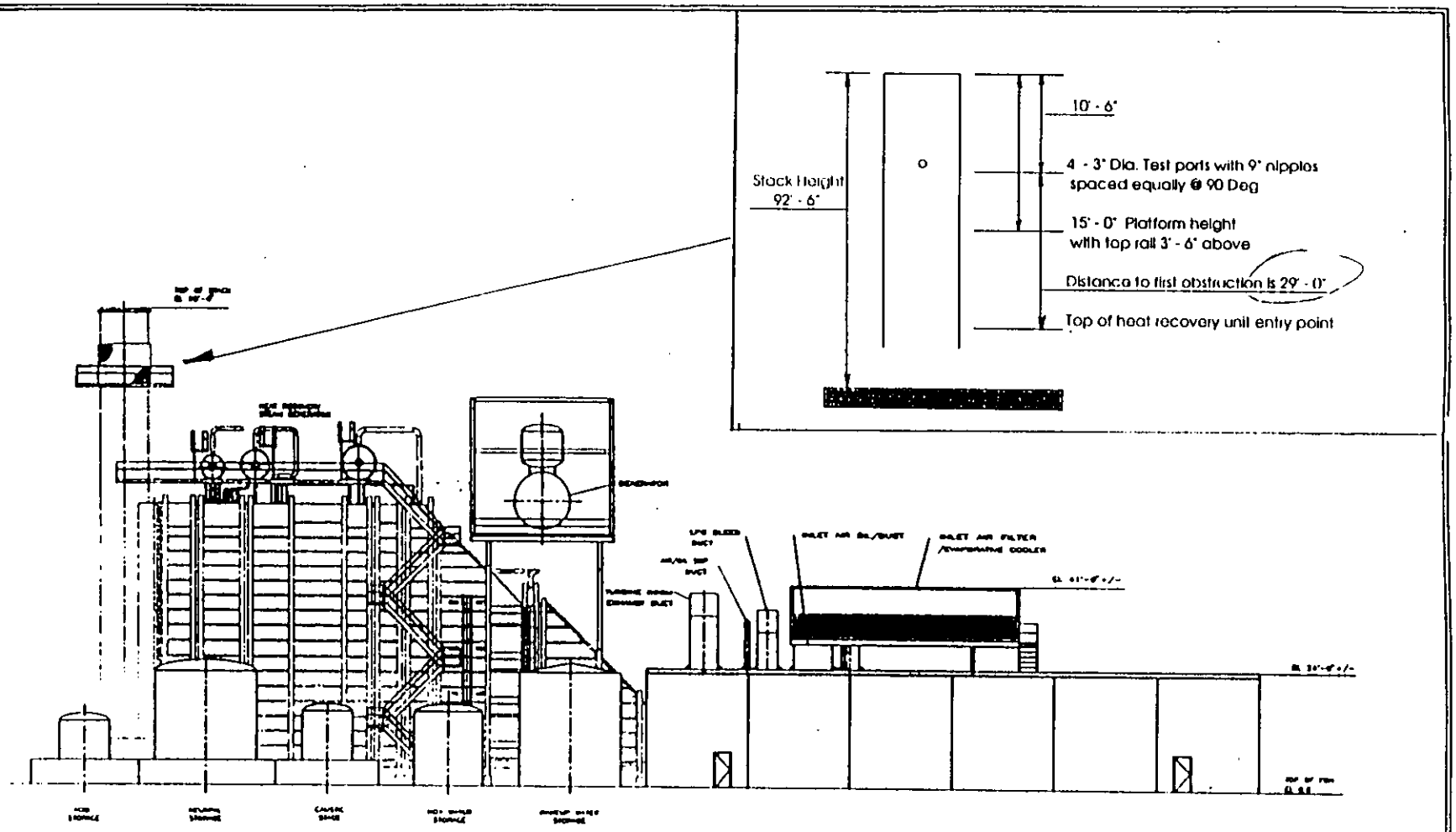


Figure 5. Site Plan of the University of Florida Co-Generation Unit

Florida Power
CORPORATION

Figure 6. Stack sampling port location
University of Florida Co-Gen Unit



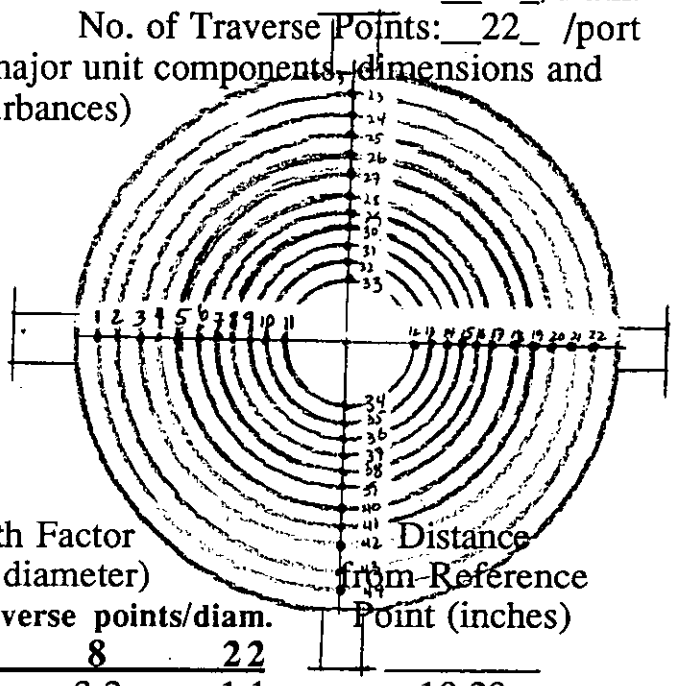
Florida Power
CORPORATION

Circular Stack Sampling Traverse Point Layout
(EPA Method 1)

Date:_____
Plant: FPC : University of Florida
Source: GE LM-6000
Technician(s):_____

Port + Stack ID:_____126_____in.
Port Extension:_____9_____in.
Stack ID:_____117_____in.
Stack Area:_____74.66_____ft^2
Total Req'd Traverse Points:__44__
No. of Traverse Points:__22_/diam.
No. of Traverse Points:__22_ /port

Stack Diagram (Side View showing major unit components, dimensions and nearest upstream and downstream disturbances)



Traverse Point Number	Length Factor (% of diameter) Number of traverse points/diam. 4	6	8	22	Distance from Reference Point (inches)
1	6.7	4.4	3.2	1.1	10.29
2	25.0	14.6	10.5	3.5	13.10
3	75.0	29.6	19.4	6.0	16.02
4	93.3	70.4	32.3	8.7	19.18
5		85.4	67.7	11.6	22.57
6		95.6	80.6	14.6	26.08
7			89.5	18.0	30.06
8			96.8	21.8	34.51
9				26.2	39.65
10				31.5	45.86
11				39.3	54.98
12				60.7	80.02
				68.5	89.15
				73.8	95.35
				78.2	100.05
				82.0	104.94
				85.4	108.92
				88.4	112.43
				91.3	115.82
				94.0	118.98
				96.5	121.91
				98.9	124.71

Table 4 University of Florida Co-Generation Data

Address:

Mowry Road, Building No. 82
University of Florida
Gainesville, Florida

Unit Description:

One Combustion Turbine(CT) and one Heat Recovery Steam Generator(HRSG) is under construction at this site.

The CT unit is a General Electric Model LM 6000 and fired by natural gas with steam injection for NO_x control to 25 PPMVD at 15% oxygen.

The CT is rated at 43.3 MW on natural gas.

The HRSG unit operates on the CT exhaust gases and is supplementally fired on natural gas using duct burners to generate steam only.

Exhaust Stack Information:

Height:	93 Ft.
Diameter:	9.75 Ft. (Round stack)
Gas Flow:	325,200 ACFM
Velocity	72.6 FPS
Exit Temp.:	257 ^{o} F (combine output of both CT & HRSG units)

Drawings:

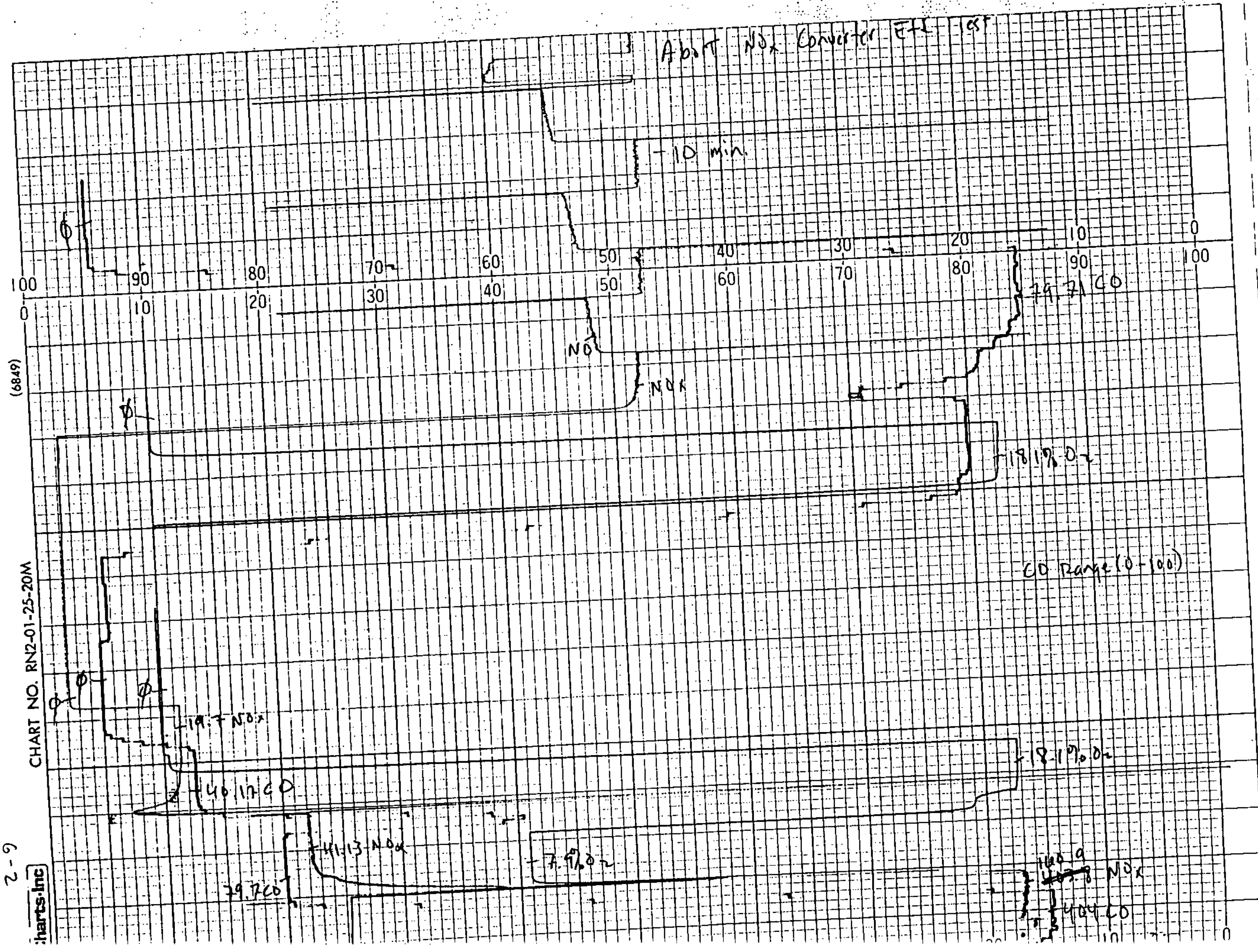
The location of the site is shown in Figure 4.
The site layout is shown in Figure 5.
The exhaust stack test port location is shown in Figure 6.

Authorized Air Permit:

The Florida Department of Environmental Regulation (FDER) Air Construction Permit No. is AC 01-204652.

APPENDIX G:
EXAMPLE STRIP CHART RECORDS

NOX, CO, O_2


Abort NOx Converter Eff test
10 min
NO
NOx
79.71 CO
18.1% O2
CO Range (0-100)
19.7 NOx
40.17 CO
41.13 NOx
7.9% O2
79.7 CO
140.9 NOx
404 CO
(6849)
CHART NO. RN2-01-25-20M
Charts-Inc

6-2

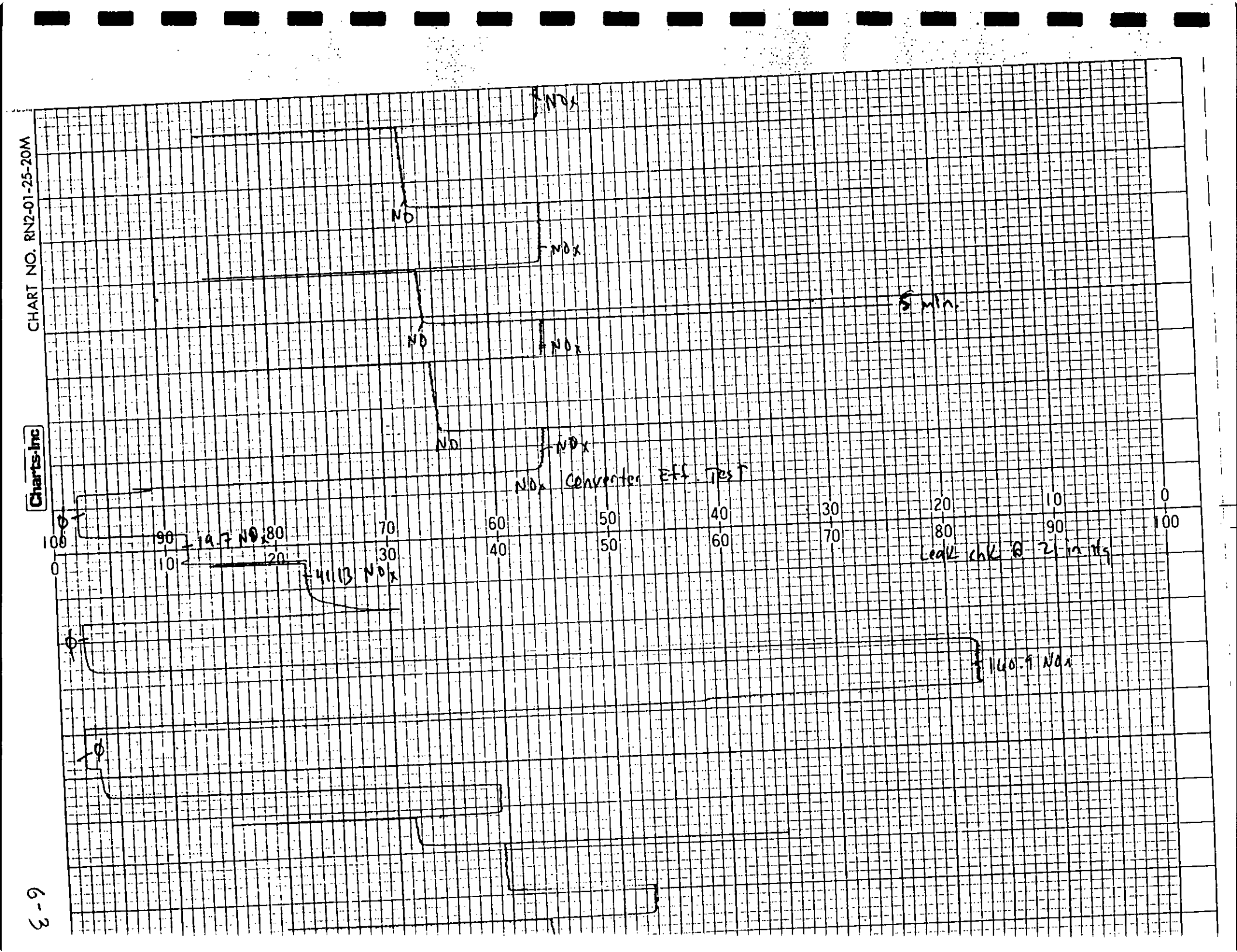
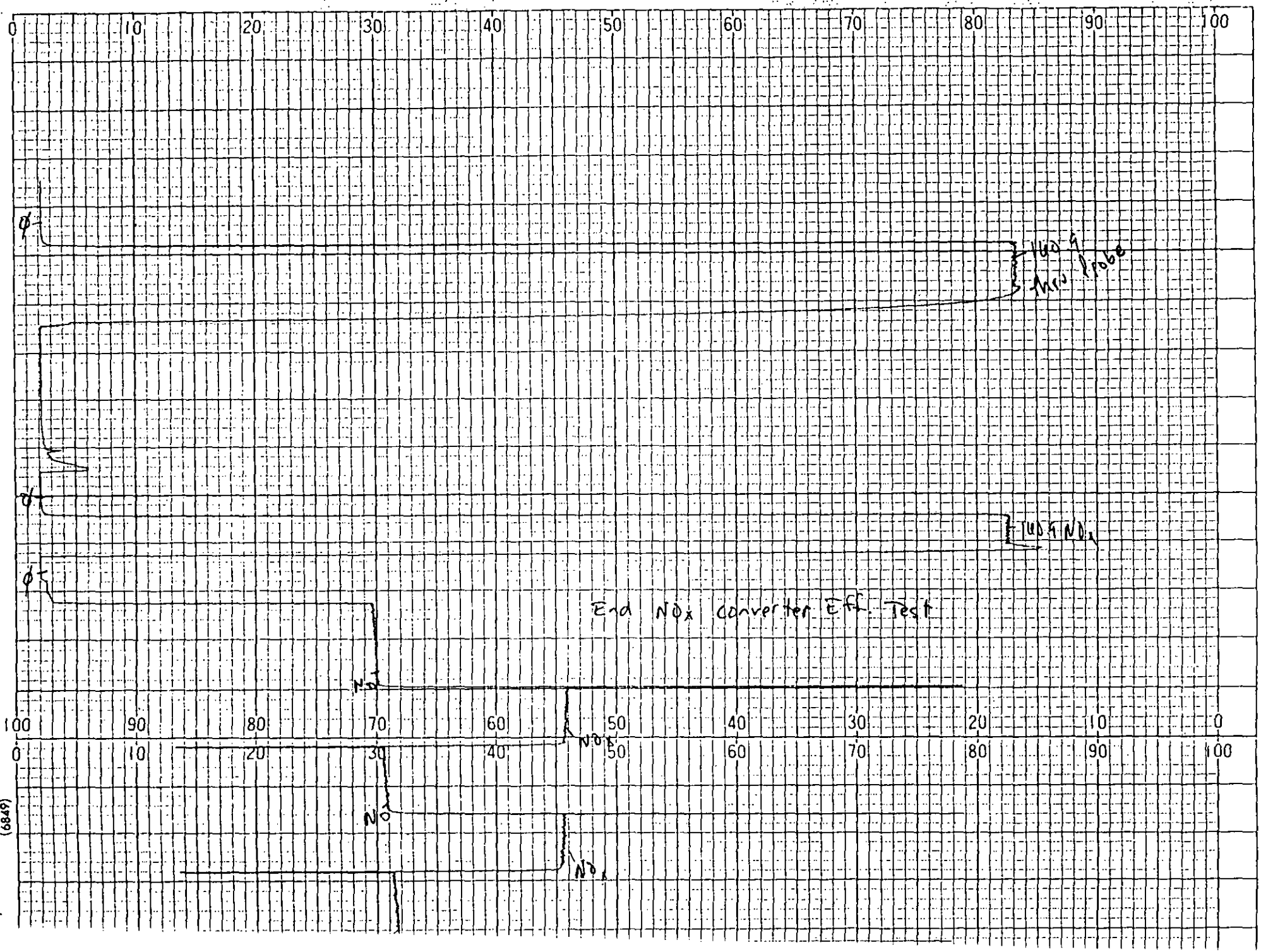
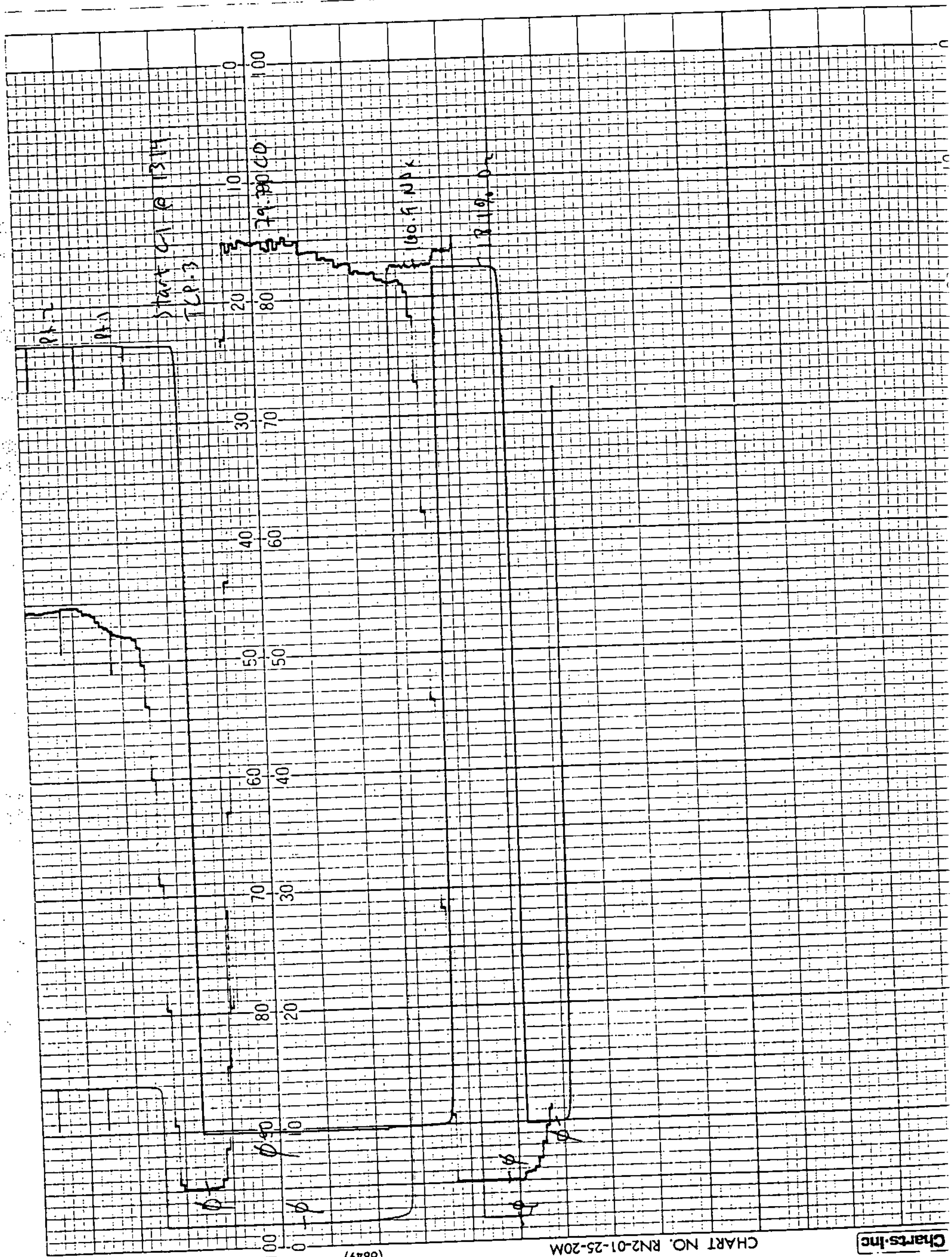


CHART NO. RN2-01-25-20M
Charts-Inc
NOx
NO
NOx
NO
NOx
NO
NOx
NOx Converter Eff. Test
5 min.
19.7 NOx
41.13 NOx
160.9 NOx
Leak chk @ 2 in Hg
100
90
80
70
60
50
40
30
20
10
0


0 10 20 30 40 50 60 70 80 90 100
ϕ
ϕ
ϕ
End NOx converter Eff. Test
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100



G-5

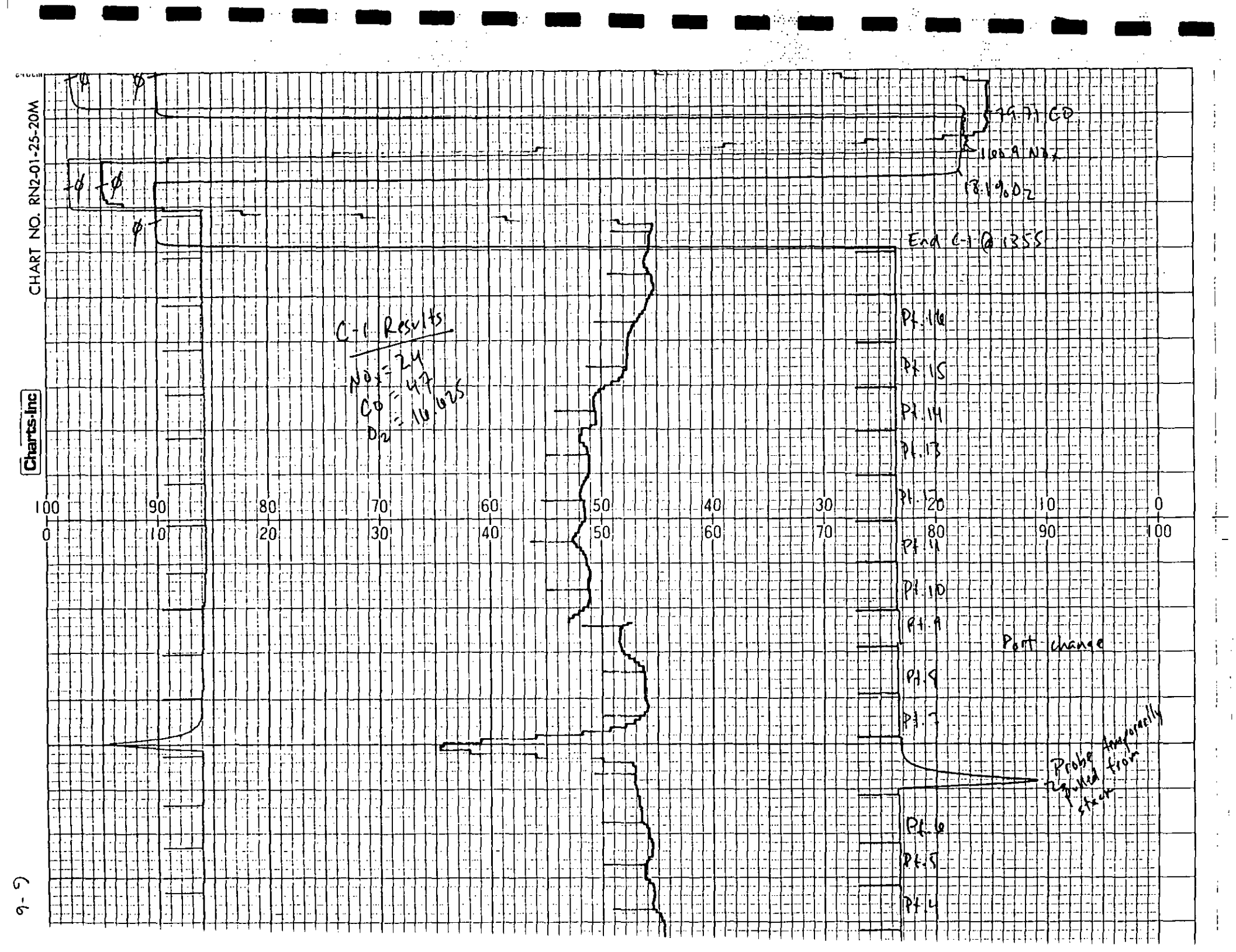
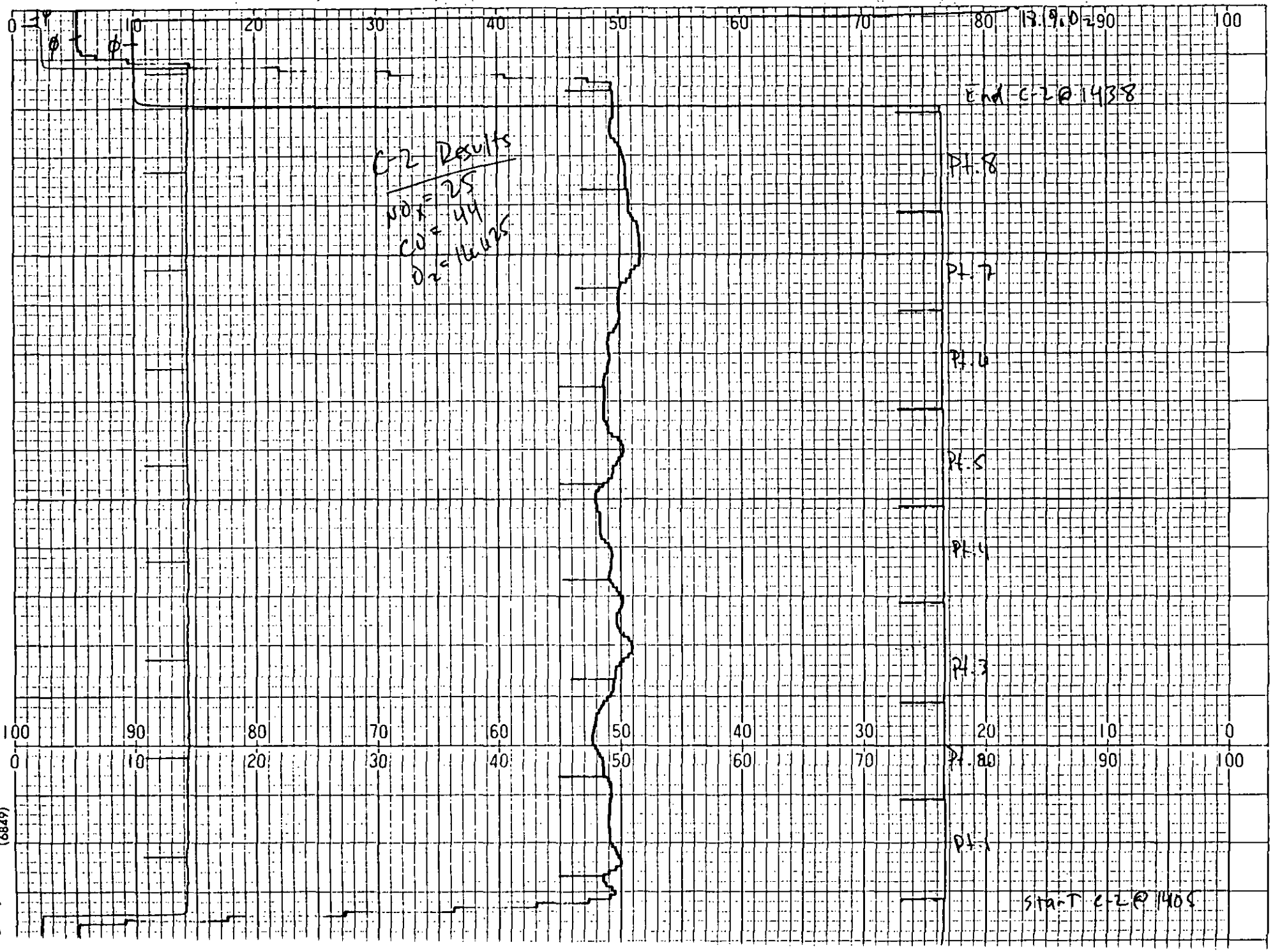


CHART NO. RN2-01-25-20M
Charts-Inc
19.71 CO
100.9 NOx
18.190 O2
End C-1 @ 1355
C-1 Results
NOx = 24
CO = 47
O2 = 18.025
Pt. 16
Pt. 15
Pt. 14
Pt. 13
Pt. 12
Pt. 11
Pt. 10
Pt. 9
Pt. 8
Pt. 7
Pt. 6
Pt. 5
Pt. 4
Port change
Probe removed from stack
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

9-5


C-2 Results
NOx = 25
CO = 44
O2 = 14.425
End C-2 @ 1438
Pt. 8
Pt. 7
Pt. 6
Pt. 5
Pt. 4
Pt. 3
Pt. 2
Pt. 1
Start C-2 @ 1405
(6849)

Patty copy and file

Florida Power
CORPORATION

RECEIVED

DEC - 3 1993

Division of Air
Resources Management

December 3, 1993

Mr. Chris Kirts
Air Program Manager, Northeast District
7825 Bay Meadows Way
Suite B200
Jacksonville, Florida 32256

Dear Mr. Kirts:

Re: Initial Startup of New Combustion Turbine at the University of Florida
DEP Permit No. AC01-204652

As required by 40 CFR 60, Florida Power Corporation (FPC) is providing the Department of Environmental Protection (DEP) notification of the initial startup of the new combustion turbine at FPC's University of Florida Cogeneration facility. The initial startup is scheduled for December 17, 1993. FPC will subsequently notify your agency of the actual date that startup occurred.

Please feel free to contact me at (813) 866-5158 if you have any questions or if you need additional information.

Sincerely,

Scott H. Osbourn
Senior Environmental Engineer

cc: Mr. John Brown, DEP Tallahassee