P 256 396 228

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL

(See Reverse)

Sent to Brian Travis	
Street and No. Empire Energy Mgmt	
P.O., State and ZIP Code PO BOX 6840 MacDill, AFB, FL	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date AC 29-178834 11-13-90	

PS Form 3800, June 1985 ☆U.S.G.P.O. 1989-234-555

SENDER: Complete items 3 and 4.

Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:
Brian Travis, Pres.
Empire Energy Mgmt Sys.
P.O. Box 6840, Bldg. 970
MacDill AFB, FL 33608-0840

4. Article Number
P256 396 228

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X

7. Date of Delivery
NOV 15 1990

8. Addressee's Address *(ONLY if requested and fee paid)*

RECEIPT

UNITED STATES POSTAL SERVICE

OFFICIAL BUSINESS

SENDER INSTRUCTIONS

Print your name, address and ZIP Code in the space below.

- Complete items 1, 2, 3, and 4 on the reverse.
- Attach to front of article if space permits, otherwise affix to back of article.
- Endorse article "Return Receipt Requested" adjacent to number.

RECEIVED

NOV 19 1990

DER - BAQM

U.S.MAIL

PENALTY FOR PRIVATE USE, $300

RETURN TO

Print Sender's name, address, and ZIP Code in the space below.

Patty Adams - D.E.R. - BAR

2600 Blair Stone Rd - Twin Towers

Tallahassee, Fl 32399-2400

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMITS

Mr. Brian Travis, President
Empire Energy Management Systems, Inc.
P. O. Box 6840, Bldg. 970
MacDill AFB, Florida 33608-0840

November 9, 1990

Enclosed are construction permits Nos. AC 29-178833 and AC 29-178834 to install Cogeneration Plant Nos. 1 and 2 at the MacDill Air Force Base in Tampa, Hillsborough County, Florida. These permits are issued pursuant to Section 403, Florida Statutes.

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

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

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

Copy furnished to:

B. Thomas, SW District
I. Choronenko, HCEPC
E. Spivey, P.E.
D. Lock, US Turbine

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of buisness on 11-13-90.

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Kris Baker — Clerk

11-13-90 — Date

Final Determination

Empire Energy Management Systems, Inc.
Tampa, Hillsborough County, Florida

Cogeneration Plant Nos. 1 and 2
Permit Nos. AC 29-178833 and AC 29-178834

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

November 9, 1990

Final Determination

The Technical Evaluation and Preliminary Determination for the permits to install Cogeneration Plant Nos. 1 and 2 at the MacDill Air Force Base in Tampa, Hillsborough County, Florida, was distributed on October 4, 1990. The Notice of Intent to Issue was published in The Tampa Tribune on October 17, 1990. Copies of the evaluation were available for public inspection at the Department's Southwest District office in Tampa and Bureau of Air Regulation office in Tallahassee.

No comments were submitted on the Department's Intent to Issue the permit. The final action of the Department will be to issue construction permit Nos. AC 29-178833 and AC 29-178834 as proposed in the Technical Evaluation and Preliminary Determination.

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

PERMITTEE:
Empire Energy Management
Systems, Inc.
MacDill AFB
P. O. Box 6840
Tampa, Florida 33608

Permit Number: AC 29-178834
Expiration Date: Jan. 15, 1992
County: Hillsborough
Latitude/Longitude: 27°51'27"N
82°28'06"W
Project: Cogeneration Plant No. 1

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of Cogeneration Plant No. 1 consisting of an Allison 501-KH, UST 5600 CC Gas Turbine fired by natural gas and/or No. 2 fuel oil (with a maximum heat input of 56.37 MMBtu/hr and sulfur content in the No. 2 fuel oil not to exceed 0.8%), in series with a duct burner with a maximum heat input of 35.0 MMBtu/hr which can be fired on only natural gas; and an Allison 501-KB5, UST 3800 Gas Turbine fired on only natural gas with a maximum heat input rate of 51 MMBtu/hr.

Nitrogen oxide emissions from both units are controlled by steam injection.

The cogeneration plant No. 1 is located on MacDill Avenue and Second Street at the A.F.B. and the UTM coordinate is Zone 17, 337.6 km E and 1283.6 km N. in Hillsborough County, Florida.

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

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

Attachments are listed below:

1. Application to Construct Air Pollution Sources, DER Form 17-1.202(1) dated April 9, 1990.
2. Department's letter dated May 4, 1990.
3. Empire Energy Management Systems, Inc.'s letter dated May 15, 1990.
4. Department's letter dated June 14, 1990.
5. Empire Energy Management Systems, Inc.'s letter dated June 22, 1990.
6. Empire Energy Management Systems, Inc.'s letter dated July 26, 1990.
7. Mr. Edward C. Spivey, Jr., P.E.'s letter dated August 2, 1990.

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

GENERAL CONDITIONS:

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

13. This permit also constitutes Determination of Best Available Control Technology (BACT) and Compliance with New Source Performance Standards (NSPS).

14. The permittee shall comply with the following:

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

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

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

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

SPECIFIC CONDITIONS:

1. The construction and operation during the period of this permit shall be in accordance with the capacities and specifications stated in the application.

2. The Allison 501-KH, UST 5600 CC Gas Turbine shall be fired by natural gas and/or fuel oil No. 2 (with a maximum sulfur content of 0.8%) and a maximum heat input of 56.37 MMBtu/hr and rated at 5.52 MW. This unit, when operated on only No. 2 fuel oil (not to exceed 720 hrs/yr) will have a maximum heat input of 54.04 MMBtu/hr and rated at 4.1 MW.

3. The duct burner shall be fired on only natural gas with a maximum heat input of 35.0 MMBtu/hr and is designed to produce 44,600 lbs/hr of steam.

SPECIFIC CONDITIONS:

4. The Allison 501-KB5, UST 3800 Gas Turbine shall be fired on only natural gas with a maximum heat input rate of 51 MMBtu/hr and is rated at 4.1 MW and a designed flow of 24,890 ACFM.

5. Cogeneration Plant No. 1 shall be permitted to operate 24 hrs/day, 7 days/wk, and 52 wks/yr.

6. The nitrogen oxide emissions from each gas turbine are subject to the New Source Performance Standards, 40 CFR 60.332, Subpart GG and shall not exceed 0.0125% by volume at 15% oxygen on dry basis.

7. The sulfur dioxide emissions from each gas turbine are subject to 40 CFR 60.333 and shall not exceed 0.015% by volume at 15% oxygen on a dry basis (0.8% of the fuel by weight).

8. Visible emissions from the Allison 501-KH gas turbine and the duct burner shall be less than 5% when operated on only natural gas and less than 10% when fired by No. 2 fuel oil. Visible emissions from the Allison 501-KB5 gas turbine shall be less than 5%.

9. Particulate matter emissions from these gas turbines/duct burner/boiler shall not exceed 0.1 lbs/MMBtu of heat input.

10. Compliance stack tests shall be conducted to measure the NO_x and visible emissions from each gas turbine, and a particulate and VE test shall be performed for the Heat Recovery Steam Generator (duct burner/boiler) within 60 days of completion of construction. The compliance test for the gas turbines shall be conducted at 30%, 50%, 75%, and 100% loading to ensure that the NO_x and visible emissions standards are being met at all loads. The Heat Recovery Steam Generator (duct burner/boiler) shall be tested within 90% of its designed capacity.

11. The particulate, NO_x, and visible emissions tests shall be conducted using EPA Methods 1, 2, 3, 4, 5, 9, and 20 respectively, and subject to 40 CFR 60.335.

12. A log shall be maintained of the hours of operation for the Allison 501-KH Gas Turbine, along with a fuel oil analysis report for each shipment of No. 2 fuel oil received.

SPECIFIC CONDITIONS:

13. The NO_x emissions from the Allison 501-KH gas turbine shall be controlled by injecting steam at a rate of 19,800 lbs/hr at 205 psig and; the Allison 501-KB5 gas turbine steam injection shall be maintained at a rate of 3600 lbs/hr at 250 psig.

14. The sulfur dioxide emissions shall be assumed in compliance if the No. 2 fuel oil fired in the gas turbines contains no more than 0.8% sulfur content by weight.

15. The Allison 501-KH and 501-KB5 Gas Turbines shall be equipped with a continuous emission monitoring system pursuant to 40 CFR 60.334 that will produce on the same chart, multi-colored lines, charting fuel consumption (natural gas and No. 2 fuel oil) as applicable, steam injection and power production. For this facility the system shall be maintained in accordance with the requirements of 40 CFR 60.13. Excess emissions shall be determined pursuant to 40 CFR 60.334.

16. Any change in the method of operation, equipment, or operating hours shall be submitted to the Bureau of Air Regulation office for approval.

17. The HCEPC office shall be given written notice at least fifteen (15) days prior to compliance testing. The compliance test results shall be submitted to the HCEPC office within 45 days of such testing. The permittee shall comply with the notification and record keeping requirements of 40 CFR 60.7.

18. The permittee shall comply with all the applicable requirements of F.A.C. Chapters 17-2 and 17-4 and 40 CFR 60, Subpart GG.

19. 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).

20. An application for an operation permit must be submitted to the HCEPC and Southwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

PERMITTEE:
Empire Energy Management
Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

Issued this 9th day
of November, 1990

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

STEVE SMALLWOOD, P.E., Director
Division of Air Resources
Management

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

PERMITTEE:
Empire Energy Management
Systems, Inc.
MacDill AFB
P. O. Box 6840
Tampa, Florida 33608

Permit Number: AC 29-178833
Expiration Date: Jan. 15, 1992
County: Hillsborough
Latitude/Longitude: 27°51'41"N
82°28'13"W
Project: Cogeneration Plant No. 2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a Cogeneration Plant No. 2 consisting of a Kawasaki MIA-13, UST 1500 Gas Turbine fired by natural gas and/or No. 2 fuel oil (containing a maximum of 0.8% sulfur and not to exceed 720 hrs/yr on oil) with a maximum heat input of 22.4 MMBtu/hr.

Nitrogen oxide emissions from this turbine are controlled by injecting water at a ratio of 0.5 lbs water per lb of fuel and at a designed flow of 19,230 ACFM.

The cogeneration plant No. 2 is located at the Base Hospital on Emergency Drive at the AFB, and the UTM coordinates are Zone 17, 347.9 km E and 1276.5 km N in Hillsborough County, Florida.

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

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

Attachments are listed below:

1. Application to Construct Air Pollution Sources, DER Form 17-1.202(1) dated April 9, 1990.
2. Department's letter dated May 4, 1990.
3. Empire Energy Management Systems, Inc.'s letter dated May 15, 1990.
4. Department's letter dated June 14, 1990.
5. Empire Energy Management Systems, Inc.'s letter dated June 22, 1990.
6. Empire Energy Management Systems, Inc.'s letter date July 26, 1990.
7. Mr. Edward C. Spivey, Jr., P.E.'s letter dated August 2, 1990.

GENERAL CONDITIONS:

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

13. This permit also constitutes a Determination of Best Available Control Technology (BACT) and Compliance with New Source Performance Standards (NSPS).

14. The permittee shall comply with the following:

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

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

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

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

SPECIFIC CONDITIONS:

1. The construction and operation during the period of this permit shall be in accordance with the capacities and specifications stated in the application.

2. The Kawasaki MIA-13, UST 1500 Gas Turbine shall be fired by natural gas and/or fuel oil No. 2 (with a maximum sulfur content of 0.8%) and a maximum heat input of about 22.4 MMBtu/hr and is rated at 1.429 MW. This unit, when operated on only No. 2 fuel oil, shal not exceed 720 hrs/yr.

3. The Cogeneration Plant No. 2 shall be permitted to operate 24 hrs/day, 7 days/wk, and 52 wks/yr.

4. The nitrogen oxide emissions from the gas turbines are subject to the New Source Performance Standards, 40 CFR 60.332, Subpart GG and shall not exceed 0.0125% by volume at 15% oxygen on dry basis.

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

SPECIFIC CONDITIONS:

5. The sulfur dioxide emissions from the gas turbines are subject to 40 CFR 60.333 and shall not exceed 0.015% by volume at 15% oxygen on a dry basis (0.8% of the fuel by weight).

6. Visible emissions from this gas turbine shall be less than 5% when operated on only natural gas and less than 10% when fired by No. 2 fuel oil.

7. Compliance stack test shall be conducted to measure the NO_x and visible emissions from this gas turbine, within 60 days of completion of construction. The compliance test shall be conducted at 30%, 50%, 75%, and 100% loading to ensure that the standards are being met at all loads.

8. The NO_x and visible emissions tests shall be conducted using EPA Methods 9 and 20, and subject to 40 CFR 60.335.

9. The NO_x emissions from this gas turbine shall be controlled by injecting water at a ratio of 0.5 lbs/hr water per pound of fuel.

10. The sulfur dioxide emissions shall be assumed in compliance if the No. 2 fuel oil fired in the gas turbine contains no more than 0.8% sulfur content by weight.

11. The Kawasaki MIA-13 Gas Turbine shall be equipped with a continuous emission monitoring system pursuant to 40 CFR 60.334 that will produce on the same chart, multi-colored lines, charting fuel consumption (natural gas and No. 2 fuel oil) as applicable, water injection rate and power production. For this facility, the system shall be maintained in accordance with the requirements of 40 CFR 60.13. Excess emissions shall be determined pursuant to 40 CFR 60.334.

12. Any change in the method of operation, equipment, or operating hours shall be submitted to the Bureau of Air Regulation office for approval.

13. The HCEPC office shall be given written notice at least fifteen (15) days prior to compliance testing. The compliance test results shall be submitted to the HCEPC office within 45 days of such testing. The permittee shall comply with the notification and record keeping requirements of 40 CFR 60.7.

14. The permittee shall comply with all the applicable requirements of F.A.C. Chapters 17-2 and 17-4 and 40 CFR 60, Subpart GG.

PERMITTEE:
Empire Energy Management
Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

SPECIFIC CONDITIONS:

15. 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).

16. An application for an operation permit must be submitted to the HCEPC and Southwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this 9th day
of November, 1990

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

STEVE SMALLWOOD, P.E., Director
Division of Air Resources
Management

Best Available Control Technology (BACT) Determination
Empire Energy Management Systems, Inc.
MacDill AFB, Hillsborough County

The applicant plans to install two Allison Gas Turbines at Cogeneration Plant No. 1, and a Kawasaki Gas Turbine at Cogeneration Plant No. 2. At Plant No. 1 the Allison 501-KB5 Gas Turbine will be fired on only natural gas generating a maximum of 4.1 MW, while the Allison 501-KH Gas Turbine has a combined cycle Heat Recovery Steam Generator (duct burner/boiler). The gas turbine will be fired by natural gas and/or No. 2 fuel oil (not to exceed 0.8% sulfur and 720 hours/year on fuel oil), whereas the duct burner/boiler is fired on only natural gas capable of producing 44,600 lbs of steam per hour at 125 psig and 335°F. The Cogeneration Plant No. 2 has a Kawasaki MIA-13 Gas Turbine which is fired by natural gas and/or fuel oil No. 2 (not to exceed 0.8% sulfur and 720 hours/year on fuel oil) capable of generating 1.429 MW.

The BACT determination is addressed only to the duct burner/boiler (HRSG) as required by Rule 17-2.600(6), F.A.C. - Emission Limiting and Performance Standards.

BACT Determination Requested by the Applicant:

Firing the duct burner/boiler with natural gas constitutes the best available control technology for this project. The applicant requested using natural gas for the heat recovery steam generator. In addition to this, applicant proposes to fire the gas turbines primarily with natural gas and supplement them with No. 2 fuel oil with a maximum sulfur content of 0.8% (firing with No. 2 fuel oil not to exceed 720 hours/year for the Allison 501-KB5 and Kawasaki MIA-13 gas turbines). The applicant stated that it will not have any problems meeting 5% opacity when fired on natural gas and 10% opacity when fired on No. 2 fuel oil.

BACT Determination by DER

BACT for particulate and sulfur dioxide emissions is established as the firing of natural gas.

No visible emissions (less than 5% opacity).

EPA Method 9 (40 CFR 60, Appendix A) will be used to determine compliance with the opacity standard, and EPA Method 5 for the particulate emissions.

BACT Determination Rationale:

Sulfur in fuel is a primary air pollution concern. Most of the sulfur becomes SO_2 when fuel is burned. Particulate emissions from fuel burning are related to the sulfur content of the fuel. The Department agrees with the applicant's proposal that the firing of natural gas is BACT for the duct burner boiler.

Details of the Analysis May be Obtained by Contacting:

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

Recommended by:

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

Approved by:

Steve Smallwood, P.E. Director
Division of Air Resources Mgmt.

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

Clair

TO: Steve Smallwood OK BA

FROM: Clair Fancy

DATE: November 7, 1990

SUBJ: Approval of Construction Permit Nos. AC 29-178833 & 834
Empire Energy Management Systems, Inc.

Attached for your approval and signature is are permits prepared by the Bureau of Air Regulation for the above mentioned company to install Cogeneration Plant Nos. 1 and 2 at the MacDill Air Force Base in Tampa, Hillsborough County, Florida.

No comments were received during the public notice period.

Day 90, after which this permit will be issued by default, is December 1, 1990.

I recommend your approval and signature.

CF/MB/plm

Attachments

OK/ 11-9-90 → CHF - note for future reference SEAL ALL BACTS. 11-9-90

Note

Please call the applicant as soon as this permit has been signed.

Thanks!

→ P 4/18

Check Sheet

Company Name: Empire Cogen
Permit Number: AC 29 -178833, -178834
PSD Number:
County: Hillsborough
Permit Engineer:
Others involved:

Application:
- ☐ Initial Application
- ☑ Incompleteness Letters
- ☑ Responses
- ☐ Final Application (if applicable)
- ☐ Waiver of Department Action
- ☐ Department Response

Intent:
- ☑ Intent to Issue
- ☑ Notice to Public
- ☑ Technical Evaluation
- ☑ BACT Determination
- ☑ Unsigned Permit

  Attachments:
  - ☐
  - ☐
  - ☐
- ☐ Correspondence with:
  - ☐ EPA
  - ☐ Park Services
  - ☐ County
  - ☑ Other
- ☑ Proof of Publication
- ☐ Petitions - (Related to extensions, hearings, etc.)

attachment # 4
~~#~~ 6 to Empire's letter dated 6/22/90

Final Determination:
- ☑ Final Determination
- 2 ☑ Signed Permit
- ☐ BACT Determination

Post Permit Correspondence:
- ☑ Extensions
- ☐ Amendments/Modifications
- ☐ Response from EPA
- ☐ Response from County
- ☐ Response from Park Services

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES AND WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
TELEPHONE (813) 272-5960
AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530
WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788
ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY

FAX TRANSMITTAL SHEET

DATE: 2/15/94

TO: PATTY ADAMS

FAX PHONE: 904-922-6979 VOICE PHONE: SC 278-1344

TOTAL NUMBER OF PAGES INCLUDING THIS COVER PAGE: 2

EPC FAX TRANSMISSION LINE: (813) 272-7144
FOR RETRANSMISSION OR ANY FAX PROBLEMS, CALL: (813) 272-5530

FROM: LARRY NYE
(CIRCLE APPLICABLE SECTION BELOW)

AIR DIVISION

-ENFORCEMENT

-ENGINEERING

-SUPPORT OPERATIONS

SPECIAL INSTRUCTIONS: Here is Empire Energy Management's response to our incompleteness letter (PATS 242414 and 242415) -- It should have been sent to you directly.

2/15/94

John -

Aren't you handling this?

Patty

VIA FACSIMILE

254 W. 54th Street
New York, NY 10019
February 7, 1994

Ben Kalra, Air Permit Engineer
Hillsborough County
Environmental Protection Commission
1410 N. 21st Street
Tampa, Florida 33605

Re: Hillsborough County - AP
DEP File Nos. 242414 (AC29-178834) and 242415 (AC29-178833)

Dear Mr. Kalra:

This is Empire Energy Management Systems, Inc.'s ("Empire") response to your letter dated January 7, 1994. Empire hereby responds to items 1 and 2 as follows:

> Empire has good cause for needing the permits to be extended because (i) the EPA did not authorize construction of the MacDill Avenue Cogeneration Facility until June 2, 1993 (see attachment), (ii) the Air Force is, to Empire's knowledge, still working with the EPC to resolve problems with the Hospital boiler blowdown discharge that may affect construction of the Hospital Cogeneration Facility, and (iii) the Air Force unilaterally ordered construction to halt as of September 1, 1993, seized control of the facility, and is still negotiating a basis on which to resume such construction. These negotiations are expected to be completed by February 28, 1994.

Since the negotiations referred to above are still in process, Empire is unable to respond to item 3 at this time. ~~However, per your letter, a response will be filed with your office within 30 days of the date of this letter.~~ If you have any questions, I can be reached at 813-525-1260.

Very truly yours,

Empire Energy Management Systems, Inc.

Steven L. Greenberg
Vice President

Preston — we have some thick files on Empire Energy but nothing that you wouldn't have there — Tall'e has been processing Empire's permits — most of what we have is copies of Tall'e material. This 2/4/93 letter is a key item and our permit eng's file is attached, including your copy of [redacted] 1/26/94 [redacted] letter.

Jerry Russell 1/27/94

Patty

Lets give this to JR. HCEPC Processed it thru (at incompletness then realized that they were excluded from [redacted] it by SOA Preston (over)

Perhaps it should have gone to SWD but let John look at it anyway

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
TELEPHONE (813) 272-5960

AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530

WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

January 26, 1994

Mr. Stephen L. Greenberg
Vice President
Empire Energy Management Systems, Inc.
P.O. Box 6840, Building 970
MacDill AFB, FL 33608-0840

Re: Hillsborough County - AP
DEP File Nos. 242414 (AC29-178834) and 242415 (AC29-178833)

Dear Mr. Greenberg:

On January 7, 1994 we sent you a letter of incompletion on your request to extend the two referenced permits. Subsequently, it has been determined that the permit extension requests will be processed by the Florida Department of Environmental Protection. Please address your response to our letter to:

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

You may contact Jerry Kissel or me at 272-5530 if you have any questions.

Sincerely,

Larry E. Nye
Air Permitting Specialist

bm

cc: Preston Lewis, P.E., FDEP w/permit work files
J. Harry Kerns, P.E., FDEP S.W. District

PATS UPDATED 0107

COMMISSION
PHYLLIS BUSANSKY
JOE CHILLURA
SYLVIA KIMBELL
LYDIA MILLER
JIM NORMAN
JAN KAMINIS PLATT
ED TURANCHIK

FAX (813) 272-5157

ENVIRONMENTAL PROTECTION COMMISSION
HILLSBOROUGH COUNTY

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
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TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

January 7, 1994

CERTIFIED MAIL # P 282 479 725

Mr. Stephen L. Greenberg,
Vice President
Empire Energy Management
Systems, Inc.
P.O. Box 6840, Building 970
MacDill AFB, FL 33608-0840

Re: Hillsborough County - AP
DEP File Nos. 242414 (AC29-178834) and 242415 (AC29-178833)

Dear Mr. Greenberg:

Please be advised that the Environmental Protection Commission of Hillsborough County (EPC), as delegated by the Florida Department of Environmental Protection (DEP), has completed their initial review of the above application and found it to be incomplete. In order to complete the review process the following additional information is being requested pursuant to Chapter 17-4.055, F.A.C.:

1. Refer to DEP letter dated February 4, 1992 and Rule 17.212.200(19)(a), F.A.C.; pursuant to Specific Condition No. 15, you are requested to explain the good cause that you need to extend the permits.

2. Summarize the main obstacles which have been preventing the start of cogeneration plant No. 2 project. Provide EPC/HC with a reasonable assurance to demonstrate that the situation is under your control.

3. List separately the main activities involved in both projects and estimate completion dates. Please submit a "critical path method" or "milestone chart" and assure EPC/HC that you will be able to complete and test the sources within the requested period.

"NOTICE! Pursuant to the provisions of Chapter 17-4.070, F.A.C. and Section 120.600 F.S., if the EPC does not receive a response to this request for information within 90 days of the date of this letter, the EPC will issue a final order denying your application.

You need to respond within 30 days after you receive this letter, responding to as many of the information requests as possible and indicating when a response to any unanswered question will be submitted. If the response will require longer than 90 days to develop, an application for new construction should be withdrawn and resubmitted when completed information is available. Or for operating permits, you should develop a specific time table for the submission of the requested information for Department review and consideration. Failure to comply with a time table accepted by the EPC will be grounds for the EPC to issue a Final Order of Denial for lack of timely response. A denial for lack of information or response will be unbiased as to the merits of the application. The applicant can reapply as soon as the requested information is available."

If you have any questions, please feel free to contact me at (813) 272-5530.

Sincerely,

Bkalra

Ben Kalra
Air Permit Engineer

ph

cc: Edward C. Spivey, Jr., P.E., Bosek, Gibson & Associates

INSPECTION REPORT FOR
ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY

FACILITY: EMPIRE ENERGY MANAGEMENT SYSTEMS, Inc				PAGE ____ OF ____
FACILITY ADDRESS: 1. MACDILL AVE 2. MACDILL AFB HOSPITAL.			CITY: MACDILL AFB.	
MAILING ADDRESS: P.O. BOX. 6840 Building 970	CITY: MAC DILL AFB.	ST: FL	ZIP: 33608-0840	
INSPECTION DATE: 01.04.1994	TIME IN: 10.00 AM	TIME OUT: 11.00 AM	INSPECTION TYPE: III, ANNOUNCED	STATUS: III
NEDS NO.	BEP FILE NO. 242404 & 242415			
SOURCE DESCRIPTION: COGENERATOR				
CONTACT(S) Person: CHUCK MONTEICH 1 Phone: 840-0100, 522-5944		2	3	

EMPIRE ENERGY HAS REQUESTED AN EXTENTION FOR THEIR TWO CONSTRUCTION PERMITS. THESE PERMITS WERE ISSUED ON . CHUCK ESCORTED ME TO THE SITE. THE MACDILL AVE CO-GEN PROJECT SEEMS TO BE IN PROGRESS. CHUCK SAID THE MAIN ELECTRICAL WORK INCLUDING POWER LINE, Tubings & WIRINGS FOR THE PUMP, GENERATOR, CONTROL PANEL AND MONITORS IS FINISHED. I SAW VARIOUS HOOK UP POINTS COMING OUT OF GROUND. THE BOILER (ABCO BOILER - HR STEAM GENERATOR IS INSTALLED. UST 5600 AND UST 3800 UNITS ARE PLACED IN POSITION; THESE UNITS WERE COVERED WITH DUST COVERS. THE PILLARS FOR PIPING SUPPORT ARE ERECTED. THE STACK FOR UTS 3800 WAS KEPT NEXT TO THE UNIT. THE WATER COOLER IS INSTALLED. I SAW THE SIDE WALLS (PARTIALLY FINISHED) THE ROOFING WORK HAD NOT STARTED. CHUCK SAID THAT THEY HAVE ALREADY INVESTED 90% OF THE CAPITAL. THE CHILLER, VARIBLE CONTROLS, SWITCH GEARS ARE PURCHASED AND STORED IN WAREHOUSE OR YET TO BE PICKED UP FROM THE DISTRIBUTOR WHO IS PAID UPTO 50% OF THE PRICE ALONG WITH ORDER FORM. HE SAID 60% OF THE CONSTRUCTION WORK IS DONE. I FEEL ABOUT 40-50% WORK IS COMPLETED.

CONT'D (PLEASE SEE BACK PAGE)

1 ~~Carlos Gonzalez~~ BENKALRA REPORT 01.04.94

THE SECOND COGEN PROJECT _ (NEAR TO THE HOSPITAL), I SAW JUST A PLAIN GROUND. CHUCK SAID THAT THEY HAVE NOT STARTED ANY CONSTRUCTION WORK BESIDES CLEANING UP THE GROUND. BUT THEY INTEND TO PURSUE THE PROJECT. THE PROJECT IS ON HOLD BUT A LOT OF TIME AND MONEY IS SPENT ON THE PROJECT. It is for the interest of both the parties (Empire Energy & MACDILL) the project is desirable and kept alive. If we can not work upon this project in a year's time probably we will not be able to pursue it.

EMPIRE ENERGY COGEN-1
MACDILL AVE

Florida Department of Environmental Regulation

Southwest District • 4520 Oak Fair Boulevard • Tampa, Florida 33610-7347

Lawton Chiles, Governor 813-623-5561 Carol M. Browner, Secretary

EMPIRE ENERGY, COGEN-1
MACDILL AVE

Florida Department of Environmental Regulation

Southwest District • 4520 Oak Fair Boulevard • Tampa, Florida 33610-7347

Lawton Chiles, Governor

Carol M. Browner, Secretary

Delegated, Non-Title V
Time Ext for AC29-178834 (Plant #1)
& AC29-178833 (Plant #2)

EXHIBIT II

PERMIT APPLICATION FEE/ASSIGNMENT SHEET

APPLICATION TYPE/SUBTYPE (2) AC/TX PATS FILE NO. 242414 (Plant 1) / 242415 (Plant 2)

COMPANY Empire Energy Management Systems, Inc. Cogeneration Plant DATE APP. REC'D (Day 1): 12/9/93

CHECK ATTACHED: (Y) N Not Required ( )

FEE SUBMITTED: (✓) correct ( ) incorrect - Should Be $ 100
Submitted $ 100
Needed/Refund $

FEE CHECKED BY: LM/GK DATE 12/13/93

APPLICATION ASSIGNED TO: Ben Kalra DATE 12/15/93

PERMIT APPLICATION PROCESSING STATUS

	Completed	Initials
Date of Initial PATS Entry:		
Permit Engineer Submit Finished Permit Package and Recommendations to Section Chief:		
Permit Package to Assistant Director		
Permit Package to Executive Director		
Permit Package Mailed Out:		

Is this a Construction Permit Requiring Public Notice? Y N

ONLY FOR CONSTRUCTION PERMITS WHICH REQUIRE PUBLIC NOTICE

	Completed	Initials
Notice of Publication Received:		
Section Chief Approval:		
Assistant Director Approval:		
Executive Director Approval:		
Final Permit Mailed:		

DATE FOLLOW UP

	Completed	Initials
Issue Date Updated on PATS:		

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
TELEPHONE (813) 272-5960

AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530

WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

December 13, 1993

Mr. Charles R. Monteith
Empire Cogen, Inc.
3135 31st Avenue North
St. Petersburg, FL 33713

Dear Mr. Monteith:

We received the enclosed letter and check (#2734) for a time extension to air permits AC29-178834 and AC29-178833 issued to construct two cogeneration plants at MacDill Air Force Base. Concurrent with your submittal, we received a duplicated application from Mr. Brian Travis of Empire Energy Management Systems, Inc. with check #1226 attached.

We have processed Mr. Travis' request and are returning your submittal. If there are questions, please contact me at (813) 272-5530.

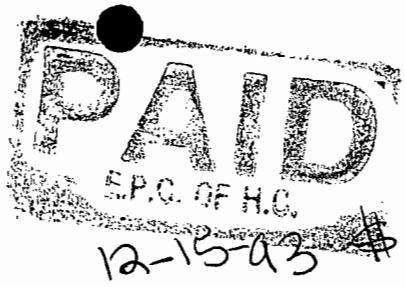
Sincerely,

Larry E. Nye
Air Permit Specialist

bm

Enclosure

cc: Brian Travis, Empire Cogen, Inc.



Brian A. Travis President

REC'D
DEC 9 1993
ENV. PROT. COMM.
OF H.C.

December 07, 1993

Mr. Larry E. Nye
Air Permitting Specialist
Environmental Protection Commission, Hillsborough County
1900 9th Avenue
Tampa, FL 33605

RE: Hillsborough County - A.P. / Empire Energy Management Systems, Inc.
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

Subject: Extension of Construction Permits

Dear Mr. Nye:

Per the specific conditions of the construction permits, and F.A.C. Rule 17-4.090, Empire Energy Management Systems, Inc. hereby requests an extension of the permits referenced above. Construction of the MacDill Cogeneration Project is expected to be completed by February of 1995. As such, an extension of the permit expiration dates from February 9, 1994 to February 9, 1995 is requested.

Enclosed please find a check on behalf of Empire Energy Management Systems, Inc. for one hundred dollars ($100.00), to pay the processing fee for the extension request.

If you have any comments or questions, please contact me or Chuck Monteith the Construction Manager.

Very truly yours,
Empire Energy Management Systems, Inc.

Brian A. Travis

Brian A. Travis, President

cc: Chuck Monteith, Empire Cogen, Inc.
Edward C. Spivey, Jr., P.E., Bosek, Gibson and Associates

BAT/tb

P 062 921 966

Receipt for Certified Mail

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

UNITED STATES POSTAL SERVICE

Sent to Stephen Greenberg	
Street and No. Empire Energy Mgmt	
P.O., State and ZIP Code MacDill AFB, Fl	
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 2-9-93	

PS Form 3800, June 1991

AC 29-178834 #1
AC 29-178833 #2

SENDER: Complete items 1, 2, 3 and 4.

Put your address in the "RETURN TO" space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for service(s) requested.

1. ☐ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to:
Stephen L. Greenberg, V.P.
Empire Energy Mgmt. Sys.
PO Box 6840, Bldg. 970
MacDill AFB, FL 33608-0840

4. Type of Service:	Article Number
☐ Registered ☐ Insured ☑ Certified ☐ COD ☐ Express Mail	P062921966

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form 3811, July 1983 447-845

DOMESTIC RETURN RECEIPT

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

February 4, 1993

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Stephen L. Greenberg
Vice President
Empire Energy Management Systems, Inc.
Post Office Box 6840, Building 970
MacDill AFB, Florida 33608-0840

Dear Mr. Greenberg:

Re: Request for Extension of Expiration Dates
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

The Department has reviewed your letters received October 26, 1992, and January 14, 1993, requesting a second expiration date extension. Based on your letters and a review of the files and regulations, the following facts are relevant:

- The above referenced construction permits were issued on November 9, 1990, and had an expiration date of January 15, 1992. As part of the construction permits, a determination of Best Available Control Tecgnology (BACT) was required pursuant to Florida Administrative Code (F.A.C.) Rule 17-2.600(6), Fossil Fuel Steam Generators with Less than 250 MMBtu/hr Heat Input (note: the new rule citing is 17-296.406).

- Construction commenced for the MacDill Avenue Facility (Cogeneration Plant #1) in February of 1991, and ceased in April of 1991.

- Site activity resumed in May of 1992 at the MacDill Avenue Facility, but was halted on May 15, 1992.

- Construction has not yet commenced at the MacDill AFB Hospital Facility (Cogeneration Plant #2).

- The expiration date has been extended once since the issuance of the construction permits. The extension was issued on January 15, 1992, and established an expiration date of December 31, 1992.

- F.A.C. Rule 17-212.200(19)(a), Commence Construction, states that the owner has obtained all required permits for the construction of a facility and has "begun, or caused to begin, a **continuous** program of actual on-site construction or physical modification of the facility, **to be completed within a resonable time**".

Based on the above, the Department feels that the granting of a second extension for an additional year should constitute a "reasonable time" period for the completion of the construction of the two cogeneration units (note: total time allowed will be 3 yrs. & 3 mths). However, please be advised that the current BACT standards for the sulfur content of back-up No. 2 fuel oil has dropped to 0.05%, by weight, and your permitted level is still at 0.8%, by weight. Consequently, after this extension, the Department does not intend to renew these permits again without revisiting BACT for the No. 2 fuel oil sulfur content.

In response to this request, the following shall be changed and/or added:

1. Expiration Date Extension: AC 29-178834 & -178833

FROM: December 31, 1992
TO: February 9, 1994

2. Attachments to be Incorporated:

- Mr. Steven L. Greenberg's letter received October 29, 1992.
- Mr. C. H. Fancy's letter dated November 3, 1992.
- Mr. Fred Nassar's FAX cover sheet with attachments received January 4, 1993.
- Mr. Steven L. Greenberg's letter with enclosure received January 14, 1993.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the amendment applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit Amendment File Number(s) and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the request/application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office in General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

This letter amendment must be attached to the construction permits, Nos. AC 29-178834 & -178833, and shall become a part of the permits.

Sincerely,

Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/RBM/rbm

Attachments

cc: B. Thomas, SWD
D. Beason, Esq., DER
G. Kissel, EPCHC
E. Spivey, Jr., P.E., BG&A

Attachments

Available Upon Request

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

Interoffice Memorandum

TO: Howard L. Rhodes

FROM: Clair Fancy

DATE: February 3, 1993

SUBJ: Approval of an Amendment to Construction Permits
AC 29-178834: Cogeneration Plant #1
AC 29-178833: Cogeneration Plant #2
Empire Energy Management Systems, Inc.

Attached for your approval and signature is an amendment to the construction permits prepared by the Bureau of Air Regulation for the above referenced company. The purpose of the amendment is to extend the expiration dates.

The proposed two cogeneration facilities are to be located at MacDill AFB, in Hillsborough County, for the purpose of supplying electricity and chilled water. The company began construction in February of 1991, but stopped construction in April of 1991 after learning that MacDill AFB had been selected by the Closure and Realignment Commission as one of the military bases to be closed. However, the base has since learned that it will not be closed.

The original construction permits were issued on November 9, 1990. The Department granted a first extension of the expiration dates on January 15, 1992, with an expiration date of December 31, 1992. The proposed extension will run through February 9, 1994. The Department does not propose to grant a third extension without revisiting BACT.

I recommend your approval and signature.

HLR/BM/rbm

P 062 922 022

Receipt for Certified Mail

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

UNITED STATES POSTAL SERVICE

Sent to Mr. Charles Monteith, Empire	
Street and No. Energy Mgmt. Sys. P.O. Box 6840, Bldg. 970	
P.O., State and ZIP Code MacDill AFB, FL 33608-0840	
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: 1-6-93 Permit: AC 29-178833, -34	

PS Form **3800**, June 1991

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 Fee will provide you the signature of the person delivered to and the date of delivery.

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. Charles Monteith
Empire Energy Mgmt. Systems, Inc
P. O. Box 6840, Bldg. 970
MacDill AFB, FL 33608-0840

4a. Article Number
P 062 922 022

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

7. Date of Delivery

5. Signature (Addressee)

6. Signature (Agent)

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

PS Form **3811**, November 1990 ☆U.S. GPO: 1991—287-066 **DOMESTIC RETURN RECEIPT**

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

January 5, 1993

Mr. Charles Monteith
Empire Energy Management Systems, Inc.
P.O. Box 6840, Building 970
MacDill AFB, Florida 33608-0840

Dear Mr. Monteith:

Re: AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)
Request for permit extensions

Per our telephone conversation yesterday, the Department is requesting a chronological listing of construction activities (site work complete, foundation work complete, etc.) associated with this project, beginning with the date the construction permit was issued. Also, please include copies of any correspondence between your company and the Department's Southwest District, the Environmental Protection Commission of Hillsborough County or the U.S. EPA (Region IV), that may be applicable to this project.

You indicated that you should be able to get this information in the mail by this afternoon (1/5/93). We will continue to process your extension request as soon as this material has arrived. If you have any questions, please contact Jonathan Holtom at (904) 488-8163, extension 45.

Sincerely,

For

John C. Brown, Jr., P.E.
Administrator
Air Permitting and Standards

JCB/JH/plm

cc: B. Thomas, SWD
J. Campbell, EPCHC
D. Beason, Esq., DER

Patty file Puente 1/14/93

Brian A. Travis President

January 4, 1993

John C. Brown, Jr., P.E., Administrator
Air Permitting and Standards
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P. / Empire Energy Management Systems, Inc.
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

Subject: Extension of Construction Permits

Dear Mr. Brown:

As you requested, I have enclosed a summary of construction activities that have been performed on the MacDill Cogeneration Project since the Florida Department of Environmental Regulation ("FDER") issued the above referenced construction permits.

As we discussed, site construction was halted in May of 1992, due to the possibility of hazardous soil contamination resulting from the Air Force's operation of an oil/water separator ("OWS") located on the site. Since then, Empire Energy Management Systems, Inc. ("Empire") has been working with the Air Force and the Environmental Protection Commission of Hillsborough County to address the problem.

In July 1992, Empire retained OHM Corporation to perform a Phase I Environmental Assessment of the site. The results of this assessment led to recommendations that additional site testing be conducted and that the storm water drainage pipe, that carried the contaminated discharge from the OWS, be removed. Most recently, the Air Force has been working with the EPA to expedite the completion of an outstanding RCRA facility investigation of the OWS and storm water pipe. I have enclosed copies of reports and recommendations provided by environmental consultants, and correspondence with regulatory agencies regarding this matter.

If you have any comments or questions, feel free to contact me.

Very truly yours,

Empire Energy Management System, Inc.

Steven L. Greenberg
Vice President

cc: Edward C. Spivey, Jr, P.E., Bosek, Gibson and Assoc.
J. Campbell, EPCHC
B. Thomas, SWD
D. Beason, Esq., FDER
Jonathan Holtom, FDER

MACDILL AFB COGENERATION PROJECT CONSTRUCTION SUMMARY

In 1988, the Air Force awarded Empire Energy Management Systems, Inc. ("Empire") a long-term contract to provide electricity and thermal energy to MacDill AFB in Tampa, Florida. The contract was accompanied by a 30 year lease of federal land to Empire.

Empire is responsible for designing, constructing, owning, fueling, financing and operating two natural gas fired cogeneration facilities, with No. 2 fuel oil as a backup fuel source. One facility will be located on MacDill Avenue, and will supply thermal energy to the Base Commissary/BX and the U.S. Central Operations Command Headquarters (USCENTCOM). This facility will consist of two combustion turbines capable of generating about 9.6MW of electricity, and an absorption chiller capable of delivering 1060 tons of chilled water. It will have a 10,000 gallon above-ground oil storage tank with a spill prevention and fire detection system. The second facility will be located adjacent to the MacDill AFB Hospital, near Bayshore Drive. It will consist of a single combustion turbine capable of generating about 1.4MW of electricity, and an absorption chiller capable of delivering 750 tons of chilled water. It will use two existing 25,000 gallon above-ground oil storage tanks.

In November of 1990, the Florida Department of Environmental Regulation issued construction permit Nos. AC 29-178833 (Hospital Facility) and AC 29-178834 (MacDill Ave. Facility) authorizing construction of the MacDill Project. Since that time, the following construction activities have been performed:

- Site construction began on the MacDill Avenue facility in February of 1991, and per the construction permits, was to be complete before January 15,1992 (actual completion was scheduled for September 1991). Upon commencement of construction, the project subcontractors were mobilized at the site and initial site work preparations were performed. This included the removal of the existing topsoil, excavation of the surface water management system, installation of concrete footers and reinforcement steel for the MacDill Ave. cogeneration plant and administration building, and installation of underground sanitary sewer piping and underground mechanical and electrical utilities. Concurrently, deliveries of the cogeneration equipment began.

  Unexpectedly, in April of 1991, MacDill AFB was selected by the Base Closure and Realignment Commission to be included on the list of military bases to be closed. As such, site work on the project was suspended until final decisions regarding the suggested base closure and its effect on the cogeneration project could be determined. This led Empire to request a time extension from the FDER for the construction permits. Permit extensions were granted.

- In May of 1992 construction activities on the project recommenced, with project completion scheduled for October of 1992. At that time, the work that

had been previously performed was inspected and, where necessary, redone. Footer blocks were installed to grade in preparation for pouring the building slabs, installation of underground utilities continued, and the excavations required for the cooling tower installation began. To provide access for concrete deliveries, Empire requested the Air Force to remove an aboveground oil/water separator tank ("OWS") located on the site. The Air Force had previously agreed to relocate the OWS when it became an impediment to construction. On May 15, 1992, however, the Air Force notified Empire that the tank could not be relocated until it was pumped out, due to the hazardous nature of the OWS' contents.

The delays in moving the OWS led to investigations that identified the OWS as an environmental hazard. Therefore, in order to ensure the safety of the construction workers, on May 19, 1992, Empire notified the Air Force that all site work had been halted. Since then, Empire has been working with the Air Force and various regulatory agencies to resolve the environmental concerns. To date, on-site construction has not recommenced, but most of the major equipment is being stored near the site.

- On April 17, 1992, an inspection was conducted by the EPC, and on May 15, 1992, the EPCHC confirmed the results of this inspection by letter. This letter stated that the purpose of the inspection was to "verify the disposal of industrial waste water streams at [MacDill Air Force] base." It concluded that "Most of the waste streams examined discharge[d] to the base sanitary sewer system; however, three sources were found to have surface or ground water discharges. They [were] as follows: 1) Building 1050 - A large oil/water separator was determined to discharge to a storm sewer. 2) Building 712 - Boiler blowdown was observed to discharge to a stormwater ditch. 3) Tank Farm - An oil/water separator which serves a loading rack discharges to a storm ditch." The EPC wrote that these discharges "ultimately flow to the bay [Tampa Bay]." "These discharges are unauthorized without a valid industrial waste permit. Within twenty (20) days, please present plans to this agency that outline corrective actions for the above discharges."

  Thus, the oil-water/storm pipe system on the MacDill Avenue Cogeneration site was identified as operating unlawfully, as was Building 712, the MacDill AFB Hospital Boiler facility, a facility which is adjacent to the MacDill AFB Hospital Cogeneration site.

- In June 1992, Empire had lab tests conducted on the oil-water separator effluent. In early July, these tests revealed excessive concentrations of petroleum and lead, the only chemicals tested for. In late July, Dames & Moore conducted soil testing on the MacDill Avenue Cogeneration site, and in August, reported only limited contamination. Dames & Moore did not, however, test along the storm pipe that was the suspected source of contamination. Also in July 1992, OHM Corporation conducted soil and

groundwater tests. In September, these tests revealed excessive petroleum contamination at the outlet of the storm water pipe, just north of Empire's site and along the gas piping right-of-way, as well as excessive levels of Chromium on the site. In October, these tests led the DER to request that the EPCHC conduct additional tests for Chromium. They also led OHM to recommend additional testing of the site and removal of the storm pipe. The additional groundwater tests, conducted in October, revealed normal levels of Chromium. In late October, on the basis of the Dames & Moore and OHM tests, the EPC issued the attached letter to Empire.

- The EPA's RCRA facility investigation is still outstanding, as the OHM recommendations are still under review by the EPA.

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
TELEPHONE (813) 272-5960

AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530

WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

May 15, 1992

Mr. Dennis Korycinski
Environmental Engineer
56th CSG/DEV
MacDill AFB, Florida 33608

Dear Mr. Korycinski:

SUBJECT: APRIL 17, 1992 FOLLOW UP INSPECTION

Thank you for your time and assistance during my inspection referenced above. As you recall, the purpose of my visit was to verify the disposal of industrial waste water streams at the base. Most of the waste streams examined discharge to the base sanitary sewer system; however, three sources were found to have surface or ground water discharges. They are as follows:

1) Building 1050 - A large oil/water separator was determined to discharge to a storm sewer.

2) Building 712 - Boiler blowdown was observed to discharge to a stormwater ditch.

3) Tank Farm - An oil/separator which serves a loading rack discharges to a storm ditch.

The above discharges ultimately flow to the bay. These discharges are unauthorized without a valid industrial waste permit. Within twenty (20) days, please present plans to this agency that outline corrective actions for the above discharges.

If you have any questions please feel free to call me.

Sincerely,

Frederick Nassar
Environmental Engineer II
Industrial Waste Section

rr
cc: Robert Vanderslice, FDER IW Permitting
(1.L)

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
TELEPHONE (813) 272-5960

AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530

WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

October 23, 1992

Chuck Monteith
Empire Energy Management Systems, Inc.
Post Office Box 6840, Building 970
MacDill Air Force Base
Tampa, FL 33608

Dear Mr. Monteith:

SUBJECT: POTENTIAL PETROLEUM CONTAMINATION AT COGENERATION SITE ADJACENT TO BUILDING 1050 FROM OIL/WATER SEPARATOR DISCHARGES

Recently the Environmental Protection Commission (EPC) received two unsolicited preliminary environmental assessment reports. A report submitted by Dames and Moore on behalf of MacDill AFB and a report submitted by OHM Corporation on behalf of Empire Energy. The focus of both reports dealt with potential petroleum contamination caused by an oil/water separator discharge near the cogen site, adjacent to building 1050.

After review of both reports the EPC requested OHM to resample one of their wells (EW1) in order to verify the metals sampling results. On October 6, 1992, resampling of EW1 took place for lead and chromium. Regulatory exceedences for lead and chromium could not be duplicated upon resampling. The original results might be dismissed as a turbidity problem with the original unfiltered sample. Neither report, taken separately or together, presents any reason to suspect widespread, gross contamination of the soils or groundwater at this site. There is no evidence, based upon the reports, to justify any further pursuit of these issues at this time.

The EPC understands that a RCRA Facility Investigation (RFI) may be underway at the base due to prior releases to the environment. The work done to date by Dames and Moore and OHM may fulfill in total or in part the requirements of the RFI. However, that determination will be made by EPA. Based on the reports and resampling the EPC is satisfied that no further petroleum related assessment is needed for the above referenced site.

If you have any questions please feel free to contact this office.

Sincerely,

Sam Elrabi
Supervisor
Industrial Waste Section

cc: Henry Dominick, FDER IW C/E

Brian A. Travis President

October 26, 1992

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P. / Empire Energy Management Systems, Inc.
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

Subject: Extension of Construction Permits

Dear Mr. Fancy:

Construction of the MacDill Cogeneration Project was scheduled to have been completed during October of 1992. In May of this year, however, concerns about potential environmental contamination on the site were raised when it was discovered that the Air Force had been improperly discharging from an oil/water separator, located on the site, into a storm water drainage system on the site. Preliminary soil and groundwater testing indicated exceedences of Florida regulatory standards, which led to additional testing. The resolution of these environmental problems has interfered with the construction schedule. Empire Energy Management Systems, Inc. ("Empire") has been working with the Hillsborough County Environmental Protection Commission to properly address the environmental issues at hand, so that construction can resume.

Per the specific conditions of the constructions permits, and F.A.C. Rule 17-4.090, Empire hereby requests an extension of the permits referenced above, from December 31, 1992 to December 31, 1993.

If you have any comments or questions, feel free to contact me.

Very truly yours,

Empire Energy Management System, Inc.

Steven L. Greenberg
Vice President

cc: Edward C. Spivey, Jr, P.E., Bosek, Gibson and Assoc.
Environmental Protection Commission of Hillsborough County

der1026.ltr M. Bailey

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

November 3, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Steven L. Greenberg
Vice President
Empire Energy Management Systems, Inc.
P. O. Box 6840, Bldg. 970
MacDill AFB, FL 33608-0840

Dear Mr. Greenberg:

RE: AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)
Request for Permit Extensions

The Bureau of Air Regulation received your October 26, 1992, request for the above referenced project. On October 30, 1991, Rule 17-4.050(4)(o), F.A.C., was changed to require a $50 processing fee for a permit extension; therefore, we will not be able to take action on your request until a fee of $100 ($50 for each permit) is received. 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

P 062 921 909

Receipt for Certified Mail

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

Sent to	Steven L Greenberg
Street and No.	P.O Box 6840 Bldg 970
P.O. State and ZIP Code	MacDill AFB, FL 33608
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	11-3-92

AC 29-178834
" " 178883

PS Form 3800, June 1991

PS Form 3811, July 1983 447-845

SENDER: Complete items 1, 2, 3 and 4.

Put your address in the "RETURN TO" space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for service(s) requested.

1. ☐ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to:
Mr Steven L. Greenberg
Empire Energy Mgmt Systems Inc.
PO Box 6840, Bldg 970
MacDill AFB, 33608-0840

4. Type of Service:
☐ Registered ☐ Insured
☑ Certified ☐ COD
☐ Express Mail

Article Number
P 062 921 909

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X

7. Date of Delivery
11-6-92

8. Addressee's Address *(ONLY if requested and fee paid)*

DOMESTIC RETURN RECEIPT

November 6, 1992

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P. / Empire Energy Management Systems, Inc.
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

Subject: Extension of Construction Permits

Dear Mr. Fancy:

We are in receipt of your letter dated November 3, 1992. Enclosed please find Empire's check No. 11632, in the amount of $100.00, which represents the processing fee for Empire's permit extension request dated October 26, 1992.

If you have any questions or require any additional information, please call.

Very truly yours,

Empire Energy Management System, Inc.

Steven L. Greenberg
Vice President

SLG/rmt

Enclosures

001031

C.R.R.

der1106.ltr
M. Bourg

November 6, 1992

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P. / Empire Energy Management Systems, Inc.
AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)

Subject: Extension of Construction Permits

Dear Mr. Fancy:

We are in receipt of your letter dated November 3, 1992. Enclosed please find Empire's check No. 11632, in the amount of $100.00, which represents the processing fee for Empire's permit extension request dated October 26, 1992.

If you have any questions or require any additional information, please call.

Very truly yours,

Empire Energy Management System, Inc.

EMPIRE ENERGY MANAGEMENT SYSTEMS
P.O. BOX 6840
BUILDING 970
MACDILL AFB, FL 33608-0840

FIDELITY INVESTMENTS
SHAWMUT BANK, N.A.
BOSTON, MASSACHUSETTS 02110
5-20-110

11632

DATE	CHECK NO.	PAYEE I.D.
11/06/92	11632	FLA05

**********One Hundred Dollars and No Cents**********

PAY THIS AMOUNT $100.00

PAY TO THE ORDER OF
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ritin M Stone

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

November 3, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Steven L. Greenberg
Vice President
Empire Energy Management Systems, Inc.
P. O. Box 6840, Bldg. 970
MacDill AFB, FL 33608-0840

Dear Mr. Greenberg:

RE: AC 29-178834 (Cogeneration Plant #1)
AC 29-178833 (Cogeneration Plant #2)
Request for Permit Extensions

The Bureau of Air Regulation received your October 26, 1992, request for the above referenced project. On October 30, 1991, Rule 17-4.050(4)(o), F.A.C., was changed to require a $50 processing fee for a permit extension; therefore, we will not be able to take action on your request until a fee of $100 ($50 for each permit) is received. 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

OHM Corporation

November 16, 1992

Mr. Steve Greenberg
Empire Energy
Management Systems, Inc.
P.O. Box 6840, Building 970
MacDill Air Force Base
Tampa, FL 33608-0840

RE: Preliminary Work Plan for
Expanded Contamination Assessment and
Subsurface Storm Drainage Line Removal
MacDill Cogeneration Plant
Tampa, Florida

Dear Mr. Greenberg:

OHM Remediation Services Corp. (OHM) is pleased to present this Work Plan and associated cost estimate to conduct the expanded Contamination Assessment (CA) and storm drainage line removal at the above-referenced location.

The CA Work Plan that follows is designed to meet the requirements typically imposed by the Environmental Protection Commission of Hillsborough County (EPCHC) and the Florida Department of Environmental Regulation (FDER). However, as these agencies have not defined what additional action is required at this time, this Work Plan may not meet all future regulatory agency requirements. Further, this Work Plan is recommended based on OHM's Preliminary Investigation (August 25, 1992). During that investigation, sediments in the storm drain outfall were determined to exhibit Chemicals of Concern (COCs), Polynuclear Aromatic Hydrocarbons, Volatile Aromatics, Total Recoverable Petroleum Hydrocarbons, and select metals.

The CA objectives are as follows:

- Define the vertical and horizontal extent of dissolved contaminants in the groundwater
- Define the vertical and horizontal extent of organic vapors in soils
- Determine aquifer(s) depth to water, hydraulic gradient, and groundwater flow direction

- Assess hydrocarbon characteristics
- Identify potential receptors
- Describe local and regional hydrogeology

The Work Plan to accomplish the CA objectives includes:

- Construct four shallow and one deep monitor wells in addition to the three existing shallow wells
- During monitor well construction, obtain soil sample and analyze in the field using an organic vapor analyzer equipped with a flame ionization detector (OVA-FID)
- Sample groundwater from each newly-constructed monitor well and analyze for the COCs
- Obtain one soil sample exhibiting excessive organic vapor concentrations from each monitor well boring and analyze for the COCs
- Gauge liquid levels in all monitor wells; determine the depth to water and hydraulic gradient
- Conduct an elevation survey of all monitor well top of casings
- Perform aquifer slug tests to determine shallow aquifer hydraulic conductivity
- Document groundwater flow rate and direction
- Identify potential methods of contaminate transport
- Conduct water well inventory
- Research publications to describe published local and regional hydrogeologic conditions

Following receipt of the analytical data, the results of the field work and laboratory analyses will be compiled into a report that described the findings of the Expanded Contamination Assessment. Further recommendations for applicable additional investigation(s) and/or

remediation activities necessary to ensure compliance with federal and/or state requirements will be provided.

A cost estimate to perform the CA Work Plan is provided on Exhibit A. The estimated cost to perform the CA is $24,710.00.

The proposed Work Plan to remove the subsurface storm drain includes:

- Excavation of the surface cover
- Bulk containment of soil
- Composite analysis for COCs in staged soils
- Cap storm drain outfall
- Pump all standing storm water to Drainage Retention Area
- Removal and decontamination of the drain line
- Backfill and sod the former storm drain locations
- Coordination, manifesting, transportation and disposal of soils and sediment

The cost estimate to perform the Subsurface Storm Drain Removal is provided in Exhibit B. The estimated cost to perform this removal is $16,784.80, based on the following assumptions:

1. Total length of the storm drain is 800 feet
2. No additional utilities will be encountered or cause obstruction during storm drain removal
3. No contaminated soils will be encountered during excavation

If conditions are different than those anticipated, costs will be adjusted accordingly. Because the quantity of contaminated soil, if any, cannot be determined at this time, this estimate does not include the cost for transportation and disposal of contaminated soils.

OHM offers to perform each Work Plan on a Time and Materials basis in accordance with the Terms and Conditions of OHM's Environmental Services Agreement (ESA). To initiate

this project, please sign, date, and return the ESA to my attention. Upon authorization to proceed, the described Work Plans will be initiated within two weeks and completed within forty-two working days.

This proposal will remain in effect for a period of thirty days.

OHM appreciates your review and consideration of these Work Plans. If you have any questions, please call me at 904-394-8601.

Sincerely,

OHM REMEDIATION SERVICES CORP.

Daniel P. Leigh, P.G.
Project Manager

DPL:Dae

pc: Curtis Lee, OHM
Alan Lubell, OHM

Attachments

EXHIBIT A
EXPANDED CONTAMINATION ASSESSMENT
MACDILL COGENERATION PLANT
TAMPA, FLORIDA

	QUANTITY UNIT	UNIT COST	TOTAL
PERSONNEL			
Secretary I	5 hours	24.92	$ 124.60
Word Processor	10 hours	35.33	353.60
Recovery Technician	60 hours	29.60	1,776.00
Draftsperson	10 hours	39.60	396.00
Scientist I	60 hours	48.14	2,888.40
Senior Project Scientist	40 hours	84.31	3,372.40
Project Manager	5 hours	73.62	368.10
	SUBTOTAL -- PERSONNEL		$9,279.10
EQUIPMENT			
Van	3 days	66.00	$198.00
Hand Auger	2 days	35.00	70.00
OVA-FID	2 days	50.00	100.00
Survey Equipment	1 day	75.00	75.00
Data Logger	1 day	125.00	125.00
Portable Computer	2 days	50.00	100.00
Water Level Indicator	2 days	25.00	50.00
	SUBTOTAL -- EQUIPMENT		$718.00
SUBCONTRACTOR SERVICES			
MONITOR WELL CONSTRUCTION			
Shallow Wells	4 each	660.00	$2,640.00
Deep Well	1 each	1,374.00	1,374.00
Decontamination	4 hours	75.00	300.00
Permits	5 each	50.00	200.00
	SUBTOTAL -- MONITOR WELL CONSTRUCTION		$4,514.00
ANALYTICAL (WATER)			
Trip Blank	1 each	75.00	$ 75.00
Unknown Product Group (Chapter 17-770)	7 each	690.00	4,830.00

EXHIBIT A
(continued)

	QUANTITY UNIT	UNIT COST	TOTAL
SUBCONTRACTOR SERVICES (continued)			
ANALYTICAL (SOIL)			
Preburn Analysis	1 each	330.00	330.00
	SUBTOTAL -- ANALYTICAL		$5,235.00
	SUBTOTAL -- SUBCONTRACTOR SERVICES		$9,749.00
EXPENDABLES & MISCELLANEOUS (E&M)			
Mileage	600 miles	.29	$174.00
Field Analytical Supplies	2 days	25.00	50.00
Per Diem	6 each	50.00	300.00
	SUBTOTAL -- E&M		$524.00
TOTAL ESTIMATED COST			$24,784.10

EXHIBIT B
SUBSURFACE STORM DRAIN LINE REMOVAL
MACDILL COGENERATION PLANT
TAMPA, FLORIDA

	QUANTITY UNIT	UNIT COST	TOTAL
PERSONNEL			
Secretary I	5 hours	24.92	$ 124.50
Recovery Technician	40 hours	39.50	1,184.00
Foreman	40 hours	47.00	1,180.00
Supervisor	40 hours	67.50	2,700.00
Equipment Operator	40 hours	42.30	1,692.00
Project Manager	15 hours	73.62	1,104.30
	SUBTOTAL -- PERSONNEL		$7,984.80
EQUIPMENT			
Pickup Truck	5 days	90.00	$ 450.00
Stake-Bed Truck	4 days	250.00	1,000.00
Backhoe/Excavator	4 days	400.00	1,600.00
Trailer	4 days	125.00	500.00
OVA-FID	4 days	50.00	200.00
2-inch diaphragm pump	1 day	135.00	135.00
Air Compressor	1 day	495.00	495.00
Pressure Washer	4 days	360.00	1,440.00
	SUBTOTAL -- EQUIPMENT		$5,820.00
SUBCONTRACTOR SERVICES			
Contaminated Soil Treatment	ton		To be determined
Contamianted Soil Transportation	cu yd		To be determined
Backfill	150 cu yd	10.00	500.00
Grass	6,400 sq ft	0.15	960.00
Drainage Pipe, disposal*	40 tons	30.00	1,200.00
Drainage Pipe, transported	40 tons	8.00	320.00
TOTAL ESTIMATED COST			$16,748.80

* Provided materials are considered clean, and material is accepted at a non-hazardous landfill.

COMMISSION
PHYLLIS BUSANSKY
JOE CHILLURA
PAM IORIO
SYLVIA KIMBELL
JAN KAMINIS PLATT
JAMES D. SELVEY
ED TURANCHIK

FAX (813) 272-5157

ENVIRONMENTAL PROTECTION COMMISSION
HILLSBOROUGH COUNTY

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES AND WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
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AIR MANAGEMENT DIVISION
TELEPHONE (813) 272-5530

WASTE MANAGEMENT DIVISION
TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

November 19, 1992

Major Nyle E. Bosler
56th CES/CEV
MacDill Air Force Base
Tampa, Florida 33608

Dear Major Bosler:

SUBJECT: **POTENTIAL PETROLEUM CONTAMINATON AT COGENERATION SITE ADJACENT TO BUILDING 1050 FROM OIL/WATER SEPARATOR DISCHARGES**

EPC's Industrial Waste staff brought your Facsimile and draft letter. Unfortunately, EPC cannot accede to your request.

EPC does indeed have jurisdiction over the matter of the discharge from the oil/water separator, as do other regulatory agencies for whom we cannot speak with any finality. EPC also has jurisdiction over other environmental concerns, some of which are within the industrial waste section's area of responsibility, some of which are not. EPC is not in a position to speak on any of those matters at this time.

EPC has spoken with regard to its concern for the contamination caused by the oil/water separator discharge in its letter of October 23, 1992, (copy attached). Essentially, EPC's position on this matter is that, based upon the information currently available to EPC, it does not have any reason to believe that further research, analysis, or correction is required. EPC therefore has no intentions of pursuing this issue, and at this time does not require anything further from MacDill or Empire on this matter.

Sincerely,

Sara M. Fotopulos

Sara M. Fotopulos
Chief Counsel

ljh

xc: Henry Dominick, DER

Enclosure

(macdill.ltr)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

JAN 04 1993

4WD-FFB

Major Bozier, USAF
Chief Environmental Engineering
56 CES/CEV
MacDill Air Force Base, Florida 33608-5000

RE: DRAFT RCRA FACILITY ASSESSMENT AND INVESTIGATION
WORK PLAN - SWMU # 35 and Area of Concern # 22

Dear Major Bozier:

On November 18, 1992, the Environmental Protection Agency (EPA) received two reports on an area adjacent to Solid Waste Management Unit (SWMU) #35 and Area of Concern (AOC) #22, at MacDill Air Force Base (MAFB). The reports were prepared by Dames and Moore and OHM Corporation. The Dames and Moore report was reviewed and our findings were presented in a letter dated December 11, 1992. The OHM report is presently under review.

In the report review letter of December 11, 1992, EPA incorrectly identified AOC # 22 as AOC # 29. There is no AOC # 29 at MAFB. AOC # 22 is identified as Fuel Bladders, Building 1050, in the RCRA Facility Investigation (RFI) and the RCRA Permit and is a bermed area contiguous with the cogeneration site.

If you have any questions concerning these comments, please contact me at (404) 347-3016.

Sincerely yours,

Elizabeth Wilde

Elizabeth L. Wilde
Remodial Project Manager
DOD Remedial Section
Federal Facilities Branch

Enclosure

cc: Eric Nuzie, DER

OPTIONAL FORM 99 (7-80)
FAX TRANSMITTAL

To Judy Hall	From LIZ WILDE
Dept./Agency MACDILL AFB	Phone # 404 347-3016
Fax # 813 830-3667	Fax # 404 347-5205

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Printed on Recycled P:

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
1900 - 9TH AVENUE
TAMPA, FLORIDA 33605
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TELEPHONE (813) 272-5788

ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

ENVIRONMENTAL PROTECTION COMMISSION
of Hillsborough County

FAX Transmittal Sheet

DATE: 1-4-93

TO: John Holtom @ 8:39

FAX Phone: (904) 922-6979 Voice Phone: Suncom 278-8163

TOTAL NUMBER OF PAGES INCLUDING THIS COVER PAGE: 10

EPC FAX Transmission Line: (813) 272-5157 For retransmission or any FAX problems, call: (813) 272-5960

FROM: Fred Wasser (circle applicable phone number and organization below)

(813) 272-5960	(813) 272-5530	(813) 272-5788	(813) 272-5960	(813) 272-7104
Executive Director	Air Division	Waste Management	Water Division	Ecosystems Management
Legal Counsel	- Special Programs	- UST Clean-Up	- Enforcement	- Environmental Engineering
Finance & Administration	- Air Engineering	- Solid/Hazardous Waste	- Water Engineering	- Environmental Assessment
Accounting & Budgeting		- UST Compliance	- Monitoring & Analysis	- Compliance & Enforcement
Data Processing/MIS				

SPECIAL INSTRUCTIONS: Some info on MacDill AFB in Tampa. I could not find any Memo that would indicate a stall on Empires part However, there is one Memo included that may give you some insight as to what the problem is.

If you need any thing else please let me know Thanks Fred

(File:\work\mis\FAXTrans.Frm)

ENVIRONMENTAL PROTECTION COMMISSION
HILLSBOROUGH COUNTY

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
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ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

MEMORANDUM

DATE: September 3, 1992

TO: Fred Nassar, Acting IW Chief

FROM: Diana Nix, Hydrogeologist

SUBJECT: MacDill Cogeneration Site Phase I Results
Dames & Moore Submittal

Technical staff has reviewed the document referred to above, and has the following observations and comments:

Based upon what has been submitted by Dames & Moore, there appears to be no reason to suspect widespread, gross lead contamination of the soil at this site. The one small area discovered during the sampling is obviously isolated, and could be attributed to any one of a number of causes. Staff does not believe that this could be considered to be an indication of a problem. The MDLs for the 8270 compounds, as noted previously, are too high for a similar statement to be made regarding the presence of 8270 substances in the soil; however, neither could this be construed as an indication of a soil problem onsite. In addition, this report does not address groundwater, although, groundwater was not raised as an issue. Based solely upon the information received thus far, there are no indications which would raise the question of groundwater pollution at this particular site.

Brian A. Travis

'92 SEP -9 A6:34

President

September 8, 1992

Mrs. Judith A. Hall, Contracting Officer
56 CONS/COK, Contracting Division
Building 960
MacDill Air Force Base, Florida 33608

Re: Contract No. F44650-88-C0004 ("Contract")

Dear Mrs. Hall:

On the basis of recent inquiries with the Hillsborough County Environmental Protection Commission ("EPC"), Empire believes that your letters of July 17, 1992 and August 28, 1992 constitute a deliberate attempt to misrepresent the position of the EPC, the Florida Department of Environmental Regulation ("DER") and the United States Environmental Protection Agency ("EPA") with regard to the site contamination.

The fallacious MacDill AFB statements we refer to relate to the soil tests conducted by MacDill AFB, and are (respectively):

(1) You said that MacDill AFB's "methods and procedures have been reviewed by the Hillsborough County Environmental Protection Commission (EPC) representatives and meet their requirements";

(2) You said that the MacDill AFB "test plan, their analysis, and their conclusion have been reviewed by the Environmental Protection Commission of Hillsborough County, representing the Florida Department of Environmental Regulation and the Environmental Protection Administration, who agree with the findings and conclusions".

The EPC statements which directly contradict your statements come from an EPC memorandum dated July 28, 1992 and entitled "Corrections to MacDill Meeting Notes" and a telephone conversation on September 4, 1992. They are (respectively):

(1) "The question under consideration was why MacDill would only screen soils, and not groundwater, as any site could not be considered 'clean' until the issue of the presence/absence of groundwater pollutants had been addressed satisfactorily";

(2) Although the EPC had been asked to provide a written analysis of MacDill AFB's final report, it has not done so, and has elected not to do so until Empire's final report and test results are also provided to the EPC.

Clearly if the EPC was of the opinion that the site could not be considered "clean" without groundwater testing, as also stated to MacDill AFB by Empire in its letter dated July 20, 1992 and by MacDill AFB's own environmental consultant, Dames & Moore, in its initial proposal to MacDill AFB, the EPC could not have possibly agreed that MacDill AFB's test plan met the EPC's requirements, much less concurred with its conclusions. The July 17, 1992 and August 28, 1992 statements are therefore clear misrepresentations by MacDill AFB of the EPC's position.

Further, since MacDill AFB has not only misrepresented the EPC's position, but has expanded upon this misrepresentation by construing it as being a concurrence by the DER and the EPA with MacDill AFB's order that Empire resume site work, MacDill AFB's misrepresentations appear to have been made deliberately in order to thwart any independent inquiry into MacDill AFB's contamination of the environment and corresponding endangering of the community.

Empire hereby advises MacDill AFB that pursuant to Section 17-770.250 of the Florida Administrative Code and Empire's letter dated August 31, 1992, MacDill AFB has one week from August 31, 1992 to notify the DER of the excess soil contamination found, or be in violation of Section 17-770.250 F.A.C.

Empire expects to have OHM's final report within the next week. Upon receipt, Empire will provide copies to the Air Force as well as the EPC and the DER, and hopes that this will expedite a resolution of the outstanding environmental issues.

Until MacDill AFB notifies the DER of the soil contamination, obtains a waiver for continued construction without the need for carbon filtering during dewatering activities, and establishes a contractual basis on which Empire can proceed, site construction cannot continue.

Very truly yours,

Empire Energy Management Systems, Inc.

Steven L. Greenberg
Vice President

cc: Honorable Connie Mack, United States Senator
Honorable Alfonse D'Amato, United States Senator

COMMISSION
THOMAS BUSANSKY
JOE CHILLURA
PAM IORIO
SYLVIA KIMBELL
JAN KAMINIS PLATT
JAMES D. SELVEY
ED TURANCHIK

FAX (813) 272-5157

ENVIRONMENTAL PROTECTION COMMISSION
HILLSBOROUGH COUNTY

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ECOSYSTEMS MANAGEMENT DIVISION
TELEPHONE (813) 272-7104

October 23, 1992

Dennis Korycinski
Environmental Engineer
56th CES/CEV
MacDill Air Force Base
Tampa, FL 33608

Dear Mr. Korycinski:

SUBJECT: POTENTIAL PETROLEUM CONTAMINATION AT COGENERATION SITE ADJACENT TO BUILDING 1050 FROM OIL/WATER SEPARATOR DISCHARGES

Recently the Environmental Protection Commission (EPC) received two unsolicited preliminary environmental assessment reports. A report submitted by Dames and Moore on behalf of MacDill AFB and a report submitted by OHM Corporation on behalf of Empire Energy. The focus of both reports dealt with potential petroleum contamination caused by an oil/water separator discharge near the cogen site, adjacent to building 1050.

After review of both reports the EPC requested OHM to resample one of their wells (EW1) in order to verify the metals sampling results. On October 6, 1992, resampling of EW1 took place for lead and chromium. Regulatory exceedences for lead and chromium could not be duplicated upon resampling. The original results might be dismissed as a turbidity problem with the original unfiltered sample. Neither report, taken separately or together, presents any reason to suspect widespread, gross contamination of the soils or groundwater at this site. There is no evidence, based upon the reports, to justify any further pursuit of these issues at this time.

The EPC understands that a RCRA Facility Investigation (RFI) may be underway at the base due to prior releases to the environment. The work done to date by Dames and Moore and OHM may fulfill in total or in part the requirements of the RFI. However, that determination will be made by EPA. Based on the reports and resampling the EPC is satisfied that no further petroleum related assessment is needed for the above referenced site.

If you have any questions please feel free to contact this office.

Sincerely,

Sam Elrabi
Supervisor
Industrial Waste Section

cc: Henry Dominick, FDER IW C/E

FACSIMILE ELECTRO MAIL TRANSMITTAL

(This information collection is not subject to OMB review under PL-96, The Paperwork Reduction Act.)

COMPLETED BY ORIGINATOR

	TRANSMISSION	PAGE ONE OF PAGES
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TO (Organization and Functional Address Symbol)	FAX NO.	
ERHC MR FRED NASSER	DSN	COMMERCIAL (813) 272-5157
ATTENTION	**VOICE NO.**	
MR FRED NASSER	DSN	COMMERCIAL (813) 272-5960

SUBJECT

PROPOSED LETTER

FROM (Organization and Functional Address Symbol)	FAX NO.	
56 CES/CEV MAJOR BOSIER	DSN	COMMERCIAL (813) 830-5390
	VOICE NO.	
	DSN	COMMERCIAL (813) 830-2527

RECD
NOV 17 1992
ENV. PROT. COMM.
OF H.C.

REMARKS

FRED

DURING OUR LATEST MEETING WITH EMPIRE THEY REQUESTED A LETTER FROM ERHC FOLLOWING THE ATTACHED FORMAT WHICH WOULD SATISFY THEIR REQUIREMENTS TO MOVE FORWARD WITH CONSTRUCTION OR SOMETHING AS CLOSE AS POSSIBLE. YOUR COMMENTS PLEASE

RELEASER'S SIGNATURE	DATE	TIME
Major E. Bosier	11/18/92	1636

SECTION II - TO BE COMPLETED BY ELECTRO MAIL OPERATOR

DATE TRANSMITTED	TIME TRANSMITTED	TRANSMITTER'S SIGNATURE
DATE ADDRESSEE CONTACTED	**TIME ADDRESSEE CONTACTED**	**CONTACTOR'S SIGNATURE**

AF Form 3535, SEP 91

BEST AVAILABLE COPY

November 17, 1992

MacDill AFB &
Empire Energy Management Systems, Inc.

To Whom it May Concern:

The Environmental Protection Commission of Hillsborough County ("EPCHC") is the regulatory agency having jurisdiction over compliance with State, county and local environmental laws at MacDill AFB, Florida. The EPCHC represents the Florida Department of Environmental Regulation ("FDER").

The EPCHC is aware that Empire Energy Management Systems, Inc. ("Empire") is under contract to build, own and operate a cogeneration facility on a site on MacDill AFB, situated south of the retention pond along North Boundary Road, east of MacDill Avenue and north of Zemke Way. The EPC is also aware that prior to July 1992, the Air Force was operating an oil-water separator device in the vicinity of the site, and that without the necessary permit(s), this oil-water separator was discharging into a storm water system that feeds into the aforementioned retention pond.

The EPCHC has reviewed the documents prepared by CH2M-Hill, Radian Corporation, Dames and Moore and OHM Corporation. Pursuant to the request of the FDER, the EPC, on behalf of the FDER, requested that additional groundwater testing be performed. The EPC has reviewed the results of this additional testing.

The EPCHC has concluded that the aforementioned site is in full compliance with all applicable environmental laws and regulations. Therefore:

(1) Neither Empire nor the Air Force needs to perform any additional environmental testing prior to or during construction, including the additional testing recommended by OHM Corporation in it letter dated 16 November 1992; and

(2) Neither Empire nor the Air Force needs to conduct any remedial activities prior to, during or subsequent to construction on the aforementioned site, including without limitation (i) carbon absorption filtering, (ii) air stripping, (iii) off-site soil or water disposal, and (iv) removal of the storm water pipe as recommended by OHM Corporation in its letter dated 16 November 1992; and

(3) The EPCHC waives any and all causes of action it has or may have against Empire and/or the Air Force with respect to MacDill Avenue cogeneration site and/or the associated oil-water separator and storm water system.

Very truly yours,

EPCHC, Director

COMMISSION
PHYLLIS BUSANSKY
JOE CHILLURA
PAM IORIO
SYLVIA KIMBELL
JAN KAMINS PLATT
JAMES D. SELVEY
ED TURANCHIK

FAX (813) 272-5157

ENVIRONMENTAL PROTECTION COMMISSION
HILLSBOROUGH COUNTY

ROGER P. STEWART
EXECUTIVE DIRECTOR
ADMINISTRATIVE OFFICES
AND
WATER MANAGEMENT DIVISION
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TELEPHONE (813) 272-7104

November 19, 1992

Major Nyle E. Bosler
56th CES/CEV
MacDill Air Force Base
Tampa, Florida 33608

Dear Major Bosler:

SUBJECT: POTENTIAL PETROLEUM CONTAMINATON AT COGENERATION SITE ADJACENT TO BUILDING 1050 FROM OIL/WATER SEPARATOR DISCHARGES

EPC's Industrial Waste staff brought your Facsimile and draft letter. Unfortunately, EPC cannot accede to your request.

EPC does indeed have jurisdiction over the matter of the discharge from the oil/water separator, as do other regulatory agencies for whom we cannot speak with any finality. EPC also has jurisdiction over other environmental concerns, some of which are within the industrial waste section's area of responsibility, some of which are not. EPC is not in a position to speak on any of those matters at this time.

EPC has spoken with regard to its concern for the contamination caused by the oil/water separator discharge in its letter of October 23, 1992, (copy attached). Essentially, EPC's position on this matter is that, based upon the information currently available to EPC, it does not have any reason to believe that further research, analysis, or correction is required. EPC therefore has no intentions of pursuing this issue, and at this time does not require anything further from MacDill or Empire on this matter.

Sincerely,

Sara M. Fotopulos

Sara M. Fotopulos
Chief Counsel

ljh

xc: Henry Dominick, DER

Enclosure

(macdill.ltr)

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

June 8, 1992

MR RICHARD BURNETT
56 CSG/DEV
MACDILL AFB FL 33608

Dear Mr. Burnett:

Department personnel have completed the technical review of the Draft RCRA Facility Investigation Report documents. I have enclosed a memorandum addressed to me from Mr. Mark Canfield. Our concerns and comments on the documents are discussed in the memorandum.

If I can be of any further assistance with this matter, please contact me at (904)488-0190.

Sincerely,

Eric S. Nuzie
Federal Facilities Coordinator

ESN/dd

Enclosure

cc: Diane Trommer
Rose Anne Rudd
Mark Canfield
Lynn Griffin
Alex Cordero

4WMD/FFB

DRAFT

Major Bozier, USAF
Chief Environmental Engineering
56 CES/CEV
MacDill Air Force Base, Florida 33608-5000

RE: DRAFT RCRA FACILITY INVESTIGATION
WORK PLAN

Dear Major Bozier:

The U.S. Environmental Protection Agency (EPA) has reviewed the above referenced document. Enclosed are EPA comments on the RCRA Facility Investigation Work Plan for MacDill Air Force Base, Florida.

EPA recommends that these comments be incorporated into the final document. If you have any questions concerning these comments, please contact me at (404) 347-3016.

Sincerely yours,

DRAFT

Elizabeth L. Wilde
Remedial Project Manager
SOD Remedial Section
Federal Facilities Branch

Enclosure

cc: Eric Nuzie, DER

12-29

Empire Energy Management

~~applied~~ Request for extension

F.A.C 17-4.090 - Renewals
"Prior to 60 days before expiration of operation Permit
→ This pertains to renewal of operation permits

403.087

17-4.080 (3)

Department Policy
equipment delays, Labor problems
Reasonable excuses
don't keep extending if it appears they are just stalling
3rd ext. - Extreme conditions
4th practically unheard of
→ verify with someone else ←
if over 6mos Look closely
treat 1yr request as 2nd extension, more

Start FAC update File
re-write 17-4.080 (3) to read
"60 days prior" Then refer to it, Not .090

Empire

please provide copy of correspondence authorizing contractor to delay construction

Contact Local E.P.C. for verification

→ Charles Monteith (813) 890-0100
problem discovered by construction. Storage tank was in the way of cement trucks. When requested Air force to move, they discovered that E.P.C had them under notice for contaminating storm water drainage system. Drain pipe needs to be resolved before further construction can continue (Footers are in, needs service, across affected area, before slab can be poured) All equipment on site to complete construction. 7 months physical const. 1 month Testing, 8 months to solve problem.

Sam El Robbie - EPC 543-5960
Fred Masser
No Order to Clean up, Or Cease Const.
early 1992, Empire requested E.P.C. to Empire Felt conduit was contaminated. Asked E.P.C. to evaluate. E.P.C. found No Hotspots. Empire did own study & found Chromium, E.P.C. retested - Clean
E.P.A. - R.F.I. ? Recra Facility Investigation
Contractual dispute between Empire & Mac Dill

Empire MacDill

Rec. 10/29/92 Request to extend permits From
Dec 31, 92 to Dec 31, 93
Cogen Plant #1 AC 29-178839
Cogen Plant #2 AC 29-178833

10/21/91 extended Const. Permit From
1/15/92 TO 12/31/92
Due to MacDill AFB. Being undecided about
closing or re-alignment

To Add File to another File
In file
Gold - Get Doc.
DOC

agree to extend 6 mo.
if Const.

as a rule. once Const begins, 6 mo ext
rare to get 1 yr.
very rare to give 2 - 1 yr extensions
H.B. cnty delaying Const? Testing?, Completion?
Confirm with H.B. Co.
Provide us with New Bact Det. & diff between
0.6 % Fuel & 0.05 % Fuel * SO_2 & NO_x
Not Satisfactory any Longer #2 Fuel oil

Empire

40 CFR 60 Subpart A
Define Const. Start

40 CFR 52.21

Last Const. Date

proof of Site Const. Vouchers for Labor
Verify what has been done to date including dates

Date Const. Permit Issued!
↳ When did const. begin – verify/validate
↳ Is the facility still under active const. – y/n
If not, when was last const. active.

Dates & Correspondence

→ Footers - Last Construction - February 1991

Empire Energy Management, Inc.
P.O Box 6840 Bldg 970
MacDill AFB, Fl. 33608

1-11-93 Charles Monteith - Postage to go in mail today
including info from E.P.A. that just arrived

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

Interoffice Memorandum

To: File

From: Mirza Baig MB

Date: June 19, 1992

Subj: Empire Energy Mgmt. Services, Inc.

I recevied a call today from Mr. John Wyburn, Regional Manager of U S Turbine, Miami, Fl office requesting a copy of the construction permits (issued on Nov 9, 1990) for the above referenced projects. A copy of these permits were mailed to him today at the following address:

U S Turbine
9481 S.W. 147 St.
Miami, Fl 33176
Phone: 305/251-1614

P 617 884 179

Certified Mail Receipt

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

UNITED STATES POSTAL SERVICE

Sent to Brian Travis	
Street & No. Empire Energy M.S.	
P.O., State & ZIP Code MACDill, AFB, FL	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Address of Delivery	
TOTAL Postage & Fees	$
Postmark or Date 10-24-91	

AC 29-178833
" " 834

PS Form **3800**, June 1990

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

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

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

Consult postmaster for fee.

3. Article Addressed to:
Mr. Brian Travis, Pres.
Empire Energy Mgmt. Sys.
P.O. Box 6840
MacDill AFB, FL
33608

4a. Article Number P 617 884 179

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

7. Date of Delivery OCT 28 1991

5. Signature (Addressee)

6. Signature (Agent)

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

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

United States Postal Service

Official Business

RECEIVED

OCT 30 1991

Division of Air Resources Management

U.S. MAIL

PENALTY FOR PRIVATE USE, $300

Print your name, address and ZIP Code here

Patty Adams, DER-BAR
2600 Blair Stone - Twin Towers
Tallahassee, Fl 32399-2400

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

October 21, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Brian Travis, President
Empire Energy Management Systems, Inc.
P. O. Box 6840
MacDill AFB, Florida 33608

Re: Permit Expiration Date Extension
Two Cogeneration Plants
AC 29-178833 and AC 29-178834

Dear Mr. Travis:

The Department is in agreement with your request dated October 9, 1991, for an extension of the expiration date of the above permits. The following shall be changed and added to the permit:

Expiration Date:

From: January 15, 1992
To: December 31, 1992

Attachment to be Added:

- Thomas E. Bartley's letter received October 15, 1991.

This letter must be attached to the above mentioned permit and shall become a part of that permit.

Sincerely,

STEVE SMALLWOOD, P.E.
Director
Division of Air Resources
Management

SS/MB/plm

c: B. Thomas, SWD
I. Choronenko, HCEPC
E. Spivey, P.E.
D. Lock, US Turbine

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

Interoffice Memorandum

OK
spl 10/21/91

TO: Steve Smallwood

FROM: Clair Fancy

DATE: October 21, 1991

SUBJ: Amendment to Construction Permit AC 29-178833/34
Empire Energy Management System, Inc.
Cogeneration Plant Nos. 1 & 2

Attached for your approval and signature is a letter extending the expiration dates for the above referenced construction permit.

The Bureau recommends approval of this amendment.

CF/MB/plm

Attachment

October 9, 1991

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P.
Empire Energy Management Systems, Inc.
AC 29-178833 (Cogeneration Plant #1)
AC 29-178834 (Cogeneration Plant #2)

Subject: Extension for Construction Permits

Dear Mr. Fancy:

The actions and inactions of the Air Force, primarily in response to listings put forth by the Base Closure and Realignment Commission, have delayed construction on the MacDill AFB Cogeneration Project. As you are probably aware, the Base Closure and Realignment Commission initially placed MacDill on its realignment list, then it closure list, and then back to its realignment list. Needless to say, these designations created considerable concern and led to a suspension of site work on the cogeneration project. However, following the Commission's final decision to suggest a realignment rather than a closing for the MacDill, and the ultimate approval of the closure and realignment lists by the President and Congress in late July 1991, the decision has been made to move forward with completion of the project.

As a result of the above policy and decision-making processes, construction on the cogeneration plants will not be complete on January 15, 1992 -- the present expiration date for the permits. Therefore, we are requesting an extension of these construction permits from January 15, 1992 to November 1, 1992. Please provide this extension as soon as your schedule permits; this extension is crucial to facilitating project implementation.

Empire Empire Energy Management Systems, Inc. P.O. Box 6840, Building 970 MacDill AFB, FL 33608-0840 (813) 840-0100

CERTIFIED

P 398 993 122

MAIL

OCT 10'91 FLA. P.O METER 3369564 $2.29

Empire

P.O. Box 6840, Building 970
MacDill AFB, FL 33608-0840

RETURN RECEIPT REQUESTED

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

As always, if you have any comments or questions, feel free to contact me.

Very truly yours,

Empire Energy Management Systems, Inc.

Thomas E. Bartley, CEM
Project Manager

cc: Brian Travis, Empire
Edward C. Spivey, Jr, P.E., Bosek, Gibson and Assoc.
Environmental Protection Commission of Hillsborough County
M. Baig
B. Thomas, SW Dist

der1009.ltr

October 22, 1990

RECEIVED
OCT 23 1990
DER - BAQM

Mr. Barry Andrews
Bureau of Air Regulation
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: DER File No. AC 29-178833; AC 29-178834

Dear Mr. Andrews:

Attached is Proof of Publication of the Notice of Intent to Issue for the above permit applications, as required.

Feel free to contact me with any comments or questions.

Sincerely,

Empire Energy Management Systems, Inc.

Thomas E. Bartley, CEM
Project Manager

TEB/stk
Enclosures
cc: M. Bucq
B. Thomas, SW Dist.
J. Campbell, EPC14E

THE TAMPA TRIBUNE

Published Daily
Tampa, Hillsborough County, Florida

State of Florida
County of Hillsborough } ss.

Before the undersigned authority personally appeared R. Putney, who on oath says that he is Accounting Manager of The Tampa Tribune, a daily newspaper published at Tampa in Hillsborough County, Florida; that the attached copy of advertisement being a

.....

LEGAL NOTICE

.....

in the matter of .....

October 17, 1990 GAS TURBINE

.....

.....

was published in said newspaper in the issues of .....

October 17, 1990

.....

Affiant further says that the said The Tampa Tribune is a newspaper published at Tampa, in said Hillsborough County, Florida, and that the said newspaper has heretofore been continuously published in said Hillsborough County, Florida, each day and has been entered as second class mail matter at the post office in Tampa, in said Hillsborough County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm, or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

R. Putney

.....

Notary Public, State of Florida
My Commission Expires Sept. 3, 1994
Bonded Thru Troy Fain - Insurance Inc.

Sworn to and subscribed before me, this 18 *day of* October *A.D. 19* 90

Scott D. Williams

.....

(SEAL)

SCOTT D. WILLIAMS NOTARY PUBLIC STATE OF FLORIDA

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue permits to construct the following: 1) Cogeneration Plant No. 1 consisting of (a) Allison 501-KH, Gas Turbine with a Heat Recovery Steam Generator rated at 5.52 MW and (b) Allison 501-KB5 Gas Turbine rated at 4.1 MW and; 2) Cogeneration Plant No. 2 consisting of a Kawasaki MIA-13 Gas Turbine rated at 1.43 MW. Both plants will be located at the MacDill AFB in Tampa, Hillsborough County, Florida. A determination of Best Available Control Technology (BACT) is required for the Heat Recovery Steam Generator. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within fourteen (14) days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

Con't. From Preceding Column

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the applications have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The applications are available for public inspection during business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

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

Department of Environmental Regulation
Southwest District
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Hillsborough County
Environmental
Protection Commission
1410 North 21st Street
Tampa, Florida 33605

Any person may send written comments on the proposed action to Mr. Barry Andrews at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

4782 10/17/90

P 256 395 210

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

Sent to Brian Travis	
Street and No. Empire Eng. Mgmt.	
P.O., State and ZIP Code P.O. Box 6840	
Postage MacDill, AFB	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date 10-4-90 AC 29-178833 29-178834	

PS Form 3800, June 1985 ☆U.S.G.P.O. 1989-234-555

SENDER: Complete items 1 and 2 when additional services are desired, and comp... ...ms 3 and 4.

Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent ... ...card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:
Brian Travis, Pres.
Empire Energy Mgmt. Sys.
P.O. Box 6840, Bldg. 970
MacDill AFB, Fl 33608-0840

4. Article Number
P 256 395 210

Type of Service:
☐ Registered ☐ Insured
☑ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X Suzanne Kelly

7. Date of Delivery
10 OCT 90

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form 3811, Apr. 1989 ★U.S.G.P.O. 1989-238-815 **DOMESTIC RETURN RECEIPT.**

UNITED STATES POSTAL SERVICE

OFFICIAL BUSINESS

SENDER INSTRUCTIONS

Print your name, address and ZIP Code in the space below.

- Complete items 1, 2, 3; and 4 on the reverse.
- Attach to front of article if space permits, otherwise affix to back of article.
- Endorse article "Return Receipt Requested" adjacent to number.

RECEIVED
OCT 15 1990
DER-BAQM

U.S.MAIL

PENALTY FOR PRIVATE USE, $300

RETURN TO

Print Sender's name, address, and ZIP Code in the space below.

Patty Adams - D.E.R. - BAR
2600 Blair Stone Rd. - Twin Towers
Tallahassee, Fl 32399-2400

File Copy

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

October 4, 1990

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Brian Travis, President
Empire Energy Management Systems, Inc.
P. O. Box 6840, Bldg. 970
MacDill AFB, Florida 33608-0840

Dear Mr. Travis:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permits to Empire Energy Management Systems, Inc. to construct three gas turbines at the Cogeneration Plant Nos. 1 and 2 at the MacDill AFB in Tampa, Hillsborough County, Florida.

Please publish the attached "Notice of Intent to Issue" in the legal ad section of a newspaper of general circulation in the area affected and submit the proof of publication to the Department within seven days of publication, along with any written comments you wish to have considered concerning the Department's proposed action, to Mr. Barry Andrews of the Bureau of Air Regulation.

Sincerely,

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

CHF/MB/plm

Attachments

c: B. Thomas, SW District
I. Choronenko, HCEPC
E. Spivey, P.E.
D. Lock, US Turbine
Ready File
Mirza Baig } 10-4-90

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 10-4-90.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Kimi Tober
Clerk

10-4-90
Date

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Permits by:

Empire Energy Management Systems, Inc. · DER File No. AC 29-178833
P. O. Box 6840, Bldg. 970 AC 29-178834
MacDill AFB, Florida 33608-0840

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue air construction permits (copies attached) for the proposed project as detailed in the applications specified above. The Department is issuing this Intent to Issue for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Empire Energy Management Systems, Inc., applied on April 10, 1990, to the Department of Environmental Regulation for permits to construct three gas turbines at the Cogeneration Plant Nos. 1 and 2 at the MacDill AFB in Tampa, Hillsborough County, Florida.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that air construction permits are required for the proposed work.

Pursuant to Section 403.815, F.S. and DER Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permits. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department, at the address specified within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permits.

The Department will issue the permits with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application(s) have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office in General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such

person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

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

Copies furnished to:

B. Thomas, SW District
I. Choronenko, HCEPC
E. Spivey, P.E.
D. Lock, US Turbine

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue permits to construct the following: 1) Cogeneration Plant No. 1 consisting of (a) Allison 501-KH, Gas Turbine with a Heat Recovery Steam Generator rated at 5.52 MW and (b) Allison 501-KB5 Gas Turbine rated at 4.1 MW and; 2) Cogeneration Plant No. 2 consisting of a Kawasaki MIA-13 Gas Turbine rated at 1.43 MW. Both plants will be located at the MacDill AFB in Tampa, Hillsborough County, Florida. A determination of Best Available Control Technology (BACT) is required for the Heat Recovery Steam Generator. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within fourteen (14) days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the applications have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The applications are available for public inspection during business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

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

Department of Environmental Regulation
Southwest District
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Hillsborough County Environmental
Protection Commission
1410 North 21st Street
Tampa, Florida 33605

Any person may send written comments on the proposed action to Mr. Barry Andrews at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

Technical Evaluation
and
Preliminary Determination

Empire Energy Management Systems, Inc.
Tampa, Hillsborough County, Florida

Cogeneration Plant Nos. 1 and 2
Permit Nos. AC 29-178833 and AC 29-178834

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

October 4, 1990

I. Application Information

A. Applicant

Empire Energy Management Systems, Inc.
MacDill AFB, Building 970
P. O. Box 6840
Tampa, Florida 33608

B. Project and Location

Applications to construct two cogeneration plants at the MacDill AFB in Tampa, Florida was received by the Department on April 10, 1990. Additional information was requested by the Department on May 4, 1990 and again on June 14, 1990. A response to our requests were received on May 16, 1990 and on June 25, 1990, respectively. Additional information was received on August 2, 1990 at which time these applications were deemed complete.

The cogeneration plant No. 1 is located on MacDill Avenue and Second Street at the AFB, and the UTM coordinate is Zone 17, 337.6 km E and 1283.6 km N. The cogeneration plant No. 2 is located at Base Hospital on Emergency Drive at the AFB, and the UTM coordinate is Zone 17, 347.9 km E and 1276.5 km N.

C. Facility Category

The SIC Code is 4911 and the SCC Codes are 2-01-002-01 and 2-01-001-01.

II. Project Description

Cogeneration Plant No. 1:

(a) Allison 501-KH, UST 5600 CC Gas Turbine.

This project consists of a gas turbine which is operated by firing natural gas and/or No. 2 fuel oil (with a maximum sulfur content of 0.8%), and a maximum heat input of about 56.37 MMBtu/hr capable of generating 5.52 MW. This unit, when operated on only No. 2 fuel oil (not to exceed 720 hrs/yr), will have a maximum heat input of 54.04 MMBtu/hr capable of generating 4.1 MW.

This gas turbine has a combined cycle with a natural gas fired Heat Recovery Steam Generator (duct burner/boiler) with a maximum heat input of 35.0 MMBtu/hr and capable of producing about 44,600 #/hr of steam at 125 psig and 335°F. The emissions from the gas turbine are controlled by injecting steam at a rate of 19,800 #/hr at 205 psig and exhausting through a common stack at a designed flow of 44,670 ACFM.

(b) Allison 501-KB5, UST 3800 Gas Turbine.

This project consists of a gas turbine fired on only natural gas with a maximum heat input rate of 51 MMBtu/hr capable of generating a maximum of 4.099 MW. Emissions from this turbine are controlled by injecting steam at a rate of 3600 #/hr and at 250 psig and exhausting through a seperate stack at a designed flow of 24,890 ACFM.

Cogeneration Plant No. 2:

Kawasaki MIA-13, UST 1500 Gas Turbine.

This project consists of a gas turbine fired by natural gas and/or fuel oil #2 (containing a maximum of 0.8% sulfur and not to exceed 720 hrs/yr) with a maximum heat input of 22.4 MMBtu/hr and capable of generating 1.429 MW. Emissions from this turbine are controlled by injecting water at a ratio of 0.5 lb water/lb fuel and exhausting through a stack at a designed flow of 19,230 ACFM.

III. Rule Applicability

Empire Energy Management Systems, Inc.'s gas turbines and duct burner/HRSG permit applications are subject to preconstruction review under provisions of F.A.C. Chapters 17-2 and 17-4. The source is located in Hillsborough County, an attainment area for NO_x and SO_2. These turbines do not have the potential to emit more than 250 TPY of NO_x or any other pollutant and are not included in the list of 28 Major Facility Categories, Table 500-1. Therefore, the proposed projects are minor with respect to the PSD regulations in F.A.C. Rule 17-2.500. The gas turbines are not subject to the BACT determination. However, the duct burner/HRSG with a heat input of 35.0 MMBtu/hr is subject to a BACT determination in accordance with F.A.C. Rule 17-2.600(6). BACT is proposed as the firing of natural gas.

These gas turbines are subject to the Federal New Source Performance Standards set forth in 40 CFR 60, Subpart GG, Standards of Performance for Stationary Gas Turbines, adopted by the Department under F.A.C. Rule 17-2.660(2)(a). According to the provisions of 40 CFR 60.332(a)(2) and 40 CFR 60.333, the maximum exhaust concentration shall not exceed 0.0125% by volume at 15% oxygen on a dry basis and SO_2 emissions shall not exceed 0.015% by volume at 15% oxygen on a dry basis (0.8% sulfur by weight in No. 2 fuel oil).

This project will be subject to a visible emission of 10% opacity when fired by fuel oil No. 2 and 5% opacity when fired by natural gas, as proposed by the applicant, and compliance testing and reporting requirements in accordance with F.A.C. Rule 17-2.700. The compliance testing shall be conducted at 30%, 50%, 75%, and 100% loading to ensure that the CO and NO_x emission

standards are being met at all loads. The visible emission testing shall be conducted using EPA Method 9 and shall be for the duration of at least 30 minutes.

V. Conclusion

Based on the information provided by Empire Energy Management Systems, Inc., the Department has reasonable assurance that the proposed construction of these gas turbines, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.

Best Available Control Technology (BACT) Determination
Empire Energy Management Systems, Inc.
MacDill AFB, Hillsborough County

The applicant plans to install two Allison Gas Turbines at Cogeneration Plant No. 1, and a Kawasaki Gas Turbine at Cogeneration Plant No. 2. At Plant No. 1 the Allison 501-KB5 Gas Turbine will be fired on only natural gas generating a maximum of 4.1 MW, while the Allison 501-KH Gas Turbine has a combined cycle Heat Recovery Steam Generator (duct burner/boiler). The gas turbine will be fired by natural gas and/or No. 2 fuel oil (not to exceed 0.8% sulfur and 720 hours/year on fuel oil), whereas the duct burner/boiler is fired on only natural gas capable of producing 44,600 lbs of steam per hour at 125 psig and 335°F. The Cogeneration Plant No. 2 has a Kawasaki MIA-13 Gas Turbine which is fired by natural gas and/or fuel oil No. 2 (not to exceed 0.8% sulfur and 720 hours/year on fuel oil) capable of generating 1.429 MW.

The BACT determination is addressed only to the duct burner/boiler (HRSG) as required by Rule 17-2.600(6), F.A.C. - Emission Limiting and Performance Standards.

BACT Determination Requested by the Applicant:

Firing the duct burner/boiler with natural gas constitutes the best available control technology for this project. The applicant requested using natural gas for the heat recovery steam generator. In addition to this, applicant proposes to fire the gas turbines primarily with natural gas and supplement them with No. 2 fuel oil with a maximum sulfur content of 0.8% (firing with No. 2 fuel oil not to exceed 720 hours/year for the Allison 501-KB5 and Kawasaki MIA-13 gas turbines). The applicant stated that it will not have any problems meeting 5% opacity when fired on natural gas and 10% opacity when fired No. 2 fuel oil.

BACT Determination by DER

BACT for particulate and sulfur dioxide emissions is established as the firing of natural gas.

No visible emissions (less than 5% opacity).

EPA Method 9 (40 CFR 60, Appendix A) will be used to determine compliance with the opacity standard, and EPA Method 5 for the particulate emissions.

BACT Determination Rationale:

Sulfur in fuel is a primary air pollution concern. Most of the sulfur becomes SO_2 when fuel is burned. Particulate emissions from fuel burning are related to the sulfur content of the fuel. The Department agrees with the applicant's proposal that the firing of natural gas is BACT for the duct burner boiler.

Details of the Analysis May be Obtained by Contacting:

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

Recommended by:

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

Approved by:

Dale Twachtmann, Secretary
Dept. of Environmental Regulation

Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

PERMITTEE:
Empire Energy Management
Systems, Inc.
MacDill AFB
P. O. Box 6840
Tampa, Florida 33608

Permit Number: AC 29-178834
Expiration Date: Jan. 15, 1992
County: Hillsborough
Latitude/Longitude: 27°51'27"N
82°28'06"W
Project: Cogeneration Plant No. 1

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of Cogeneration Plant No. 1 consisting of an Allison 501-KH, UST 5600 CC Gas Turbine fired by natural gas and/or No. 2 fuel oil (with a maximum heat input of 56.37 MMBtu/hr and sulfur content in the No. 2 fuel oil not to exceed 0.8%), in series with a duct burner with a maximum heat input of 35.0 MMBtu/hr which can be fired on only natural gas; and an Allison 501-KB5, UST 3800 Gas Turbine fired on only natural gas with a maximum heat input rate of 51 MMBtu/hr.

Nitrogen oxide emissions from both units are controlled by steam injection.

The cogeneration plant No. 1 is located on MacDill Avenue and Second Street at the A.F.B. and the UTM coordinate is Zone 17, 337.6 km E and 1283.6 km N. in Hillsborough County, Florida.

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

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

Attachments are listed below:

1. Application to Construct Air Pollution Sources, DER Form 17-1.202(1) dated April 9, 1990.
2. Department's letter dated May 4, 1990.
3. Empire Energy Management Systems, Inc.'s letter dated May 15, 1990.
4. Department's letter dated June 14, 1990.
5. Empire Energy Management Systems, Inc.'s letter dated June 22, 1990.
6. Empire Energy Management Systems, Inc.'s letter dated July 26, 1990.
7. Mr. Edward C. Spivey, Jr., P.E.'s letter dated August 2, 1990.

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

GENERAL CONDITIONS:

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

13. This permit also constitutes Determination of Best Available Control Technology (BACT) and Compliance with New Source Performance Standards (NSPS).

14. The permittee shall comply with the following:

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

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

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

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

SPECIFIC CONDITIONS:

1. The construction and operation during the period of this permit shall be in accordance with the capacities and specifications stated in the application.

2. The Allison 501-KH, UST 5600 CC Gas Turbine shall be fired by natural gas and/or fuel oil No. 2 (with a maximum sulfur content of 0.8%) and a maximum heat input of 56.37 MMBtu/hr and rated at 5.52 MW. This unit, when operated on only No. 2 fuel oil (not to exceed 720 hrs/yr) will have a maximum heat input of 54.04 MMBtu/hr and rated at 4.1 MW.

3. The duct burner shall be fired on only natural gas with a maximum heat input of 35.0 MMBtu/hr and is designed to produce 44,600 lbs/hr of steam.

SPECIFIC CONDITIONS:

4. The Allison 501-KB5, UST 3800 Gas Turbine shall be fired on only natural gas with a maximum heat input rate of 51 MMBtu/hr and is rated at 4.1 MW and a designed flow of 24,890 ACFM.

5. Cogeneration Plant No. 1 shall be permitted to operate 24 hrs/day, 7 days/wk, and 52 wks/yr.

6. The nitrogen oxide emissions from each gas turbine are subject to the New Source Performance Standards, 40 CFR 60.332, Subpart GG and shall not exceed 0.0125% by volume at 15% oxygen on dry basis.

7. The sulfur dioxide emissions from each gas turbine are subject to 40 CFR 60.333 and shall not exceed 0.015% by volume at 15% oxygen on a dry basis (0.8% of the fuel by weight).

8. Visible emissions from the Allison 501-KH gas turbine and the duct burner shall be less than 5% when operated on only natural gas and less than 10% when fired by No. 2 fuel oil. Visible emissions from the Allison 501-KB5 gas turbine shall be less than 5%.

9. Particulate matter emissions from these gas turbines/duct burner/boiler shall not exceed 0.1 lbs/MMBtu of heat input.

10. Compliance stack tests shall be conducted to measure the NO_x and visible emissions from each gas turbine, and a particulate and VE test shall be performed for the Heat Recovery Steam Generator (duct burner/boiler) within 60 days of completion of construction. The compliance test for the gas turbines shall be conducted at 30%, 50%, 75%, and 100% loading to ensure that the NO_x and visible emissions standards are being met at all loads. The Heat Recovery Steam Generator (duct burner/boiler) shall be tested within 90% of its designed capacity.

11. The particulate, NO_x, and visible emissions tests shall be conducted using EPA Methods 1, 2, 3, 4, 5, 9, and 20 respectively, and subject to 40 CFR 60.335.

12. A log shall be maintained of the hours of operation for the Allison 501-KH Gas Turbine, along with a fuel oil analysis report for each shipment of No. 2 fuel oil received.

SPECIFIC CONDITIONS:

13. The NO_x emissions from the Allison 501-KH gas turbine shall be controlled by injecting steam at a rate of 19,800 lbs/hr at 205 psig and; the Allison 501-KB5 gas turbine steam injection shall be maintained at a rate of 3600 lbs/hr at 250 psig.

14. The sulfur dioxide emissions shall be assumed in compliance if the No. 2 fuel oil fired in the gas turbines contains no more than 0.8% sulfur content by weight.

15. The Allison 501-KH and 501-KB5 Gas Turbines shall be equipped with a continuous emission monitoring system pursuant to 40 CFR 60.334 that will produce on the same chart, multi-colored lines, charting fuel consumption (natural gas and No. 2 fuel oil) as applicable, steam injection and power production. For this facility the system shall be maintained in accordance with the requirements of 40 CFR 60.13. Excess emissions shall be determined pursuant to 40 CFR 60.334.

16. Any change in the method of operation, equipment, or operating hours shall be submitted to the Hillsborough County Environmental Protection Commission (HCEPC) and the Bureau of Air Regulation offices for approval.

17. The HCEPC office shall be given written notice at least thirty (30) days prior to compliance testing. The compliance test results shall be submitted to the HCEPC office within 45 days of such testing. The permittee shall comply with the notification and record keeping requirements of 40 CFR 60.7.

18. The permittee shall comply with all the applicable requirements of F.A.C. Chapters 17-2 and 17-4 and 40 CFR 60, Subpart GG.

19. 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).

20. An application for an operation permit must be submitted to the HCEPC and Southwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

PERMITTEE:
Empire Energy Management
Systems, Inc.

Permit Number: AC 29-178834
Expiration Date: January 15, 1992

Issued this _____ day
of _____, 1990

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

_____

STEVE SMALLWOOD, P.E., Director
Division of Air Resources
Management

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

PERMITTEE:
Empire Energy Management
Systems, Inc.
MacDill AFB
P. O. Box 6840
Tampa, Florida 33608

Permit Number: AC 29-178833
Expiration Date: Jan. 15, 1992
County: Hillsborough
Latitude/Longitude: 27°51'41"N
82°28'13"W
Project: Cogeneration Plant No. 2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a Cogeneration Plant No. 2 consisting of a Kawasaki MIA-13, UST 1500 Gas Turbine fired by natural gas and/or No. 2 fuel oil (containing a maximum of 0.8% sulfur and not to exceed 720 hrs/yr on oil) with a maximum heat input of 22.4 MMBtu/hr.

Nitrogen oxide emissions from this turbine are controlled by injecting water at a ratio of 0.5 lbs water per lb of fuel and at a designed flow of 19,230 ACFM.

The cogeneration plant No. 2 is located at the Base Hospital on Emergency Drive at the AFB, and the UTM coordinates are Zone 17, 347.9 km E and 1276.5 km N in Hillsborough County, Florida.

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

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

Attachments are listed below:

1. Application to Construct Air Pollution Sources, DER Form 17-1.202(1) dated April 9, 1990.
2. Department's letter dated May 4, 1990.
3. Empire Energy Management Systems, Inc.'s letter dated May 15, 1990.
4. Department's letter dated June 14, 1990.
5. Empire Energy Management Systems, Inc.'s letter dated June 22, 1990.
6. Empire Energy Management Systems, Inc.'s letter date July 26, 1990.
7. Mr. Edward C. Spivey, Jr., P.E.'s letter dated August 2, 1990.

PERMITTEE:
Empire Energy Management Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

GENERAL CONDITIONS:

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

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

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

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

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

GENERAL CONDITIONS:

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

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

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

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

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

13. This permit also constitutes a Determination of Best Available Control Technology (BACT) and Compliance with New Source Performance Standards (NSPS).

14. The permittee shall comply with the following:

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

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and

GENERAL CONDITIONS:

records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

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

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

SPECIFIC CONDITIONS:

1. The construction and operation during the period of this permit shall be in accordance with the capacities and specifications stated in the application.

2. The Kawasaki MIA-13, UST 1500 Gas Turbine shall be fired by natural gas and/or fuel oil No. 2 (with a maximum sulfur content of 0.8%) and a maximum heat input of about 22.4 MMBtu/hr and is rated at 1.429 MW. This unit, when operated on only No. 2 fuel oil, shal not exceed 720 hrs/yr.

3. The Cogeneration Plant No. 2 shall be permitted to operate 24 hrs/day, 7 days/wk, and 52 wks/yr.

4. The nitrogen oxide emissions from the gas turbines are subject to the New Source Performance Standards, 40 CFR 60.332, Subpart GG and shall not exceed 0.0125% by volume at 15% oxygen on dry basis.

SPECIFIC CONDITIONS:

5. The sulfur dioxide emissions from the gas turbines are subject to 40 CFR 60.333 and shall not exceed 0.015% by volume at 15% oxygen on a dry basis (0.8% of the fuel by weight).

6. Visible emissions from this gas turbine shall be less than 5% when operated on only natural gas and less than 10% when fired by No. 2 fuel oil.

7. Compliance stack test shall be conducted to measure the NO_x and visible emissions from this gas turbine, within 60 days of completion of construction. The compliance test shall be conducted at 30%, 50%, 75%, and 100% loading to ensure that the standards are being met at all loads.

8. The NO_x and visible emissions tests shall be conducted using EPA Methods 9 and 20, and subject to 40 CFR 60.335.

9. The NO_x emissions from this gas turbine shall be controlled by injecting water at a ratio of 0.5 lbs/hr water per pound of fuel.

10. The sulfur dioxide emissions shall be assumed in compliance if the No. 2 fuel oil fired in the gas turbine contains no more than 0.8% sulfur content by weight.

11. The Kawasaki MIA-13 Gas Turbine shall be equipped with a continuous emission monitoring system pursuant to 40 CFR 60.334 that will produce on the same chart, multi-colored lines, charting fuel consumption (natural gas and No. 2 fuel oil) as applicable, water injection rate and power production. For this facility, the system shall be maintained in accordance with the requirements of 40 CFR 60.13. Excess emissions shall be determined pursuant to 40 CFR 60.334.

12. Any change in the method of operation, equipment, or operating hours shall be submitted to the Hillsborough County Environmental Protection Commission (HCEPC) and the Bureau of Air Regulation offices for approval.

13. The HCEPC office shall be given written notice at least thirty (30) days prior to compliance testing. The compliance test results shall be submitted to the HCEPC office within 45 days of such testing. The permittee shall comply with the notification and record keeping requirements of 40 CFR 60.7.

14. The permittee shall comply with all the applicable requirements of F.A.C. Chapters 17-2 and 17-4 and 40 CFR 60, Subpart GG.

PERMITTEE:
Empire Energy Management
Systems, Inc.

Permit Number: AC 29-178833
Expiration Date: January 15, 1992

SPECIFIC CONDITIONS:

15. 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).

16. An application for an operation permit must be submitted to the HCEPC and Southwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this _____ day
of _____, 1990

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

_____
STEVE SMALLWOOD, P.E., Director
Division of Air Resources
Management

Attachments Available Upon Request

C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Hillsborough County - A.P.
Empire Energy Management Systems, Inc.
AC 29-178833 (Cogeneration Plant #1)
AC 29-178834 (Cogeneration Plant #2)

Subject: Response to Your Letter of June 14, 1990; Additional Information Requested to Complete Applications

Dear Mr. Fancy:

Pursuant to your letter of June 14, 1990, we are herewith providing the information you requested. I will address the items in the same order that they appeared in the above referenced letter:

(1) All eight (four for each plant) of the applications were originally submitted to the Hillsborough County Environmental Protection Commission, which passed some of the copy(s) along to the Southwest District DER office, which in turn sent at least one of the copies to the Tallahassee DER office. I am not certain how it happened, but Page 2 of the application for Cogeneration Plant #1 that was sent to you is, in reality, Page 2 of the application for Cogeneration Plant #2. In any event, I am sending six copies of the correct Page 2 of the application for Cogeneration Plant #1 -- two copies to you in Tallahassee; two copies to Mr. Gary Maier at the Southwest District DER; and two copies to the Hillsborough EPC. These copies can be found in the enclosed Attachment #1.

(2) Cogeneration Plant #1 has two turbine/gensets, only one of which (the Allison 501-KH) is dual fuel (natural gas and #2 fuel oil). The other turbine/genset is an Allison 501-KB5 and is designed to operate on natural gas only. Likewise, the auxiliary duct burner provided with the Allison 501-KH package can be fired on only natural gas. When natural gas is available, the maximum potential fuel consumption when all the equipment is operating at full load is 141.72mmBTU/hr and the electrical generation production is 9616 KW.

When the supply of natural gas is interrupted, and the equipment must be switched to the back-up fuel (#2 fuel oil), only the Allison 501-KH can be operated. The fuel consumption during these periods is a maximum of 52.66 mmBTU/hr; the power production at full load is 4096 KW. A process/heat balance diagram of this mode of operation is included as Attachment #2.

(3) The calculation sheets for determining the maximum potential emissions totals for both plants is included as Attachment #3. It is based on the manufacturers' (Allison and Kawasaki) guaranteed rate of emissions (previously supplied to you), and is based on full load operation 8760 hours per year, with compensations for the average annual ambient temperature in the Tampa Bay Area - 72.3 DegF.

There are a number of safety factors involved with theses calculations. First, the guaranteed emissions rates are 25 to 60 percent higher than the expected level of emissions (also, previously provided). Second, it is physically impossible for these turbines to operate 8760 hours per year; they must be turned off for scheduled maintenance and inspections, dropping the maximum expected hours of operation to 8500 hours per year.

(4) A drawing of the waste heat recovery boiler, along with the associated exhaust stack, is included as Attachment #4. Please note that this drawing includes details and information on platform design, electrical service, and eyebolts per the requirements of FAC 17-2.700(4).

(5) Following is a listing of the make, model number and maximum designed power generation for the turbine/gensets in each of the plants:

<u>COGENERATION PLANT #1</u>

1 - Allison 501-KH, with full load electrical output of 5520 KW (5.520 MW)
This unit uses steam injection for NOx abatement and power augmentation.

1 - Allison 501-KB5, with full load electrical output of 4096 KW (4.096 MW)
This unit uses steam injection for NOx abatement only.

<u>COGENERATION PLANT #2</u>

1 - Kawasaki M1A-13, with full load electrical output of 1429 KW (1.429 MW)
This unit uses water injection for NOx abatement.

A more complete listing of the equipment to be supplied for each plant, including the waste heat recovery boilers and the auxiliary duct burner, can be found in Attachment #5.

(6) Pursuant to a telephone conversation with Mr. Mirza Baig of your office on June 19, 1990, it was discussed and agreed that it is inappropriate at this time to require serial numbers of the monitoring devices (as they have not yet been purchased, or even manufactured). As described in 40 CFR 60.334, Empire is required to provide continuous monitoring equipment with an accuracy of plus-or-minus 5% for fuel rates and water/steam injection rates. The following equipment exceeds the accuracy requirements set forth by the NSPS, and all measurements will be recorded on multiple-pen chart recorders manufactured by Yokogawa (Model 4153-333). Here is a listing of the devices (by unit) to be incorporated:

COGENERATION PLANT #1, ALLISON 501-KH

PEN #	MONITOR DESCRIPTION	MAKE	MODEL
1	Steam Injection Flow	Foxboro	E83W-04SSIT-K
2	Gas Consumption MCFH	Foxboro	E83W-02SSIT
3	Fuel Oil Consumption GPH	Hoffer	HO-B-B-1-MX-NPT

COGENERATION PLANT #1, ALLISON 501-KB5

PEN #	MONITOR DESCRIPTION	MAKE	MODEL
1	Steam Injection Flow	Foxboro	E83W-04SSIT-K
2	Gas Consumption MCFH	Foxboro	E83W-02SSIT

COGENERATION PLANT #2, KAWASAKI M1A-13

PEN #	MONITOR DESCRIPTION	MAKE	MODEL
1	Water Injection Flow	Hoffer	HO-C-8-1-MX-NPT
2	Gas Consumption MCFH	Foxboro	E83W-02SSIT
3	Fuel Oil Consumption GPH	Hoffer	HO-B-B-1-MX-NPT

Attachment #6 details the Piping and Instrument Diagrams (P & ID's) for these monitoring devices.

The power production of the turbine/gensets will be recorded by Scientific Columbus JEM-2 meters and will be logged on continuous load-graph charts. The watthour meter/transducers for these units will be manufactured by Crompton, their model #069-805X/X1. All of this data will also be stored on electronic media, which can produce

I hope that this provides you with all of the necessary information required for your evaluation. Please contact me if this is not the case.

Sincerely,

Thomas E. Bartley, C.E.M.
Project Manager

cc: Brian Travis, Empire
Edward C. Spivey, Jr, P.E., Bosek, Gibson and Assoc.
Gary Maier, BSChE, DER Southwest District Office
Environmental Protection Commission of Hillsborough County
Don Lock, U.S. Turbine

der0621.ltr

enclosures: 6

ATTACHMENT #1

TWO COPIES OF PAGE 2 OF APPLICATION FOR PLANT #1

the pollution control facilities, when properly maintained and operated, will discharg an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant's set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Edward C. Spivey, Jr.

Edward C. Spivey, Jr.
Name (Please Type)

Bosek, Gibson and Associates, Inc.
Company Name (Please Type)

111 Bullard Parkway, Temple Terrace, FL 33617
Mailing Address (Please Type)

Florida Registration No. 32690 Date: 6/20/90 Telephone No. (813) 985-3499

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Cogeneration plant using one gas turbine as the prime mover in a combination Brayton-steam injection cycle that will provide the MacDill AFB electrical grid with power and Buildings 501, 540, 925 and 926 with thermal energy in the form of hot and chilled water. A second gas-only turbine will operate as a peaking unit. The prime mover will operate a minimum of 11 months/yr on natural gas; maximum of 1 month/yr on #2 fuel oil.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction 01 JUL 1990 Completion of Construction 01 NOV 1991

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Steam Injection Systems for NOx Abatement - $200,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

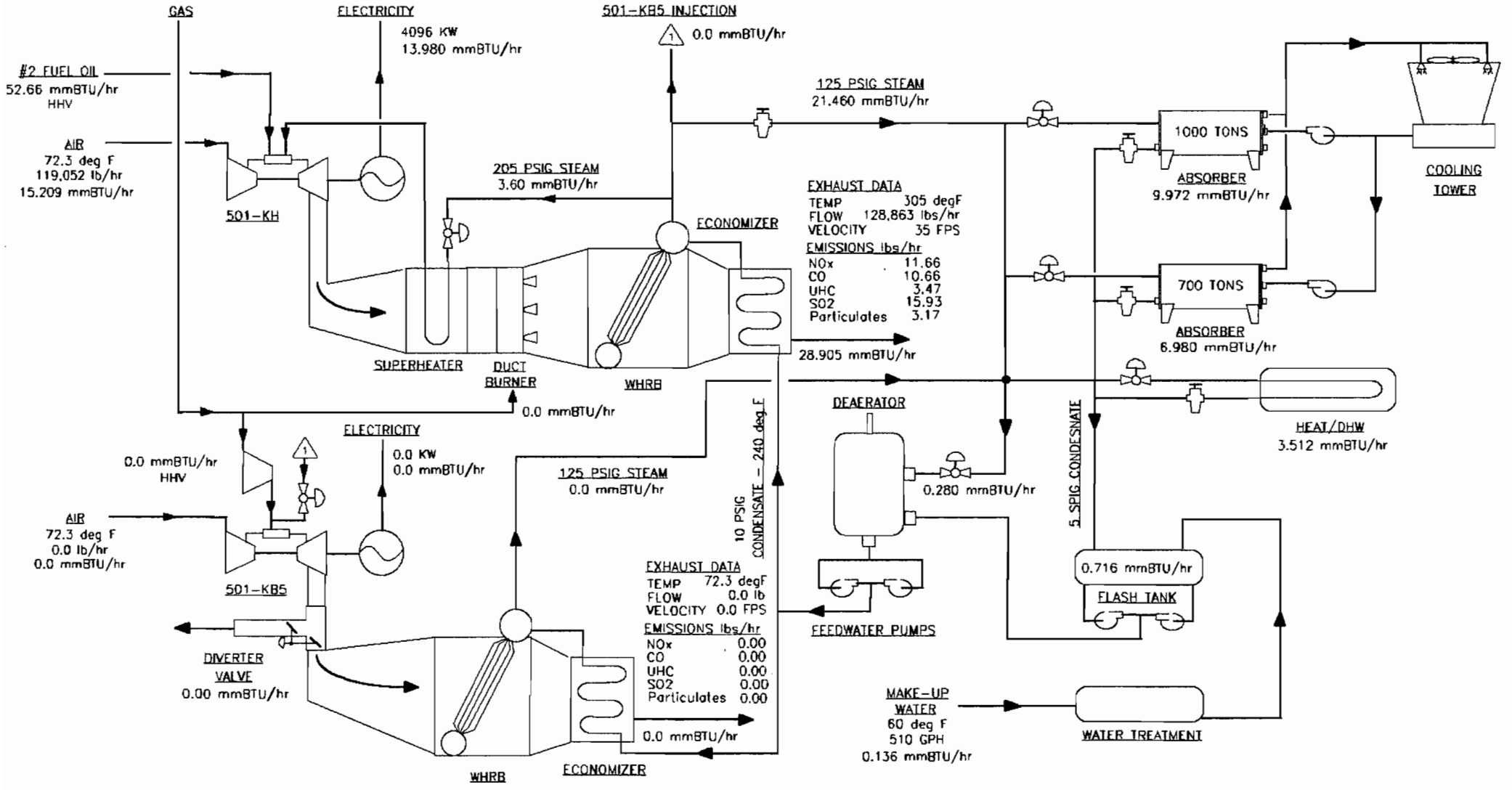
ATTACHMENT #2

COGENERATION PLANT #1

PLANT PROCESS/HEAT BALANCE ON #2 FUEL OIL

MACDILL AVENUE PLANT EMISSIONS – #2 FUEL OIL ONLY

100 % FULL LOAD PRODUCTION – 72.3 degF, 60% RH



ATTACHMENT #3

CALCULATIONS SHEETS FOR EMISSIONS ESTIMATES

MACDILL AFB COGENERATION PROJECT

PLANT EMISSIONS CALCULATIONS

Prepared by Empire Energy Management Systems, Inc.

21-Jun-90

COGENERATION PLANT #1

SYSTEM IDENTIFICATION	POLLUTANT TYPE	NATURAL GAS			#2 FUEL OIL			TOTAL****
		PPM**	lbs/hr**	Hrs/Yr***	PPM**	lbs/hr**	Hrs/Yr***	Tons/Yr
ALLISON 501-KH	NOx	39.1	8.07	8040	58.00	11.90	720	36.725
ALLISON 501-KH	CO	39.0	4.90	8040	80.00	10.00	720	23.298
ALLISON 501-KH	VOC (UHC)	18.0	1.50	8040	41.00	3.40	720	7.254
ALLISON 501-KH	SO2*	0.000%	0.00	8040	0.005%	15.93	720	5.735
ALLISON 501-KH	PM	10.0	1.50	8040	20.0	3.0	720	7.110
ALLISON 501-KB5	NOx	39.4	7.79	8760	N/A	N/A	0	34.120
ALLISON 501-KB5	CO	43.0	5.40	8760	N/A	N/A	0	23.652
ALLISON 501-KB5	VOC (UHC)	18.0	1.30	8760	N/A	N/A	0	5.694
ALLISON 501-KB5	SO2*	0.000%	0.00	8760	N/A	N/A	0	0.000
ALLISON 501-KB5	PM	10.0	1.50	8760	N/A	N/A	0	6.570
DUCT BURNER	NOx	.1 lb/MCF	3.50	8760	N/A	N/A	0	15.330
DUCT BURNER	CO	.1 lb/MCF	3.50	8760	N/A	N/A	0	15.330
DUCT BURNER	VOC (UHC)	.01 lb/MCF	0.35	8760	N/A	N/A	0	1.533
DUCT BURNER	SO2*	0.000%	0.00	8760	N/A	N/A	0	0.000
DUCT BURNER	PM	.025 lb/MCF	0.88	8760	N/A	N/A	0	3.833

PLANT TOTALS/YEAR:

(Tons/Yr Allison 501-KH + Tons/Yr Allison 501-KB5 + Tons/Yr Duct Burner)

NOX Tons/Yr	CO Tons/Yr	VOC Tons/Yr	SO2 Tons/Yr	PM Tons/Yr
86.176	**62.280**	**14.481**	**5.735**	**17.513**

COGENERATION PLANT #2

SYSTEM IDENTIFICATION	POLLUTANT TYPE	NATURAL GAS			#2 FUEL OIL			TOTAL****
		PPM**	lbs/hr**	Hrs/Yr***	PPM**	lbs/hr**	Hrs/Yr***	Tons/Yr
KAWASAKI M1A-13	NOx	77.0	6.40	8040	109.0	9.00	720	28.968
KAWASAKI M1A-13	CO	16.0	0.81	8040	12.0	0.61	720	3.476
KAWASAKI M1A-13	VOC (UHC)	12.0	0.35	8040	8.0	0.23	720	1.490
KAWASAKI M1A-13	SO2*	0.000%	0.00	8040	0.005%	9.90	720	3.564
KAWASAKI M1A-13	PM	10.0	0.72	8040	20.0	1.45	720	3.416

PLANT TOTALS/YEAR:

NOX Tons/Yr	CO Tons/Yr	VOC Tons/Yr	SO2 Tons/Yr	PM Tons/Yr
28.968	**3.476**	**1.490**	**3.564**	**3.416**

GENERAL NOTES:

* Based on Sulfur Content in Fuels - Natural Gas 0.0 %; #2 Fuel Oil 3 %; PPM given as % Volume in Exhaust

** Rates Guaranteed by Manufacturer of Equipment

*** Only the Allison 501-KH and the Kawasaki M1A-13 can operate on #2 Fuel Oil. Permit Applications Request a Maximum of 30 Days/Year Operation on #2 Fuel Oil. As the Emissions are Higher for Oil Operation than for Gas, the Worst-Case (8040 hrs/yr on Gas; 720 hrs/yr on Oil) Scenario is Used in the Annual Total Calculations.

**** Tons/Yr = (Rate/hr for Gas * No. Hrs on Gas + Rate/hr for Oil * No. Hrs. on Oil) / 2000

ATTACHMENT #4

STACK/BOILER/PLATFORM DRAWINGS

Mirza has Attachment #4

ATTACHMENT #5

COGENERATION EQUIPMENT LISTS

COGENERATION PLANT #1

UST5600 EQUIPMENT LIST

3.1.A. BILL OF MATERIAL
UST5600CC GAS TURBINE GENERATOR SET

GENERATOR SET SYSTEM

GENERAL

• Gas Turbine	Allison Model 501-KH gas fuel single shaft gas turbine with high speed shaft and control system. Rated: 5.6 MW at ISO conditions with full steam injection.
• Generator	Ideal air cooled generator rated 5300 kW @ 40°C and 0.8 p.f.,ODP 13,200 Volt, 3 ph, 60 Hz, Class F total temperature, Class F insulation.
• Speed Reducing Gearbox	Single reduction double helical horizontal off-set speed reducing gearbox.
• Water Wash System	Mixing cart with quick disconnect couplings. One cart for (2) two units. (i.e. UST5600CC and UST3800).
• Controls	Allen Bradley process control cabinet, MCC, and turbine/generator control panel.
• Ventilation System	Engine compartment fans, motors and filter hood.
• Space Heater	Generator enclosure space heater.
• Coupling	Dry type, low speed coupling with shear section assembly and guard.
• Enclosure	Weatherproof acoustic enclosure with bolted post and beam framework designed for maximum noise level of 85 dBA three feet from enclosure.
• Baseplate	Common baseplate, fabricated and machined structural steel.
• Junction Boxes	Generator neutral box, with current transformers and neutral ground connection. Generator high voltage power cable connections.

AIR INTAKE

• Inlet Filter	2-stage combustion air inlet filter, silencer and differential pressure gauge and switch.

TURBINE FUEL AND INJECTION SYSTEMS

• Fuel Control	Control valve, fuel shutoff valves, simplex filter, instrumentation and controls for gas guel only.
• Steam Injection Piping	Headers, expansion joints and connections between the gas turbine combustor casing and the connection on the genset skid to piping from the HRSG.

LUBE OIL SYSTEM

• Main Lube Oil Pump	100% capacity shaft driven pump.
• Prelube Oil Pump	AC motor driven pump.
• Lube Oil Cooler	100% capacity air cooled heat exchanger with AC motor driven fan. Supplied loose and mounted by others.
• Lube Oil Reservoir	Reservoir with immersion heater, temperature controls, level gauge, level switch and tank vent with coalescer element.
• Duplex Oil Filters	100% capacity cartridge type filters with differential pressure indication and alarm.
• Starting System	Electric/hydraulic start system with hydraulic pump, 125 HP AC motor, starter and overrunning clutch.

T/G FIRE PROTECTION

• Halon System	Halon system for gas turbine generator enclosure with detectors, discharge nozzles, gas storage bottles, and fire shutter louvers on all intake and discharge openings.
• Gas Detection	Gas detection system, including panel mounted monitor and gas sensors in turbine compartment.
• U.V.	Two (2) self-contained U.V. detectors in turbine compartment.

HRSG AND SUPPLEMENTAL BURNER SYSTEM

• Heat Recovery System	Single pressure waste heat recovery boiler with economizer and superheater rated at 40,000 lb/hr at 125 psig/sat. When supplying injection steam of 19,800 lb/hr at 180 psig/855°F max. The net steam to process is 20,200 lb/hr.
• Transition Exhaust Duct	Transition duct between gas turbine exhaust expansion joint to superheater with external insulation and straightening vanes.
• Superheater	Located downstream of transition duct and elevates the steam temperature from 411°F to 855°F.
• Duct Burner	Duct burner firing duct, internally insulated and lined, with gas-fueled duct burner.
• Watertube Boiler	The boiler is a two pass two drum natural circulation unit arranged for horizontal flow at the inlet and vertical gas flow at the exit.
• Steam Drums	A 60" I.D. steam drum and a 30" I.D. lower drum (mud drum), each with 12"x 16" elliptical manways in each end.
• Steam Separator	External steam separator reduces the entrained solids in the steam from 0.2 ppm to 0.05 ppm maximum.
• Economizer	A carbon steel, gas tight casing with 2"x SA-178 type material tubing. The outlet flange channel incorporates (5) five 3" NPT connections on the front face for emissions monitoring.
• Makeup Water Preheat Exchanger	A water-to-water heat exchanger to heat system makeup water, which flows through the tube side prior to entering the deaerator.
• Economizer Exit Transition	Carbon steel transition from economizer outlet to the exhaust stack.
• Feedwater Controls	Three element feedwater control instrumentation and control valve assembly with block, bypass and drain valves.

• Process Steam Controls	Main process steam pressure control valve with block and drain valves.
• Injection Steam Controls	Injection steam flow control valve with block and drain valves.
• Injection Steam Piping	Piping, strainers (2) and staged injection steam valve between the superheater outlet and the genset skid injection steam inlet (requires 2 or 3 field welds by other).
• Miscellaneous Valves	Safety valves, control valves, economizer inlet check valve.

BALANCE OF PLANT SYSTEM

• Deaerator	Recirculation type deaerator 1200 gallons capacity, sized for 60,000 lb/hr, 50 psig design pressure, 10 min. storage.
• Feedwater Pumps	Three 50% capacity centrifugal pumps, based on 60,000 lb/hr dearator sizing.
• Continuous Blowdown Drum	24 inch diameter 3'-0" seam/seam, carbon steel vessel, designed for 50 psig @ 450°F.
• HRSG MCC	480V MCC with starters, and panels from HRSG and BOP power, lighting and control needs.
• Neutral Grounding	Neutral grounding equipment including transformer and resistor.
• Battery Charger and Batteries	DC control power system including 24V DC batteries and battery charger.
• HRSG Control Cabinet	Bailey Network 90 or Allen Bradley controls for the duct burner, HRSG and BOP equipment.
• OIU	Operator interface unit, including CRT, keyboard, printer, disk memory and console work surface.
• Switchgear	Generator circuit breaker and protective relays.
• Intermittent Blowdown Drum	24 inch diameter, 6'0" seam/seam, carbon steel vessel.

CHEMICAL FEED

- Boiler Chemical System — Storage containers and feed system.

PIPING

The following SA106-B carbon steel piping will be prefabricated. Assembly requires field installation by others.

- Piping incidental to mounting the water column.
- Piping from water column and gauge glass drain connections to near grade.
- Piping from economizer discharge nozzle to the feedwater regulating valve at grade operating level, to feedwater inlet nozzle on steam drum (includes piping at economizer inlet nozzle).
- Piping from deaerator pump discharge to make up water heat exchanger.
- Piping from makeup water heat exchanger to deaerator.

LADDERS AND PLATFORMS

A platform runs the length of the outboard side of the steam drum for access to drum mounted appurtenances. The platform will wrap around the drum ends to access manways and attached appurtenances. At one end the platform will extend to provide access to boiler second pass inspection door. Platforming will be supported from the boiler structural members. A straight ladder will be provided at one end of the platform and a stairway at the opposite end.

A second level of platforming will be provided at the approximate elevation of the economizer inlet flange and will provide wrap around access to the economizer on three sides. This platform is reached by means of straight ladders approximately 5′ high from the boiler side extension platforms. The approximately 10′ long portion of the upper platform that services the front casing face of the economizer will be 48" wide.

Platforming for the deaerator is accessible from the intermediate landing of the stairwell serving the steam drum platform. The deaerator platforming provides access to the full length of the elevating stand base, with wrap around access at each end. Access to top mounted appurtenances of the deaerator vessel can be reached from the second level of the HRSG platforming.

MISCELLANEOUS

- Contract Documentation — Operation and maintenance manuals, installation drawings, parts lists and kit lists, customer drawings, specifications and information as required.

• Contract Services	Factory testing, per USTC and customer's standards. Four person-weeks of onsite service time (one person week is Monday through Friday, eight hours per day, for one service representative).
• Shipment Terms	F.O.B. Maineville, Ohio.

OPTIONAL EQUIPMENT QUOTED SEPARATELY (SEE SECTION 2)

• Gas Turbine Dual Fuel System	Control valves, fuel shutoff valves, filter, instrumentation, controls and fuel collecting tank.
• Fuel Gas Compressor	Positive displacement, oil-flooded, rotary screw-type compressor, electric motor, motor-to-compressor flexible coupling with guard, inlet strainer and check valve, discharge gas/oil separator, oil system including cooler, capacity control system, control panel, discharge cooler and condensate separator; NEC CL.1, DIV 2, Group D onskid electrical component compliance, 480 VAC NEMA 1 non-reversing motor starter, discharge check valve, block and relief valves - note: sizing and pricing are based on gas supply being min. 40 PSIG, max. 105°F, min. 17.0 molecular wt. and k value of 1.30. The equipment selection and pricing may change if these parameters change.
• Delivery	F.O.B. jobsite terms.
• HRSG Fresh Air Firing	Electric motor, coupling, blower, isolation valve, expansion joint and controls.

COGENERATION PLANT #1

UST3800 EQUIPMENT LIST

3.1.B. BILL OF MATERIAL
UST3800 GAS TURBINE GENERATOR SET

GENERATOR SET SYSTEM

GENERAL

• Gas Turbine	Allison model 501-KB5 single shaft gas turbine with high speed output shaft, coupling, fuel valve and control system.
• Generator	Ideal 13,200 Volt, 60 Hz, 3 phase, .8 PF, 6 wire generator with Class F total temperature and Class F insulation, direct coupled brushless exciter.
• Speed Reducing Gearbox	Epicyclic reduction gearbox with auxiliary pads for lube oil pump and starting pump.
• Water Wash System	Compressor crank soak water wash system.
• Engine Compartment Cooling	Single stage gas turbine compartment cooling air inlet filter with differential pressure gauge and switch.
• Generator Cooling	Single-stage generator cooling air inlet filter with differential pressure gauge and switch.
• Discharge Hoods	Discharge hoods for the generator cooling and turbine compartment cooling air.
• Space Heater	Generator enclosure space heater.
• Enclosure	Weather proof acoustic enclosure, bolted post and beam framework, designed for a maximum noise level of 85 dBA three feet from the enclosure. The enclosure is completely painted to withstand outdoor environment.
• Baseplate	Common baseplate, fabricated and machined structural steel, completely painted to withstand outdoor environment.
• Instrument Air System	Instrument air piping and distribution tubing system for louvers, gas fuel valves and seals.

AIR INTAKE

• Inlet Filter	2-stage combustion air inlet filter, silencer and differential pressure gauge and switch.
• Inlet Plenum	All carbon steel gas turbine combustion air inlet plenum with inspection port.

FUEL SYSTEM

• Fuel Controls	Gas fuel system including distribution piping, fuel control valve, shutoff valves, filter, switches, gauges and automatic vent system.

COMMON LUBE OIL SYSTEM

• Main Lube Oil Pump	100% Capacity shaft driven pump.
• Prelube Oil Pump	1½ HP AC motor driven pre/post lube pump.
• Lube Oil Cooler	100% Capacity air cooled lube oil heat exchanger with 5 HP AC motor driven fan.
• Lube Oil Reservoir	Stainless steel reservoir with immersion heater, temperature controls, and tank vent with a coalescer element.
• Duplex Oil Filters	100% Capacity cartridge type filters with differential pressure indication and alarm.
• Start System	Electric/Hyrdraulic start system with hydraulic pump, 125 HP AC motor, starter and overrunning clutch.

T/G FIRE PROTECTION

• Halon System	Halon system for the gas turbine generator enclosure with detectors, discharge nozzles, gas storage bottles, and fire shutter louvers on all intake and discharge openings.
• Gas Detection	Gas detection system, including panel mounted monitor and gas sensors in turbine compartment.
• U.V.	One (1) U.V. detector mounted in turbine compartment.

EXHAUST SYSTEM

• Diffuser	All stainless steel 700 sq. in. turbine exhaust diffuser.
• Expansion Joint	Turbine exhaust expansion joint for attachment to the exhaust diverter valve.
• Heat Recovery Steam Generator (HRSG)	Riley Beaird HRSG, wih integral diverter valve and bypass duct, evaporator (130 psig), EPA ports, economizer, outlet silencer, stack (50′), steam separator, transition to the GT and boiler and pipework trim.

ELECTRICAL SYSTEMS

• Control System	Turbine generator control system including control panel (shipped loose for installation in customers power control room), protective devices, alarms and shutdowns, vibration monitoring system, temperature monitoring system and governor system. System also includes all generator voltage regulation equipment for auto and manual operation.
• Battery Charger & Batteries	24 VDC lead acid recombination batteries and battery charger for control system.
• A.C. Power System	Skid lighting system including four (4) A.C. lights and two (2) single phase A.C. plug-in receptacles.
• Switchgear	Generator circuit breaker and protective relays in a Nema 1 cabinet; and, on-skid, surge capacitors and lightning arrestors.
• Neutral Grounding	Neutral grounding equipment including transformer and resistor.
• Junction Boxes	Generator neutral box with current transformers, neutral ground connection and generator high voltage power cable connections.

OTHER

• Contract Documentation	Five (5) sets of Operation and Maintenance manuals, installation drawings, parts lists and kit lists, customer drawings, specifications and information as required.
• Contract Services	Testing, per USTC and customers standards. Two person-weeks of installation and startup service. One person-week is Monday through Friday, eight hours per day, for one service representative.
• Shipment Terms	F.O.B. Maineville, Ohio.

OPTIONAL EQUIPMENT QUOTED SEPARATELY (SEE SECTION 2)

• NOx Abatement Water	Strainer, pump, valves, onskid pipework and instrumentation, handling user-supplied purified water (see Section 9).
• NOx Abatement Steam	Valves, onskid pipework and instrumentation, handling steam from the UST5600CC unit.

• Fuel Gas Compressor	Positive displacement, oil-flooded, rotary screw-type compressor, electric motor, motor-to-compressor flexible coupling with guard, inlet strainer and check valve, discharge gas/oil separator, oil system including cooler, capacity control system, control panel, discharge cooler and condensate separator; NEC CL.1, DIV 2, Group D onskid electrical component compliance, 480 VAC NEMA 1 non-reversing motor starter, discharge check valve, block and relief valves. Note: sizing and pricing are based on gas supply being min. 40 PSIG, max 105°F, min. 17.0 molecular wt. and k value of 1.30. The equipment selection and pricing may change if these parameters change.
• Delivery	F.O.B. jobsite terms.
• MCC	480 VAC non-reversing motor starters and distribution panel for all loads associated with USTC-supplied equipment, in a NEMA 1 panel.

COGENERATION PLANT #2

UST1500 EQUIPMENT LIST

3.1.C. UST1500 GAS TURBINE GENERATOR SET BILL OF MATERIALS

Rotating Equipment

Gas Turbine	Kawasaki Heavy Industries' heavy-duty, M1A-13 industrial gas turbine engine.
Speed Reducer	Epicyclic gearbox, with spur gear section for auxiliary drives.
Electric Generator	Kato air-cooled, four-pole, brushless, 13200 VAC, 60 HZ, 3 phase, synchronous generator, using antifriction bearings with self-contained lubricant, rated for accomodation of gas turbine output within the limits of ANSI C50.14 base class F total temperatures throughout the site ambient temperature range, with two RTDs imbedded in the windings of each phase and one bearing RTD.
Fuel Gas Compressor (optional)	Positive displacement, oil-flooded, rotary screw-type compressor, electric motor, motor-to-compressor flexible coupling with guard, inlet strainer and check valve, discharge gas/oil separator, oil system including cooler, capacity control system, control panel, discharge cooler and condensate separator; NEC CL.1, DIV 2, Group D onskid electrical component compliance, 480 VAC NEMA 1 non-reversing motor starter, discharge check valve, block and relief valves - note: sizing and pricing are based on gas supply being min. 40 PSIG, max. 105°F, min. 17.0 molecular wt. and k value of 1.30. The equipment selection and pricing may change if these parameters change.
Coupling	Torsionally resilient, flexible coupling between the speed reducer and generator.

Structural Components

Baseplate	Structural steel fabrication, machined for equipment mounting and for direct attachment to the user's foundation.
Acoustic Enclosure	Housing consisting of "sandwich" exterior skin/acoustic element/stainless interior perforated liner construction, lightweight frame posts, and access doors with stainless steel door hardware. Silencing is to 85 dBA at a distance of one meter.

Fluid and Mechanical Systems

GT Inlet Air	Weatherhood/coalescer pad/high-efficiency media combustion air inlet filter, stainless steel silencer, differential pressure gauge and switch, and stainless steel plenum.
Ventilation Air	Weatherhood/coalescer pad filter, galvanized silencer, booster fan and motor, exhaust silencer and exhaust hood, serving the enclosure and the electric generator.
Heat Recovery Steam Generator (HRSG)	Gas turbine exhaust diffuser Bellows-type expansion joint Riley-Beaird HRSG, with integral diverter valve and bypass duct, evaporator (130 psig), economizer, outlet silencer, stacks (50'), steam separator, transition to the GT and boiler and pipework trim.
Water Wash System	Mixing cart, with quick-disconnect couplings.
Starting System	Skid-mounted electric/hydraulic start system with variable-displacement hydraulic pump, 100 HP AC motor, hydraulic motor, overrunning clutch, hydraulic oil reservoir, instrumentation and protectives.
Lube Oil System	Shaft-driven positive-displacement pump, AC-powered pre/post lube oil pump, reservoir, temperature control valve, off-skid-mounted oil-to-air heat exchanger with 100 percent capacity at the site's maximum ambient air temperature, duplex ten-microns-nominal filters, pressure control valve, low pressure protective switches and supply oil high temperature protection. The generator bearings are self-lubricated.
Fuel and Injection Systems	Shutoff valves, control valves, water pump, instrumentation, manifolds, and on-skid pipework for natural gas fueled operation, with injection of water for abatement of NOx emissions.
Dual-Fuel System (optional)	Shutoff valves, control valve, fuel pumps, filter, instrumentation, manifolds and on-skid pipework for the use of liquid or gaseous fuel, with on-line change-over ability.
Fire Protection	U-V detectors, backed-up by thermal rate-of-rise detectors, ventilation air fireshutters, fast-bleed and slow-bleed Halon 1301 bottles meeting NFPA12A standards, enclosure gas sensor and control panel-mounted monitor, and explosion-proofing of electrical components within the enclosure per National Electric Code class 1, group D division 2 criteria.

Instrument Air System	Instrument air piping and distribution tubing system for louvers and gas fuel valves.

Controls and Electrical Systems

Ignition System	Exciter, cables, and high-voltage igniter plug.
Turbine-Generator Control	Free-standing, control room-mounted, NEMA 1 panel. Solid-state, load-sharing speed control and exhaust temperature-limiting governor, with cross-current compensation. VAR/power factor controller Microprocessor-based sequencer, for automated unit sequencing and protection. GT speed and temperature meters; start, stop, acknowledge, reset and test pushbuttons, hourmeters and horn. Monochrome video display unit, comprising the annunciator, status indicators, vibration readout and RTD readout. Automatic voltage regulator Generator volt, amp, KW and VAR meters and generator bus voltage meter, with associated selector switches. Voltage speed and load adjustment switches and motor-operated potentiometers. Synchroscope, auto-synchronizer, auto/manual synchronization selector, synchronization-initiate switch and synch-check relay.
Batter Charger & Batteries	24 VDC lead acid recombinant batteries with battery charger, for control system.
A.C. Power System	Skid lighting system, including four (4) A.C. lights, two (2) single phase A.C. plug-in receptacles and the generator space heater.
Switchgear	Generator circuit breaker and protective relays in a Nema 1 cabinet; and, on-skid, surge capacitors and lightning arrestors.
Neutral Grounding	Neutral grounding equipment including transformer and resistor.
Junction Boxes	Generator neutral box with current transformers, neutral ground connection and generator high voltage power cable connections.
MCC (optional)	480 VAC non-reversing motor starters and distribution panel for all loads associated with USTC-supplied equipment, in a Nema 1 panel.

ATTACHMENT #6

P & ID's OF NSPS CONTINUOUS MONITORING DEVICES

Mirza has
Attachment
#6

P 423 104 514

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

Sent to Mr. Brian Travis, Empire	
Street and No. P.O. Box 6840, Bldg. 970 Energy Mgmt. Sy	
P.O., State and ZIP Code MacDill AFB, FL 33608-0840	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date Mailed: 6-14-90 Permit: AC 29-178833 AC 29-178834	

PS Form 3800, June 1985 ☆U.S.G.P.O. 1989-234-555

SENDER: Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.
1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)* 2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to: Mr. Brian Travis, President Empire Energy Management Systems, Inc. P. O. Box 6840, Bldg. 970 McDill Air Force Base, FL 33608-0840	4. Article Number P 523 104 514 Type of Service: ☐ Registered ☐ Insured ☒ Certified ☐ COD ☐ Express Mail ☐ Return Receipt for Merchandise Always obtain signature of addressee or agent and DATE DELIVERED.
5. Signature — Addressee X	8. Addressee's Address *(ONLY if requested and fee paid)*
6. Signature — Agent X	
7. Date of Delivery JUN 18 1990	

PS Form 3811, Apr. 1989 ★U.S.G.P.O. 1989-238-815 DOMESTIC RETURN RECEIPT

Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

June 14, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Brian Travis, President
Empire Energy Management Systems, Inc.
P. O. Box 6840, Building 970
McDill Air Force Base, Florida 33608-0840

Re: Hillsborough County - A.P.
Empire Energy Management Systems, Inc.
AC 29-178833 (Cogeneration Plant #1)
AC 29-178834 (Cogeneration Plant #2)

Dear Mr. Travis:

The Department has received your response to Mr. Gary Maier's letter (dated May 4, 1990) on May 16, 1990, for the above referenced construction permit applications. Please be advised that these responses did not adequately address the incompleteness items. Therefore, these applications are still incomplete until the Department receives the information requested below:

(1) Project description, item A, page 2 of the application for the Cogeneration plant #1 submitted to the Tampa DER and EPCHC is different than the application submitted to the Tallahassee DER (a copy of both applications is attached). Please resubmit the correct application to all the offices mentioned above.

(2) Cogeneration Plant #1, item E, page 5 of the application states that heat input when firing with natural gas is 141.72 MMBtu/hr and when firing with #2 fuel oil is 52.66 MMBtu/hr. Does this mean that this plant will only generate one-third the power when fired with #2 fuel oil only?

(3) Please submit the calculation sheet for both plants, showing the derivation of the estimates for all pollutants listed in item C, page 4 of the application.

(4) Please submit the stack drawings for both plants, showing the sampling port size and location along with the upstream and downstream disturbance distances.

(5) Please submit the make, model number, and the maximum designed power generation (MW) for the gas turbines at both plants.

(6) As per NSPS, both plants will be required to install a continuous monitor with a flow chart to record the fuel flow (gpm or MCFH), water or steam injection rate, and power generation. Accordingly, please submit the make, model and serial number of such monitors/recorders that you propose to install at both plants.

Please respond to this request by July 6, so that we can promptly review your application.

If you have any questions, you may contact Mr. Mirza P. Baig at (904)488-1344.

Sincerely,

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

CHF/plm

c: Edward C. Spivey, P.E.
Don Lock, U.S. Turbine Corp.
Gary Maier, DER Tampa
Jerry Campbell, P.E., EPCHC

May 15, 1990

RECEIVED
MAY 16 1990
DER - BAQM

C. H. Fancy
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Gary Maier's Letter of May 4, 1990

Subject: Two Cogeneration Construction Permit Applications
(1) DER File #AC29-178833, (Cogen Plant #1)
(2) DER File #AC29-178834, (Cogen Plant #2)

Dear Mr. Fancy:

Pursuant to Mr. Maier's letter of May 4, 1990, the NOx emissions of these two plants combined is more than 115 tons per year. As a result, Mr. Maier transferred the permitting responsibility from the Southwest District office to Tallahassee -- specifically to you. In this same letter, Mr. Maier also raised some questions regarding water and/or steam injection for NOx abatement. Mr. Maier designated the permit applications incomplete until his questions were answered.

This letter is aimed at responding to Mr. Maier's inquiries; herewith you will find Attachment #1 from U.S. Turbine which addresses the technology of water/steam injection for NOx control in general, along with specific references to the combustion turbines to be supplied for the MacDill cogeneration plants. Accompanying this Attachment are three Supplements: #1 deals with steam injection for both NOx abatement and power enhancement in the UST5600CC; #2 contains relative portions of an injection system Operating and Maintenance manual; #3 lists injection water quality specifications for the Allison, Kawasaki and Cheng Cycle units being provided for the cogeneration plants.

As further clarification of the response to Mr. Maier's question #6 concerning the maintenance of water treatment systems, an experienced water treatment company will be retained by Empire to provide water treatment systems, chemicals, periodic water sampling/analysis, and operator training. These trained operators will, in turn, monitor the treatment systems on a daily basis.

With this letter and the responses to Mr. Maier's questions, it is our understanding that our application is complete. Please notify me if that is not the case, or if you have any need of additional information.

Sincerely,

Thomas Bartley, C.E.M.
Project Manager

cc: Brian Travis, President, Empire
Gary Maier, BSChE, JD, DER Southwest District Office
John Chisholm, SW Gas
Ed Spivey, Jr., P.E., Bosek, Gibson & Assoc.

fanc0515.ltr

ATTACHMENT #1

U.S. TURBINE RESPONSE TO DER REQUEST FOR EXPLANATION OF STEAM INJECTION FOR NOx ABATEMENT

May 11, 1990

Thomas E. Bartley
Empire Energy Management Systems, Inc.
P.O. Box 6840
Building 970
MacDill Air Force Base, Florida 33608-0840

COPY

Subject: MacDill AFB Cogeneration Emissions

Reference: May 4, 1990 letter from Gary A., Maier, Florida D.E.R., to Brian Travis
DER File #AC29-178833
PER File #AC29-178834

1) Emission Index

It is not generally true that the emission index is higher at lower loads. NOx for example is lowest at the idle setting, and increases up to full power. CO can be higher or lower, depending on the engine power setting, but is usually low from 1/2 to full power. It can increase with water injection at full power. We believe that this matter, at any rate, is not applicable to the proposed installation; since the intention is that the equipment will be baseloaded at full power.

2) Control System

Turbine-type flowmeters are used to measure injection water and distillate fuel flows for the UST5600CC and UST3800 units, and vortex flowmeters are used for steam and gaseous fuel flows (See attached schematics 20802 and 20810, for a dual-fuel, steam/water-injected UST5600CC unit). A PID loop compares the ratio of nozzle injection (water or steam) and fuel flows to the setpoint value, and uses the error signal to drive nozzle steam or water flow control valves. Output power is sometimes monitored instead of fuel flow, especially for dual-fuel units: since a nearly perfect straight-line relationship exists between fuel flow and output power. Nozzle NOx-abatement injection in either case is closed-loop controlled; and is rendered independent of the condition of the fuel/injection nozzles themselves.

Steam injection external to the combustion liners, as is used for NOx abatement and power/heat rate improvement of UST5600CC units, is usually controlled on the basis of process requirements: i.e. unfired steam production not required by the host facility is injected into the engine, to not waste the recovered energy it contains. A minimum injection limit can also be established, if there is a NOx floor value that must never be exceeded. The duct burner in the exhaust system can be used, to meet process steam requirements while reserving a fixed minimum steam flow for injection. Usually, however, the variation of injection over the course of a year leaves net-annual NOx criteria satisfied; or, as is shown in the

attached schematics 20802 and 20810, steam injection external to the combustion liners is supplemental by water injection at the fuel nozzle. The water-to-fuel ratio in this case is varied inversely with the steam injection rate, to avoid overquenching the flame.

The UST1500 unit has water flow regulated by a metering valve, driven by an electrohydraulic actuator receiving the same control signal as the fuel metering valve. A differential pressure regulator maintains a fixed pressure drop across the water metering valve orifice, such that the relationships between control signal strength, valve position, orifice area and flow are maintained independent of any erosion or plugging at the fuel nozzle. The magnitude of the water-to-fuel ratio is adjusted by changing the length of the lever connecting the metering valve input shaft to its actuator's output shaft.

Water/steam injection system maintenance typically consists of periodic calibration checks, visual inspections, filter replacements and, for units with multiple fuel nozzles, nozzle flow testing; but all these are principally directed at preserving equipment mechanical integrity. The injection rates of the units proposed are achieved on the basis of designed-in methods of operation, as were explained above, and are not dependent upon any specific hardware maintenance program for their accuracy.

3 and 5) Steam Versus Water Injection

There are two ways to inject steam into the engine. The method used for the UST3800 package has steam injected directly into the combustor at the flame front (nozzle steam injection). The second method, used in the UST5600CC, has steam injected around the foreward part of the combustor. The UST5600CC also injects some steam downstream, just before the turbine; and this steam has little influence on the NOx emissions. A portion of the steam injected around the combustor makes its way into the combustor primary (i.e. flame front) zone; so on a pound/pound basis (of injected steam) it is not as effective in reducing NOx as direct injection through the fuel nozzle. Liquid water is always injected through the fuel nozzle into the combustor primary zone.

Water injection achieves a greater flame temperature reduction than steam, because of the enthalpy of vaporization (See attached theoretical water versus steam NOx quench comparison). More steam than water can be injected into the engine, however, without degrading the expected lifetime of components. Injected water sometimes reaches the walls of the combustor liner. The relatively short residence times in the primary zone cause not all the water to flash-vaporize at the nozzle exit. A droplet of water on a hot skillet, for example, vaporizes slower than at its theoretical rate,

because of the creation of a insulating vapor between the two surfaces. Combustor temperatures are high; but so are the pressures, which act to limit the vaporization rate. Water impingement on the liner has a destructive effect on this component, and is cause for more frequent inspection and removal. Each engine manufacturer limits, therefore, the amount of a given injection fluid that may be injected into its engines. An Allison 501-KB5 engine (UST3800 package) is usually operated no higher then an 0.80 water/fuel ratio. The same engine, when equipped with nozzle steam injection, accommodates up to a 1.50 steam/fuel ratio. The 501-KH engine (UST5600CC package), having injection occur outside the combustion liners, can have in excess of an 8:1 steam/fuel ratio.

It is therefore true to say that water is more effective than steam in quenching NOx at any given injection fluid per pound of steam ratio; but the reverse is true when one deals with the maximum rate of each injection fluid the unit can withstand. Water can be used to supplement steam injected external to the combustor when, as was explained above, lowest-possible NOx levels must be maintained when little or no steam is being injected. Water injection for such a unit is curtailed when enough steam is injected to do the job of emissions abatement; and water injection is never used when steam is injected at the fuel nozzle.

The emissions abatement capabilities of the steam-injected engines proposed are borne-out by theoretical considerations, as described above, as well as by operating experience. None of the MacDill A.F.B. planned gensets incorporates new and untried technology. The emissions guarantees given reflect only results which have been achieved in practice. Steam injection for gas turbine emissions abatement, following the 1985 introduction of the 501-KH engine, has become increasingly popular, being now routinely used for the Allison 501-KB5, Allison 501-KH, Mitsubishi MF-111, GE LM-2500, GE LM-5000 and other engines.

4) The Effect of Steam Injection on Heat Rate

The engine heat rate (fuel energy consumed per unit power produced) is a direct function of the enthalpy of the fluids passing through the engine. An engine operates at a maximum temperature fixed by the materials of construction. On a standard day (59°F) a 501-KB5 will have a compressor discharge air temperature of about 650°F; and, to reach the 1895 °F turbine inlet temperature (TIT) limit, about 45 million Btu/hr of fuel must be added. The injection of liquid water into the engine, causes the heat of vaporization plus the raising of the sensible enthalpy of the water vapor to impose a heat rate penalty on the engine. That is, fuel is added, to keep the turbine inlet temperature from being reduced; but engine power does not increase as fast the fuel addition rate.

The injection of steam still requires added fuel flow to prevent a drop in turbine inlet temperature, but not as much as with water; since the steam has already been vaporized. Usually the vaporization is achieved by recovering heat from the exhaust gases, which are typically about 1000°F. The increased mass flow and the change in the engine specific heat (due to the high water content) increase engine power at a rate faster than the fuel flow rate of increase, improving the heat rate.

Expressed differently, the steam being injected into the UST3800 and UST5600CC units proposed would, if delivered instead to a steam turbine, produce far more output power than that spent in the making of the steam, given that the heat required to boil and superheat the feedwater was provided free (i.e. exhaust heat). This results in the injection of steam into the gas turbine causing the net heat rate to go down, not up. The 501-KH engine, in fact, was developed to enable users to gain the power and efficiency benefits of a combined cycle mode of operation without the expense of buying a steam turbine.

6) Water Treatment

Drawings prepared by the U.S. Turbine Corporation do not show water treatment facilities, as they are not within our scope of supply. We have provided, however stringent injection water quality requirements, which can only be met via a highly-effective purification system. Use of lower-quality water would have no adverse effect on emissions abatement; but the introduction of corrosive impurities into the engine would greatly reduce engine hot-section life.

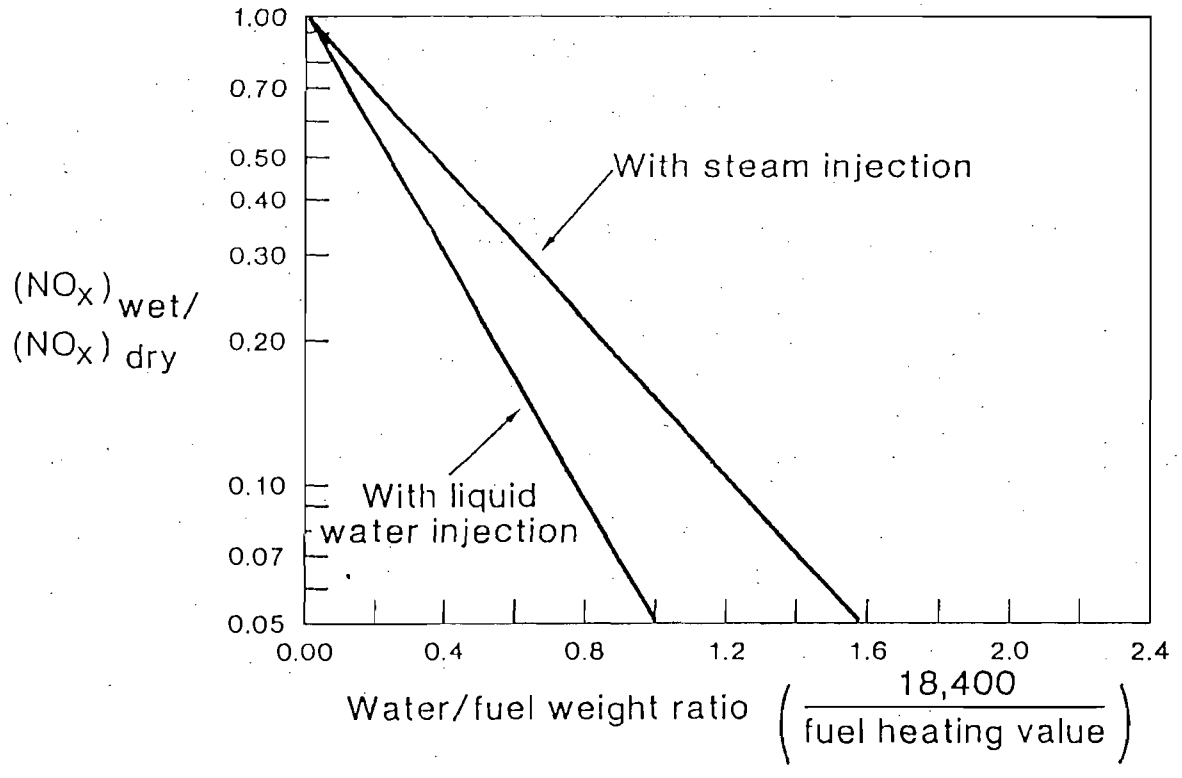
Sincerely,

Don Lock
Manager of Application Engineering

DL/ro

cc: T. Smith

Idealized NO_X Level/Water Flow Relationships



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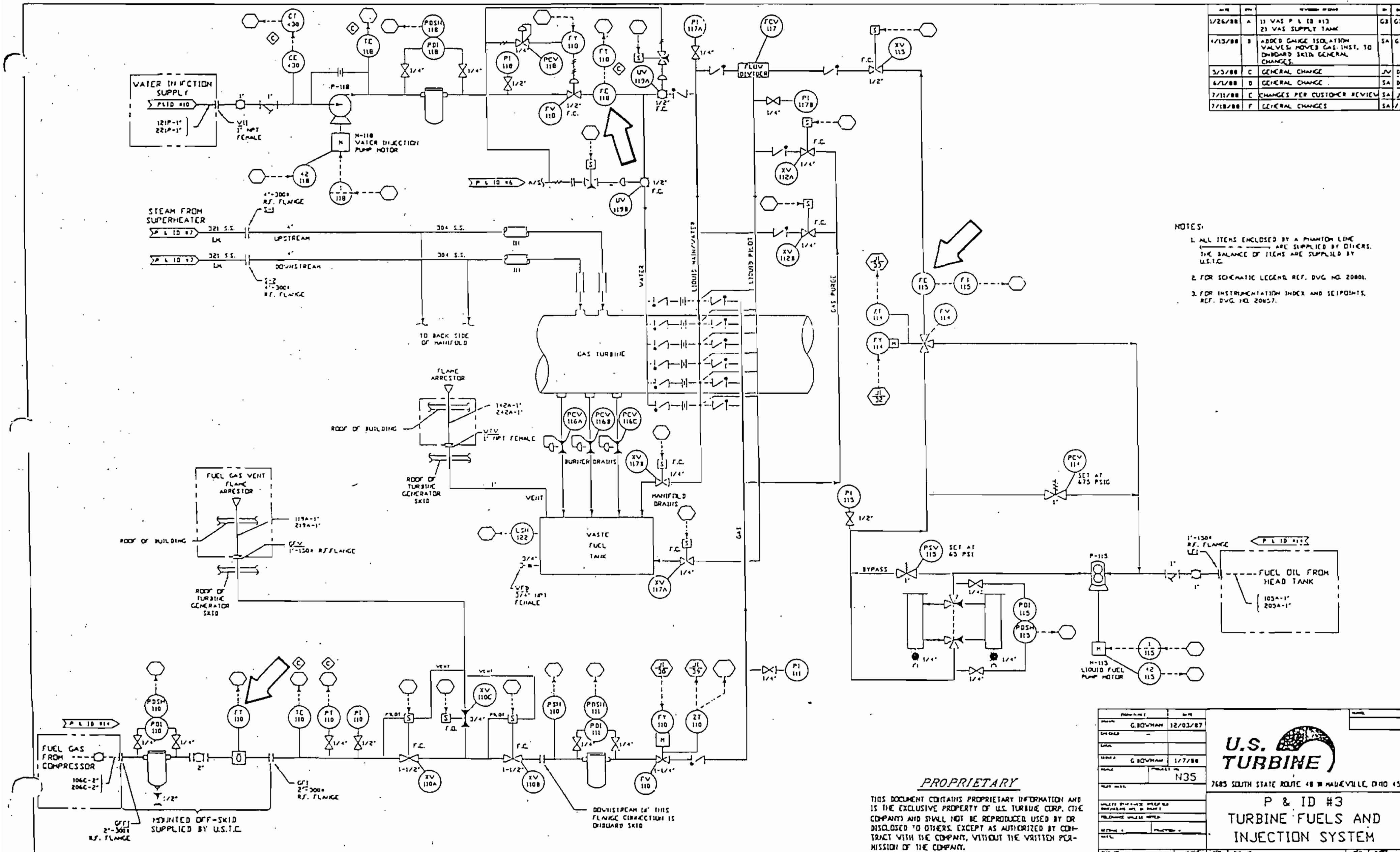


DATE	REV.	REVISION	BY	APP.
1/26/88	A	1) WAS P & ID #13 2) WAS SUPPLY TANK	GB	GB
4/13/88	B	ADDED GAUGE ISOLATION VALVES; MOVED GAS INST. TO ONBOARD SKID; GENERAL CHANGES.	SA	GB
5/3/88	C	GENERAL CHANGE	JV	DW
6/1/88	D	GENERAL CHANGE	SA	DW
7/11/88	E	CHANGES PER CUSTOMER REVIEW	SA	JD
7/18/88	F	GENERAL CHANGES	SA	//

NOTES:

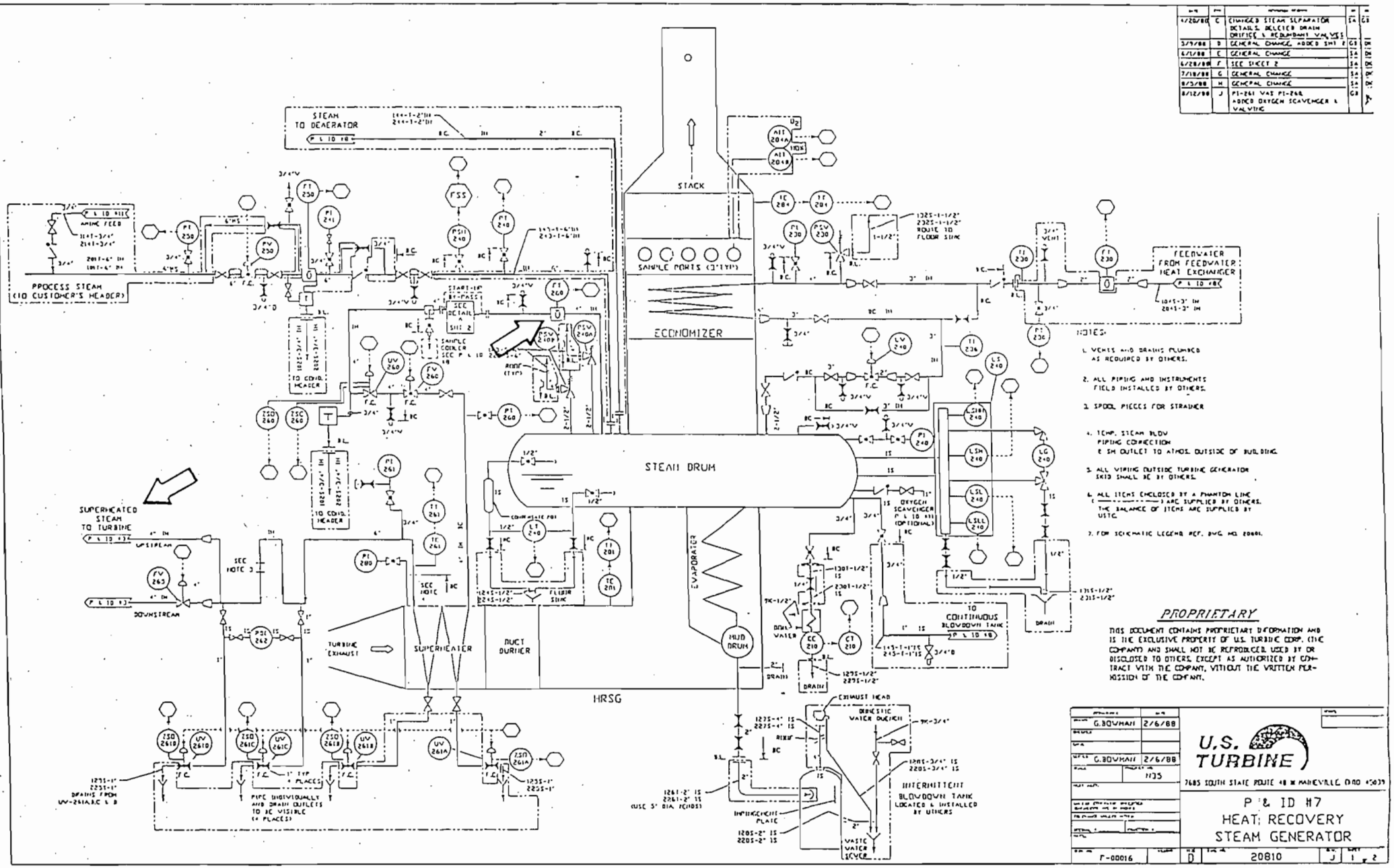
1. ALL ITEMS ENCLOSED BY A PHANTOM LINE ——— — — ——— ARE SUPPLIED BY OTHERS. THE BALANCE OF ITEMS ARE SUPPLIED BY U.S.T.C.
2. FOR SCHEMATIC LEGEND REF. DWG. NO. 20801.
3. FOR INSTRUMENTATION INDEX AND SETPOINTS, REF. DWG. NO. 20857.

DRAWN G. BOWMAN 12/03/87
CHECKED —
ISSUED G. BOWMAN 1/7/88
PROJECT NO. N35

U.S. TURBINE
7685 SOUTH STATE ROUTE 48 ■ MAINEVILLE, OHIO 45039

P & ID #3 TURBINE FUELS AND INJECTION SYSTEM

F-00015 | SIZE D | DWG. NO. 20802 | REV. F | SHEET 1 of 1



1/20/88	C	CHANGED STEAM SEPARATOR DETAILS & DELETED DRAIN ORIFICE & RECIRCULATION VALVES	EA	GS
3/9/88	D	GENERAL CHANGE, ADDED SHT 2	GS	
6/1/88	E	GENERAL CHANGE	SA	
6/28/88	F	SEE SHEET 2	SA	
7/18/88	G	GENERAL CHANGE	SA	
8/5/88	H	GENERAL CHANGE	SA	
8/12/88	J	PI-261 VIA PI-260, ADDED OXYGEN SCAVENGER & VALVING	GS	

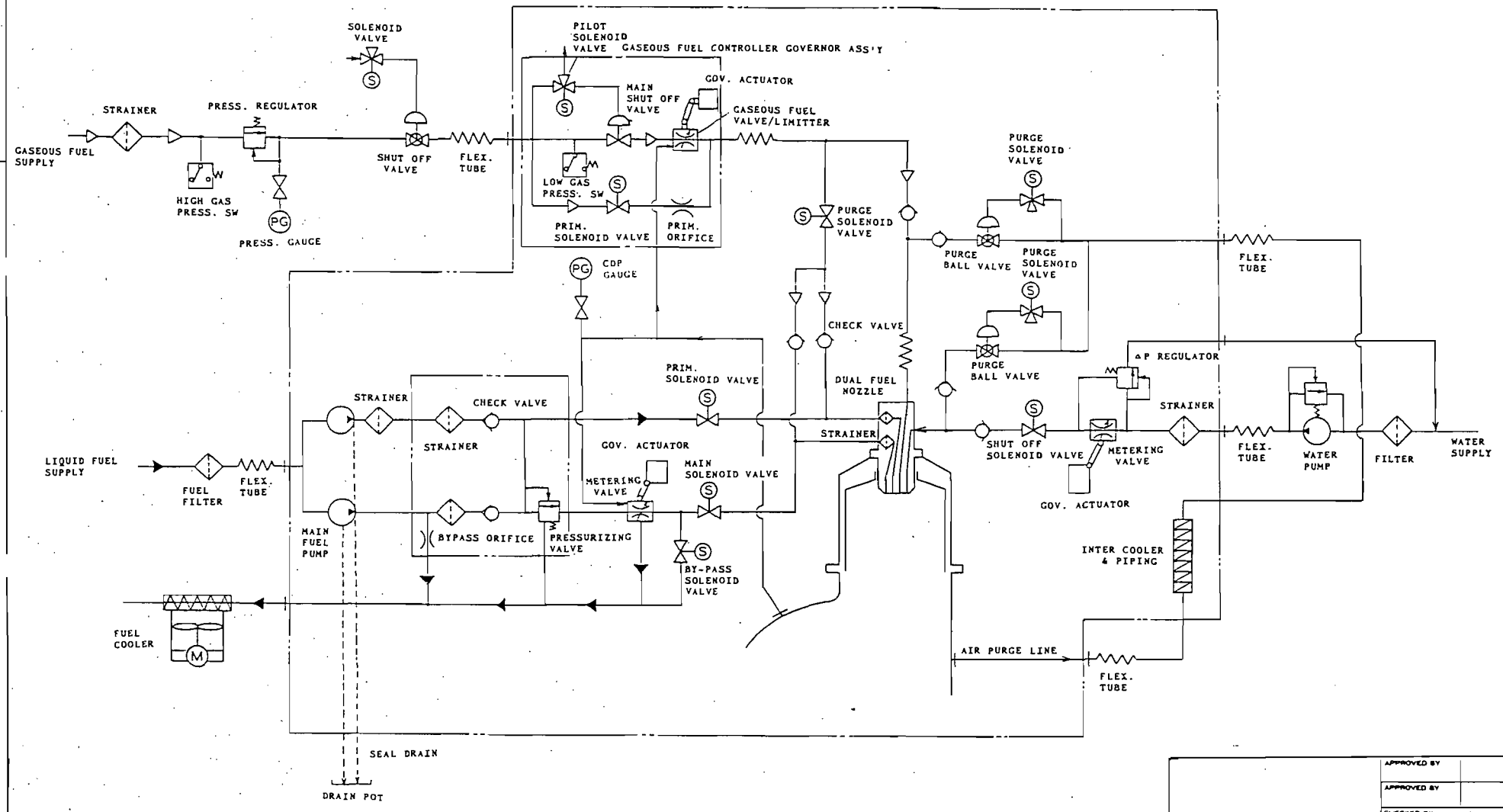
DRAWN	G.BOUMAN	2/6/88
CHECKED		
APPD	G.BOUMAN	2/6/88
PROJECT NO.	N35	

U.S. TURBINE

7685 SOUTH STATE ROUTE 48 ■ MAINEVILLE, OHIO 45039

P & ID #7
HEAT RECOVERY STEAM GENERATOR

DWG NO.	F-00016	SIZE D	DWG NO. 20810
REV	J	SHT 1 OF 2	



KAWASAKI HEAVY INDUSTRIES, LTD.
JET ENGINE DIVISION
AKASHI, HYOGO PREF., JAPAN

APPROVED BY
APPROVED BY
CHECKED BY
DESIGNED BY
DRAWN BY

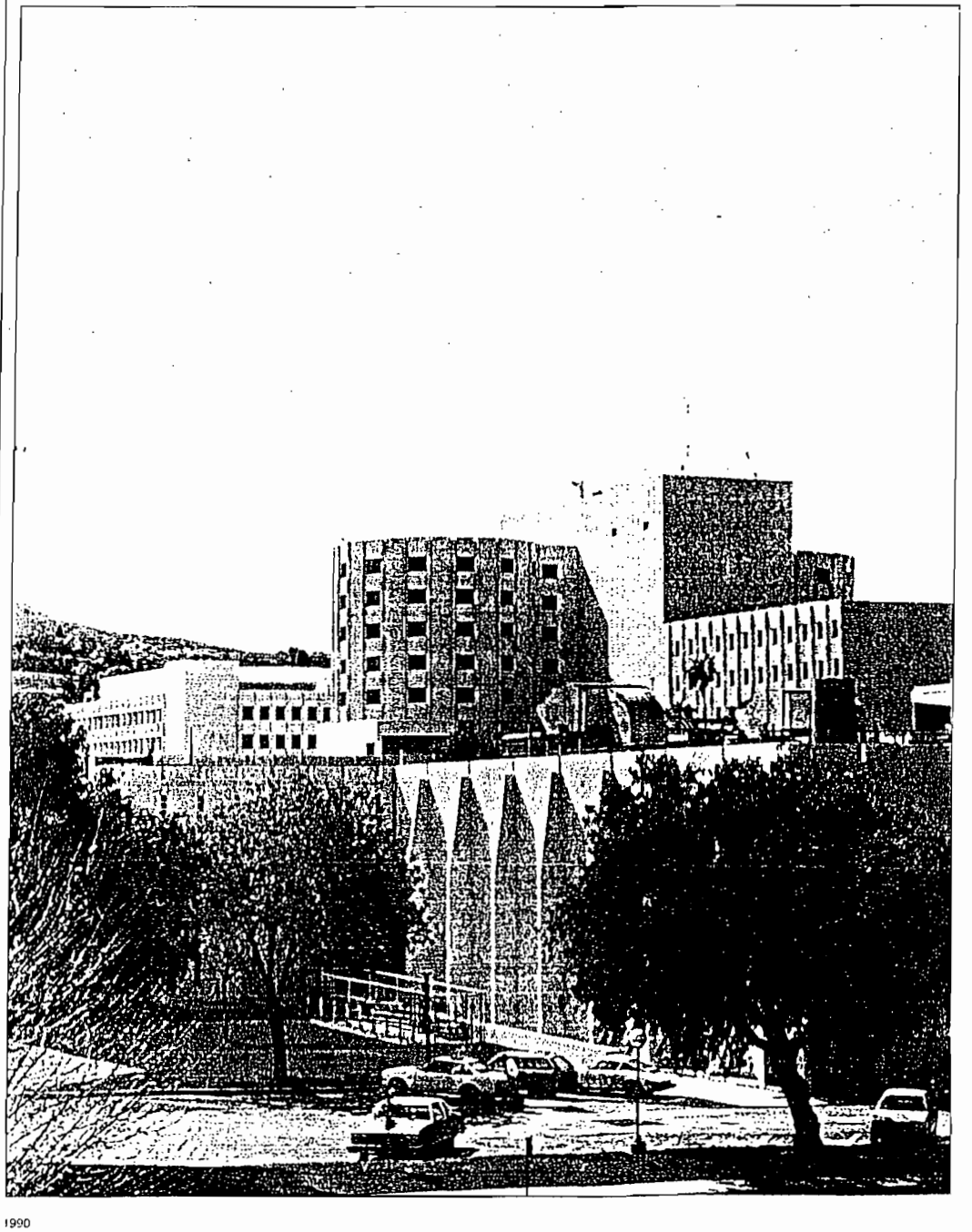
TITLE: M1A-01/03 BASELOAD ENGINE, DUAL FUEL SCHEMATIC

DRG NO. | REV
SCALE | SHEET 1 OF 1 | DATE

SUPPLEMENT #1

DESCRIPTION OF THE LOMA LINDA UST5600CC INSTALLATION, FROM A RECENTLY-ISSUED TRADE PUBLICATION.

Cheng Cycle Units Installed at Loma Linda



Loma Linda Hospital and University, Loma Linda, California, where expected energy cost savings with the Cheng Cycle are over $1 million per year.

International Power Technology (IPT) of Redwood City, California, announced recently that two Cheng Cycle cogeneration systems have completed acceptance and emission testing at Loma Linda Hospital and University, Loma Linda, California. The plant will supply up to 11.2 megawatts of electrical power and as much as 86,000 pounds per hour of steam to the institution for use in space heating and cooling. Surplus electrical output will be sold to Southern California Edison.

By simultaneously producing steam and electricity in the cogeneration plant, Loma Linda will significantly lower its total energy bills as well as become much more self-sufficient in energy production. The institution chose the Cheng Cycle for its ability to efficiently follow fluctuating steam loads and produce high electrical output during peak periods. Expected energy cost savings with the Cheng Cycle are substantially over $1 million per year. The facility was built to accommodate a third Series 7 unit as the facility's need develops.

The system was supplied to Loma Linda by the North American licensee for the Cheng Cycle 501-KH Cogen, U.S. Turbine Corporation of Maineville, Ohio. The plant is a gas turbine-based, modular cogeneration plant, each unit of which can produce up to 5.6 MW of electricity and up to 43,000 pounds per hour of process steam.

"Loma Linda is the first Cheng Cycle plant to be completed by U.S. Turbine," said Scott Baker, IPT president and CEO. "By providing reliable and economical cogeneration service to the hospital and university, it will prove to be an outstanding example of the technical advantages of the Cheng Cycle delivered through the superior engineering and packaging skills of U.S. Turbine."

International Power Technology is a supplier of cogeneration systems based on its patented Cheng Cycle technology. The Cheng Cycle is licensed to U.S. Turbine for marketing, manufacturing and installation in the Western Hemisphere. SGP-VA of Vienna, Austria performs that role in Europe while Hitachi Zosen of Osaka, Japan covers Asia and the Pacific. Kawasaki Heavy Industries is also a licensee with worldwide rights to Cheng Cycle technology.

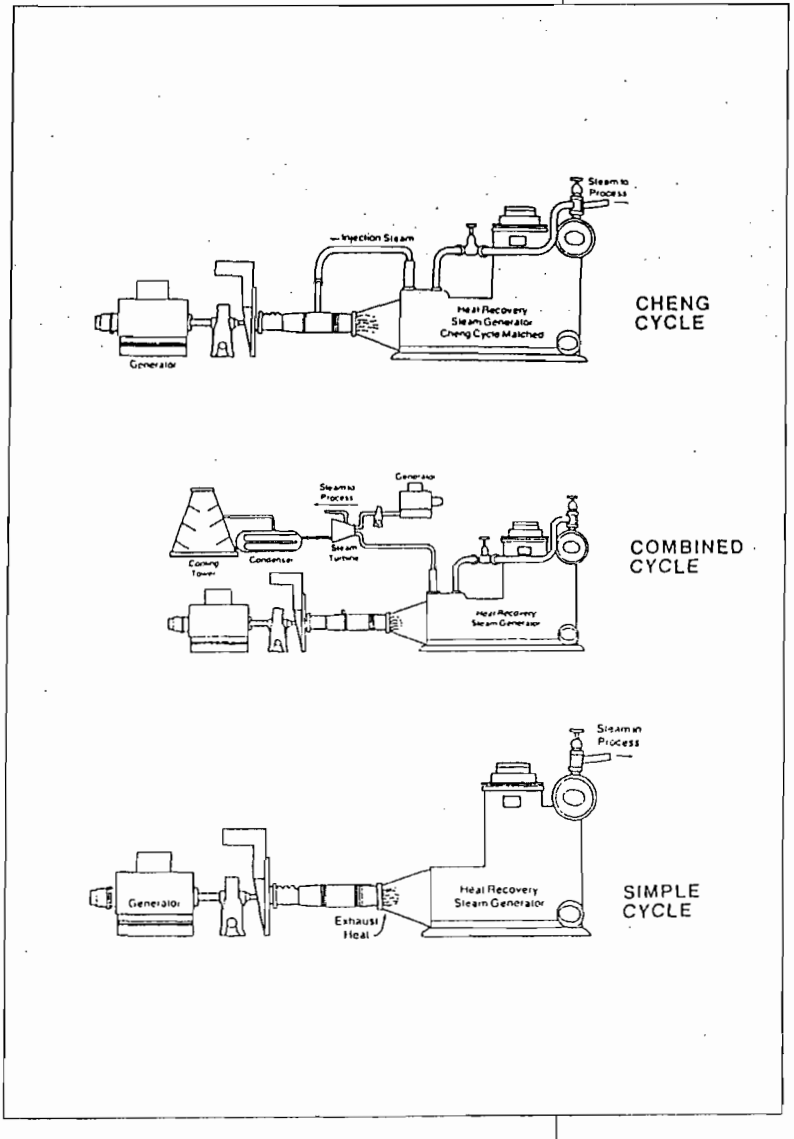
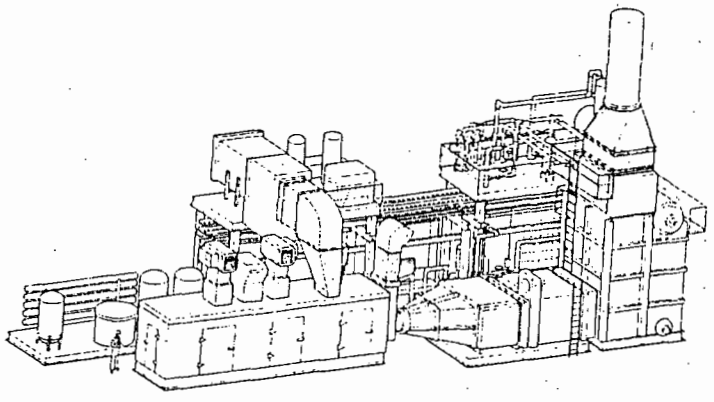


Figure 1. Cogeneration System Diagrams: Cheng Cycle, Combined Cycle and Simple Cycle.

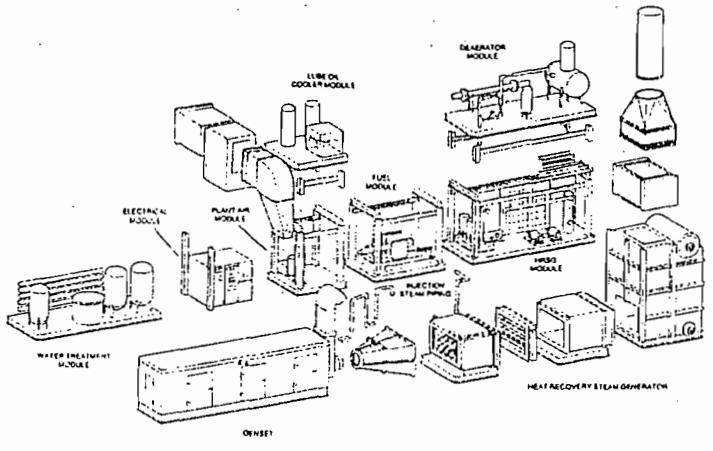
Cheng Cycle Explained

Background

The concept of gas turbine steam injection is not new; experiments have been performed



Cheng Cycle Series 7 Power Island can be completely installed and operational in less than 12 months from date of order.



Exploded view of Cheng Cycle Series 7 Cogen Plant. Pre-packaged modular systems maximize reliability and minimize installation and start-up costs.

since 1905. Until recently, however, use of steam injection has been limited to NOx control or simple power augmentation. The critical relationships between steam-to-air ratios, steam-to-fuel ratios, and other cycle parameters in optimizing the efficiency of the steam injected gas turbine cycle were first identified by Dr. Dah Yu Cheng, a professor at the University of Santa Clara. In 1974, Dr. Cheng formed International Power Technology to develop and commercialize what is now called the Cheng Cycle. Since that time IPT has been granted over 60 U.S. and international patents on the concept and associated hardware.

Unique Combination of Cycles

The Cheng Cycle combines the Brayton (gas turbine) and Rankine (steam turbine) cycles in a unique manner. Traditionally, the Brayton and Rankine cycles have been used in series, as in the well-known "combined cycle." In both combined cycle and Cheng Cycle, engine exhaust heat is used to generate steam in a waste heat boiler. In the combined cycle, steam is passed through a steam turbine to produce additional work. In the Cheng Cycle, steam is further heated and injected into the gas turbine along with the Brayton cycle air and expands through the turbine, producing additional work. The injected steam generates power in parallel with air in the gas turbine, combining the Brayton and Rankine cycles. The boiler captures otherwise wasted energy from both the steam and the air in the gas turbine's exhaust. Power output and generating efficiency are improved by 50% and 37% respectively for the Cheng Cycle Series 7 system.

Cheng Cycle achieves the parallel combining of the Brayton and Rankine cycles without requiring a steam turbine, additional generator, condenser, cooling tower, and auxiliary equipment. For gas turbines in sizes greater than 10-15,000 horsepower, both Cheng Cycle and combined cycle improve the power output and heat rate by a comparable amount. For smaller engines, combined cycle applications suffer from poor steam turbine efficiencies and the disproportionate complexity of added equipment.

Dr. Cheng discovered that peak cycle efficiency occurs at a unique mass flow of superheated steam to the gas turbine. Insufficient flow of steam to the gas turbine results in excess energy exhausted to the atmosphere in the form of sensible heat. Too much steam flow to the gas turbine results in excess energy exhausted in the form of latent heat of vaporization. The Cheng Cycle patents describe in detail how the waste heat boiler design is intrinsically tied to the compressor pressure ratio and turbine inlet temperature of the gas turbine.

An important benefit of the Cheng Cycle is greatly reduced NOx emissions. Steam injection greatly reduces nitrogen oxides (NOx) production — from 100-130 to 10-20 ppmv (dry @ 15% 0_2). Two mechanisms are involved: (1) the large specific heat of water serves to buffer the peak flame temperature and (2) the large volume of steam involved suppresses the partial pressure of oxygen.

Cheng Cycle Cogeneration Application

In a pure electrical power generating application of the Cheng Cycle, all the steam produced by waste heat is recycled through the gas turbine. The single form of useful output from the cycle is electricity. The Cheng Cycle concept can also be readily applied to cogeneration applications wherein there are two useful forms of energy output from the cycle: shaft power and/or electricity as well as thermal output (generally steam or hot water).

In cogeneration applications of the Cheng Cycle steam may be used either for process needs and/or injected into the gas turbine. (See Figure 1.) A duct burner is added between the gas turbine and the waste heat boiler to increase the total steam-producing capability of the system. The added steam

may be used to match increased process loads and/or to increased injection to the gas turbine for higher power output. When tracking process thermal loads, the cogeneration system varies the mass flow through the turbine and/or the duct burner firing rate, rather than cycling turbine firing temperature. In addition, the system can vary both steam and electricity outputs independently of each other. Thus Cheng Cycle provides operating flexibility with mechanical simplicity comparable to a simple cycle system.

In cogeneration, an IPT-developed procedure called "staged steam injection" works to enhance NOx suppression at intermediate steam injection rates. Steam is preferentially diverted to the area where it can have the greatest effect on the primary and secondary combustion zones. In some applications, water injection is used in addition to steam injection for coordinated NOx reduction. This is typically used when regulations require continuous NOx control and when periodically little or no steam is available for injection due to process demands or economic considerations.

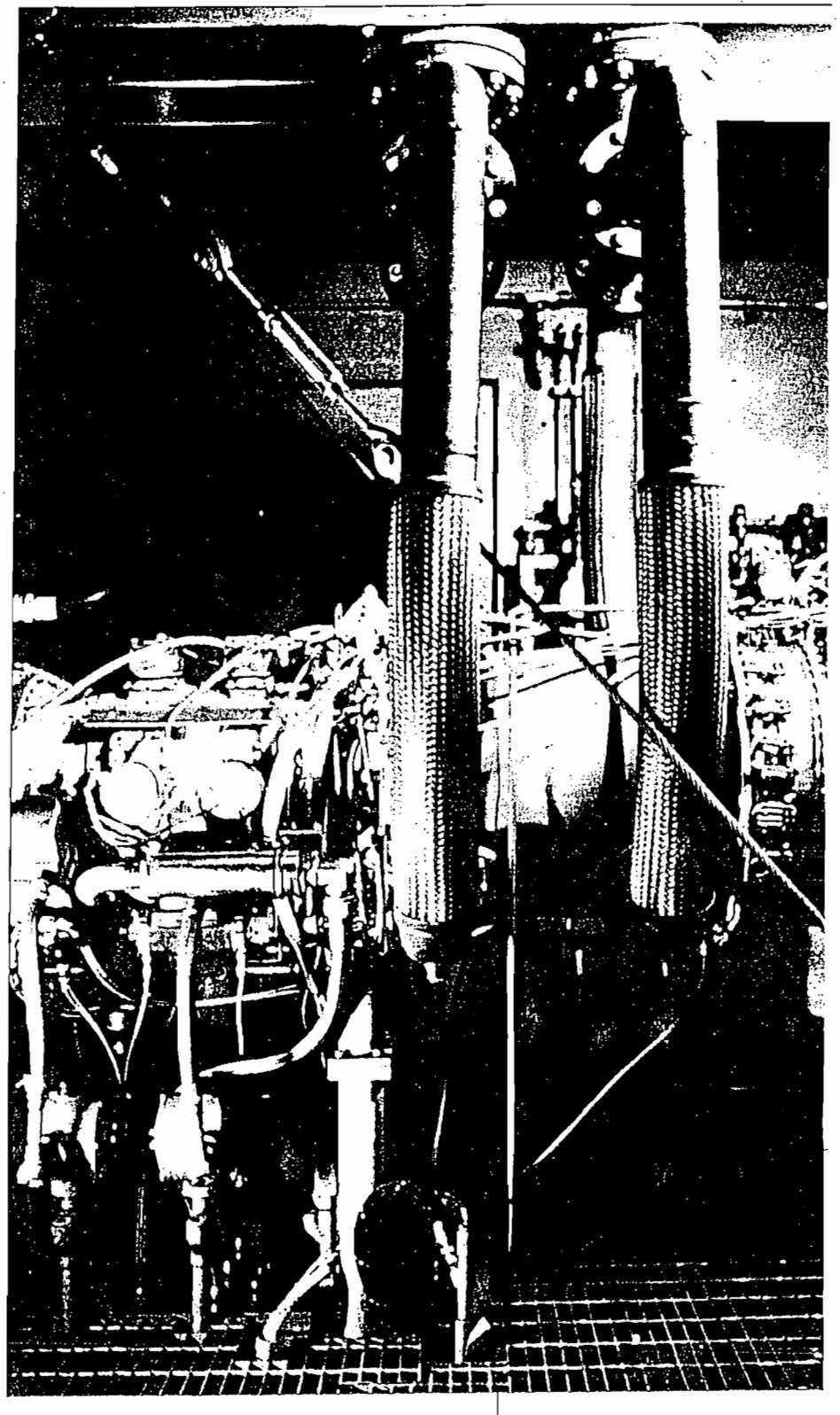
In cogeneration, Cheng Cycle offers numerous advantages over conventional simple or combined cycle systems:

- Operating flexibility. Cheng Cycle systems follow process steam load fluctuations very economically. Steam not needed for process is used for injection into the gas turbine, thus increasing efficiency, electrical output and revenues.
- Peaking electrical capacity. Steam injection, coupled with duct burner firing, allows electrical output to be increased significantly when economics or operating requirements dictate. Process steam production can be maintained simultaneously with maximum electrical production.
- Mechanical simplicity. Cheng Cycle achieves flexibility and high capacity without the steam turbine and associated systems (cooling tower, condenser, etc.) required by a combined cycle cogeneration plant. The result is less complexity and higher reliability.
- Design standardization. The operating flexibility described above means that a single Cheng Cycle system is suitable for a wide variety of applications. This allows design standardization and the accompanying benefits of lower cost and less risk.
- NOx control. Cheng Cycle systems have been permitted in some of the most stringent air quality control districts in the United States. These units have been permitted without the use of expensive selective catalytic reduction.

Cheng Cycle Series 7-Cogen

The first commercial application of the Cheng Cycle is called the Cheng Cycle Series 7-Cogen. It is based on the 501-K industrial gas turbine, modified and manufactured for Cheng Cycle operation by the Allison Gas Turbine Division of General Motors.

The six cogen units already in operation have logged over 180,000 operating hours. The first was installed at San Jose State University, San Jose, California in December 1984. In early 1985, two Series 7-Cogen systems began operation at the Sunkist Growers' facility in Ontario, California. Three Series 7-Cogen 5.6MW systems were installed in 1986 and 1987: a unit at the Frito-Lay plant in Kern County, California; one at SRI International, Menlo Park, California, and a third at the Hershey Chocolate Company Western Plant in Oakdale, California. □



Steam injection lines into 501-KH engines.

SUPPLEMENT #2

ATTACHED ARE PAGES FROM THE LOMA LINDA UST5600CC OPERATION AND MAINTENANCE MANUAL, WITH DETAILED EXPLANATIONS OF STEAM INJECTION AND WATER INJECTION SYSTEMS. THE SCHEMATICS APPENDED TO THE TYPED RESPONSE ARE ALSO FROM THE LOMA LINDA PROJECT.

CHAPTER 2.6

STEAM INJECTION SYSTEM

1.0 FUNCTION

The design function of the Steam Injection System is to produce, deliver, and control the flow of up to 19,800 lbm/hour of superheated steam for injection into the gas turbine combustion chambers.

Steam injection increases engine thermodynamic efficiency and improves heat transfer in the HRSG. Steam injection also helps control NOx emissions in the turbine combustion products.

2.0 SYSTEM DESCRIPTION

2.1 OVERALL DESCRIPTION

Refer to Figure 2.6-1. The basic components of the steam injection system include: a moisture separator, a steam injection control valve, a steam superheater, steam piping, and various instrumentation and control components.

Normal flow through the system is as follows:

Injection steam starts at the HRSG boiler (Steam Drum) where saturated steam is produced. Steam flows from the boiler, past a vortex flow meter, and through a moisture separator.

After exiting the moisture separator, the saturated steam passes through an automatic block valve and a flow control valve. The flow control valve is regulated by the control system which adjusts injection steam flow based on the Dual Fluid operating mode and turbine load setpoint.

From the flow control and block valves, steam enters the HRSG superheater where the turbine exhaust gas heats the steam to superheated conditions.

After leaving the superheater, the superheated steam flow branches into two individual steam lines. On one of the injection lines is the staged steam control valve where 0 to 50% of the injection flow can be modulated. The superheated steam supply now enters the turbine skid and is ported to the two gas turbine injection steam manifolds and is injected into the turbine combustion chamber.

2.2 MOISTURE SEPARATOR

The vertical in-line moisture separator is approximately 90" high and 20" in diameter. The internals of the unit consist of a coalescer bundle at the steam inlet connection and a vane bundle at the steam outlet connection. Moisture collected in the coalescer bundle and vane bundle drains to the bottom of the vessel. A float operated steam trap is provided to maintain water level and remove moisture and to prevent the loss of steam.

2.3 SUPERHEATER

The superheater is enclosed in a carbon steel casing with an inner stainless steel liner. Superheater tubes are 2.0" O.D. and 10' 6.75" in length. The turbine exhaust gas transfers a portion of its thermal energy to injection steam inside the superheater tubes, producing superheated steam for injection into the turbine.

Located on the bottom of the superheater inlet and outlet manifolds and at the bottom of the injection steam line to the skid are a set of drain valves which allow for automatic blowdown of moisture collected in the superheater during plant startup and after shutdowns. This prevents moisture from entering the turbine when starting up.

2.4 STEAM INJECTION BLOCK VALVE

The steam injection block valve isolates the steam supply to the gas turbine any time the gas turbine is shutdown or undergoing a start up ramp. During normal operation, the valve is completely open.

The block valve is closed any time that the turbine is tripped. This is to prevent damage to the turbine equipment due to overpressurization following a turbine trip.

2.5 FLOW CONTROL VALVE

The flow control valve regulates the flow of superheated steam to the turbine combustor. This valve is automatically regulated by the Dual Fluid Control System to achieve the desired steam flowrate. Steam injection flow is a function of the desired turbine generator output, the minimum flow setpoint, and the HRSG drum pressure.

2.6 STAGED STEAM CONTROL VALVE

The staged steam control valve is an air operated butterfly valve located in the downstream side inlet line to the turbine combustion chamber. This valve controls the amount of flow to both the upstream and downstream ports of the combustion chamber. The valve is modulated between 0 and 50% injection steam flow rate. At flows greater 50% the valve is fully open, allowing equal steam injection rates to both upstream and downstream injection ports. This valving process is used due to thermodynamic considerations.

2.7 PIPING AND INDICATORS

The steam injection piping downstream of the superheater is 4" and 6" inch I.D. stainless steel. Downstream of the boiler steam drum is a vortex flowmeter which provides a flowrate signal for the Dual Fluid Control System. Located downstream of the flowmeter is a steam sample tap and sample cooler.

Following the sample tap is a moisture separator and the steam injection block valve. Downstream of the block valve is the flow control valve and a manual isolation valve. Prior to entering the superheater, taps connect a pressure transmitter. Downstream of the superheater, the steam line branches into two steam supply lines to the turbine combustor.

3.0 LIST OF ATTACHMENTS

1. Figure 2.6-1, "Steam Injection System"

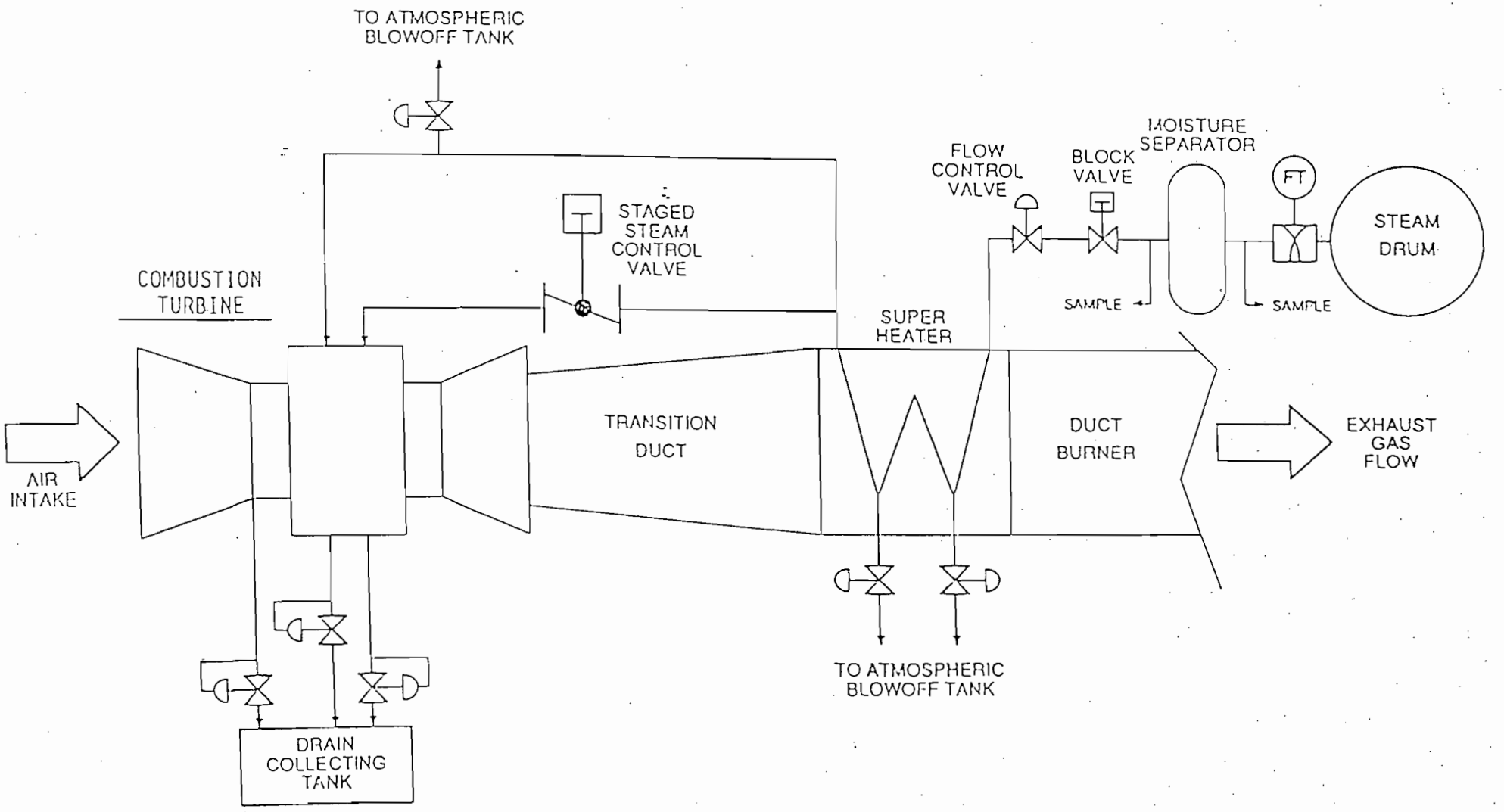


FIGURE 2.6-1

STEAM INJECTION SYSTEM

compressor discharge air is used to pressurize the steam drum. When the drum pressure is sufficiently greater than the compressor discharge pressure, the process steam valve control is released to header pressure control.

4.8.2.3 1FIK-260 Steam Injection Control Station

This station shows the injection steam flow as the process variable and the desired steam injection flow rate as the setpoint. When the station is in AUTO mode, the controller varies its output to maintain steam flow at the desired setpoint. When the station is in MANUAL mode, the operator can position the valve to permit the steam flow desired.

The injection flow setpoint is a function of the desired turbine/generator output, the minimum flow setpoint and the HRSG drum pressure. There is a maximum flow setpoint which is internally set that the controls use to limit flow.

During start-up when the injection valve is opened to permit the compressor to pressurize the steam drum. After the drum pressure has increased sufficiently above the compressor discharge to permit some steam flow, the injection valve is released to normal control.

There is a HIGH alarm at this station when the injection steam flow exceeds 20 k#/hr. There is no LOW alarm. The DEVIATION alarm is set at 2 k#/hr.

4.8.2.4 1FK-260A Minimum Injection Flow

This station is used to set the minimum steam injection flow setpoint. The value entered by the operator as the setpoint on this station is used in the calculation of the setpoint given on station 1FIK-260. This minimum flow setpoint acts as a lower limit for injection flow except in cases when there is insufficient drum pressure to supply both the process steam and injection steam demands.

The setpoint on this station is useful for setting minimum injection steam flow rates for NOx control. It is useful also to keep a minimum flow in the injection steam line under all operating conditions.

4.8.2.5 1FIK-265 Staged Steam Injection

This station is used to control valve 1FV-265 which controls the amount of steam injected into the downstream injection steam manifold. In automatic operation, the valve is controlled so that it is fully closed at low injection steam flow rates. This allows all of the injected steam to go to the upstream injection manifold. After the injection steam flow rate has reached the maximum allowable for upstream injection, the valve begins to modulate open so that it is fully open when at the maximum total injection steam flow rate. The control action is open loop since there is no flow measurement other than the total injection steam flow rate. The output of the controller is characterized to match the valve flow characteristic so that upstream steam injection is held nearly constant after its maximum flow rate has been reached. In manual operation, the staged steam injection valve can be positioned wherever desired.

The setpoint shown on the right hand scale is the desired valve position. There is no process variable shown on this station.

4.9 Feedwater, Drum Level and Blowdown Systems

These systems are all concerned with maintenance of water in the HRSG steam drum. The feedwater flow rate required to maintain drum level is closely tied to changes in steam flow from the drum to the process and turbine injection.

CHAPTER 2.17

INJECTION WATER SYSTEM

1.0 FUNCTION

The turbine is furnished with a water injection system to reduce thermal NO_x. De-ionized water is injected into the turbine combustion chamber through the liquid fuel ports of the dual fuel nozzles. The water lowers the peak combustion flame temperature which reduces the thermally created NO_x. Major components of the water injection system are an electrical motor driven integral gear high speed centrifugal pump, a turbine flow meter, control valve with current to pneumatic converter, shutoff valve, filter and panel mounted micro processor based controller, signal conditioner, and watt transducer.

2.0 SYSTEM DESCRIPTION

De-ionized water is supplied at a positive pressure to the suction of the injection pump. The pump increases the pressure to a level high enough to injection water into the combustion chamber at the flow rate required by the control system. The flow rate is measured by a turbine type flow meter which transmits a pulse rate proportional to the flow to the panel mounted pulse to current converter. A 4-20 ma signal proportional to 0-5 G.P.M. is transmitted from the converter to the controller as the process input.

The flow rate demand signal is generated by the micron processor in the controller. An input proportional to the generator output power is wired to the controller from the watt transducer. The micro processor scales and biases the signal to a level which is proportional to .8 of the weight ratio of gaseous fuel flow expressed in G.P.M. of water. Scale and bias factors are determined from the turbine manufacturer's data, generator efficiency, gearbox efficiency and the fuel analysis.

The 4-20 ma output of the controller is wired to a current to pneumatic converter which produces a 5-20 psig signal. This signal operates against the control valve's spring loaded diaphragm to position the valve plug to maintain the flow rate required by the setpoint demand input to the controller. The controller is of the three mode type (derivative function not used in this application) and the ouput will continue to change as long as an error exists between the setpoint and process input signals. The valve is spring loaded to the closed position and will close on loss of input signal.

An R.T.D. is installed in the pump discharge line to monitor the water discharge temperature. If the temperature exceeds 190°F, the pump is shutdown and a "Water Injection System Malfunction" is annunciated. A flow switch is incorporated in the flow controller process measurement circuit. Should the flow signal from the turbine flow meter indicate a flow less than 1.5 G.P.M. from the turbine flow meter for ten seconds during pump operation, the pump will be turned off and a "Water Injection System Malfunction" is annunciated. The controller monitors the water demand signal level and will maintain its output at the "zero" level until the demand level exceeds the minimum power level allowed for water injection (1.2 MW).

4.3.1.2 1HS-118 Water Injection Pump

This switch operates the water injection pump motor. When in the "ON" position, the pump motor receives a signal to turn it on. When the switch is in the "OFF" position, the pump motor is turned off. Normally, this switch is automatically operated by the control system. The pump can be manually operated by the operator for testing purposes.

The pump is automatically turned on when 1HS-119 (Water Injection) is in the on position and 1HS-170 (Turbine start/stop) is in the on position. The pump is automatically stopped whenever the turbine is stopped or 1HS-119 is in the off position. When the turbine is running, changing 1HS-119 between the on and off positions will start and stop the water injection pump in a controlled sequence.

There is no permissive for this switch.

Indication is provided on this handswitch to indicate that the pump motor is running.

An alarm is provided to notify the operator that the indicated pump motor action does not correspond with the desired action.

4.3.2 Water Injection Auto/Manual Control Stations

There is only one auto/manual station associated with water injection:

1FIK-118 Water Injection Flow Control

4.3.2.1 1FIK-118 Water Injection Flow Control

This station controls the position of the water injection valve in order to regulate the flow of water to the turbine fuel nozzles. Water injection is used as an alternate to steam injection to help in the control of NOx emissions. The control station shows on the left scale the desired water flow. On the right scale the actual water flow is shown. The control station output represents valve position. In automatic mode, the control station output will automatically vary to make actual flow match the desired flow as close as possible. In manual mode, the operator can vary the output to produce any flow desired. When switching from manual to automatic, the output will ramp from its last value to whatever is required to

produce desired flow.

The setpoint given on the control station is a function of turbine fuel flow, TIT and injection steam flow. This function is such that at normal operating TIT, with no steam injection, the mass flow of water is 0.8 times the mass flow of gas fuel or equal to the mass flow of liquid fuel depending on the fuel being used. As steam injection is increased, the amount of water decreases in direct proportion to the amount of steam flow, such that there is no water required when steam flow is above approximately 11 Klb/hr. The effect of TIT on water injection is such that below 1325 deg F, no water is required. Between 1325 and 1550 deg F, the ratio of water to fuel flow goes from 25% of the normal ratio to 100% of its normal ratio. Above 1550 deg F the ratio is 100% of its normal value (0.8 for natural gas, 1.0 for liquid fuel).

There is a low flow cutoff of water injection such that the setpoint has a low limit of 200 lb/hr. This low limit prevents water flow from going less than this value. When the required water injection flow goes to zero, the water injection valve is ramped closed and the shutoff valves are closed. When the required water injection flow goes above 50 lb/hr, the appropriate water injection shutoff valve is opened and the flow is ramped up to the minimum setpoint.

When a fuel transfer is called for, the water injection valve is ramped closed and the shutoff valves are closed. Following completion of the fuel transfer, the shutoff valves are opened and the setpoint is ramped up to its required value.

4.4 Turbine/Generator Enclosure Ventilation and Fire Protection

The turbine/generator enclosure requires a ventilation system to prevent the buildup of excessive heat and fumes. A fire protection system is required to protect equipment and personnel in the event of fire.

SUPPLEMENT #3

U.S. TURBINE/ALLISON/KAWASAKI/CHENG CYCLE SPECIFICATIONS FOR INJECTION STEAM/WATER QUALITY.

ISSUED 5-20-88 REVISED AGT 15 FSCM NO. 63005	ENGINEERING MATERIAL SPECIFICATION E11 Allison GAS TURBINE DIVISION General Motors Corporation P.O. Box 420 Indianapolis, Indiana 46206-0420	EMS 124 INDUSTRIAL

PURIFIED WATER FOR INDUSTRIAL GAS TURBINE ENGINES

1. SCOPE:

1.1 Form: This specification covers requirements for purified water.

1.2 Application: Primarily for use in industrial 501K, 570K and 571K gas turbine engines.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of referenced specifications shall apply.

2.1 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D1125 - Tests for Electrical Conductivity and Resistivity of Water
ASTM D1192 - Equipment for Sampling Water and Steam
ASTM D2276 - Tests for Particulate Contaminant in Aviation Turbine Fuels
ASTM D3370 - Practices for Sampling Water

3. TECHNICAL REQUIREMENTS:

3.1 Demineralizing - Equipment: A mixed bed demineralizer shall be used to reduce ionic content. A dual bed unit shall not be used.

3.2 Physical Requirements: The purified water shall conform to the following requirements when tested in accordance with the designated test methods:

		Test Method
Particulates, ppm, max	2.0	ASTM D2276
Conductivity, Micromhos/cm 25°C, max	1.0	ASTM D1125

3.3 Filtration Requirements: Particulate material in the water shall have a maximum particle size of 10 microns when delivered to the engine.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

ISSUED 5-20-88 REVISED AGT 15 FSCM NO. 63005	ENGINEERING MATERIAL SPECIFICATION E11 Allison GAS TURBINE DIVISION General Motors Corporation P.O. Box 420 Indianapolis, Indiana 46206-0420	EMS 124 INDUSTRIAL

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3.3 Filtration Requirements: Particulate material in the water shall have a maximum particle size of 10 microns when delivered to the engine.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed to represent each lot.

4.3 Sampling Requirements: Shall be in accordance with ASTM D1192 and ASTM D3370. A minimum of two gallons per sample shall be supplied.

5. PREPARATION FOR DELIVERY: Not applicable.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Purified water which does not conform to requirements of this specification shall be subject to rejection.

8. NOTES:

8.1 Test Method: The particulate matter shall be determined in accordance with ASTM D2276, Annex A2. The "filtered flushing fluid" shall be deionized water which has been filtered through a 0.45 u m membrane filter. A minimum two gallon (7.57 L) sample shall be filtered.

8.2 General: This specification is issued by Allison Gas Turbine Division, General Motors Corporation, for use in manufacture of items described by Allison drawings. The user is responsible for compliance to the latest revision of this specification.

Signed _____

Chief
Materials and Processes

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed to represent each lot.

4.3 Sampling Requirements: Shall be in accordance with ASTM D1192 and ASTM D3370. A minimum of two gallons per sample shall be supplied.

5. PREPARATION FOR DELIVERY: Not applicable.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Purified water which does not conform to requirements of this specification shall be subject to rejection.

8. NOTES:

8.1 Test Method: The particulate matter shall be determined in accordance with ASTM D2276, Annex A2. The "filtered flushing fluid" shall be deionized water which has been filtered through a 0.45 u m membrane filter. A minimum two gallon (7.57 L) sample shall be filtered.

8.2 General: This specification is issued by Allison Gas Turbine Division, General Motors Corporation, for use in manufacture of items described by Allison drawings. The user is responsible for compliance to the latest revision of this specification.

Signed _____

Chief
Materials and Processes

INJECTED WATER QUALITY SPECIFICATION

1. Scope

This specification covers requirements for purified water to be injected into a gas turbine engine for NOx reduction, and is applied to S2A-01, M1A-01, M1A-03, M1A-11, M1A-13, M1T-01, M1T-11, M1T-03 and M1T-13 engine models. M1A-13CC injected steam when condensed should meet this specification into water.

2. Applicable Documents

The following publications form a part of this specification to the extent specified herein. The latest revision shall apply.

2.1 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D1125 - Tests for Electrical Conductivity and Resistivity of Water.
ASTM D1192 - Equipment for Sampling Water and Steam Formed Deposits by Flame Photometry
ASTM D2276 - Tests for Particulate Contaminants in Aviation Turbine Fuels
ASTM D3370 - Practices for Sampling Water

3. Technical Requirements:

3.1 Demineralizing-Equipment: A mixed bed demineralizer shall be used to reduce ionic content. A dual bed unit shall not be used.

3.2 Physical Requirements: The purified water shall conform to the following requirements when tested in accordance with the designated test methods:

		Test Method
All residue, ppm, max	2.0	ASTM D2276
Soluble residue on evaporation, ppm, max.	0.5	ASTM D2276
Sodium, ppm, max	0.15	ASTM D2276
SiO_2, ppm, max.	0.10	ASTM D2276
Conductivity Micromhos/cm @ 25°C, Max.	1.0	ASTM D1125

3.3 Filtration Requirements: Particulate material in the water shall have a maximum particle size of 10 microns when delivered to the engine.

4. Quality Assurance Provisions:

4.1 Responsibility for Inspection: The processing vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

4.2 Sampling Requirements: Shall be in accordance with ASTM D1192 and ASTM D3370. A minimum of two (2) gallons per sample shall be supplied.

5. Rejections: Purified water which does not conform to this specification shall be subject to rejection.

Water Quality Requirements for the Standard Series 7

This establishes the water purity requirements at the battery limits for the four water streams.

The four streams are:

	Description	Type
1)	Turbine injection water for NO_x control	III
2)	Compressor wash water	III
3)	Boiler makeup water	II
4)	Combustion air evaporative cooler	I

Type III Water Purity

Total matter, max ppm	2.0
Dissolved matter, max ppm	0.5
Total hardness, ppm	not measured
pH	6.5 - 7.5
Sodium, max ppm	0.15
Silicon Dioxide, max ppm	0.1
Chlorides, sulfates, ppm	not measured
Conductivity, max umho/cm	1.0
Particle size, max micron	10

These requirements are established by the turbine manufacturer (Re: Allison Engineering Material Specification 120D).

Type II Water Purity

For drum pressure <300 psig.

	Steam Drum		Condensate/ Makeup Water	
	Max	Nominal	2% B/D	4% B/D
Total Dissolved Solids	2500	2000	50	100 ppm
Suspended Solids	10	5	0.2	0.4 ppm
Alkalinity OH	320	250	5	10 ppm
Silica	150	125	8	15 ppm
Sodium	750	600	normally added for O_2	
Hardness	essentially 0		1	2 ppm
Oxygen	0	0	4	4 ppm
Sulfite	40	33	normally added for O_2	
Phosphate	65	50	1	2 ppm
Chlorides	not measured		not measured	
Iron + Manganese	0.4	0.33	0.05	0.1ppm
Copper	0.2	0.17	0.025	0.05ppm
pH	10.5 -	11.5	8.0-9.0	

Water Quality Requirements for the Standard Series 7

Type II Water Purity
For drum pressure <300 psig but >450 psig

	Steam Drum		Condensate/ Makeup Water	
	Max	Nominal	2% B/D	4% B/D
Total Dissolved Solids	2100	1700	34	68 ppm
Suspended Solids	9	4	1	2 ppm
Alkalinity OH	270	215	2	4 ppm
Silica	130	110	2	4 ppm
Sodium	650	500	normally added for O_2	
Hardness	essentially 0		1	2 ppm
Oxygen	0	0	4	4 ppm
Sulfite	34	28	normally added for O_2	
Phosphate	56	43	1	2 ppm
Chlorides	not measured		not measured	
Iron + Manganese	0.3	0.29	0.04	0.08 ppm
Copper	0.2	0.15	0.02	0.04ppm
pH	10.5 -	11.5	8.0-9.0	

Not measured means that it is not measured because it is not a factor.

1) It should be noted that the above condensate/make-up requirements are shown for reference purposes only. The amount of blowdown is based on maintaining the required drum water quality and, therefore, for make-up/condensate water different from that shown above, the blowdown would be adjusted up or down accordingly. Each site will have one of the parameters in the boiler column that will dictate the blowdown rate which will maintain that paramter at its maximum allowable concentration.

   It should also be noted that volative filming and/or neutralizing amines are normally supplied to the feedwater for corrosion protection of process steam supply piping and condensate return piping. Because of the large amounts of steam which can be injected into the turbine, amine addition is usually best handled by direct injection into the process steam piping downstream of the HRSG.

Water Quality Requirements for the Standard Series 7

Type I Water Purity

This is basically plant water with the only restriction that the hardness be less than 175 ppm as $CaCO_3$.

Amount of water required:

> Turbine water injection rate is a maximum of 5 gpm, but the nominal is 3 gpm. The supply system can be sized to supply the nominal rate if a surge tank is supplied to handle the peak demands.

The compressor wash requires a small amount of water on an infrequent basis and does not require consideration for sizing the Type III water system.

The boiler makeup water requires a flow rate of 120 gpm. Since condensate return comprises a part of the supply, the sizing of the water treatment system will be site specific, but is not within the normal scope of USTC's supply.

The evaporative cooler requires less than 1 gpm when in operation on hot days.

Florida Department of Environmental Regulation

Southwest District • 4520 Oak Fair Boulevard • Tampa, Florida 33610-7347 • 813-623-5561

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary
Dr. Richard Garrity, Deputy Assistant Secretary

May 4, 1990

Mr. Brian Travis, President
Empire Energy Management Systems, Inc.
P.O. Box 6840
Building 970
MacDill Air Force Base, FL. 33608-0840

Re: Two Cogeneration Construction Permit Applications
Hillsborough County - AP

(1) DER File #AC29-178833, (Cogen Plant #1)

(2) DER File #AC29-178834, (Cogen Plant #2)

Dear Mr. Travis:

The Southwest District Office of the Department of Environmental Regulation has received and reviewed the above referenced Construction Permit applications. Please be advised that they are incomplete until the Department receives the information requested below.

Questions Relevant to Both Applications

(1) It is common practice to specify the quantity of emissions from a gas turbine by a ratio termed the "emission index", which is defined as the pounds of a pollutant per thousand pounds of fuel burned (or grams of pollutant per kilogram of fuel). For gas turbines, the "emission index" is often higher at low loads than at full load. The emission estimates in the applications are based upon full load operation. Please provide information regarding low load emissions.

(2) Construction application supplemental requirement #4 requests design details for all air pollution control systems. With regard to the water/steam injection system for NO_x control, please provide the following information.
   A. Please explain how the water/steam injection rate will be measured and controlled.
   B. What criteria will be used to determine the proper ratio of water/steam to fuel under varying operating conditions?
   C. What are the proposed maintenance plans for the water/steam injection systems?

D. A common problem with water injection systems which introduce water into the gas passage of the fuel nozzle is clogging and corrosion of the fuel nozzle. How will the design and maintenance plan address this problem? What is the quality of the water used for injection?

Questions Relevant Only to AC29-178833.

(3) A. The background information provided in the application regarding NO_x reduction relates only to the use of water injection, not steam injection. Please provide information to show that steam injection will reduce NO_x as effectively as water injection.

B. I can think of at least two theoretical reasons why water injection might be superior to steam injection. Please rebut the two theoretical arguments below with either empirical operating data or a satisfactory theoretical explanation.

1. The rapid expansion of liquid water to water vapor in the combustion chamber may increase turbulent mixing in the combustion zone thereby eliminating the formation of local hot spots where NO_x formation usually occurs.
2. The latent heat of vaporization during water injection is absorbed directly from the gases in the combustion zone. This may result in more effective cooling than steam injection, thereby reducing the NO_x formation rate.

C. Assuming that steam injection is as effective as water injection, why did the manufacturer state that steam injection may need to be supplemented with water injection in order to meet the NO_x emission limit?

(4) It is general knowledge that there is an economic penalty when using water or steam injection for NO_x reduction in gas turbines (ie. heat rate penalty); however, the performance tables submitted (UST5600CC) show a better heat rate with injection than without injection. Please explain this apparent departure from "engineering common sense".

(5) The process flow diagram shows steam being injected into the combustor of Gas Turbine #501-KB5 which is what I would normally expect. However, in Gas Turbine #501-KH, steam is injected into the turbine, not the combustor. It is my understanding that NO_x formation occurs primarily in the combustor. Please explain how steam injection into the turbine will reduce the formation rate of NO_x.

Question Relevant Only to AC29-178834.

(6) The process flow diagram does not show any water treatment for the water injection. Since the most extensive problem associated with water injection is fuel nozzle clogging and corrosion, and since fuel nozzle distress is directly related to water quality, please explain how you intend to address this problem.

NOTICE!

Pursuant to Section 120.60, F.S., and Rule 17-4.070(2), F.A.C., the Department will initiate procedures to deny the permits if you fail to provide adequate responses to this request for information within a reasonable time.

Pursuant to Section 120.60, F.S., the Department hereby suspends the processing of your permit applications until receipt of the above requested information. Please be advised that the processing of these applications is being transferred to the Department's Tallahassee office because the total NO_x emissions from the facility will be 115 tons per year, making it a major facility.

Empire Energy Management Systems, Inc. is hereby notified that public notice will be required for these applications. The Department will draft the public notice and send it to Empire for publication at a future date.

If you have any questions, you may call me at (813) 623-5561 ext. 360; however, I suggest that all future communications regarding these applications be addressed directly to Mr. C. H. Fancy in Tallahassee at the address below.

Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400
Phone (904) 488-1344

Sincerely,

Gary A. Maier

Gary A. Maier, BSChE, JD

copies to: Mr. Edward C. Spivey, Jr., P.E.
at Bosek, Gibson and Associates
111 Bullard Parkway
Temple Terrace, FL. 33617

Mr. Jerry Campbell, P.E., HCEPC

INTER-OFFICE MEMORANDUM

TO: Clair H. Fancy, DER, Tallahassee

THRU: W. C. Thomas and J. H. Kerns, Tampa

FROM: Gary A. Maier, Tampa

DATE: May 4, 1990

SUBJECT: Empire Energy Mgmt. Systems
AC29-178833 (Cogen Plant #1)
AC29-178834 (Cogen Plant #2)

The sum of NO_x emissions from the 2 proposed cogeneration plants at MacDill Air Force Base is 115 tons per year, making it a major facility. Pursuant to current policy, I am transferring these applications to Tallahassee.

Per the recommendations of J. Harry Kerns and James K. Pennington, and because time was running short, I performed the 30 day completeness review here in Tampa. Enclosed is a copy of my incompletion letter to the applicant. The clock has been stopped on both applications. If you have any questions, my number is Suncom 552-7612, ext 360.

copy to: Jerry Campbell, HCEPC

STATE OF FLORIDA

AC29-178833

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHWEST DISTRICT
7601 HIGHWAY 301 NORTH
TAMPA, FLORIDA 33610-9544

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY
RICHARD D. GARRITY, PH.D.
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: GAS TURBINE COGENERATION PLANT [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] Construction [ ] Operation [ ] Modification

COMPANY NAME: EMPIRE ENERGY MANAGEMENT SYSTEMS, INC. COUNTY: HILLSBOROUGH

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) COGENERATION PLANT #1

SOURCE LOCATION: Street MACDILL AVENUE City MACDILL AFB

UTM: East 337620 North 1283622

Latitude SEE ATTACHED SURVEY Longitude ___ ° ___ ' ___ "W

APPLICANT NAME AND TITLE: BRIAN TRAVIS, PRESIDENT

APPLICANT ADDRESS: P.O. BOX 6840, BLDG 970, MACDILL AFB, FL 33608-0840

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of EMPIRE ENERGY MANAGEMENT SYSTEMS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: Brian Travis

BRIAN TRAVIS, PRESIDENT
Name and Title (Please Type)

Date: 04/09/90 Telephone No. 813-840-0100

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

No. 153940

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from Empire Cogen, Inc. Date 4/10/90

Address PO Box 6840 / MacDill AFB, FL Dollars $ 1000.00

Applicant Name & Address Empire Energy Mgmt. Systems, Inc.

Source of Revenue Cogeneration Plant #1

Revenue Code 001031 Application Number AC29-178833

ck # 10024

By Stacy Maddox

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Edward C Spivey Jr.

Edward C. Spivey, Jr.
Name (Please Type)

Bosek, Gibson and Associates
Company Name (Please Type)

111 Bullard Parkway, Temple Terrace, FL 33617
Mailing Address (Please Type)

Florida Registration No. 32690 Date: 4/10/90 Telephone No. (813) 985-3499

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Cogeneration plant using a gas turbine as the prime mover in a topping (Brayton) cycle that will provide the MacDill AFB electrical grid with power and the Base Hospital with thermal energy in the form of process steam, domestic hot water, and chilled water. The plant will operate a minimum of 11 months/yr on natural gas; maximum of 1 month/yr on #2 fuel oil.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction 01 JUL 1990 Completion of Construction 01 NOV 1991

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Water Injection for NOx Abatement - $40,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52

if power plant, hrs/yr 8760 ; if seasonal, describe:

Maximum 1 month/30 days/720 hours per year operating on #2 fuel oil

Minimum 11 months/335 days/8040 hours per year operating on natural gas

NOTE: The total hours of operation will be 8760/yr, which may be all gas.

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? yes

   a. If yes, has "offset" been applied? no

   b. If yes, has "Lowest Achievable Emission Rate" been applied? no

   c. If yes, list non-attainment pollutants. Ozone (VOC's) and Particulates

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. yes[1]

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. no

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? yes[2]

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? no

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? no

   a. If yes, for what pollutants?

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

[1]See Attachment #2A, BACT Applicability

[2]See Attachment #2B, New Source Performance Standards

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): Fuel: Gas 6861 lb/hr; #2 Oil 2666 lb/hr

2. Product Weight (lbs/hr): N/A

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
NOx	23.19	86.18	180 ppm[5]	78.9	318,963	159.48	Attch 6A,B
CO	18.90	62.28	250 T/yr[6]	57.07	90,948	54.48	Attch 6A,B
VOC (UHC)	5.05	14.48	100 T/yr[6]	22.83	24,966	12.49	Attch 6A,B
Particulates	5.38	17.52	TBD[7]		35,025	17.52	Attch 6A,B
SO_2	15.93	5.74	0.015%[8]		10,088	5.05	Attch 6A,B

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

[4] Emission, if source operated without control (See Section V, Item 3).

[5] NSPS 40 CFR 60.332 (FAC 17-2.660 Table 660-1)

[6] See Attachment #3
FAC 17-2.500

[7] To Be Determined; BACT Determination pursuant to FAC 17-2.600 (6)

[8] NSPS 40 CFR 60.333; BACT Determination pursuant to FAC 17-2.600 (6) also applies

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural Gas	140	141.72	141.72
#2 Fuel Oil	376	380	52.66

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis: Gas / # 2 Fuel Oil

Percent Sulfur: 0.0 / maximum 0.8 Percent Ash: 0.0 / 0.01

Density: NA / 7.09 lbs/gal Typical Percent Nitrogen: 0.489 / 0.1

Heat Capacity: 20,656 / 19,750 BTU/lb NA / 140,000 BTU/gal

Other Fuel Contaminants (which may cause air pollution): None

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average 5% Maximum 15%

G. Indicate liquid or solid wastes generated and method of disposal.

Used Turbine Lube Oil which will be shipped off-site for Recycling.

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: Stack #1 / Stack #2 ~~50~~ / ~~50~~ ft. Stack Diameter: 5.1875 / 2.667 ft.

Gas Flow Rate: ~~44,670~~ / ~~43,180~~ ACFM ~~24,890~~ / ~~24,760~~ DSCFM Gas Exit Temperature: 217 / 333 °F.

Water Vapor Content: max. 30% / max. 10% % Velocity: 35 / 99 FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) _____

Brief description of operating characteristics of control devices: _____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
   ATTACHMENT #1
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
   ATTACHMENTS 2A, 2B, 2C
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   ATTACHMENT #3
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
   ATTACHMENT #4
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).
   ATTACHMENT #5
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
   ATTACHMENTS 6A, 6B
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
   ATTACHMENT #7
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
   ATTACHMENT #8

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[X] Yes [ ] No

Contaminant	Rate or Concentration
Nitrogen Oxides	40 CFR 60.332, 180 ppm (see AttaCHMENT #3)
Sulfur Dioxide	40 CFR 60.333 (a),(b) 0.8% sulfur in fuel;
	0.015% SO_2 in exhaust

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration

C. What emission levels do you propose as beat available control technology?

Contaminant	Rate or Concentration
STACK # 1: Nitrogen Oxides	58 ppm (5.5 #/sec steam injection)
Sulfur Dioxide	0.005% (low sulfur oil)
STACK #2: Nitrogen Oxides	38 ppm (1.0 #/sec steam injection)
Sulfur Dioxide	0.000% (gas firing only)

D. Describe the existing control and treatment technology (if any).

1. Control Device/System: Steam Inject
2. Operating Principles: See Attachment #4
3. Efficiency:* 58.1%
4. Capital Costs: $200,000.00

*Explain method of determining See Attachment #5

5. Useful Life: 30 Years

6. Operating Costs: $100,000.00/yr

7. Energy: 2,476,631 kWH/yr

8. Maintenance Cost: $10,000.00/yr

9. Emissions: Water Vapor

Contaminant	Rate or Concentration

10. Stack Parameters (No additional stacks required - same as Section III, Part H)

a. Height: ft. b. Diameter: ft.

c. Flow Rate: ACFM d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable use additional pages if necessary).

1.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. _____ no. sites _____ TSP _____ ( ) SO^2* _____ Wind spd/dir

Period of Monitoring _____/_____/_____ to _____/_____/_____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	_____ grams/sec
SO^2	_____ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

DER AIR POLLUTION PERMIT APPLICATION

LIST OF ATTACHMENTS

ATTACHMENT 1

FUEL INPUT RATE/WEIGHT DATA

FLORIDA GAS TRANSMISSION

TYPICAL FUEL ANALYSIS

COGENERATION PLANT FUEL INPUT - RATE/WEIGHT

FUEL TYPE	mmBTU/hr	BTU/lb	lbs/hr
Natural Gas	141.72	20,656	6,861
#2 Fuel Oil	52.66	19,750	2,666

May

FLORIDA GAS TRANSMISSION COMPANY
GAS ANALYSIS ID NO: 89 186

STATION NAME: FLA HYDROCARBON - OUTLET DIST 7 STA NO: 04

FIELD DATA TAKEN BY: A. Kattawar DATE TAKEN 3-28-89

PRESS	730	TEMP	0	SP GRAV	0.586
BTU	1021	WATER	0.80	H2S	0.1 gr/hcf

ANALYSIS DATA: ANALYST Michael P. Campo DATE ANALYZED 4- 5-89

COMPONENT	MOLE %	B.T.U.	GPM	SP.
OXYGEN	0.0000	0.0000	0.0000	0.000
NITROGEN	0.4890	0.0000	0.0000	0.004
CARBON DIOXIDE	1.1110	0.0000	0.0000	0.016
METHANE	95.3670	948.4200	0.0000	0.528
ETHANE	2.4880	43.3500	0.0000	0.025
PROPANE	0.4350	10.7900	0.1199	0.006
iBUTANE	0.0300	0.9600	0.0098	0.000
nBUTANE	0.0330	1.0600	0.0104	0.000
iPENTANE	0.0130	0.5100	0.0048	0.000
nPENTANE	0.0070	0.2800	0.0025	0.000
HEXANE plus	0.0270	1.3900	0.0119	0.000
TOTALS:	100.0000	1006.7600	0.1593	0.585

BTU PER CU FT AT 14.73 PSIA
60 DEG F SAT & CORRECTED FOR Z CALC 1009 CALORIMETER 1008
60 DEG F DRY & CORRECTED FOR Z CALC 1027 CALORIMETER 1026
60 DEG F 0.80 LB/MMCF & CORRECTED FOR Z CALC 1027
SP GRAV (AIR = 1.0000) CALC 0.5850 RANAREX 0.587

COMPRESSIBILITY FACTOR Z = 0.9979

SUPERCOMPRESSIBILITY FACTOR
CALC AT 0.587 SP GR 600 PSIG 90 DEG

BY TEST WITH BURNETT APPARATUS**********	1.0358
CALCULATED AGA-NX-19 NO DILUENTS**********	1.0379
CALCULATED AGA-NX-19 ADJUSTED FOR DILUENTS***	1.0364

NOTES:
PHYSICAL CONSTANTS FROM AGA 3
GPM FROM NGPA PUB NO 2145-84
HEXANE PLUS DERIVED FROM ALPHAGAZ REF STANDARD

REMARKS:
3000 cc line pressure spot sample.
Percent difference with respect to Burnett Apparatus
for calculated value using AGA-NX-19 formula
and adjusted for diluents equals (+ 0.058 %)

ATTACHMENT 2A

BACT APPLICABILITY

For the control of particulates and sulfur dioxide, the DER is to make a BACT Determination pursuant to FAC 17-2.600 (6) and FAC 17-2.630. The following information is only included to aid the DER in understanding the parameters of project operation.

As a consideration in the control of particulate emissions, it is important to note than more than 80,000 CFM of ambient air will be channeled through a two-stage combustion air inlet filter (gas turbines like clean air). Also of note is the fact that the proposed dual fuel turbine produces virtually no particulates while operating on natural gas and only a very small amount on #2 fuel oil. The result is a "vacuum cleaner" effect, whereby the exhaust gas stream may actually contain less particulates than the inlet ambient air. However, nominal amounts of particulate emissions are guaranteed by the manufacturer; these can be found Attachment 2C.

Regarding sulfur dioxide emissions, only one of the two turbines in the proposed cogeneration plant is capable of firing on fuel oil. This fuel oil will contain a maximum sulfur content of 0.8%, which ensures compliance with the NSPS as discussed in Attachment 2B. Additionally, the operating parameters of the plant limit operation on #2 fuel oil to a maximum of 720 hours per year; the remainder of the year natural gas (with 0.0 percent sulfur) will be used as the fuel source. The resultant maximum annual total of sulfur dioxide emissions is 5.74 tons, as shown in Section III, Part C of the DER application.

ATTACHMENT 2B

NEW SOURCE PERFORMANCE STANDARDS APPLICABILITY

The New Source Performance Standard (NSPS) that is applicable to this proposed cogeneration plant is 40 CFR 60.330, Subpart GG Standards of Performance for Stationary Gas Turbines.

Per Section 60.332, the standard for nitrogen oxides emissions is directly proportional to the turbine fuel rate per KWH. The turbine manufacturer, Allison, has calculated the NSPS standard for different modes of operation in Attachment #2C, Guaranteed Performance and Emissions Data. Included in these calculations are corrections for a fuel-bound nitrogen content of 0.489% and a factor for ascertaining emissions levels at 15% O_2. In order to comply with the requirements of 40 CFR 60.332, steam will be injected into the combustion chamber at a rate of 1 pound per second to achieve NOx abatement. The manufacturer's guaranteed emissions when utilizing this level of steam injection can be found in Attachment 2C. A typical fuel analysis from Florida Gas Transmission showing the level of fuel-bound nitrogen present in the natural gas is included as Attachment 1.

Regarding the sulfur dioxide emissions standard of Section 60.333, the amount of sulfur present in the natural gas will be negligent and the sulfur concentration in the liquid fuel (#2 oil) will be a maximum of 0.8 percent by weight -- the limit of 0.8 percent set by paragraph (b) of this section. As detailed in the manufacturer's guaranteed emissions data (Attachment 2C), the turbine exhaust gas will have a maximum concentration of 0.005 percent by volume. This is considerably less than the limit of 0.015 percent set in paragraph (a) of Section 60.333.

ATTACHMENT 2C

U.S. TURBINE/ALLISON

GUARANTEED PERFORMANCE AND EMISSIONS DATA

No. 90-648 B
03-Apr-90
Page 1 of 2
09:11 AM

Emission Summary
501-KH Stage Steam Injection
Liner: Emission II Nozzle; Dual Fuel

Case	1	2
Liner Type	E2	E2
Reference Fuel	Df-2	Df-2
Engine	501-KH	501-KH
Temp, ambient, F	72.3	72.3
Altitude, feet	5	5
Pres, ambient, psia	14.693	14.693
Relative Humidity, %	60	60
Specific Humidity, #/#	0.0101	0.0101
Losses, in/out, in H2O	4/10	4/10
Water/Fuel, #/#	0.00	7.39
Engine RPM	14200	14200
Engine Load, %.	100	100
Engine SHP, nominal	4699.9	7472.6
Exhaust Flow, lb/sec	33.07	38.09
Exhaust Temp. F	1067.30	999.90
Fuel Flow, MMBtu/hr	43,376	49,323
Steam injection rate, #/sec	0	5.5
Steam temperature, F	...	900
1. Estimated Emissions		
NOx, 15% O2, dry basis, ppm	160	42.9
CO, 15% O2, dry basis, ppm	26	58
Wet Exhaust Gas Components, ppm		
NOx	152	37.0
CO	25	50
HC	11	25
Mass Emission Rate, lb/eng-hr		
NOx	28.82	8.81
CO	2.9	7.3
HC	0.7	2.1
SO2	14.01	15.93
Exhaust Gas Analysis, vol. pct.		
CO2	4.104	3.718
H2O	5.536	26.053
O2	14.14	10.37
N2	75.31	59.14
Ar	0.903	0.709
SO2	0.005	0.005
Total	100.0	100.0

Case	1	2
2. Guaranteed Emissions Data		
NOx, 15% O2, dry basis, ppm	216	58
CO, 15% O2, dry basis, ppm	36	80
Wet Exhaust Gas Components, ppm		
NOx	205	50
CO	34	69
HC	18	41
Mass Emission Rate, lb/eng-hr		
NOx	38.9	11.9
CO	4.0	10.0
HC	1.2	3.4
NSPS Standard for NOx @ 15 % O2, dry basis	165	231

3. Explanations

1. 700 sq. in nozzle
no gap

2. Emission guarantees are given on a case by case basis depending on the number of engines tested, the site conditions, and the emission controls required. If water injection is required to meet guaranteed emissions, the water injection rate (or water/fuel ratio) is not guaranteed. In case 2 (staged steam injection) a small amount of water injection may be required to meet NOx emissions (in addition to the steam injection).

3. Diesel fuel emissions based on DF-2, assuming 0.3 wt % sulfur in the fuel and LHV=18,400 Btu/lb. Because sulfur dioxide emissions are fuel specific these emissions are not guaranteed by the engine manufacturer.

4. NOx emissions computed as NO2, hydrocarbons as CH4 (methane).

5. Non-methane hydrocarbon emissions estimated as follows:
Natural gas operation: 60 percent by volume of the total hydrocarbons.

Diesel fuel operation: 60 percent by volume of the total hydrocarbons.
The distribution of hydrocarbons in the exhaust may change with load and water injection.

OPERATING CONDITIONS APPLICABLE TO PERFORMANCE DATA

Ambient air temperature, °F	72.3
Elevation, feet above sea level	5
Relative humidity, percent	60
Fuel	Natural gas
Steam to process pressure, psig	130
Steam to process pressure, temperature	Saturated
Boiler feedwater temperature, °F	240
Continuous blowdown, percent	3
Output Power EMF, volts/power factor	13,200/0.80

Power and heat rate data are for measurements at the electric generator terminals.

UST1500 and 3800 steam production data are exclusive of any bleed for deaerator heating.

UST5600CC steam production data are based on the combined makeup/returned water flow being at 140°F, and have the steam bleed to the deaerator taken into account.

The UST5600CC duct burner has been selected for 35 MMBtuHHV/h heat release, instead of the full capability of in excess of 40 MMBtuHHV/h, to match the MacDill A.F.B. project requirements.

NOMINAL PERFORMANCE, UST5600CC

Operating Conditions (ref. Jones Chart)	1P	2P	1	2	3	4
Output Power, KW	-5520	5520	5292	5292	3503	3503
Heat Rate, Btu HHV/KWH	10,106	10,106	10,113	10,113	13,956	13,956
Exhaust flow, lb/h	142,020	142,020	142,056	142,056	122,940	122,940
Exhaust temperature, °F	986	986	946	946	1054	1054
Injection rate, lb/h	19,800	19,800	19,800	19,800	0	0
Injection fluid	steam	steam	steam	steam	steam	steam
Steam to process, lb/h	1773	24,800	586	24,800	22,642	43,028
Duct burner fuel, MMBtuHHV/h	0.0	30.52	0.0	31.99	0.0	26.90

GUARANTEED PERFORMANCE, UST5600CC

Operating Conditions (ref. Jones Chart)	1P	2P	1	2	3	4
Output Power, KW	5419	5419	5137	5202	3503	3503
Heat Rate, Btu HHV/KWH	10,612	10,612	10,774	10,619	14,654	14,654
Injection rate, lb/h	19,800	19,800	19,040	19,800	0	0
Injection fluid	steam	steam	steam	steam	steam	steam
Steam to process, lb/h	450	24,800	0	24,800	21,510	41,900
Duct burner fuel, MMBtuHHV/h	0.0	33.03	0.0	34.46	0.0	26.90

EMISSION SUMMARY

LINER: EMISSION II NOZZLE: DUAL OR GAS

Case	1	2	3	4
Liner Type	E2	E2	E2	E2
Reference Fuel	Ng	Ng	Ng	Ng
Engine	501KB5	501KB5	501KH	501KH
Temp, ambient, F	72.3	72.3	72.3	72.3
Altitude, feet	5	5	5	5
Pres, ambient, psia	14.693	14.693	14.693	14.693
Relative Humidity,%	60	60	60	60
Specific Humidity, #/#	0.0101	0.0101	0.0101	0.0101
Losses, in/out, in H_2O	4/10	4/10	4/10	4/10
Water (or steam)/ Fuel, #/#	0.80	1.51	0.00	7.98
Engine RPM	14,400	14,400	14,600	14,600
Engine Load, %	100	100	100	100
Engine SHP, nominal	5527.3	5807.9	4325.8	7853.6
Exhaust Flow, lb/sec	34.25	34.67	34.11	39.44
Exhaust Temp. F	1088.30	1088.30	968.60	986.40
Fuel Flow, MMBtu/hr	50.340	49.125	40.895	51.245
Steam Flow, #/sec	0	1.00	0	5.50
Steam Temp, F	0	450	0	900
Engine TIT, F	1935	1895	1800	1800
1. Estimated Emissions				
NOx, 15% O2, dry basis, ppm	38.2	29.3	94.7	29.0
CO, 15% O2, dry basis, ppm	23	30	21	26
Wet Exhaust Gas Components, ppm				
NOx	38.3	28.1	78.2	24.0
CO	23	29	18	22
HC	11	11	11	11
Mass Emission Rate, lb/eng-hr				
NOx	7.73	5.77	15.5	5.98
CO	2.8	3.6	2.1	3.3
HC	0.8	0.8	0.8	1.0
SO2	0.00	0.00	0.00	0.00
Exhaust Gas Analysis, vol. pct.				
CO2	3.414	3.277	2.827	2.821
H2O	10.549	12.251	6.990	26.986
O2	12.78	12.67	14.56	10.37
N2	72.39	70.96	74.73	59.11
Ar	0.868	0.850	0.896	0.708
SO2	0.000	0.000	0.000	0.000
TOTAL	100.0	100.0	100.0	100.00

2. Guaranteed Emissions Data

Case	1	2	3	4
NOx, 15% O2, dry basis ppm	51.6	39.4	128	39.1
CO, 15% O2, dry basis, ppm	31	45	30	39
Wet Exhaust Gas Components, ppm				
NOx	51.7	37.9	106	32.4
CO	31	43	25	32
HC	18	18	18	18
Mass Emission Rate, lb/eng-hr				
NOx	10.44	7.79	21.0	8.07
CO	3.8	5.4	3.0	4.9
HC	1.3	1.3	1.2	1.5
NSPS Standard for NOx @ 15% O2, dry basis	168	180	161	234

3. Explanations

1. 700 sq. in nozzle
   no gap

   Case 1: Super KB5
   Case 2: Nozzle Steam Injection
   Cases 3: 501-KH (no steam)
   Cases 4: 501-KH (max steam)

2. Emission guarantees are given on a case by case basis depending on the number of engines tested, the site conditions, and the emission controls required. If water injection is required to meet guaranteed emissions, the water injection rate (or water/fuel ratio) is not guaranteed. 501-KH emissions are based on the STAGED STEAM INJECTION.

3. Natural gas emissions based on customer's natural gas, LHV=20,656 Btu/lb

4. NOx emissions computed as NO2, hydrocarbons as CH4 (methane).

5. Non-methane hydrocarbon emissions estimated as follows:
   Natural gas operation: 60 percent by volume of the total hydrocarbons.

PERFORMANCE AND EMISSIONS, UST3800

	Nominal		Guaranteed	
Output power, kW	4,096	3,913	4,096	3,913
Heat rate, BtuLHV/kWh	12,015	12,910	12,435	13,362
Exhaust flow, lb/h	124,800	123,370		
Exhaust temperature, °F	1,088	1,088		
Gross steam production, lb/h	25,060	24,770	22,550	22,290
NOx, ppmv @ dry 15 vol. % O_2				
Injection rate	3600 lb/h	0.8 lb/lb	3600 lb/h	0.8 lb/lb
Injection fluid	Steam	Water	Steam	Water

ATTACHMENT 3

NSPS/EMISSIONS CALCULATIONS

I. NEW SOURCE PERFORMANCE STANDARDS

Per 40 CFR 60.332, the standard for nitrogen oxides for a stationary gas turbine is defined as follows:

$$STD = 0.0075\ (14.4)/Y + F$$

where Y is the fuel rate/kWH (up to a maximum of 14.4) and F is the allowance for fuel-bound nitrogen. With this turbine the fuel rate is in excess of the 14.4 kjoule figure, so the 14.4 maximum number applies. Given a nitrogen content (by weight) in the fuel of 0.489 %, the value of F is 0.005.

The manufacturer of the gas turbines, Allison, has calculated the NSPS standard for various fuel/kWH rates in Attachment 2C, the lowest of which are applicable to projected plant operation is 180 ppm.

II. EMISSIONS CALCULATIONS

The emissions calculations were based on the turbine manufacturer's exhaust analysis, taking into account corrections to 15% O_2 and full operation of the auxiliary duct burner. One of the Allison gas turbines is dual fuel -- gas and #2 fuel oil; the other turbine and the duct burner are natural gas only. The hourly limits displayed in Section III, Part C of the DER application represent a "worst-case" analysis between the emissions on natural gas or #2 fuel oil. The annual totals shown in the same section are the maximum possible combination of emissions from dual fuel operation, the only limit being a maximum of 720 hours per year running on #2 fuel oil. The following formula was used to calculate the mass of the exhaust emissions:

POLLUTANT MASSFLOW = (MW Pollutant/MW Dry Exhaust Gas) * (ppmv @ 15% Volume O_2)/(15% Volume O_2 Correct. Factor * 10^6) * Exhaust Dry Massflow

In order to guarantee compliance with the NSPS standard for NOx of 180 ppmv, the emissions calculations utilized a steam injection of 1.0 lb/sec. The guaranteed levels of emissions, as provided and guaranteed by U.S. Turbine and Allison can be found in Attachment 2C.

ATTACHMENT 4

POLLUTION CONTROL DEVICES

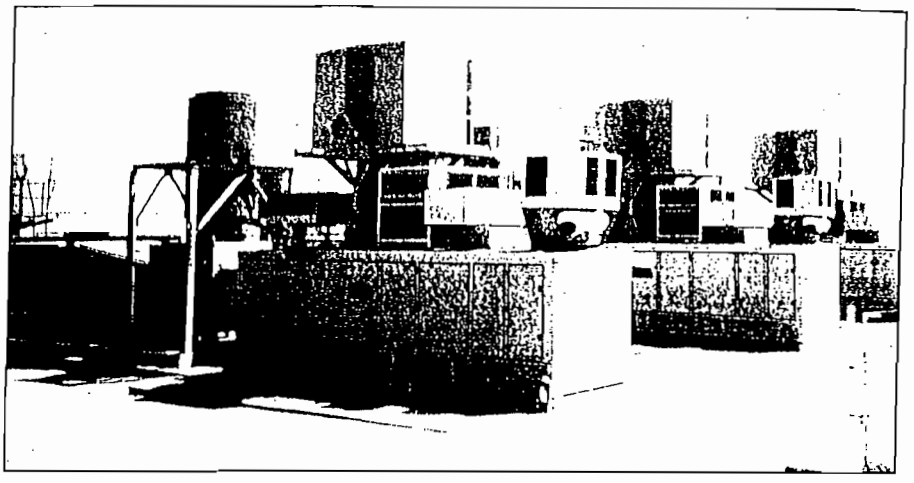
WATER INJECTION FOR NOx ABATEMENT

Although the following article specifically relates to the use of water injection on Allison gas turbines, steam injection can also be used to achieve similar results in the reduction of thermal NOx production. The proposed Allison 501 turbines use steam injection for NOx abatement.

NO_X Reduction Experience With Allison Model 501-KB And 501-KB5 Gas Turbines

By J. M. Vaught and C. S. Bach

Editor's Note: This article has been extracted from a more extensive paper giving additional background information on emissions reduction. The authors are with the Allison Gas Turbine Div., General Motors Corp, Indianapolis, Indiana, U.S.A.



Installation of Allison 501-KB5 gas turbines with water injection. These turbines were packaged by U. S. Turbine for a 10 MW system.

Water injection has been used for control of oxides of nitrogen on Allison model 501-K engines for several years. The experience with this control method has been positive — the engines have met the stringent control requirements in California and elsewhere.

The injection of water into a combustor reduces the reaction zone temperature and nitric oxide (NO) formation. However, arbitrarily increasing the water rate above a water/fuel ratio near unity increases the system operating expense and generates additional hydrocarbons and carbon monoxide pollutants. This result is not acceptable in most pollution control areas.

The 501-K series engine uses an electronically controlled dual fuel system. The fuel system is modified to inject water through that portion of the nozzle not being used. The major problems associated with water injection are due to either poor water quality or poor water system control and result in turbine and combustor life reduction. Design improvements are being developed that may reduce the sensitivity of the fuel nozzle and combustor to poor water quality and flow control.

As the rate of water injection is increased in cogeneration systems, system costs increase. At the extreme water rates being considered for some projects, system viability is affected. A logical balance between system costs and regulatory requirement is necessary.

The reduction of oxides of nitrogen emissions in a gas turbine is accomplished by controlling the time, temperature, and stoichiometry of the reaction and thus the rate of pollutant formation. Two control methods that have reached the production stage are reverse-flow primary zone cooling and water injection. Reverse-flow cooling was introduced into production on Allison engines over 13 years ago and is now featured on all 501 industrial engines. Water injection, discussed in this presentation, was introduced over eight years ago and is available as an engine option. Both are relatively simple and neither introduces major changes in engine design or durability. Used in combination, these control methods have allowed 501-powered cogeneration packages to meet stringent emissions standards.

Water injection becomes less effective in reducing NO_X as more water is used. For injection rates above W/F = 1, the reduction becomes very small because water injection controls formation of thermal NO but not that of prompt NO.

For this reason, the water/fuel ratio is often limited. Allison has established these values at W/F = 0.8 for natural gas fuel and 1.0 for diesel fuel. In extreme cases in which higher water/fuel ratios are used to meet NO_X control requirements, a catalyst can be installed in the turbine exhaust to oxidize the unburned pollutants.

The 501-KB/KB5 engine is a modular, single-shaft, aero derivative engine. It has a 14-stage axial compressor, a can annular combustor with six individual combustors and a four-stage turbine.

On the 501 engine, the water injection system is integrated with the fuel system, which is a dual fuel design. For natural gas operation, water is injected through the main liquid fuel passage. The fuel system components are Allison-supplied; the water injection system is supplied by the packager.

The water injection system includes a manifold supplied by the packager to introduce water into the gas passage of the fuel nozzles. The manifold must allow incorporation of check valves and orifices. Solenoid shutoff valves are used to direct water to the appropriate passages. Only the highest quality, leak-proof check valves should be used; otherwise, system integrity is jeopardized.

Water control in the water injection system is critical to engine life and durability. The control system must accurately measure both fuel flow and water flow and integrate these flows to produce the proper water-to-fuel ratio. Simply measuring fuel valve position or metering water flow by a fixed orifice results in inaccurate and unsatisfactory water control.

The operation of a dual fuel system is relatively simple. When the engine operates on liquid fuel, only the liquid fuel shutoff valves are open. When the engine is operating on natural gas, the liquid fuel

continued on page 22

shutoff valves are closed, the manifold drain valves are closed, and all other valves are open. Leaving these valves open allows gas taken from downstream of the gas fuel metering valve to purge the liquid fuel passages of the dual fuel nozzle. Flowing gas through the liquid side of the nozzle prevents coking of liquid fuel left in the nozzle and prevents recirculation of combustion products through the fuel nozzle, which can plug the fuel nozzle.

The addition of water changes the basic system operation very little. During natural gas operation, water is injected into the combustor through the liquid main fuel passage. Natural gas is still used to purge the pilot side of the nozzle. When the engine runs on liquid fuel, water flows through the special water manifold, check valves, orifices, and gas passage of the fuel nozzle into the combustor. The 12 check valves in the gas side of the system keep water out of the gas manifold and natural gas out of the water manifold.

Water quality is the most important factor in water injection of the engine. Recognizing this fact, Allison went through several iterations on allowable contaminants and levels. It found that early specifications had to be revised to more stringent levels of control to successfully operate a gas turbine engine with water injection. The current specifications used by Allison is EMS-1200, type III. This specification limits total and dissolved matter and the levels of certain critical compounds.

Water quality control is maintained two ways. Initially, the water out of the conditioner should be sent to a lab for complete analysis. Then throughout engine operation, a conductivity meter should be used to monitor dissolved matter in the water. When the conductivity of the water approaches or reaches the specified limit of 1.0 micro mho/cm, the system should be regenerated. By monitoring conductivity and using it in this manner, the operator has a real-time measure of water quality.

Allison's experience with water injection on the 501-KB and -KB5 engines has been highly successful. It includes almost 200 000 hours of operation of water-injected units and a high time engine with over 24 000 hours. At every installation operating to date, NO_x emission levels have met the specifications.

With the improved emission signature of the 501 engine operating with water injection, some engine distress has been noticed. This includes problems due to poor water quality and problems due to poorly designed, built, or maintained water injection systems. Problems in these two areas have resulted in life reductions in both the turbine and the combustion sections of the engine.

The most extensive problem associated with water injection is fuel nozzle clogging and corrosion. Fuel nozzle distress in a well-designed and well-built water delivery system is directly related to water quality. Allison has determined that when the water contains more contaminants than allowed by the water quality specification (EMS-120D, type III), fuel nozzle distress will occur.

Clogged fuel nozzles will result in overfiring of some combustion liners to maintain the constant average turbine temperature. The life of the vanes behind those combustors will be significantly lower than the design life for the turbine. The corrosive effects of some contaminants on the fuel nozzle and turbine parts further reduce the engine life and increase maintenance and operating costs.

The water system design, implementation, and maintenance are critical to successful water injection. The water system must deliver a balanced water flow to each of the six combustors in the engine and accurately apportion water to the fuel flow. It must also incorporate safeguards against shutting off either fuel or water independently of each other.

Distress associated with problems in the water system is usually seen in the combustion liners. Imbalanced water flow between combustors will result in high pressure temperature differentials between combustors.

The pressure differential between combustion liners results in combustor cross talk. The movement of the flame between liners through the crossover ferrules results in severe burning of the crossover tubes and clamps. Allison's experience has shown that imbalanced flow through the water manifolds is the primary cause of extreme crossover tube burning in water-injected applications.

Several improvements are being released to make the engine less sensitive to deviations in both water quality and water system design, thereby improving engine life.

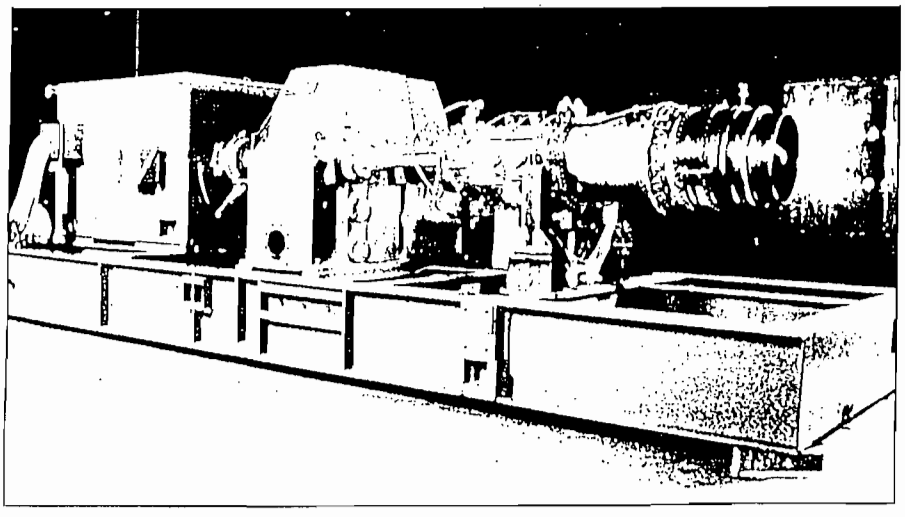
New combustion liners that incorporate a bolt-on transition and redistributed cooling air in the transition are being incorporated in the engine. These advances solve the problem of combustion liner distress from two different directions.

Most liner distress is found in the transition section of the combustor. When combustors are sent to overhaul facilities to be refurbished, typically the transition is cut off and a new one welded on. The bolt-on transition feature of the new combustion liner has been added to reduce maintenance cost. The transition can be replaced on site, which minimizes engine downtime and reduces the cost of spare parts, since the transition rather than the entire liner is replaced. The redistribution cooling results in significantly lower metal temperatures in the combustion liner transition. The lower metal temperatures result in increased life.

Allison is also qualifying a new family of fuel nozzles with separate water and fuel passages. The new design results in simplified plumbing by eliminating many of the check valves required in the current system. Accompanying these fuel nozzle improvements are new manifolds designed to minimize the pressure differences between fuel nozzles and equalize flow through each nozzle.

New turbine vanes have been designed and are being service evaluated in engines in The Netherlands and the United States. These vanes incorporate improved impingement cooling and thermal barrier coating on the leading edge. These two changes combine to make the turbine vane relatively insensitive to combustor temperature differences.

continued on page 24



Gas-turbine generator set under assembly. Shown are gas-turbine engine, gear and alternator.

NO_X Reduction Experience . . .

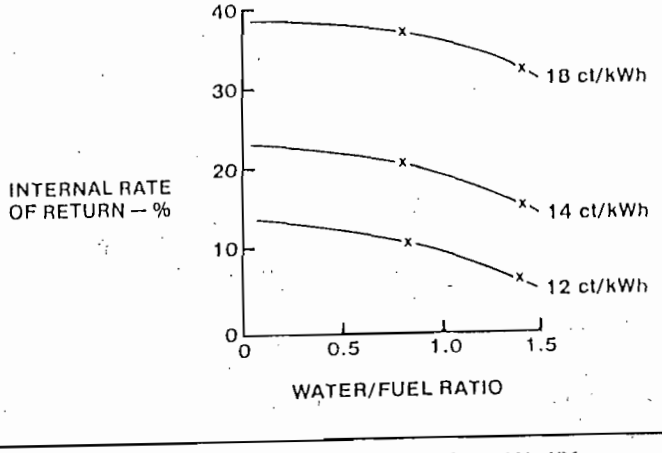
Economic And Regulatory Considerations — While water injection controls oxides of nitrogen, it also imposes an economic penalty that can adversely affect the viability of cogeneration projects. Studies on the economics of California cogeneration projects, particularly those using the 501-KB5 engine, show that the internal rate of return on investment (IRR) will be reduced sharply with increasing water-to-fuel ratios used for NO_X control. At the extreme water-to-fuel ratio of 1.4 to 1, which is required to achieve reduction to 25 ppm NO_X at 15% O_2, the reduction in IRR can be as great as 55%, depending on the fuel price. To reduce the NO_X emissions to 100 g/GJ, the proposed 1990 standards for The Netherlands, would require a water/fuel ratio of 0.5. This would reduce the IRR from 22.8% to 20.8% or by 10%. This example assumes an electricty cost of 14 ct/kWh.

From the environmental control viewpoint, the highest NO_X control measure of effectiveness — cost per ton of NO_X removed — should occur at the maximum achievable water injection rate. This is not the case, however, because the increased water injection rate has little additional influence on NO_X reduction, while the direct operating costs for water and fuel are significantly increased. As a result, the NO_X control measure of effectiveness actually increases with additional water injection at water/fuel ratios near 1.4.

As the rate of water injection increases in cogeneration systems, system costs increase. System viability is affected at the extreme injection rates being considered in California, and the cost effectiveness of NO_X is also increased. A logical balance between system costs and regulatory requirements is needed to provide economically acceptable emission controls. ★

WATER INJECTION RATE — WATER/FUEL	INCREASE IN DIRECT OPERATING COSTS — $/YEAR	REDUCTION IN OXIDES AND NITROGEN — TONS/YEAR	MEASURE OF EFFECTIVENESS — $/TON, NOx REMOVED
0	0	0	—
0.8	320,000	59.3	5396
1.4	549,000	68.5	8015

TOTAL NUMBER OF OPERATING UNITS	23
DUAL FUEL	13
GAS FUEL	9
LIQUID FUEL	1
NUMBER OF UNITS AWAITING START-UP	18
TOTAL OPERATING TIME — HOURS	199,722
HIGH TIME ENGINE — HOURS	24,360



Change in return on investment with various water rates for a 501-KB5 cogeneration system.

ATTACHMENT 5

POLLUTION CONTROL DEVICE EFFICIENCY

WATER INJECTION FOR NOx ABATEMENT

As is illustrated in the table on page Section III Part C of this application, steam injection will reduce the NOx emissions from 205.74 tons per year to 86.18 tons per year. Based on the formula:

Actual Emissions = Potential Emissions * (1 - Efficiency)

the efficiency of this level of steam injection as a pollution control technique is 58.1%.

Note, that with this water injection, there is an associated increase in CO emissions from 39.45 tons/year to 62.28 tons/yr; and in VOC's from 11.06 tons/yr to 14.48 tons/year. However, despite the increases in the emissions of these pollutants, their levels remain within the guidelines of FAC 17-2.500.

ATTACHMENT 5

POLLUTION CONTROL DEVICE EFFICIENCY

STEAM INJECTION FOR NOx ABATEMENT

As is illustrated in the table on page Section III Part C of this application, steam injection will reduce the NOx emissions from 159.48 tons per year to 86.18 tons per year. Base on the formula:

Actual Emissions = Potential Emissions * (1 - Efficiency)

the efficiency of this level of steam injection as a pollution control technique is 45.9%.

Note, that with this water injection, there is an associated increase in CO emissions from 45.48 tons/year to 62.28 tons/yr; and in VOC's from 12.49 tons/yr to 14.48 tons/year. However, despite the increases in the emissions of these pollutants, their levels remain within the guidelines of FAC 17-2.500.

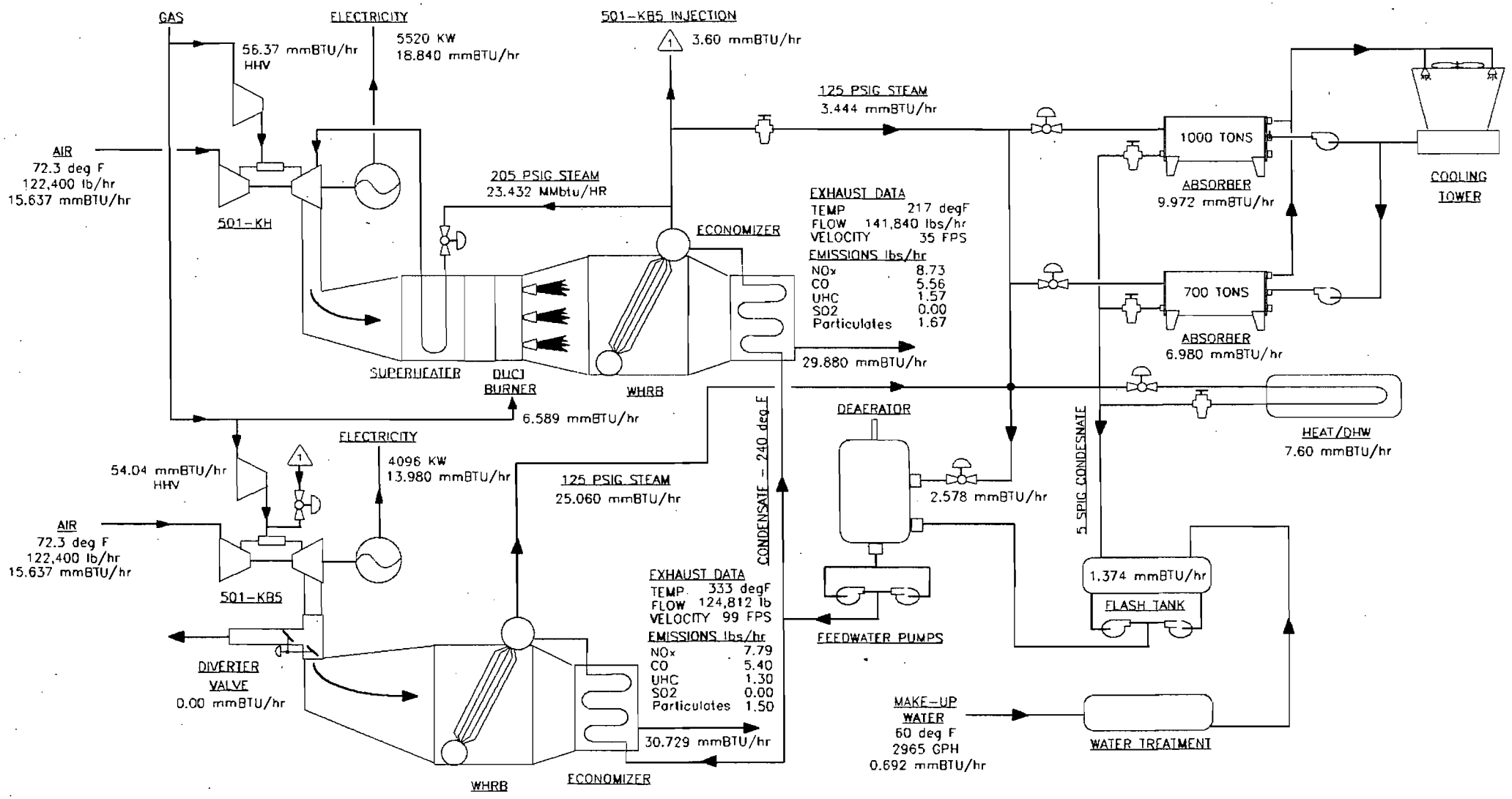
ATTACHMENT 6A

PROCESS FLOW DIAGRAM FOR NATURAL GAS

HEAT BALANCE

MACDILL AVENUE PLANT EMISSIONS – NATURAL GAS

100 % FULL LOAD PRODUCTION – 72.3 degF, 60% RH



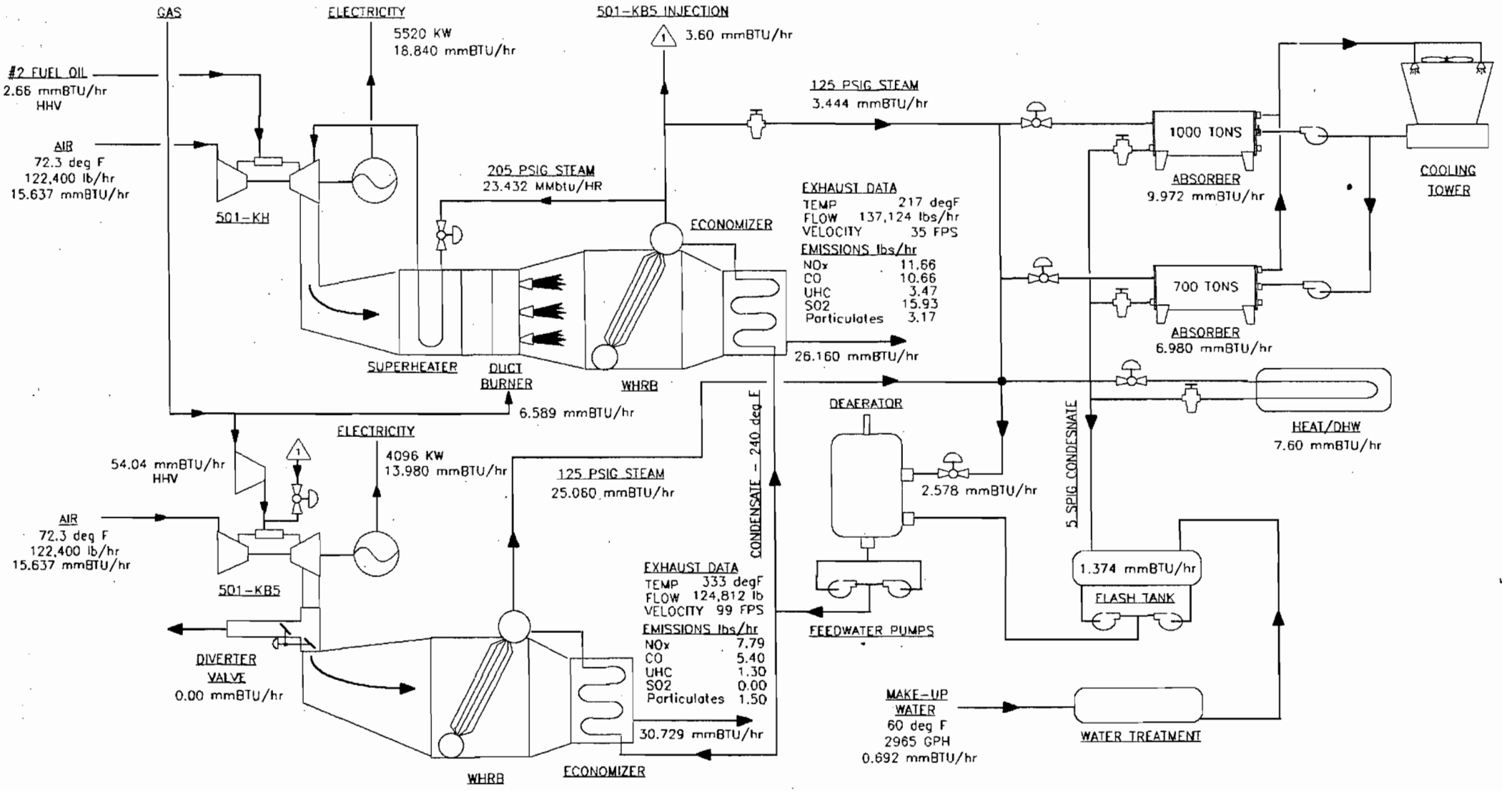
ATTACHMENT 6B

PROCESS FLOW DIAGRAM FOR #2 FUEL OIL

HEAT BALANCE

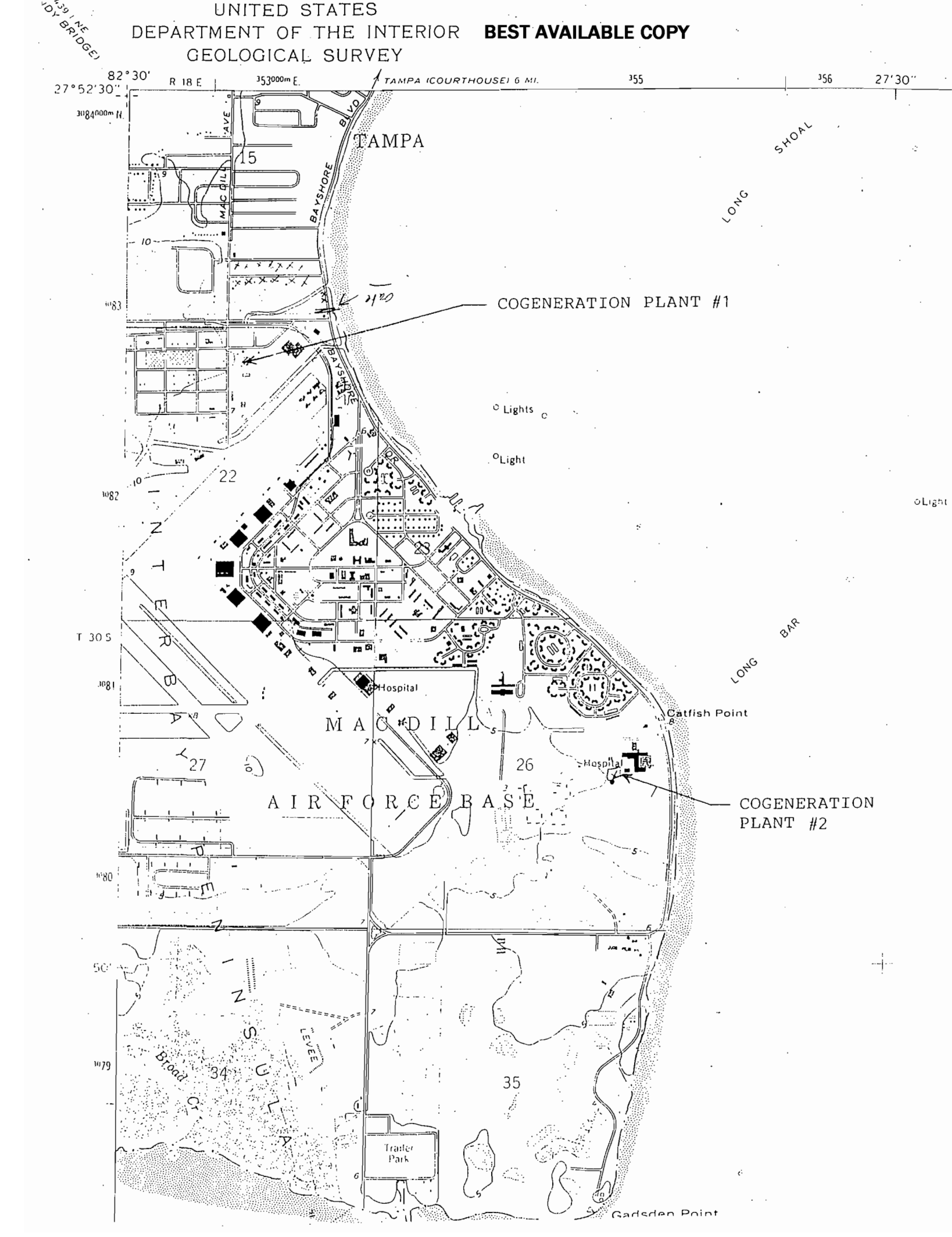
MACDILL AVENUE PLANT EMISSIONS - #2 FUEL OIL

100 % FULL LOAD PRODUCTION - 72.3 degF. 60% RH



ATTACHMENT 7

U.S.G.S. TOPOGRAPHIC MAP WITH FACILITY LOCATION



ATTACHMENT 8

FACILITY LOCATION/PLOT PLAN

LEGAL DESCRIPTION, MAP AND SURVEY

LEGAL DESCRIPTION OF COGENERATION

That certain tract or parcel of land situated in section 22, Township 30S., Range 18E., within MacDill Air Force Base Reservation, Hillsbourgh County, Florida, and more particularly described as follows:

Commencing at Bench Mark MDF 18, S 63 degrees 13'00" E. 164.38 feet.; Thence running N 89 degrees 17' 00" E. 2588.15 feet; Thence S 00 degrees 49'00" E 659.25 feet to point of beginning; Thence due E 180 feet; Thence due S 240 feet; Thence due W 180 feet; Thence due N 240 feet to point of beginning. Said land containing .92 acres, more or less; Together with the right of ingress and egress thereto.

DALE MABRY GATE

ANGLE

GLIDE SLOPE

AVE.

EXPANDED CLEAR ZONE AS REQUIRED BY AICUZ

ZONE

CONSTRUCTION PROHIBITED WITHIN THIS AREA

MACDILL AVE.

MACDILL

W

W W

LIGHTING

APPROACH

MDF 12

S63°13'E 164.38'

NORTH BOUNDARY ROAD

N89°17'E 2588.15'

MACDILL GATE

BAYSHORE GATE

929 BILLBOARD

INNER BAY

NATE RD

FIRST ST.

SECOND ST.

THIRD ST.

FOURTH ST.

926 925

927 928

CENTCOM TRAILERS 940

941 960

1069

1050

2010

Earth Berm

ZONE 3

1250 FT. 30,000 LBS. CLASS/DIVISION 1.1

MDF - 6

Slabs

Shelter Slab

1076 1075 1073

1067 1068 1072

1144 1152

1071 2008 1065

1003

1100 FT. LAUNCH MISSILES

WASTRACKS

BAYSHORE DR.

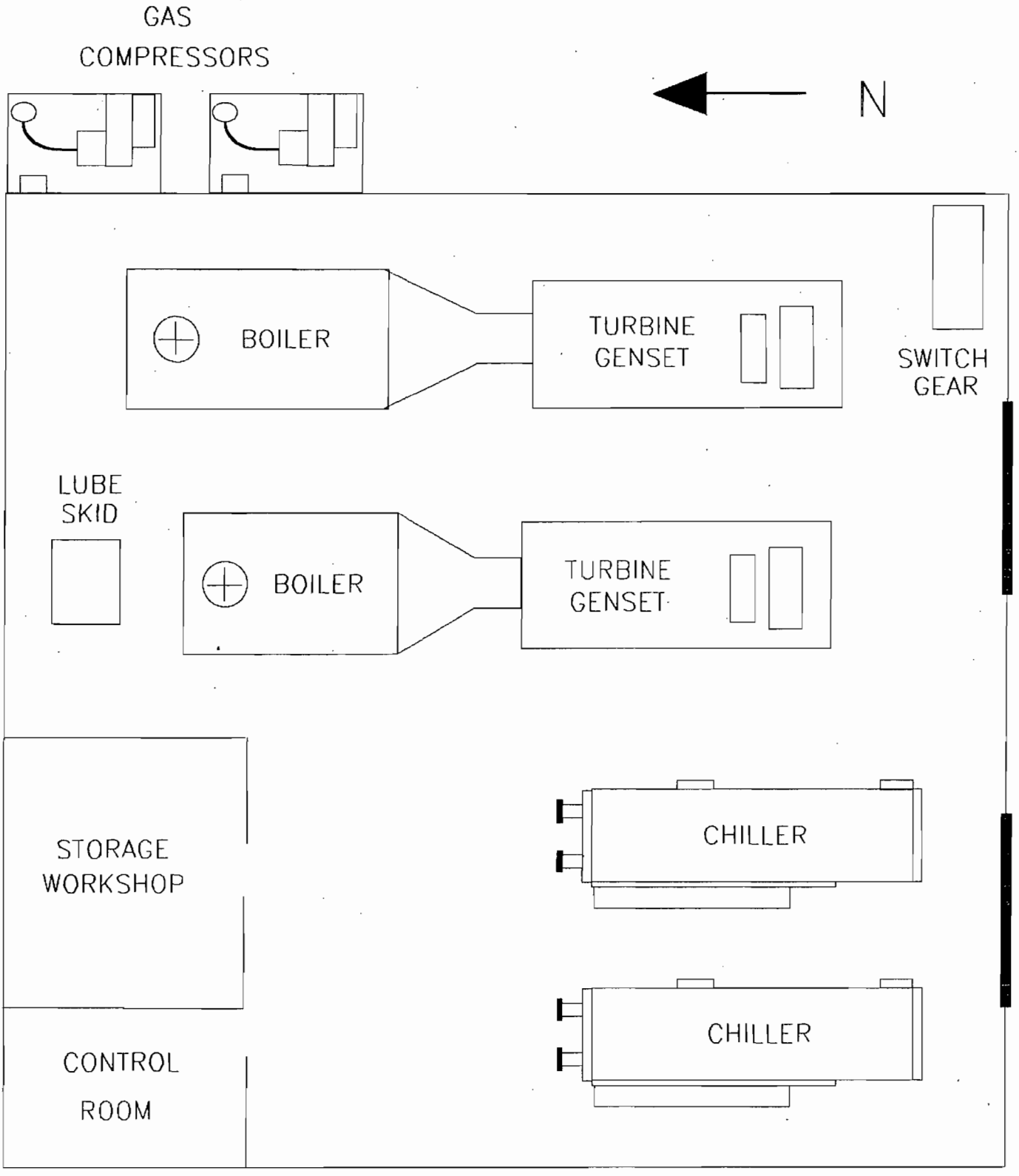
PAUL SMITH DR

PAUL SMITH CL

BLVD

518 519 520 526 527 528 555

COGEN PLANT #1 LAYOUT



ATTACHMENT 9

LEASE WITH AIR FORCE

COPY

LEASE NO. TAC 88-NVZR-L-001

SUPPLEMENTAL AGREEMENT NO. 1

THIS SUPPLEMENTAL AGREEMENT entered into this _____ day of _____, 1990, by and between the Secretary of the Air Force and Empire Energy Management Systems, Inc., a corporation organized and existing under the laws of the State of New York with its principal offices located at P. O. Box 6840, Building 970, MacDill Air Force Base, Florida 33608 ("Lessee"), WITNESSETH:

WHEREAS, on or about the 27th day of June, 1988, the Secretary of the Air Force and Empire Systems, Inc., entered into Lease No. TAC 88-NVZR-L-001 ("Lease"), covering certain premises at MacDill Air Force Base, Florida, and a related Utility Service Contract No. F44650-88-C0004 ("Utility Service Contract"); and

WHEREAS, a modification of the Utility Service Contract was issued, effective November 4, 1988, to change the company name on the contract from Empire Systems, Inc., to Empire Energy Management Systems, Inc.; and

WHEREAS, the parties desire to amend the Lease to change the company name on the Lease to correspond with the name now on the Utility Service Contract, increase the leased area and incorporate other agreed upon changes in its terms and conditions;

NOW, THEREFORE, the parties do hereby mutually agree as follows:

1. The Lease is hereby modified in the following particulars, but no others:

a. The name "Empire Energy Management Systems, Inc." is hereby substituted for "Empire Systems, Inc.," in the first paragraph of the introduction to the Lease.

b. The second paragraph of the introduction to the Lease is hereby deleted and the following inserted in its place:

> That the Secretary of the Air Force, by virtue of the authority contained in Title 10, United States Code, Section 2667, having determined that the property hereby leased is not excess property, as defined by 40 U.S.C. 472; is not for the time needed for public use; and the leasing thereof will be advantageous to the United States and in the public interest, and for the consideration hereinafter set forth, hereby leases to the party of the second part, hereinafter designated as the Lessee, for a term of thirty-one and one-third (31 1/3) years, beginning June 10, 1988, and ending October 6, 2019, unless sooner revoked or terminated in accordance with the provisions of this lease, the premises or property described in Exhibit "A-1" and shown on Exhibit "B-1," both attached hereto and made a part hereof, for purposes of construction and operation of a cogeneration system of six (6) to nine (9) megawatts, consisting of two cogeneration plants and all appurtenant facilities to supply electricity, chilled and/or hot water, and steam to MacDill Air Force Base, Florida.

c. The text of Condition 5 is hereby deleted in its entirety and the following inserted in its place:

> The leased premises shall be used solely for the purpose of constructing, erecting, installing, operating and maintaining a cogeneration system of six (6) to nine (9) megawatts, consisting of two cogeneration facilities and all facilities appurtenant thereto. The facilities will be used to supply electricity, chilled and/or hot water, and steam only to MacDill Air Force Base, Florida. The Lessee shall, at no time, sell any electricity, chilled and/or hot water and steam produced by such facilities to any other customer, export any energy from MacDill Air Force Base, or otherwise use the leased premises and any improvements erected thereon for purposes other than those expressly authorized and intended under this lease and the utility service contract identified in Condition 4.

d. The text of Condition 7 is hereby deleted in its entirety and the following inserted in its place:

> a. The Lessee shall, at its own expense and without cost to the Government, in accordance with the utility service contract, cogeneration service specifications, and Lessee's proposal identified in Condition 4 of this lease, construct, erect, install, operate, and maintain on the leased premises a 5-7MW cogeneration plant at Site 1 (one hundred eighty (180) feet by two hundred (200) feet by twenty-five (25) feet high) and a 1-2MW cogeneration plant at Site 2 (seventy (70) feet by one hundred (100) feet by twenty-five (25) feet high), and all facilities appurtenant thereto (hereinafter collectively referred to as "the Facilities"). It is specifically understood that the construction of the improvements herein is a private undertaking and that title to all such improvements shall remain in the Lessee.
>
> (1) The Lessee shall complete the construction of the Facilities within three hundred sixty-five (365) calendar days after its receipt of the Government's written

approval of the construction plans for the project. At the conclusion of that period both cogeneration plants will be fully operational. The Lessee is responsible for and will obtain all necessary environmental, safety and digging permits within this 365-day period.

(2) The Government will, within fifteen (15) days after the Lessee provides written notice to the said officer that all the facilities are complete and ready to begin energy production, inspect the Facilities. The Government will provide to the Lessee, in writing, either approval for operation of the Facilities in accordance with the utility service contract or notice of the actions which must be taken before approval will be granted. Upon approval of the Facilities, the Lessee shall operate the cogeneration plants and appurtenant facilities in accordance with the utility service contract.

(3) The chilled water, hot water, and steam lines will not be constructed or installed above ground.

(4) When sited, the cogeneration facilities will not increase the average day-night noise level (DNL) for either site. The current Air Installation Compatible Use Zone (AICUZ) for MacDill Air Force Base will be used to determine existing DNL values for the leased premises.

b. All construction, utility connections and any other work done in connection with the Facilities, whether on or off MacDill Air Force Base, will be accomplished as the sole responsibility of the Lessee and at the Lessee's expense.

c. The Lessee shall not construct any permanent structure on the leased premises, other than the buildings and improvements constituting part of the Facilities.

d. The Lessee shall not construct any temporary structure or advertising sign on the leased premises or make other modifications, alterations, or additions thereto, or make any alteration in the

external elevation or architectural design of the buildings and improvements, or damage or remove any of the principal walls or timbers thereof, without the prior written consent of the said officer.

e. Subject to Condition 19, title to all improvements placed in or upon the leased premises by the Lessee, including any installed fixtures or lines, shall, during the term of the lease, remain the property of the Lessee, but such improvements shall not be removed, replaced or altered without the prior written approval of the said officer.

e. The text of Condition 16b(1) is hereby deleted and the following inserted in its place: "a standard fire and extended coverage insurance policy or policies on the leased premises to the full insurable value thereof, which provide at a minimum, for the restoration of the property to its condition on the beginning date of this lease without cost to the Government."

f. The text of Condition 19c is hereby deleted and the following inserted in its place: "For purposes of this Condition, the term "property" includes the cogeneration facilities and all appurtenant structures and utility lines erected on the leased premises or appurtenant easements under this lease and the utility service contract identified in Condition 4."

g. The following is hereby substituted as the Lessee's address in Condition 21:

Empire Energy Management Systems, Inc.
Brian Travis, President
P. O. Box 6840, Building 970
MacDill Air Force Base, Florida 33608

h. Exhibit "A" to the Lease is hereby replaced by the attached Exhibit "A-1."

i. Exhibit "B" to the Lease is hereby replaced by the attached Exhibit "B-1."

2. The Lessee shall, within one hundred twenty (120) days after execution of this Supplemental Agreement by all parties, submit the following to the Base Commander, MacDill Air Force Base, Florida ("Base Commander"), for review and approval:

a. Building siting plans and exterior building plans and drawings, and detailed drawings and interface specifications to MacDill's utility systems.

b. Evidence of an appropriate site reclamation bond for the construction phase of the project.

c. Evidence that a firm commitment to supply natural gas in the needed quantities has been obtained in writing from an appropriate source.

3. Upon receipt of the items specified above in Paragraph 2, the Air Force will complete its review of the construction plans, drawings and specifications within thirty (30) days in accordance with Condition 8b of the Lease.

4. All other terms and conditions of the Lease shall be and remain the same.

5. The Lessee hereby expressly waives any and all claims against the United States of America for any loss or damage which the Lessee or any stockholder or officer of the Lessee may make with respect to the change in name of the Lessee on the Lease from Empire Systems, Inc., to Empire Energy Management Systems, Inc.; and the Lessee agrees to indemnify, release and hold harmless the United States of America, and its officers, agents and employees, from and against all claims, demands, or actions, liabilities, judgments, costs and attorneys fees arising out of or claimed with respect to the change in name on the Lease.

6. This Supplemental Agreement shall be effective immediately.

7. This Supplemental Agreement and the Lease may be recorded among the land records of Hillsborough County, Florida.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement as of the day and year first above written.

EMPIRE ENERGY MANAGEMENT SYSTEMS, INC.

WITNESSES:

_____

By _____

_____

Title: _____

UNITED STATES OF AMERICA

WITNESSES:

_____

_____

By _____

Title: _____

EXHIBIT A-1

LEGAL DESCRIPTION OF COGENERATION

SITE NO. 1

That certain tract of parcel of land situated in section 22, Township 30S., Range 18E, within MacDill Air Force Base Reservation, Hillsborough County, Florida, and more particularly described as follows:

Commencing at Bench Mark MDF 18, S 63 degrees 13'00" E. 164.38 feet,; Thence running N 89 degrees 17' 00" E. 2588.15 feet; Thence S 00 degrees 49'00" E 659.25 feet to point of beginning; Thence due E 180 feet; Thence due S 240 feet; Thence due W 180 feet; Thence due N 240 feet to point of beginning. Said land containing .99 acres, more or less; Together with the right of ingress and egress thereto.

LEGAL DESCRIPTION OF COGENERATION

SITE NO. 2

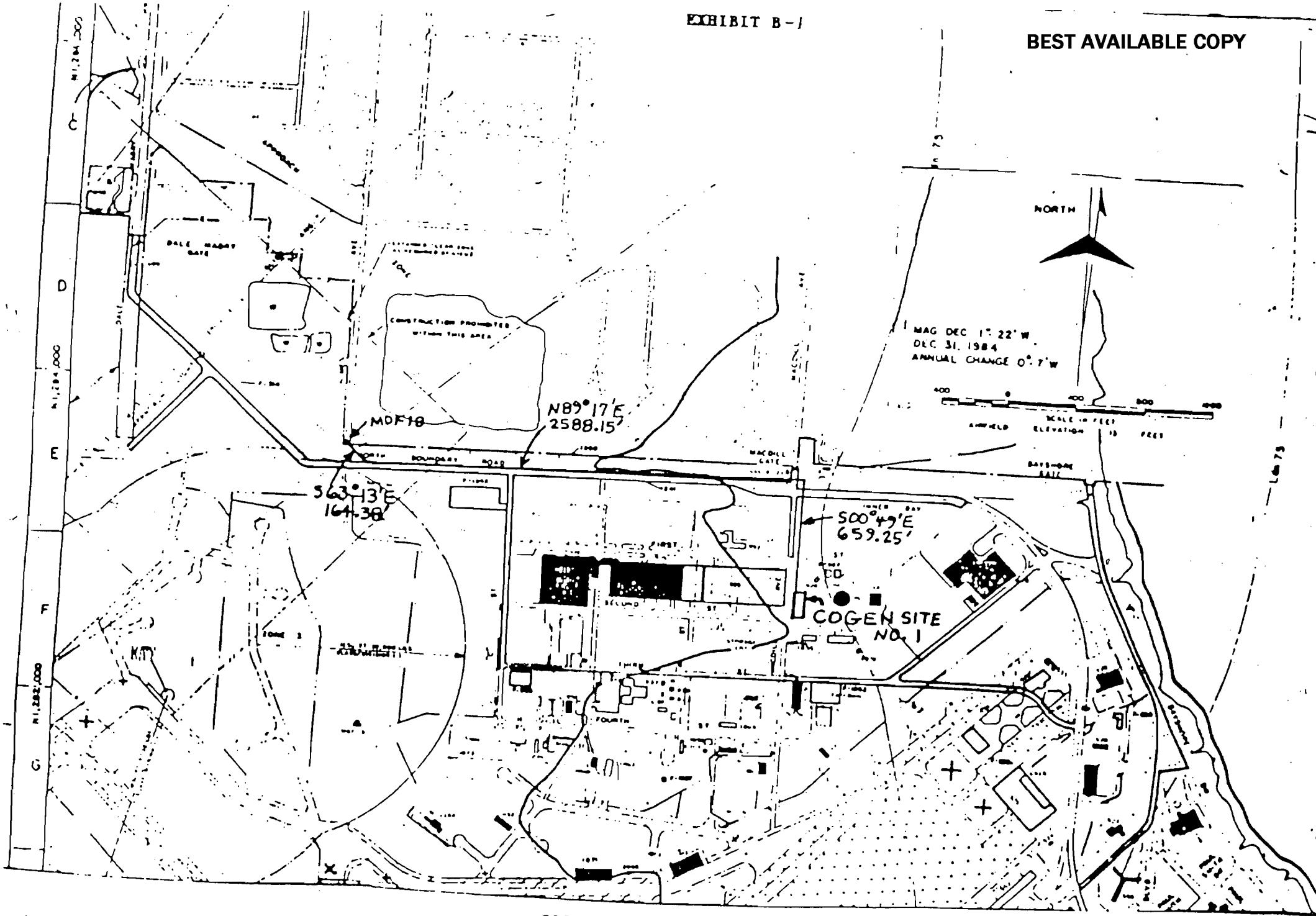
That certain tract or parcel of land situated in section 26, Township 30S., Range 18E., within MacDill Air Force Base Reservation, Hillsborough County, Florida, and more particularly described as follows:

Commencing at Bench Mark FISH, S 8 degrees 24'00" E. ~~10098.89~~ 1098.89 feet; Thence running N 87 degrees 35' 00" W. 808.64 feet; Thence N 2 degrees 45'00" E 27.66 feet to point of beginning; Thence due W 100 feet; Thence due N 70 feet; Thence due E 100 feet; Thence due S 70 feet to point of beginning. Said land containing .16 acres, more or less; Together with the right of ingress and egress thereto.

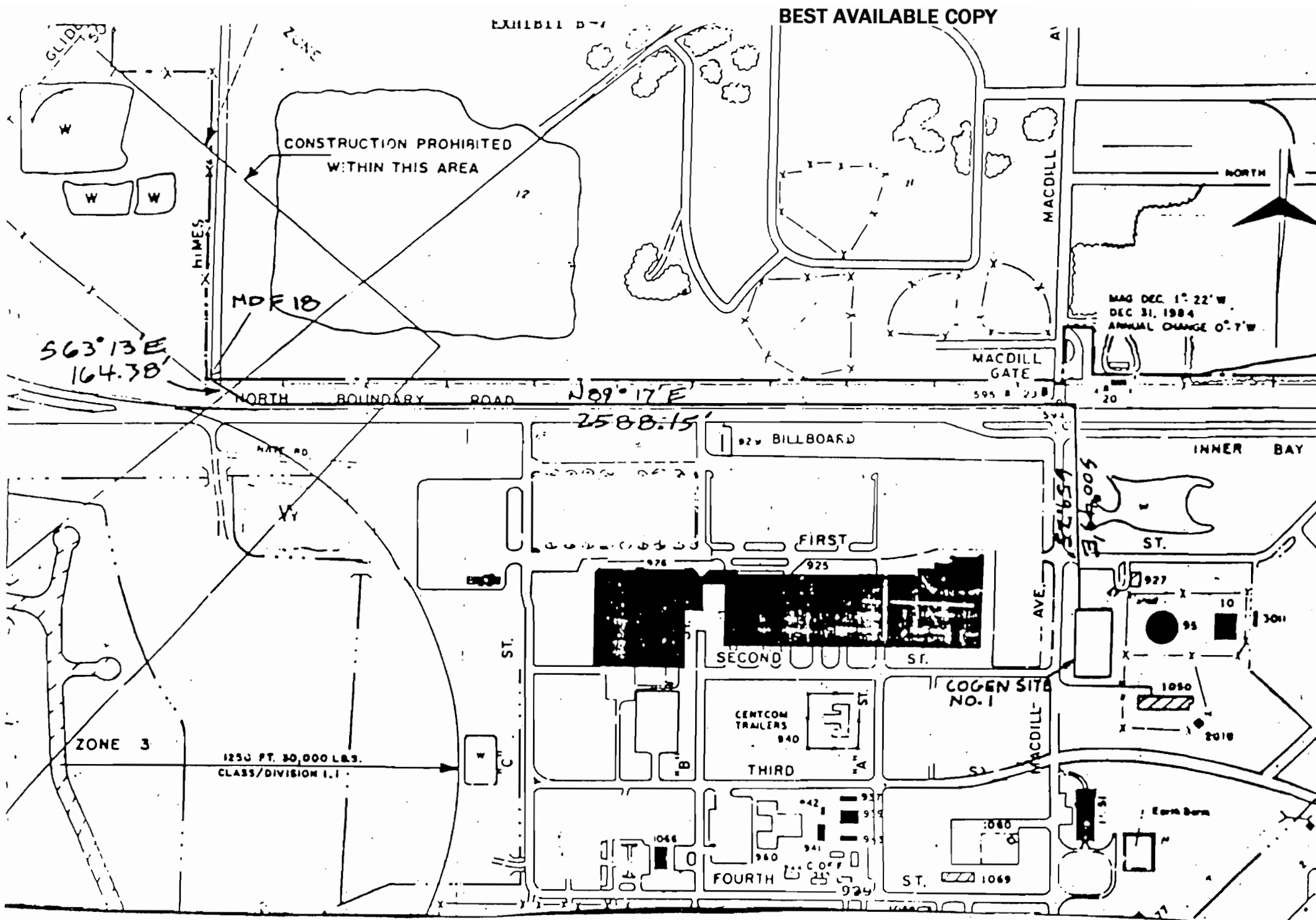
AFD: 0328R

EXHIBIT B-1

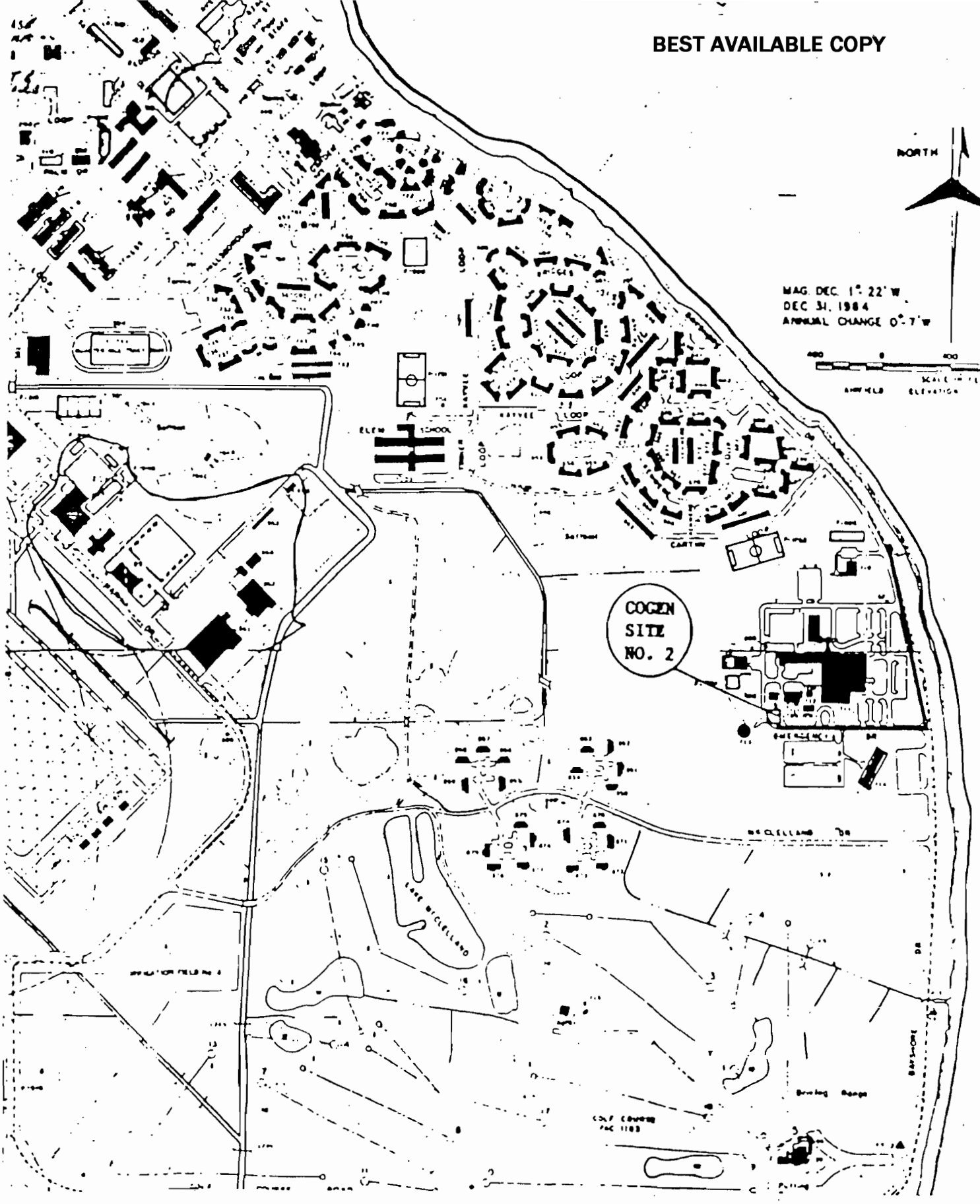
BEST AVAILABLE COPY



COGENERATION SITE PLAN
(SITE NO. 1)
MACDILL AFB, FL



COGENERATION SITE PLAN
(SITE NO. 1)
MACDILL AFB, FL SCALE = NTS



COGENERATION SITE PLAN
(SITE NO. 2)
MACDILL AFB, FL

STATE OF FLORIDA

AC29-178834

DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHWEST DISTRICT
7601 HIGHWAY 301 NORTH
TAMPA, FLORIDA 33610-9544

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY
RICHARD D. GARRITY, PH.D.
DISTRICT MANAGER

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: GAS TURBINE COGENERATION PLANT [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] Construction [ ] Operation [ ] Modification

COMPANY NAME: EMPIRE ENERGY MANAGEMENT SYSTEMS, INC. COUNTY: HILLSBOROUGH

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) COGENERATION PLANT #2

SOURCE LOCATION: Street EMERGENCY DRIVE City MACDILL AFB

UTM: East 347952 North 1276500

Latitude 27 ° 51 ' 41 "N Longitude 82 ° 28 ' 13 "W

APPLICANT NAME AND TITLE: BRIAN TRAVIS, PRESIDENT

APPLICANT ADDRESS: P.O. BOX 6840, BLDG 970, MACDILL AFB, FL 33608-0840

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of EMPIRE ENERGY MANAGEMENT SYSTEMS, INC.

I certify that the statements made in this application for a CONSTRUCTION permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: Brian Travis

BRIAN TRAVIS, PRESIDENT
Name and Title (Please Type)

Date: 04/09/90 Telephone No. 813-840-0100

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, tha

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

Nº 153941

RECEIPT FOR APPLICATION FEES AND MISCELLANEOUS REVENUE

Received from Empire Cogen, Inc. Date 4/10/90

Address PO Box 6840, Bldg. 970 / MacDill AFB, FL Dollars $ 500.00

Applicant Name & Address Empire Energy Mgmnt. Systems, Inc.

Source of Revenue Cogeneration Plant #2

Revenue Code 001031 Application Number AC29-178834

ck #10025

By Stacy Muddaugh

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Edward C Spivey Jr.

Edward C. Spivey, Jr.
Name (Please Type)

Bosek, Gibson and Associates
Company Name (Please Type)

111 Bullard Parkway, Temple Terrace, FL 33617
Mailing Address (Please Type)

Florida Registration No. 32690 Date: 4/10/90 Telephone No. (813) 985-3499

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Cogeneration plant using a gas turbine as the prime mover in a topping (Brayton) cycle that will provide the MacDill AFB electrical grid with power and the Base Hospital with thermal energy in the form of process steam, domestic hot water, and chilled water. The plant will operate a minimum of 11 months/yr on natural gas; maximum of 1 month/yr on #2 fuel oil.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction 01 JUL 1990 Completion of Construction 01 NOV 1991

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Water Injection for NOx Abatement - $40,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;

if power plant, hrs/yr 8760; if seasonal, describe:

Maximum 1 month/30 days/720 hours per year operating on #2 fuel oil

Minimum 11 months/335 days/8040 hours per year operating on natural gas

NOTE: The total hours of operation will be 8760/yr, which may be all gas.

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? yes

   a. If yes, has "offset" been applied? no

   b. If yes, has "Lowest Achievable Emission Rate" been applied? no

   c. If yes, list non-attainment pollutants. Ozone (VOC's) and Particulates

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. yes[1]

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. no

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? yes[2]

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? no

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? no

   a. If yes, for what pollutants?

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

[1]See Attachment #2A, BACT Applicability

[2]See Attachment #2B, New Source Performance Standards

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): FUEL - Gas 1085 lb/hr; #2 Oil 1081 lb/hr

2. Product Weight (lbs/hr): N/A

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
NOx	9.0	28.968	135 ppm[5]	12.33	112,320	56.160	Attch 6A,B
CO	0.81	3.476	250 T/yr[6]	57.07	5,081	2.540	Attch 6A,B
VOC (UHC)	0.35	1.490	100 T/yr[6]	22.83	2,015	1.007	Attch 6A,B
Particulates	1.45	3.416	TBD[7]		6,832	3.416	Attch 6A,B
SO_2	9.90	3.564	0.015%[8]		6,624	3.312	Attch 6A,B

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard.

[4] Emission, if source operated without control (See Section V, Item 3).

[5] NSPS 40 CFR 60.332 (FAC 17-2.660 Table 660-1)

[6] FAC 17-2.500

[7] To Be Determined; BACT Determination pursuant to FAC 17-2.600 (6)

[8] NSPS 40 CFR 60.333;BACT Determination pursuant to FAC 17-2.600 (6) also applies

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
Natural Gas	22	22.4	22.4 HHV
#2 Fuel Oil	150	155	21.75 HHV

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis: Natural Gas / Fuel Oil

Percent Sulfur: 0.0 / maximum 0.8 Percent Ash: 0.0 / 0.01

Density: NA / 7.09 lbs/gal Typical Percent Nitrogen: 0.489 / 0.1

Heat Capacity: 20,656 / 19,750 BTU/lb NA / 140,000 BTU/gal

Other Fuel Contaminants (which may cause air pollution): None

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average 5% Maximum 35%

G. Indicate liquid or solid wastes generated and method of disposal.

Used Turbine Lube Oil which will be shpped off-site for Recycling

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 50 ft. Stack Diameter: 2.667 ft.

Gas Flow Rate: 19,230 ACFM 11,630 DSCFM Gas Exit Temperature: 324 °F.

Water Vapor Content: maximum 10% % Velocity: 47 FPS

SECTION IV: INCINERATOR INFORMATION

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] [redacted] (specify) _____

Brief description of operating characteristics of control devices: _____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]
   ATTACHMENT #1
2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.
   ATTACHMENTS 2A, 2B, 2C
3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).
   ATTACHMENT #3
4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)
   ATTACHMENT #4
5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential.(1-efficiency).
   ATTACHMENT #5
6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.
   ATTACHMENTS 6A, 6B
7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).
   ATTACHMENT #7
8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.
   ATTACHMENT #8

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construct permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[X] Yes [ ] No

Contaminant	Rate or Concentration
Nitrogen Oxides	40 CFR 60.332, 135 ppm (See Attachment #3)
Sulfur Dioxide	40 CFR 60.333 (a),(b) 0.8% sulfur in fuel; 0.015% SO_2 in exhaust

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
Nitrogen Oxides	109 ppm (0.5 ratio water injection)
Sulfur Dioxide	90 ppm, 0.009% (low sulfur oil)

D. Describe the existing control and treatment technology (if any).

1. Control Device/System: Water Inject
2. Operating Principles: See Attachment # 4
3. Efficiency:* 48.44
4. Capital Costs: $40,000.00

*Explain method of determining See Attachment #5

5. Useful Life: 30 Years

6. Operating Costs: $10,000/yr

7. Energy: 725,491 kWH/yr

8. Maintenance Cost: $2,500/yr

9. Emissions: Water Vapor

Contaminant	Rate or Concentration

10. Stack Parameters (No additional stack required - same as Section III, Part H)

a. Height: ft. b. Diameter: ft.

c. Flow Rate: ACFM d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable use additional pages if necessary).

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. _____ no. sites _____ TSP _____ ( ) SO_2* _____ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate	
TSP	_____	grams/sec
SO^2	_____	grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

DER AIR POLLUTION PERMIT APPLICATION

LIST OF ATTACHMENTS

ATTACHMENT 1

FUEL INPUT RATE/WEIGHT DATA

FLORIDA GAS TRANSMISSION

TYPICAL FUEL ANALYSIS

COGENERATION PLANT FUEL INPUT - RATE/WEIGHT

FUEL TYPE	mmBTU/hr	BTU/lb	lbs/hr
Natural Gas	22.4	20,656	1,085
#2 Fuel Oil	21.75	19,750	1,081

May

FLORIDA GAS TRANSMISSION COMPANY
GAS ANALYSIS ID NO: 89 186

STATION NAME: FLA HYDROCARBON - OUTLET DIST 7 STA NO: 047

FIELD DATA TAKEN BY: A. Kattawar DATE TAKEN 3-28-89

PRESS	730	TEMP	0	SP GRAV	0.586
BTU	1021	WATER	0.80	H2S	0.1 gr/hcf

ANALYSIS DATA: ANALYST Michael P. Campo DATE ANALYZED 4- 5-89

COMPONENT	MOLE %	B.T.U.	GPM	SP. GR
OXYGEN	0.0000	0.0000	0.0000	0.0000
NITROGEN	0.4890	0.0000	0.0000	0.0047
CARBON DIOXIDE	1.1110	0.0000	0.0000	0.0169
METHANE	95.3670	948.4200	0.0000	0.5283
ETHANE	2.4880	43.3500	0.0000	0.0258
PROPANE	0.4350	10.7900	0.1199	0.0066
iBUTANE	0.0300	0.9600	0.0098	0.0006
nBUTANE	0.0330	1.0600	0.0104	0.0007
iPENTANE	0.0130	0.5100	0.0048	0.0003
nPENTANE	0.0070	0.2800	0.0025	0.0002
HEXANE plus	0.0270	1.3900	0.0119	0.0009
TOTALS:	100.0000	1006.7600	0.1593	0.5850

BTU PER CU FT AT 14.73 PSIA
60 DEG F SAT & CORRECTED FOR Z CALC 1009 CALORIMETER 1008
60 DEG F DRY & CORRECTED FOR Z CALC 1027 CALORIMETER 1026
60 DEG F 0.80 LB/MMCF & CORRECTED FOR Z CALC 1027
SP GRAV (AIR = 1.0000) CALC 0.5850 RANAREX 0.587

COMPRESSIBILITY FACTOR Z = 0.9979

SUPERCOMPRESSIBILITY FACTOR
CALC AT 0.587 SP GR 600 PSIG 90 DEG

BY TEST WITH BURNETT APPARATUS**********	1.0358
CALCULATED AGA-NX-19 NO DILUENTS**********	1.0379
CALCULATED AGA-NX-19 ADJUSTED FOR DILUENTS***	1.0364

NOTES:
PHYSICAL CONSTANTS FROM AGA 3
GPM FROM NGPA PUB NO 2145-84
HEXANE PLUS DERIVED FROM ALPHAGAZ REF STANDARD

REMARKS:
3000 cc line pressure spot sample.
Percent difference with respect to Burnett Apparatus
for calculated value using AGA-NX-19 formula
and adjusted for diluents equals (+ 0.058 %)

ATTACHMENT 2A

BACT APPLICABILITY

For the control of particulates and sulfur dioxide, the DER is to make a BACT Determination pursuant to FAC 17-2.600 (6) and FAC 17-2.630. The following information is only included to aid the DER in understanding the parameters of project operation.

As a consideration in the control of particulate emissions, it is important to note than more than 17,000 CFM of ambient air will be channeled through a two-stage combustion air inlet filter (gas turbines like clean air). Also of note is the fact that the proposed dual fuel turbine produces virtually no particulates while operating on natural gas and only a very small amount on #2 fuel oil. The result is a "vacuum cleaner" effect, whereby the exhaust gas stream may actually contain less particulates than the inlet ambient air. However, nominal amounts of particulate emissions are guaranteed by the manufacturer; these can be found Attachment 2C.

Regarding sulfur dioxide emissions, the proposed cogeneration plant will only use fuel oil with a maximum sulfur content of 0.8%, which ensures compliance with the NSPS as discussed in Attachment 2B. Additionally, the operating parameters of the plant limit operation on #2 fuel oil to a maximum of 720 hours per year; the remainder of the year natural gas (with 0.0 percent sulfur) will be used as the fuel source. The resultant maximum annual total of sulfur dioxide emissions is 3.564 tons, as shown in Section III, Part C of the DER application.

ATTACHMENT 2B

NEW SOURCE PERFORMANCE STANDARDS APPLICABILITY

The New Source Performance Standard (NSPS) that is applicable to this proposed cogneration plant is 40 CFR 60.330, Subpart GG Standards of Performance for Stationary Gas Turbines.

Per Section 60.332, the standard for nitrogen oxides emissions for this particular turbine (based on a fuel rate of 14,820 BTU per kWH, fuel bound nitrogen content of 0.49 percent, and correction factor to 15% O_2 of 1.08) is 135 ppm. To comply with this requirement, water injection will be incorporated at a rate of 0.5 pound of water per pound of fuel. The manufacturer's guaranteed emissions when utilizing water injection for at this rate can be found in Attachment 2C. A typical fuel analysis from Florida Gas Transmission showing the level of fuel-bound nitrogen present in the natural gas is included as Attachment 1.

Regarding the sulfur dioxide emissions standard of Section 60.333, the amount of sulfur present in the natural gas will be negligent and the sulfur concentration in the liquid fuel (#2 oil) will be a maximum of 0.8 percent by weight -- the limit of 0.8 percent set by paragraph (b) of this section. As detailed in the manufacturer's guaranteed emissions data (Attachment 2C), the turbine exhaust gas will have a maximum concentration of 90 ppm, or 0.009 percent by volume. This is considerably less than the limit of 0.015 percent set in paragraph (a) of Section 60.333.

ATTACHMENT 2C

U.S. TURBINE/KAWASAKI HEAVY INDUSTRIES

GUARANTEED PERFORMANCE AND EMISSIONS DATA

REV. E 3/27/90

OPERATING CONDITIONS APPLICABLE TO PERFORMANCE DATA

Elevation, feet above sea level	5
Relative humidity, percent	60
Steam to process pressure, psig	130
Steam to process pressure, temperature	Saturated
Boiler feedwater temperature, °F	240
Continuous blowdown, percent	3
Output Power EMF, volts/power factor	13,200/0.80

Power and heat rate data are for measurements at the electric generator terminals.

UST1500 and 3800 steam production data are exclusive of any bleed for deaerator heating.

UST5600CC steam production data are based on the combined makeup/returned water flow being at 140°F, and have the steam bleed to the deaerator taken into account.

The UST5600CC duct burner has been selected for 33 MMBtuLHV/h heat release, instead of the full capability of in excess of 40 MMBtuLHV/h, to match the MacDill A.F.B. project requirements.

Fuel gas composition, volume percent (per Buyer's analysis)

N_2	0.49
CO_2	1.11
CH_4	95.37
C_2H_6	2.49
C_3H_8	0.43
IC_4H_{10}	0.03
NC_4H_{10}	0.03
IC_5H_{12}	0.01
NC_5H_{12}	0.01
C_6 +	0.03

Fuel oil composition, weight percent (assumed USTC standard)

Carbon	86.2
Hydrogen	13.5
Sulfur	0.30
Nitrogen	0.000

Fuel oil calorific value, BtuLHV/lb 18,400

Oil-fueled sulfur emissions will be proportional to the distillate's actual sulfur content. The 1.60 guaranteed/nominal ratio used here is only meant to account for measurement uncertainty at an exact 0.30 weight percent sulfur content and for the conversion from ppmv dry as-measured to ppmv @ dry 15 vol. % O_2.

REV. E 3/27/90

Oil-fueled NO_x emissions can be heavily influenced by fuel-bound nitrogen, e.g., an 0.02 weight percent nitrogen content can raise NO_x emissions by 15 to 20 percent. The data provided here are, in the absence of a Buyer's fuel specification, for standard, clean (i.e. no nitrogen content), no. 2 distillate fuel.

PERFORMANCE AND EMISSIONS, UST1500

Water/fuel ratio	0	0.5	0.8	0	0.5	0.8
Fuel type	Gas	Gas	Gas	Oil	Oil	Oil
1) Nominal	①	②	③	④	⑤	⑥
Output power, kw	1,313	1,346	1,366	1,284	1,316	1,336
Heat rate, BtuLHV/kwh	14,820	15,030	15,154	15,003	15,220	15,344
Exhaust flow, lb/h	56,630	57,120	57,440	56,670	57,270	57,630
Exhaust temperature, °F	1038	1038	1038	1038	1038	1038
Gross steam production, lb/h	10,590	10,775	10,895	10,610	10,830	10,960
Emissions, ppmv @ dry 15 vol. % O2						
NOx	120	48	32	167	68	46
CO	3	4	11	3	3	3
UHC	2	3	5	2	2	2
SOx	--	--	--	52	54	56
Particulates, ppmw	--	--	--	--	--	--
2) Guaranteed						
Output power, kw	1,248	1,279	1,298	1,220	1,250	1,269
Heat rate, BtuLHV/kwh	15,560	15,782	15,912	15,753	15,981	16,111
Gross steam production, lb/h	9,531	9,698	9,806	9,549	9,747	9,864
Emissions, ppmv # dry 15 vol. % O2						
NOx**	150	77	51	267*	109*	74*
CO	12	16	44	12	12	12
UHC	8	12	20	8	8	8
SOx	--	--	--	83*	86*	90*
Particulates, ppmw	10	10	10	20	20	20
DRY VOL. % : N_2	80.4	80.5	80.6	79.5	79.6	79.6
CO_2	3.2	3.3	3.4	4.1	4.2	4.3
O_2	15.4	15.2	15.0	15.4	15.2	15.1
Ar	1.0	1.0	1.0	1.0	1.0	1.0
CORR. FACTOR FOR 15 VOL. % O_2	1.08	1.03	1.01	1.08	1.04	1.01
EXHAUST MW, DRY	29.2	29.3	29.2	29.4	29.4	29.4
DRY EXHAUST FLOW, lb/h	54,040	53,960	53,890	54,850	54,850	54,840
GUARANTEED EMISSIONS, lb/h, NOx	12	6.4	4.3	2.2	9.0	6.3
CO	0.58	0.81	2.3	0.58	0.61	0.62
SOx	—	—	—	9.2	9.9	11

$$\text{POLLUTANT MASSFLOW} = \frac{\text{MW POLLUTANT}}{\text{MW DRY EXH. GAS}} \times \frac{\text{ppmvC DRY 15 VOL. \% O2}}{\text{15 VOL. \% O2 CORR. FACTOR} \times 10^6} \times \text{EXHAUST DRY MASSFLOW}$$

PERFORMANCE AND EMISSIONS, UST1500

Water/fuel ratio	0	0.5	0.8	0	0.5	0.8
Fuel type	Gas	Gas	Gas	Oil	Oil	Oil
1) Nominal						
Output power, kw	1,313	1,346	1,366	1,284	1,316	1,336
Heat rate, BtuLHV/kwh	14,820	15,030	15,154	15,003	15,220	15,344
Exhaust flow, lb/h	56,630	57,120	57,440	56,670	57,270	57,630
Exhaust temperature, °F	1038	1038	1038	1038	1038	1038
Gross steam production, lb/h	10,590	10,775	10,895	10,610	10,830	10,960
Emissions, ppmv @ dry 15 vol. % O_2						
NOx	120	48	32	167	68	46
CO	3	4	11	3	3	3
UHC	2	3	5	2	2	2
SO_x	--	--	--	52	54	56
Particulates, ppmw	--	--	--	--	--	--
2) Guaranteed						
Output power, kw	1,248	1,279	1,298	1,220	1,250	1,269
Heat rate, BtuLHV/kwh	15,560	15,782	15,912	15,753	15,981	16,111
Gross steam production, lb/h	9,531	9,698	9,806	9,549	9,747	9,864
Emissions, ppmv # dry 15 vol. % O_2						
NO_x**	150	77	51	267*	109*	74*
CO	12	16	44	12	12	12
UHC	8	12	20	8	8	8
SO_x	--	--	--	83*	86*	90*
Particulates, ppmw	10	10	10	20	20	20

* = See notes on "Operating Conditions Applicable to Performance Data" page.

** = A 1.25 guaranteed/nominal ratio is applied for uninjected gas-fueled NOx only. Elsewhere KHI's standard 1.60 multiplier is used. USTC recommends, if injection is required, an 0.50 ratio; since it appears to achieve the desired effect for both fuels, while requiring only moderate purification equipment size and expense.

(1)

MACDILL A.F.B.
M1A-13

** FUEL PROPERTIES **

-- FUEL IS GAS. --
-- COMPOSITION OF GAS (VOLUME PERCENT) --

S =	.000	N2 =	.490
O2 =	.000	H2 =	.000
CO2=	1.110	CO =	.000
H2O=	.000	H2S=	.000
C 1H 4=	95.370		
C 2H 6=	2.490		
C 3H 8=	.430		
C 4H10=	.060		
C 5H12=	.020		
C 6H14=	.030		

-- FUEL COMPOSITION (WEIGHT PERCENT) --

C =	73.225	O =	2.097
H =	23.868	S =	.000
N =	.810		

** AMBIENT CONDITION **

T AMB.	=	22.4 DEG.C
R.H.	=	60.0 %
WATER IN AIR	=	253.4 KG/H

** FLOW **

INLET. AIR FLOW	=	25250.	KG/H	(WET)	19647.	NM3/H (WET)
	=	24997.	KG/H	(DRY)	19331.	NM3/H (DRY)
FUEL FLOW	=	432.	KG/H			
STEAM/WATER INJ.	=	0.	KG/H			
EXH. GAS FLOW	=	25682.	KG/H	(WET)	20229.	NM3/H (WET)
	=	24507.	KG/H	(DRY)	18768.	NM3/H (DRY)

** EXHAUST GAS COMPOSITION **

		WEIGHT %	KG/H	VOLUME %	NM3/H
H2O	=	4.57	1175.	7.22	1461.
N2	=	73.52	18881.	74.64	15098.
CO2	=	4.56	1171.	2.95	596.
SO2	=	.00	0.	.00	0.
O2	=	16.10	4135.	14.31	2895.
AR	=	1.25	320.	.89	180.

DRY O2 = 15.42 VOLUME %

O2 4%= 3.05 5%= 2.87 15%= 1.08 16%= .90

(2)

MACDILL A.F.B.

** FUEL PROPERTIES **

-- FUEL IS GAS. --
-- COMPOSITION OF GAS (VOLUME PERCENT) --

S =	.000	N2 =	.490
O2 =	.000	H2 =	.000
CO2=	1.110	CO =	.000
H2O=	.000	H2S=	.000
C 1H 4=	95.370		
C 2H 6=	2.490		
C 3H 8=	.430		
C 4H10=	.060		
C 5H12=	.020		
C 6H14=	.030		

-- FUEL COMPOSITION (WEIGHT PERCENT) --

C =	73.225	O =	2.097
H =	23.868	S =	.000
N =	.810		

** AMBIENT CONDITION **

T AMB.	=	22.4 DEG.C
R.H.	=	60.0 %
WATER IN AIR	=	253.2 KG/H

** FLOW **

INLET. AIR FLOW	=	25232.	KG/H (WET)	19632.	NM3/H (WET)
	=	24978.	KG/H (DRY)	19317.	NM3/H (DRY)
FUEL FLOW	=	449.	KG/H		
STEAM/WATER INJ.	=	225.	KG/H		
EXH. GAS FLOW	=	25905.	KG/H (WET)	20516.	NM3/H (WET)
	=	24470.	KG/H (DRY)	18731.	NM3/H (DRY)

** EXHAUST GAS COMPOSITION **

	WEIGHT %	KG/H	VOLUME %	NM3/H
H2O =	5.54	1435.	8.70	1785.
N2 =	72.83	18867.	73.54	15087.
CO2 =	4.70	1216.	3.02	619.
SO2 =	.00	0.	.00	0.
O2 =	15.69	4066.	13.87	2846.
AR =	1.24	320.	.87	179.

DRY O2 = 15.19 VOLUME %

O2 4%= 2.93 5%= 2.76 15%= 1.03 16%= .86

(3)

MACDILL A.F.B.

** FUEL PROPERTIES **

-- FUEL IS GAS. --
-- COMPOSITION OF GAS (VOLUME PERCENT) --

S =	.000	N2 =	.490
O2 =	.000	H2 =	.000
CO2=	1.110	CO =	.000
H2O=	.000	H2S=	.000
C 1H 4=	95.370		
C 2H 6=	2.490		
C 3H 8=	.430		
C 4H10=	.060		
C 5H12=	.020		
C 6H14=	.030		

-- FUEL COMPOSITION (WEIGHT PERCENT) --

C =	73.225	O =	2.097
H =	23.868	S =	.000
N =	.810		

** AMBIENT CONDITION **

T AMB.	=	22.4 DEG.C
R.H.	=	60.0 %
WATER IN AIR	=	253.1 KG/H

** FLOW **

INLET. AIR FLOW	=	25213.	KG/H	(WET)	19618.	NM3/H (WET)
	=	24960.	KG/H	(DRY)	19303.	NM3/H (DRY)
FUEL FLOW	=	460.	KG/H			
STEAM/WATER INJ.	=	377.	KG/H			
EXH. GAS FLOW	=	26050.	KG/H	(WET)	20706.	NM3/H (WET)
	=	24439.	KG/H	(DRY)	18703.	NM3/H (DRY)

** EXHAUST GAS COMPOSITION **

		WEIGHT %	KG/H	VOLUME %	NM3/H
H2O	=	6.19	1611.	9.68	2003.
N2	=	72.38	18854.	72.81	15076.
CO2	=	4.78	1246.	3.06	634.
SO2	=	.00	0.	.00	0.
O2	=	15.43	4019.	13.59	2814.
AR	=	1.23	320.	.87	179.

DRY O2 = 15.04 VOLUME %

O2 4%= 2.85 5%= 2.69 15%= 1.01 16%= .84

(4)

MACDILL A.F.B.

** FUEL PROPERTIES **

-- FUEL IS OIL. --
-- COMPOSITION OF OIL (WEIGHT PERCENT) --

C	=	86.200
H	=	13.500
S	=	.300
N	=	.000
O	=	.000
H2O	=	.000
ASH	=	.000

-- FUEL COMPOSITION (WEIGHT PERCENT) --

C	=	86.200	O	=	.000
H	=	13.500	S	=	.300
N	=	.000			

** AMBIENT CONDITION **

T AMB.	=	22.4 DEG.C
R.H.	=	60.0 %
WATER IN AIR	=	253.2 KG/H

** FLOW **

INLET. AIR FLOW	=	25225.	KG/H	(WET)	19627.	NM3/H (WET)
	=	24972.	KG/H	(DRY)	19312.	NM3/H (DRY)
FUEL FLOW	=	475.	KG/H			
STEAM/WATER INJ.	=	0.	KG/H			
EXH. GAS FLOW	=	25700.	KG/H	(WET)	19963.	NM3/H (WET)
	=	24074.	KG/H	(DRY)	18956.	NM3/H (DRY)

** EXHAUST GAS COMPOSITION **

		WEIGHT %	KG/H	VOLUME %	NM3/H
H2O	=	3.21	826.	5.14	1027.
N2	=	73.38	18859.	75.46	15080.
CO2	=	5.98	1512.	3.85	770.
SO2	=	.01	3.	.00	1.
O2	=	16.24	4180.	14.64	2926.
AR	=	1.24	320.	.90	179.

DRY O2 = 15.44 VOLUME %

O2 4%= 3.06 5%= 2.88 15%= 1.08 16%= .90

(5)

MACDILL A.F.B.

** FUEL PROPERTIES **

-- FUEL IS OIL. --
-- COMPOSITION OF OIL (WEIGHT PERCENT) --

C	= 86.200
H	= 13.500
S	= .300
N	= .000
O	= .000
H2O	= .000
ASH	= .000

--- FUEL COMPOSITION (WEIGHT PERCENT) --

C	= 86.200	O	= .000
H	= 13.500	S	= .300
N	= .000		

** AMBIENT CONDITION **

T AMB.	=	22.4 DEG.C
R.H.	=	60.0 %
WATER IN AIR	=	253.2 KG/H

** FLOW **

INLET. AIR FLOW	=	25231.	KG/H (WET)	19632.	NM3/H (WET)
	=	24978.	KG/H (DRY)	19317.	NM3/H (DRY)
FUEL FLOW	=	494.	KG/H		
STEAM/WATER INJ.	=	247.	KG/H		
EXH. GAS FLOW	=	25972.	KG/H (WET)	20309.	NM3/H (WET)
	=	24876.	KG/H (DRY)	18946.	NM3/H (DRY)

** EXHAUST GAS COMPOSITION **

		WEIGHT %	KG/H	VOLUME %	NM3/H
H2O	=	4.22	1096.	6.71	1364.
N2	=	72.63	18863.	74.27	15084.
CO2	=	6.05	1572.	3.94	800.
SO2	=	.01	3.	.01	1.
O2	=	15.85	4117.	14.19	2882.
AR	=	1.23	320.	.88	179.

DRY O2 = 15.21 VOLUME %

O2 4%= 2.94 5%= 2.76 15%= 1.04 16%= .86

(6)

MACDILL A.F.B.

** FUEL PROPERTIES **

-- FUEL IS OIL. --
-- COMPOSITION OF OIL (WEIGHT PERCENT) --

C	=	86.200			
H	=	13.500			
S	=	.300			
N	=	.000			
O	=	.000			
H2O	=	.000			
ASH	=	.000			

-- FUEL COMPOSITION (WEIGHT PERCENT) --

C	=	86.200	O	=	.000
H	=	13.500	S	=	.300
N	=	.000			

** AMBIENT CONDITION **

T AMB.	=	22.4	DEG.C
R.H.	=	60.0	%
WATER IN AIR	=	253.2	KG/H

** FLOW **

INLET. AIR FLOW	=	25227.	KG/H	(WET)	19629.	NM3/H	(WET)
	=	24974.	KG/H	(DRY)	19314.	NM3/H	(DRY)
FUEL FLOW	=	505.	KG/H				
STEAM/WATER INJ.	=	404.	KG/H				
EXH. GAS FLOW	=	26136.	KG/H	(WET)	20510.	NM3/H	(WET)
	=	24870.	KG/H	(DRY)	18935.	NM3/H	(DRY)

** EXHAUST GAS COMPOSITION **

		WEIGHT %	KG/H	VOLUME %	NM3/H
H2O	=	4.85	1266.	7.68	1575.
N2	=	72.16	18860.	73.53	15081.
CO2	=	6.15	1607.	3.99	816.
SO2	=	.01	3.	.01	1.
O2	=	15.61	4079.	13.92	2856.
AR	=	1.22	320.	.87	179.

DRY O2 = 15.08 VOLUME %

O2 4%= 2.87 5%= 2.70 15%= 1.01 16%= .84

ATTACHMENT 3

NSPS/EMISSIONS CALCULATIONS

I. NEW SOURCE PERFORMANCE STANDARDS

Per 40 CFR 60.332, the standard for nitrogen oxides for a stationary gas turbine is defined as follows:

$$STD = 0.0075\ (14.4)/Y + F$$

where Y is the fuel rate/kWH (up to a maximum of 14.4) and F is the allowance for fuel-bound nitrogen. With this turbine the fuel rate is in excess of the 14.4 kjoule figure, so the 14.4 maximum number applies. Given a nitrogen content (by weight) in the fuel of 0.489 %, the value of F is 0.005. Without using any water injection, the exhaust gas analysis provided by the manufacturer of the turbine puts the factor for correcting to 15% O_2 at 1.08. Taking all of the preceding into account, the standard for nitrogen oxides emissions is calculated as follows:

$$STD = (0.0075 * (14.4/14.4) + 0.005) * 1.08$$

which works out to 0.0135% by volume, or in terms of ppm:

$$0.0135 * 100/1{,}000{,}000 = 135 \text{ ppm}$$

II. EMISSIONS CALCULATIONS

The emissions calculations were based on the turbine manufacturer's exhaust analysis, taking into account corrections to 15% O_2. The hourly limits displayed in Section III, Part C of the DER application represent a "worst-case" analysis between the emissions on natural gas or #2 fuel oil. The annual totals shown in the same section are the maximum possible combination of emissions from dual fuel operation, the only limit being a maximum of 720 hours per year running on #2 fuel oil. The following formula was used to calculate the mass of the exhaust emissions:

POLLUTANT MASSFLOW = (MW Pollutant/MW Dry Exhaust Gas) * (ppmv @ 15% Volume O_2)/(15% Volume O_2 Correct. Factor * 10^6) * Exhaust Dry Massflow

In order to guarantee compliance with the NSPS standard for NOx of 135 ppmv, the emissions calculations utilized a water injection of 0.5 pound of water per pound of fuel. The guaranteed levels of emissions, as provided by U.S. Turbine (the U.S. distributor for Kawasaki Gas Turbines), can be found in Attachment 2C.

ATTACHMENT 4

POLLUTION CONTROL DEVICES

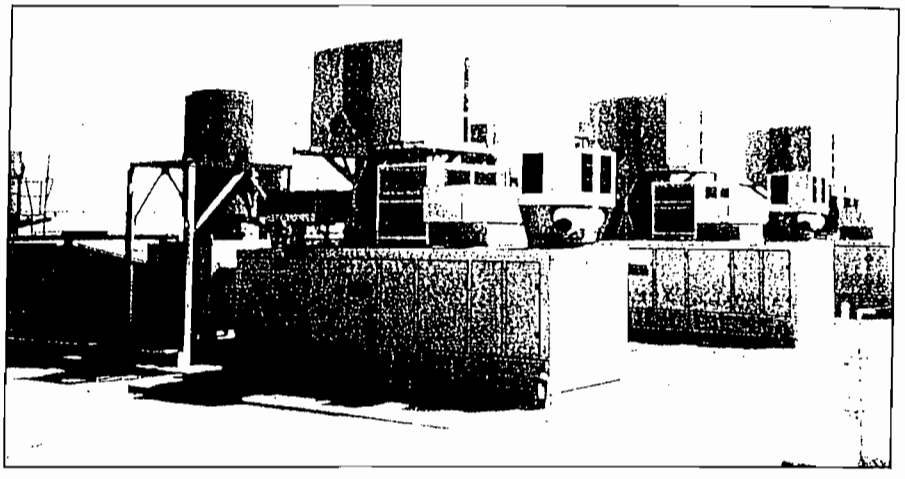
WATER INJECTION FOR NOx ABATEMENT

Although the following article specifically relates to the use of water injection on Allison gas turbines, the technology is applicable to others -- in this case, the Kawasaki M1A-13. Also note that higher water/fuel ratios generate additional hydrocarbon and carbon monoxide pollutants. As a result, a ratio of 0.5 lb water/lb fuel was selected to meet the NSPS while keeping the level of VOC emissions as small as possible.

NO_X Reduction Experience With Allison Model 501-KB And 501-KB5 Gas Turbines

By J. M. Vaught and C. S. Bach

Editor's Note: This article has been extracted from a more extensive paper giving additional background information on emissions reduction. The authors are with the Allison Gas Turbine Div., General Motors Corp, Indianapolis, Indiana, U.S.A.



Installation of Allison 501-KB5 gas turbines with water injection. These turbines were packaged by U. S. Turbine for a 10 MW system.

Water injection has been used for control of oxides of nitrogen on Allison model 501-K engines for several years. The experience with this control method has been positive — the engines have met the stringent control requirements in California and elsewhere.

The injection of water into a combustor reduces the reaction zone temperature and nitric oxide (NO) formation. However, arbitrarily increasing the water rate above a water/fuel ratio near unity increases the system operating expense and generates additional hydrocarbons and carbon monoxide pollutants. This result is not acceptable in most pollution control areas.

The 501-K series engine uses an electronically controlled dual fuel system. The fuel system is modified to inject water through that portion of the nozzle not being used. The major problems associated with water injection are due to either poor water quality or poor water system control and result in turbine and combustor life reduction. Design improvements are being developed that may reduce the sensitivity of the fuel nozzle and combustor to poor water quality and flow control.

As the rate of water injection is increased in cogeneration systems, system costs increase. At the extreme water rates being considered for some projects, system viability is affected. A logical balance between system costs and regulatory requirement is necessary.

The reduction of oxides of nitrogen emissions in a gas turbine is accomplished by controlling the time, temperature, and stoichiometry of the reaction and thus the rate of pollutant formation. Two control methods that have reached the production stage are reverse-flow primary zone cooling and water injection. Reverse-flow cooling was introduced into production on Allison engines over 13 years ago and is now featured on all 501 industrial engines. Water injection, discussed in this presentation, was introduced over eight years ago and is available as an engine option. Both are relatively simple and neither introduces major changes in engine design or durability. Used in combination, these control methods have allowed 501-powered cogeneration packages to meet stringent emissions standards.

Water injection becomes less effective in reducing NO_X as more water is used. For injection rates above W/F = 1, the reduction becomes very small because water injection controls formation of thermal NO but not that of prompt NO.

For this reason, the water/fuel ratio is often limited. Allison has established these values at W/F = 0.8 for natural gas fuel and 1.0 for diesel fuel. In extreme cases in which higher water/fuel ratios are used to meet NO_X control requirements, a catalyst can be installed in the turbine exhaust to oxidize the unburned pollutants.

The 501-KB/KB5 engine is a modular, single-shaft, aero derivative engine. It has a 14-stage axial compressor, a can annular combustor with six individual combustors and a four-stage turbine.

On the 501 engine, the water injection system is integrated with the fuel system, which is a dual fuel design. For natural gas operation, water is injected through the main liquid fuel passage. The fuel system components are Allison-supplied; the water injection system is supplied by the packager.

The water injection system includes a manifold supplied by the packager to introduce water into the gas passage of the fuel nozzles. The manifold must allow incorporation of check valves and orifices. Solenoid shutoff valves are used to direct water to the appropriate passages. Only the highest quality, leak-proof check valves should be used; otherwise, system integrity is jeopardized.

Water control in the water injection system is critical to engine life and durability. The control system must accurately measure both fuel flow and water flow and integrate these flows to produce the proper water-to-fuel ratio. Simply measuring fuel valve position or metering water flow by a fixed orifice results in inaccurate and unsatisfactory water control.

The operation of a dual fuel system is relatively simple. When the engine operates on liquid fuel, only the liquid fuel shutoff valves are open. When the engine is operating on natural gas, the liquid fuel

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shutoff valves are closed, the manifold drain valves are closed, and all other valves are open. Leaving these valves open allows gas taken from downstream of the gas fuel metering valve to purge the liquid fuel passages of the dual fuel nozzle. Flowing gas through the liquid side of the nozzle prevents coking of liquid fuel left in the nozzle and prevents recirculation of combustion products through the fuel nozzle, which can plug the fuel nozzle.

The addition of water changes the basic system operation very little. During natural gas operation, water is injected into the combustor through the liquid main fuel passage. Natural gas is still used to purge the pilot side of the nozzle. When the engine runs on liquid fuel, water flows through the special water manifold, check valves, orifices, and gas passage of the fuel nozzle into the combustor. The 12 check valves in the gas side of the system keep water out of the gas manifold and natural gas out of the water manifold.

Water quality is the most important factor in water injection of the engine. Recognizing this fact, Allison went through several iterations on allowable contaminants and levels. It found that early specifications had to be revised to more stringent levels of control to successfully operate a gas turbine engine with water injection. The current specifications used by Allison is EMS-1200, type III. This specification limits total and dissolved matter and the levels of certain critical compounds.

Water quality control is maintained two ways. Initially, the water out of the conditioner should be sent to a lab for complete analysis. Then throughout engine operation, a conductivity meter should be used to monitor dissolved matter in the water. When the conductivity of the water approaches or reaches the specified limit of 1.0 micro mho/cm, the system should be regenerated. By monitoring conductivity and using it in this manner, the operator has a real-time measure of water quality.

Allison's experience with water injection on the 501-KB and -KB5 engines has been highly successful. It includes almost 200 000 hours of operation of water-injected units and a high time engine with over 24 000 hours. At every installation operating to date, NO_X emission levels have met the specifications.

With the improved emission signature of the 501 engine operating with water injection, some engine distress has been noticed. This includes problems due to poor water quality and problems due to poorly designed, built, or maintained water injection systems. Problems in these two areas have resulted in life reductions in both the turbine and the combustion sections of the engine.

The most extensive problem associated with water injection is fuel nozzle clogging and corrosion. Fuel nozzle distress in a well-designed and well-built water delivery system is directly related to water quality. Allison has determined that when the water contains more contaminants than allowed by the water quality specification (EMS-120D, type III), fuel nozzle distress will occur.

Clogged fuel nozzles will result in overfiring of some combustion liners to maintain the constant average turbine temperature. The life of the vanes behind those combustors will be significantly lower than the design life for the turbine. The corrosive effects of some contaminants on the fuel nozzle and turbine parts further reduce the engine life and increase maintenance and operating costs.

The water system design, implementation, and maintenance are critical to successful water injection. The water system must deliver a balanced water flow to each of the six combustors in the engine and accurately apportion water to the fuel flow. It must also incorporate safeguards against shutting off either fuel or water independently of each other.

Distress associated with problems in the water system is usually seen in the combustion liners. Imbalanced water flow between combustors will result in high pressure temperature differentials between combustors.

The pressure differential between combustion liners results in combustor cross talk. The movement of the flame between liners through the crossover ferrules results in severe burning of the crossover tubes and clamps. Allison's experience has shown that imbalanced flow through the water manifolds is the primary cause of extreme crossover tube burning in water-injected applications.

Several improvements are being released to make the engine less sensitive to deviations in both water quality and water system design, thereby improving engine life.

New combustion liners that incorporate a bolt-on transition and redistributed cooling air in the transition are being incorporated in the engine. These advances solve the problem of combustion liner distress from two different directions.

Most liner distress is found in the transition section of the combustor. When combustors are sent to overhaul facilities to be refurbished, typically the transition is cut off and a new one welded on. The bolt-on transition feature of the new combustion liner has been added to reduce maintenance cost. The transition can be replaced on site, which minimizes engine downtime and reduces the cost of spare parts, since the transition rather than the entire liner is replaced. The redistribution cooling results in significantly lower metal temperatures in the combustion liner transition. The lower metal temperatures result in increased life.

Allison is also qualifying a new family of fuel nozzles with separate water and fuel passages. The new design results in simplified plumbing by eliminating many of the check valves required in the current system. Accompanying these fuel nozzle improvements are new manifolds designed to minimize the pressure differences between fuel nozzles and equalize flow through each nozzle.

New turbine vanes have been designed and are being service evaluated in engines in The Netherlands and the United States. These vanes incorporate improved impingement cooling and thermal barrier coating on the leading edge. These two changes combine to make the turbine vane relatively insensitive to combustor temperature differences.

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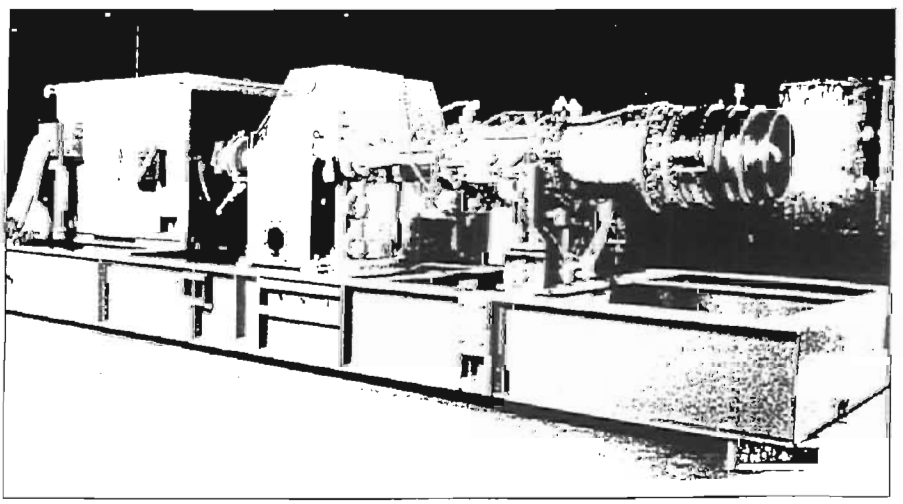


Gas-turbine generator set under assembly. Shown are gas-turbine engine, gear and alternator.

NO_X Reduction Experience . . .

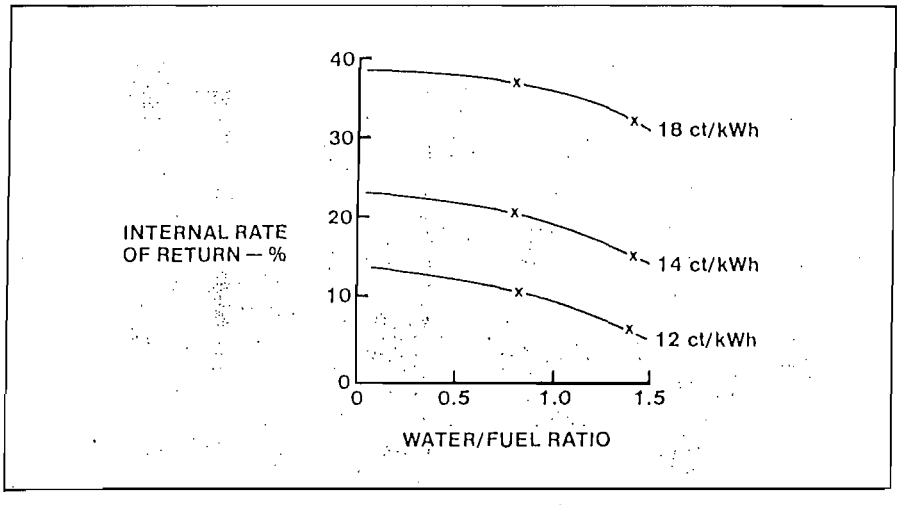
Economic And Regulatory Considerations — While water injection controls oxides of nitrogen, it also imposes an economic penalty that can adversely affect the viability of cogeneration projects. Studies on the economics of California cogeneration projects, particularly those using the 501-KB5 engine, show that the internal rate of return on investment (IRR) will be reduced sharply with increasing water-to-fuel ratios used for NO_X control. At the extreme water-to-fuel ratio of 1.4 to 1, which is required to achieve reduction to 25 ppm NO_X at 15% O_2, the reduction in IRR can be as great as 55%, depending on the fuel price. To reduce the NO_X emissions to 100 g/GJ, the proposed 1990 standards for The Netherlands, would require a water/fuel ratio of 0.5. This would reduce the IRR from 22.8% to 20.8% or by 10%. This example assumes an electricty cost of 14 ct/kWh.

From the environmental control viewpoint, the highest NO_X control measure of effectiveness — cost per ton of NO_X removed — should occur at the maximum achievable water injection rate. This is not the case, however, because the increased water injection rate has little additional influence on NO_X reduction, while the direct operating costs for water and fuel are significantly increased. As a result, the NO_X control measure of effectiveness actually increases with additional water injection at water/fuel ratios near 1.4.

As the rate of water injection increases in cogeneration systems, system costs increase. System viability is affected at the extreme injection rates being considered in California, and the cost effectiveness of NO_X is also increased. A logical balance between system costs and regulatory requirements is needed to provide economically acceptable emission controls. ★

WATER INJECTION RATE — WATER/FUEL	INCREASE IN DIRECT OPERATING COSTS — $/YEAR	REDUCTION IN OXIDES AND NITROGEN — TONS/YEAR	MEASURE OF EFFECTIVENESS — $/TON, NOx REMOVED
0	0	0	—
0.8	320,000	59.3	5396
1.4	549,000	68.5	8015

TOTAL NUMBER OF OPERATING UNITS	23
DUAL FUEL	13
GAS FUEL	9
LIQUID FUEL	1
NUMBER OF UNITS AWAITING START-UP	18
TOTAL OPERATING TIME — HOURS	199,722
HIGH TIME ENGINE — HOURS	24,360



Change in return on investment with various water rates for a 501-KB5 cogeneration system.

ATTACHMENT 5

POLLUTION CONTROL DEVICE EFFICIENCY

WATER INJECTION FOR NOx ABATEMENT

As is illustrated in the table on page 4 of this application, a 0.5 lb water/lb fuel injection rate will reduce the NOx emissions from 56.160 tons per year to 28.968 tons per year. Based on the formula:

Actual Emissions = Potential Emissions * (1 - Efficiency)

the efficiency of this level of water injection as a pollution control technique is 48.44%.

Note, that with this water injection, there is an associated increase in CO emissions from 2.540 tons/year to 3.476 tons/yr; and in VOC's from 1.007 tons/yr to 1.490 tons/year. However, increases of this magnitude in the emissions of these pollutants should not constitute a hazard, as these levels remain relatively low.

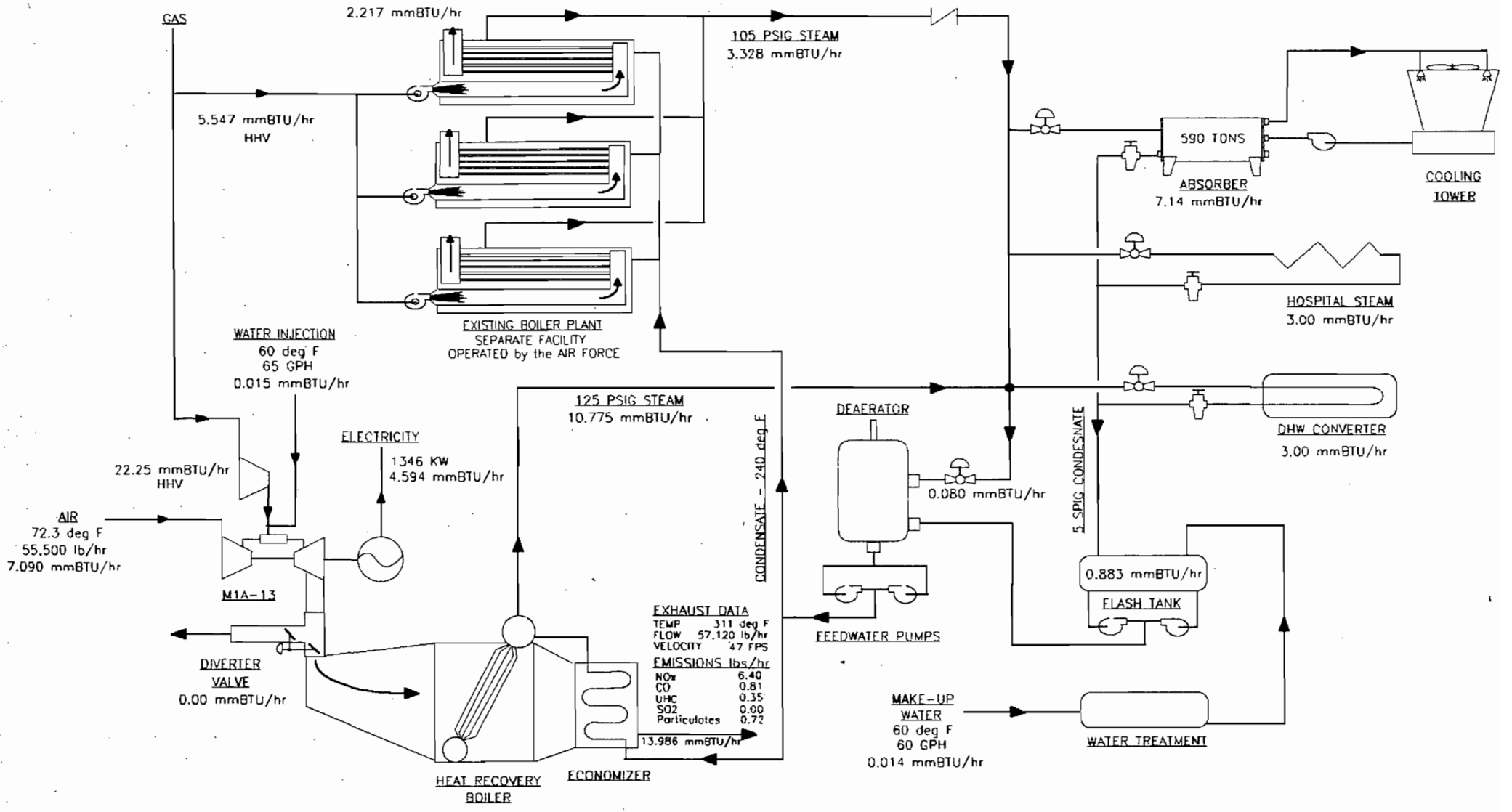
ATTACHMENT 6A

PROCESS FLOW DIAGRAM FOR NATURAL GAS

HEAT BALANCE

BASE HOSPITAL PLANT EMISSIONS – NATURAL GAS

100 % FULL LOAD PRODCUTION – 72.3 degF, 60% RH



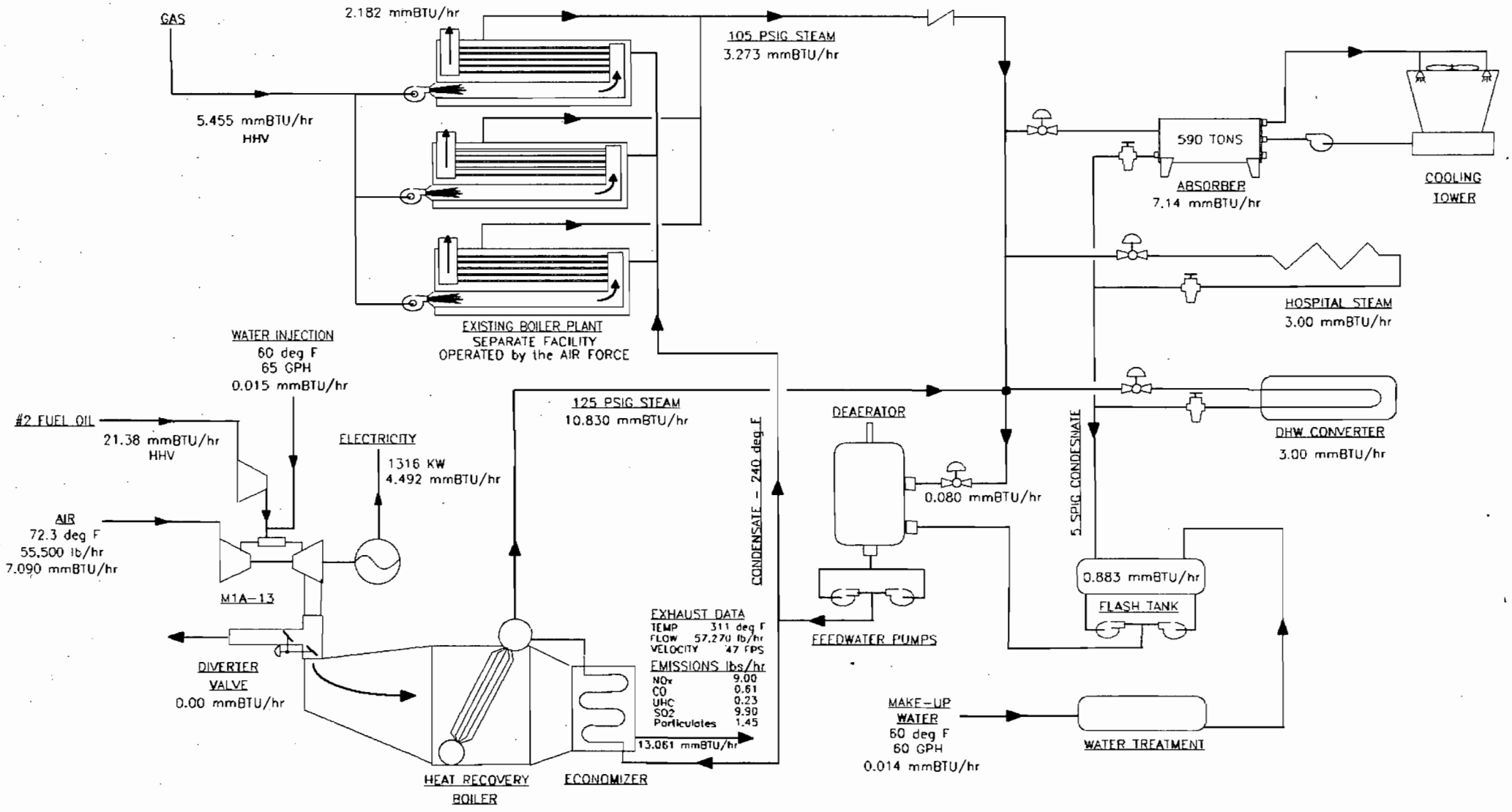
ATTACHMENT 6B

PROCESS FLOW DIAGRAM FOR #2 FUEL OIL

HEAT BALANCE

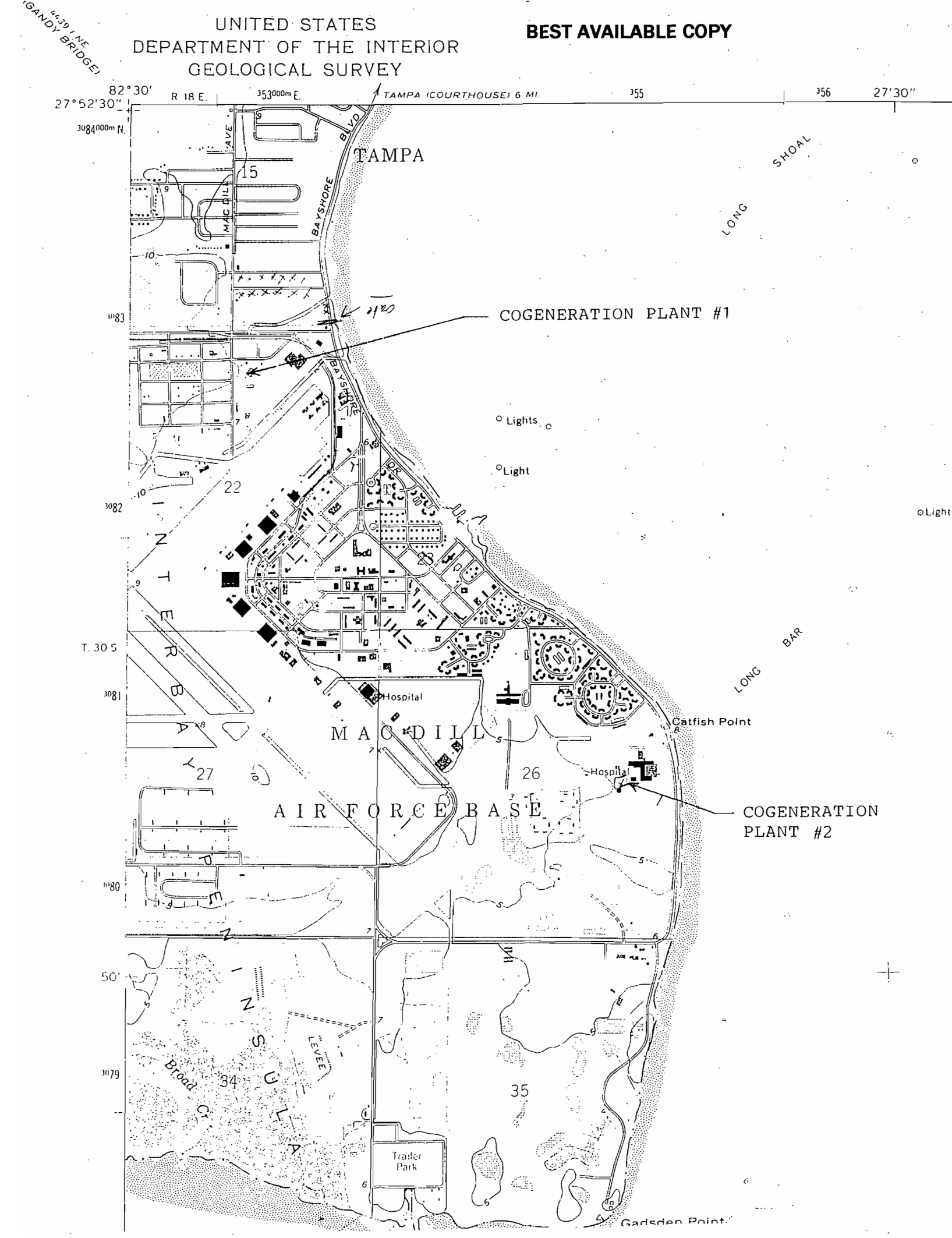
BASE HOSPITAL PLANT EMISSIONS – #2 FUEL OIL

100 % FULL LOAD PRODCUTION – 72.3 degF, 60% RH



ATTACHMENT 7

U.S.G.S. TOPOGRAPHIC MAP WITH FACILITY LOCATION



ATTACHMENT 8

FACILITY LOCATION/PLOT PLAN

LEGAL DESCRIPTION, MAP AND SURVEY

LEGAL DESCRIPTION OF COGENERATION

That certain tract or parcel of land situated in section 26, Township 30S., Range 18E., within MacDill Air Force Base Reservation, Hillsbourgh County, Florida, and more particularly described as follows:

Commencing at Bench Mark FISH, S 8 degrees 24'00" E. 1098.89 feet.; Thence running N 87 degrees 35' 00" W. 808.64 feet; Thence N 2 degrees 45'00" E 27.66 feet to point of beginning; Thence due W 100 feet; Thence due N 70 feet; Thence due E 100 feet; Thence due S 70 feet to point of beginning. Said land containing .16 acres, more or less; Together with the right of ingress and egress thereto.

AFD: 0328R

BEST AVAILABLE COPY

COUNTY: Hillsborough	STAMPING: Bronze Disk	STATION: F1SH	
LOCALITY: MacDill AFB	STAMPING OR MARK: F1SH 1934, 1959	AGENCY (CAST IN MARKS): U.S.C. & G5	ELEVATION (FT.): 4.39
LATITUDE: 27° 51' 41.896N	LONGITUDE: 82° 28' 13.673W	DATUM: N/A	DATUM: MSL
NORTHING – EASTING (FT.): X = 347,952	EASTING – NORTHING (FT.): Y = 1,276,600.12	GRID & ZONE: L-26	ESTABLISHED BY (AGENCY): U.S.C. & G5
NORTHING – EASTING (FT.):	EASTING – NORTHING (FT.):	GRID & ZONE:	DATE: Jun 53 — ORDER:

TO OBTAIN GRID AZIMUTH (ADD) TO THE [illegible] AZIMUTH

TO OBTAIN GRID AZIMUTH (ADD) (SUB) TO THE [illegible] AZIMUTH

OBJECT	AZIMUTH OR DIRECTION (GEODETIC/GRID) MAGNETIC	BACK AZIMUTH	GEOD. DISTANCE (METERS) (FEET)	[illegible] DISTANCE (METERS) (FEET)
F1SH #5	X=347,950 "	Y=1,276,600 "	Reference Marker	

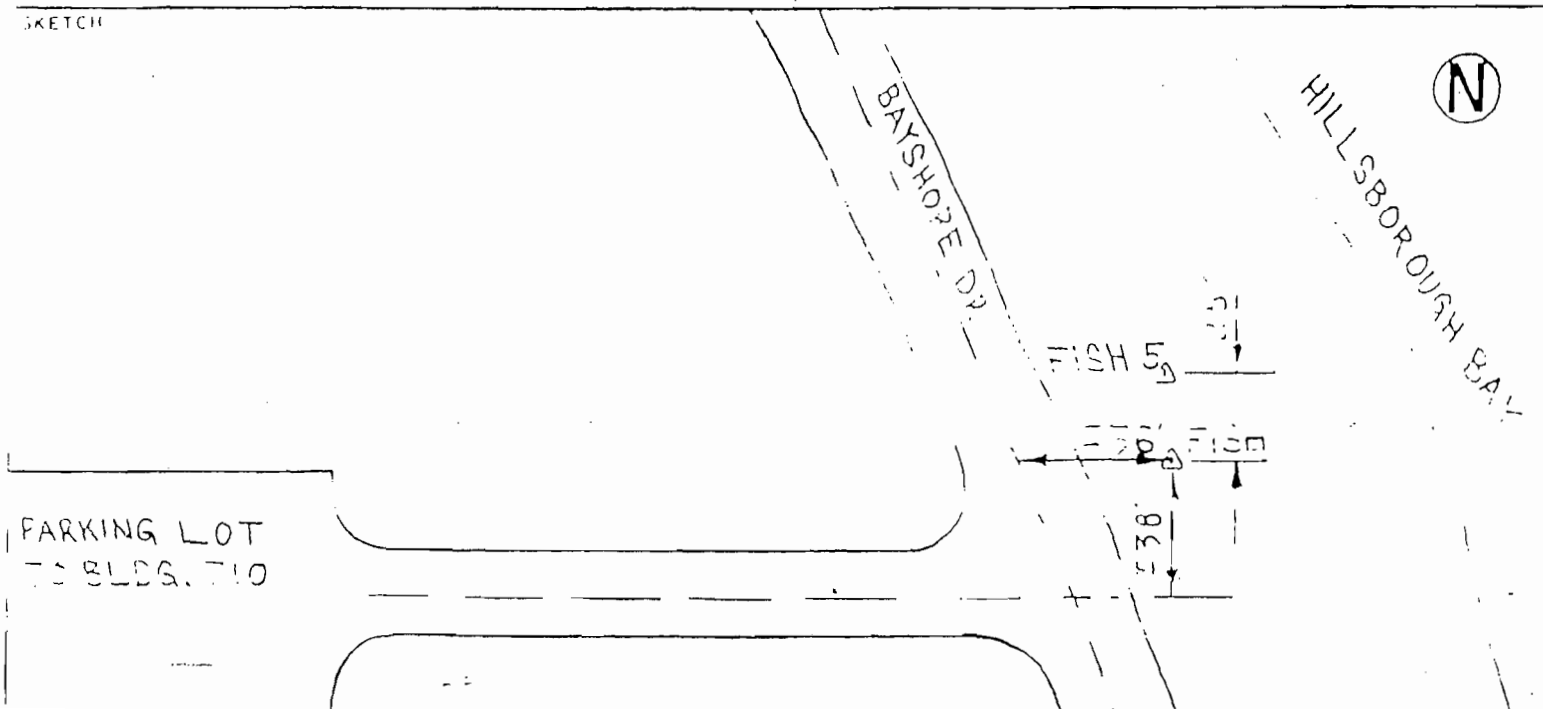
DESCRIPTION & LOCATION

MacDill Air Force Base, ± 36' east center line of Bayshore Drive. ±38' north of centerline of entrance road to parking lot to Bldg 710 (Aerospace Physiology). 25" south of U.S.C. & GS F1SH #5 witness monument.

NOTE: Flush with ground.

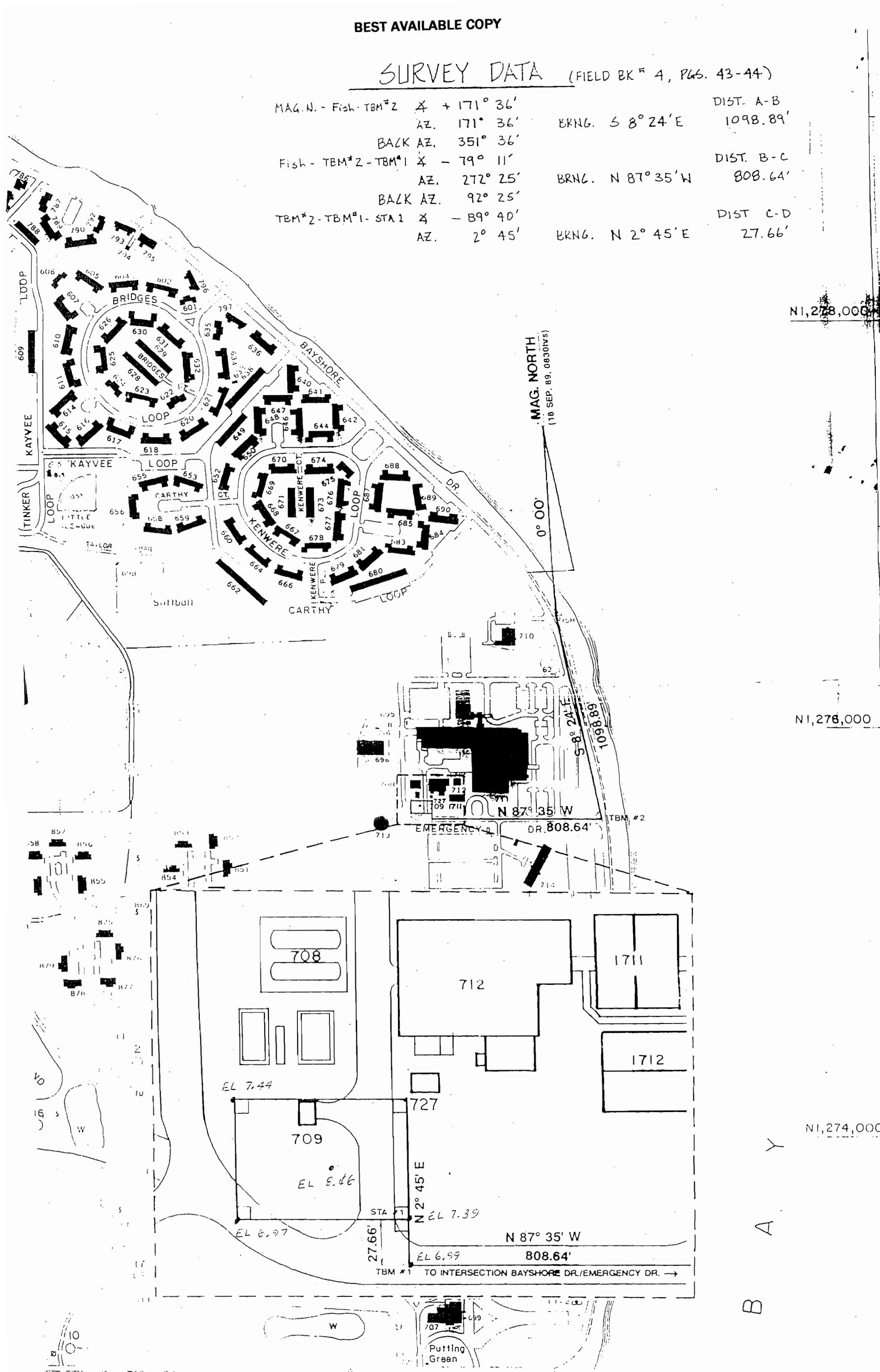
Visited 6 Dec 83 - Good shape.

SKETCH

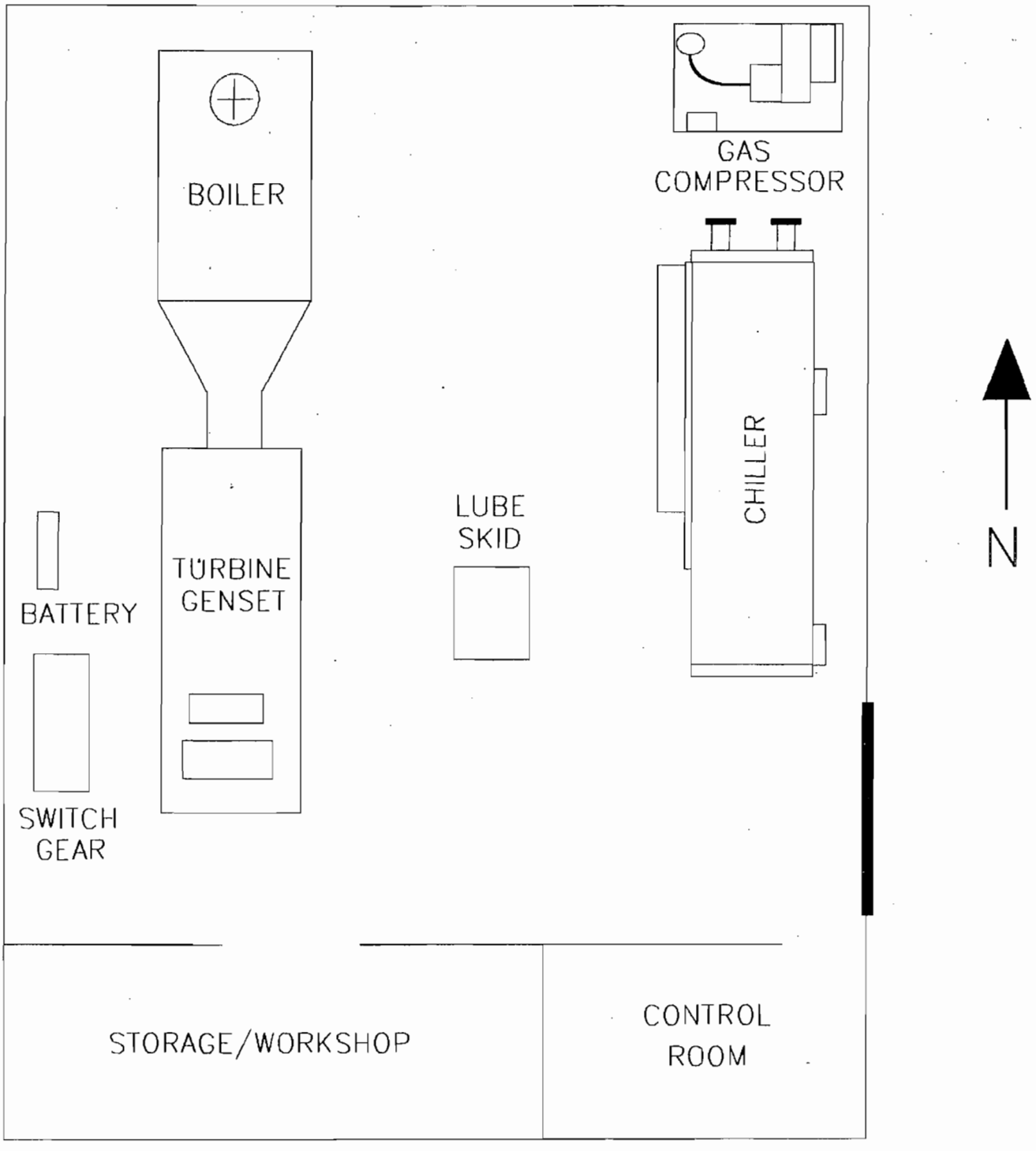


SURVEY DATA (FIELD BK # 4, PGS. 43-44)

MAG. N. - Fish - TBM #2	∠	+ 171° 36′		DIST. A-B
	AZ.	171° 36′	BRNG. S 8° 24′ E	1098.89′
	BACK AZ.	351° 36′		
Fish - TBM #2 - TBM #1	∠	− 79° 11′		DIST. B-C
	AZ.	272° 25′	BRNG. N 87° 35′ W	808.64′
	BACK AZ.	92° 25′		
TBM #2 - TBM #1 - STA 1	∠	− 89° 40′		DIST C-D
	AZ.	2° 45′	BRNG. N 2° 45′ E	27.66′



COGEN PLANT #2 LAYOUT



ATTACHMENT 9

LEASE WITH AIR FORCE

COPY

LEASE NO. TAC 88-NVZR-L-001

SUPPLEMENTAL AGREEMENT NO. 1

THIS SUPPLEMENTAL AGREEMENT entered into this _____ day of _____, 1990, by and between the Secretary of the Air Force and Empire Energy Management Systems, Inc., a corporation organized and existing under the laws of the State of New York with its principal offices located at P. O. Box 6840, Building 970, MacDill Air Force Base, Florida 33608 ("Lessee"), WITNESSETH:

WHEREAS, on or about the 27th day of June, 1988, the Secretary of the Air Force and Empire Systems, Inc., entered into Lease No. TAC 88-NVZR-L-001 ("Lease"), covering certain premises at MacDill Air Force Base, Florida, and a related Utility Service Contract No. F44650-88-C0004 ("Utility Service Contract"); and

WHEREAS, a modification of the Utility Service Contract was issued, effective November 4, 1988, to change the company name on the contract from Empire Systems, Inc., to Empire Energy Management Systems, Inc.; and

WHEREAS, the parties desire to amend the Lease to change the company name on the Lease to correspond with the name now on the Utility Service Contract, increase the leased area and incorporate other agreed upon changes in its terms and conditions;

NOW, THEREFORE, the parties do hereby mutually agree as follows:

1. The Lease is hereby modified in the following particulars, but no others:

a. The name "Empire Energy Management Systems, Inc." is hereby substituted for "Empire Systems, Inc.," in the first paragraph of the introduction to the Lease.

b. The second paragraph of the introduction to the Lease is hereby deleted and the following inserted in its place:

> That the Secretary of the Air Force, by virtue of the authority contained in Title 10, United States Code, Section 2667, having determined that the property hereby leased is not excess property, as defined by 40 U.S.C. 472; is not for the time needed for public use; and the leasing thereof will be advantageous to the United States and in the public interest, and for the consideration hereinafter set forth, hereby leases to the party of the second part, hereinafter designated as the Lessee, for a term of thirty-one and one-third (31 1/3) years, beginning June 10, 1988, and ending October 6, 2019, unless sooner revoked or terminated in accordance with the provisions of this lease, the premises or property described in Exhibit "A-1" and shown on Exhibit "B-1," both attached hereto and made a part hereof, for purposes of construction and operation of a cogeneration system of six (6) to nine (9) megawatts, consisting of two cogeneration plants and all appurtenant facilities to supply electricity, chilled and/or hot water, and steam to MacDill Air Force Base, Florida.

c. The text of Condition 5 is hereby deleted in its entirety and the following inserted in its place:

> The leased premises shall be used solely for the purpose of constructing, erecting, installing, operating and maintaining a cogeneration system of six (6) to nine (9) megawatts, consisting of two cogeneration facilities and all facilities appurtenant thereto. The facilities will be used to supply electricity, chilled and/or hot water, and steam only to MacDill Air Force Base, Florida. The Lessee shall, at no time, sell any electricity, chilled and/or hot water and steam produced by such facilities to any other customer, export any energy from MacDill Air Force Base, or otherwise use the leased premises and any improvements erected thereon for purposes other than those expressly authorized and intended under this lease and the utility service contract identified in Condition 4.

d. The text of Condition 7 is hereby deleted in its entirety and the following inserted in its place:

> a. The Lessee shall, at its own expense and without cost to the Government, in accordance with the utility service contract, cogeneration service specifications, and Lessee's proposal identified in Condition 4 of this lease, construct, erect, install, operate, and maintain on the leased premises a 5-7MW cogeneration plant at Site 1 (one hundred eighty (180) feet by two hundred (200) feet by twenty-five (25) feet high) and a 1-2MW cogeneration plant at Site 2 (seventy (70) feet by one hundred (100) feet by twenty-five (25) feet high), and all facilities appurtenant thereto (hereinafter collectively referred to as "the Facilities"). It is specifically understood that the construction of the improvements herein is a private undertaking and that title to all such improvements shall remain in the Lessee.
>
> (1) The Lessee shall complete the construction of the Facilities within three hundred sixty-five (365) calendar days after its receipt of the Government's written

approval of the construction plans for the project. At the conclusion of that period both cogeneration plants will be fully operational. The Lessee is responsible for and will obtain all necessary environmental, safety and digging permits within this 365-day period.

(2) The Government will, within fifteen (15) days after the Lessee provides written notice to the said officer that all the facilities are complete and ready to begin energy production, inspect the Facilities. The Government will provide to the Lessee, in writing, either approval for operation of the Facilities in accordance with the utility service contract or notice of the actions which must be taken before approval will be granted. Upon approval of the Facilities, the Lessee shall operate the cogeneration plants and appurtenant facilities in accordance with the utility service contract.

(3) The chilled water, hot water, and steam lines will not be constructed or installed above ground.

(4) When sited, the cogeneration facilities will not increase the average day-night noise level (DNL) for either site. The current Air Installation Compatible Use Zone (AICUZ) for MacDill Air Force Base will be used to determine existing DNL values for the leased premises.

b. All construction, utility connections and any other work done in connection with the Facilities, whether on or off MacDill Air Force Base, will be accomplished as the sole responsibility of the Lessee and at the Lessee's expense.

c. The Lessee shall not construct any permanent structure on the leased premises, other than the buildings and improvements constituting part of the Facilities.

d. The Lessee shall not construct any temporary structure or advertising sign on the leased premises or make other modifications, alterations, or additions thereto, or make any alteration in the

external elevation or architectural design of the buildings and improvements, or damage or remove any of the principal walls or timbers thereof, without the prior written consent of the said officer.

e. Subject to Condition 19, title to all improvements placed in or upon the leased premises by the Lessee, including any installed fixtures or lines, shall, during the term of the lease, remain the property of the Lessee, but such improvements shall not be removed, replaced or altered without the prior written approval of the said officer.

e. The text of Condition 16b(1) is hereby deleted and the following inserted in its place: "a standard fire and extended coverage insurance policy or policies on the leased premises to the full insurable value thereof, which provide at a minimum, for the restoration of the property to its condition on the beginning date of this lease without cost to the Government."

f. The text of Condition 19c is hereby deleted and the following inserted in its place: "For purposes of this Condition, the term "property" includes the cogeneration facilities and all appurtenant structures and utility lines erected on the leased premises or appurtenant easements under this lease and the utility service contract identified in Condition 4."

g. The following is hereby substituted as the Lessee's address in Condition 21:

Empire Energy Management Systems, Inc.
Brian Travis, President
P. O. Box 6840, Building 970
MacDill Air Force Base, Florida 33608

h. *Exhibit* "A" to the Lease is hereby replaced by the attached Exhibit "A-1."

i. Exhibit "B" to the Lease is hereby replaced by the attached Exhibit "B-1."

2. The Lessee shall, within one hundred twenty (120) days after execution of this Supplemental Agreement by all parties, submit the following to the Base Commander, MacDill Air Force Base, Florida ("Base Commander"), for review and approval:

a. Building siting plans and exterior building plans and drawings, and detailed drawings and interface specifications to MacDill's utility systems.

b. Evidence of an appropriate site reclamation bond for the construction phase of the project.

c. Evidence that a firm commitment to supply natural gas in the needed quantities has been obtained in writing from an appropriate source.

3. Upon receipt of the items specified above in Paragraph 2, the Air Force will complete its review of the construction plans, drawings and specifications within thirty (30) days in accordance with Condition 8b of the Lease.

4. All other terms and conditions of the Lease shall be and remain the same.

5. The Lessee hereby expressly waives any and all claims against the United States of America for any loss or damage which the Lessee or any stockholder or officer of the Lessee may make with respect to the change in name of the Lessee on the Lease from Empire Systems, Inc., to Empire Energy Management Systems, Inc.; and the Lessee agrees to indemnify, release and hold harmless the United States of America, and its officers, agents and employees, from and against all claims, demands, or actions, liabilities, judgments, costs and attorneys fees arising out of or claimed with respect to the change in name on the Lease.

6. This Supplemental Agreement shall be effective immediately.

7. This Supplemental Agreement and the Lease may be recorded among the land records of Hillsborough County, Florida.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement as of the day and year first above written.

EMPIRE ENERGY MANAGEMENT SYSTEMS, INC.

WITNESSES:

_____

By _____

_____

Title: _____

UNITED STATES OF AMERICA

WITNESSES:

_____

_____

By _____

Title: _____

EXHIBIT A-1

LEGAL DESCRIPTION OF COGENERATION

SITE NO. 1

That certain tract of parcel of land situated in section 22, Township 30S., Range 18E, within MacDill Air Force Base Reservation, Hillsborough County, Florida, and more particularly described as follows:

Commencing at Bench Mark MDF 18, S 63 degrees 13'00" E. 164.38 feet,; Thence running N 89 degrees 17' 00" E. 2588.15 feet; Thence S 00 degrees 49'00" E 659.25 feet to point of beginning; Thence due E 180 feet; Thence due S 240 feet; Thence due W 180 feet; Thence due N 240 feet to point of beginning. Said land containing .99 acres, more or less; Together with the right of ingress and egress thereto.

LEGAL DESCRIPTION OF COGENERATION

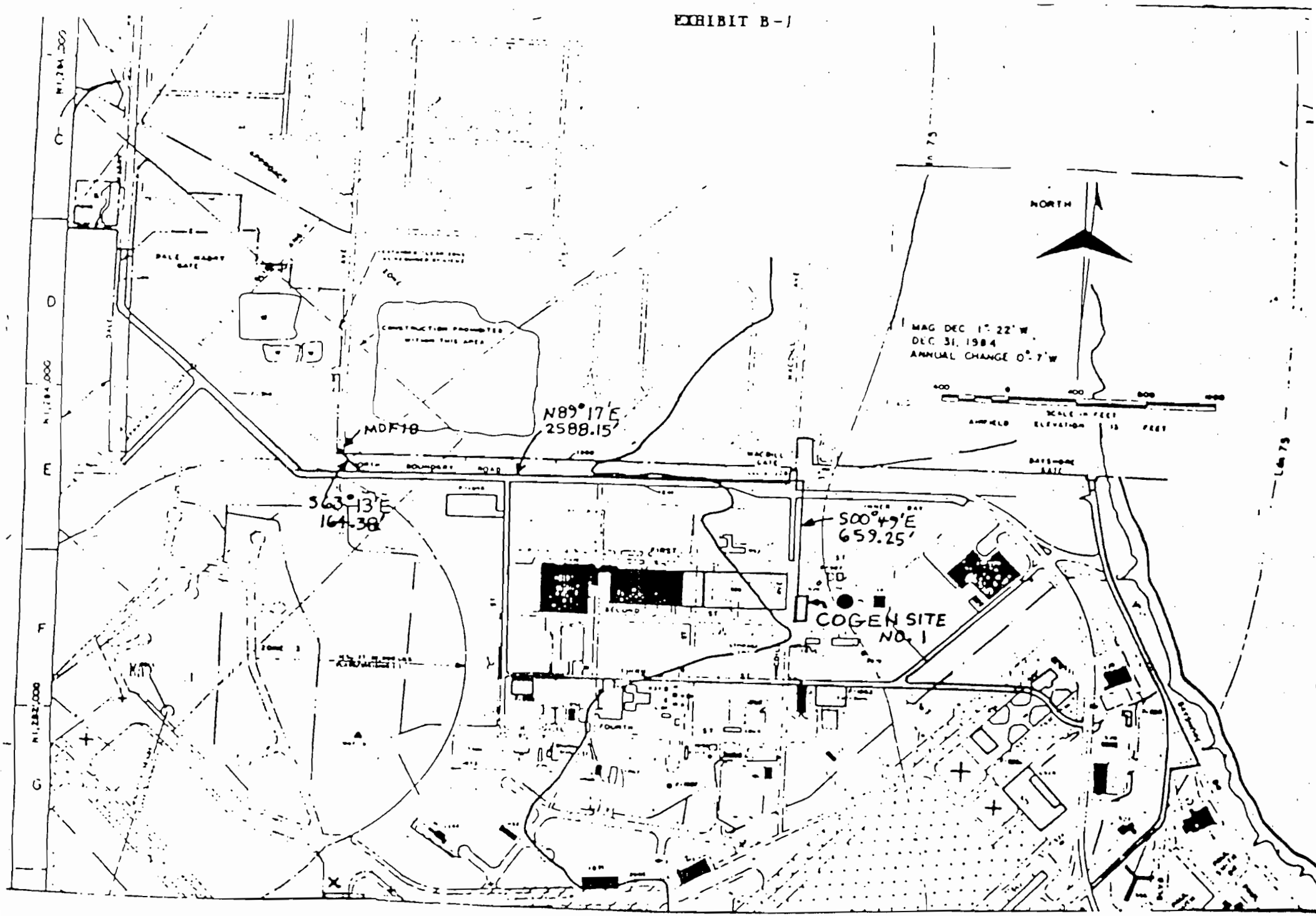
SITE NO. 2

That certain tract or parcel of land situated in section 26, Township 30S., Range 18E., within MacDill Air Force Base Reservation, Hillsborough County, Florida, and more particularly described as follows:

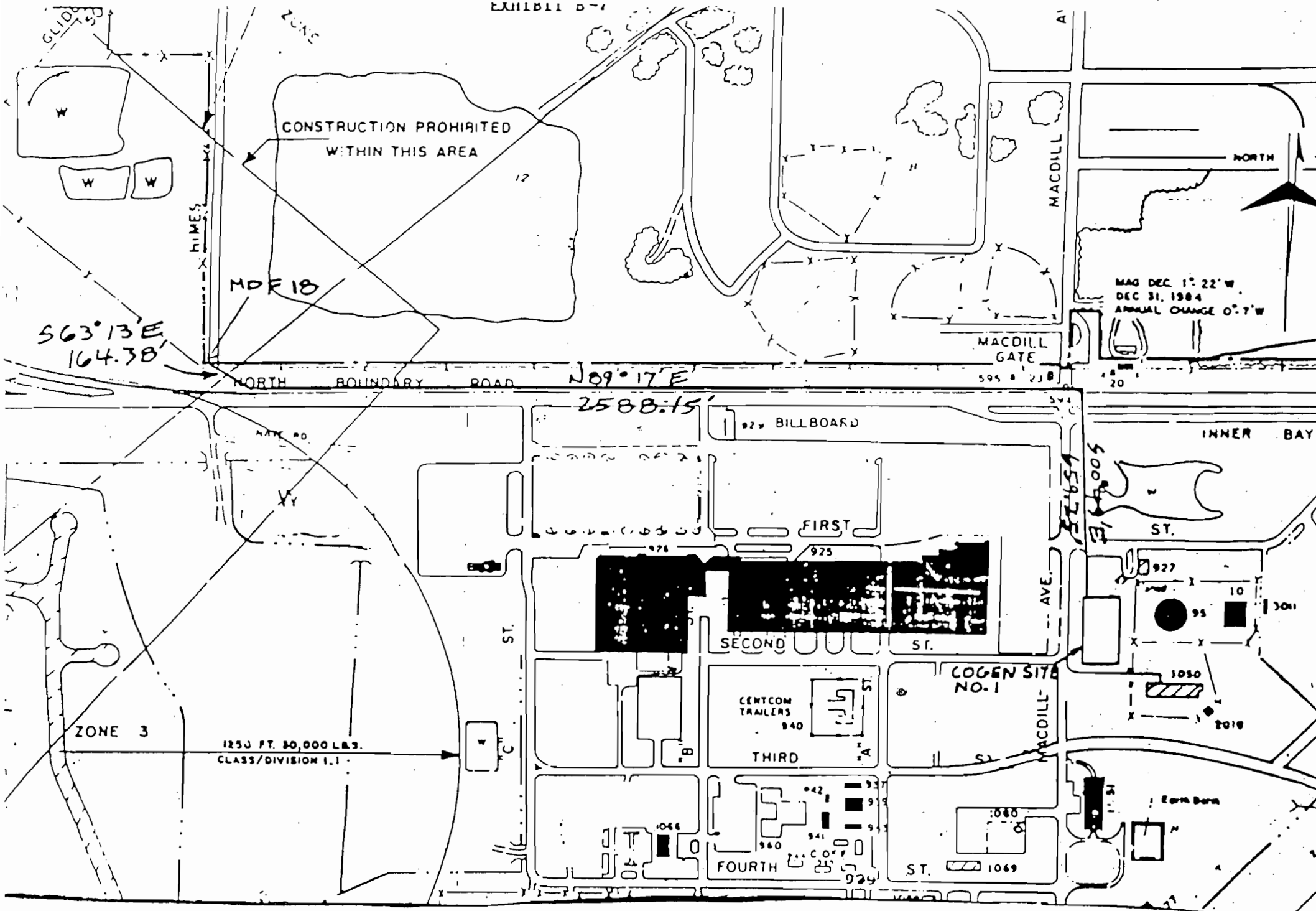
Commencing at Bench Mark FISH, S 8 degrees 24'00" E. ~~10098.89~~ 1009.89 feet; Thence running N 87 degrees 35' 00" W. 808.64 feet; Thence N 2 degrees 45'00" E 27.66 feet to point of beginning; Thence due W 100 feet; Thence due N 70 feet; Thence due E 100 feet; Thence due S 70 feet to point of beginning. Said land containing .16 acres, more or less; Together with the right of ingress and egress thereto.

AFD: 0328R

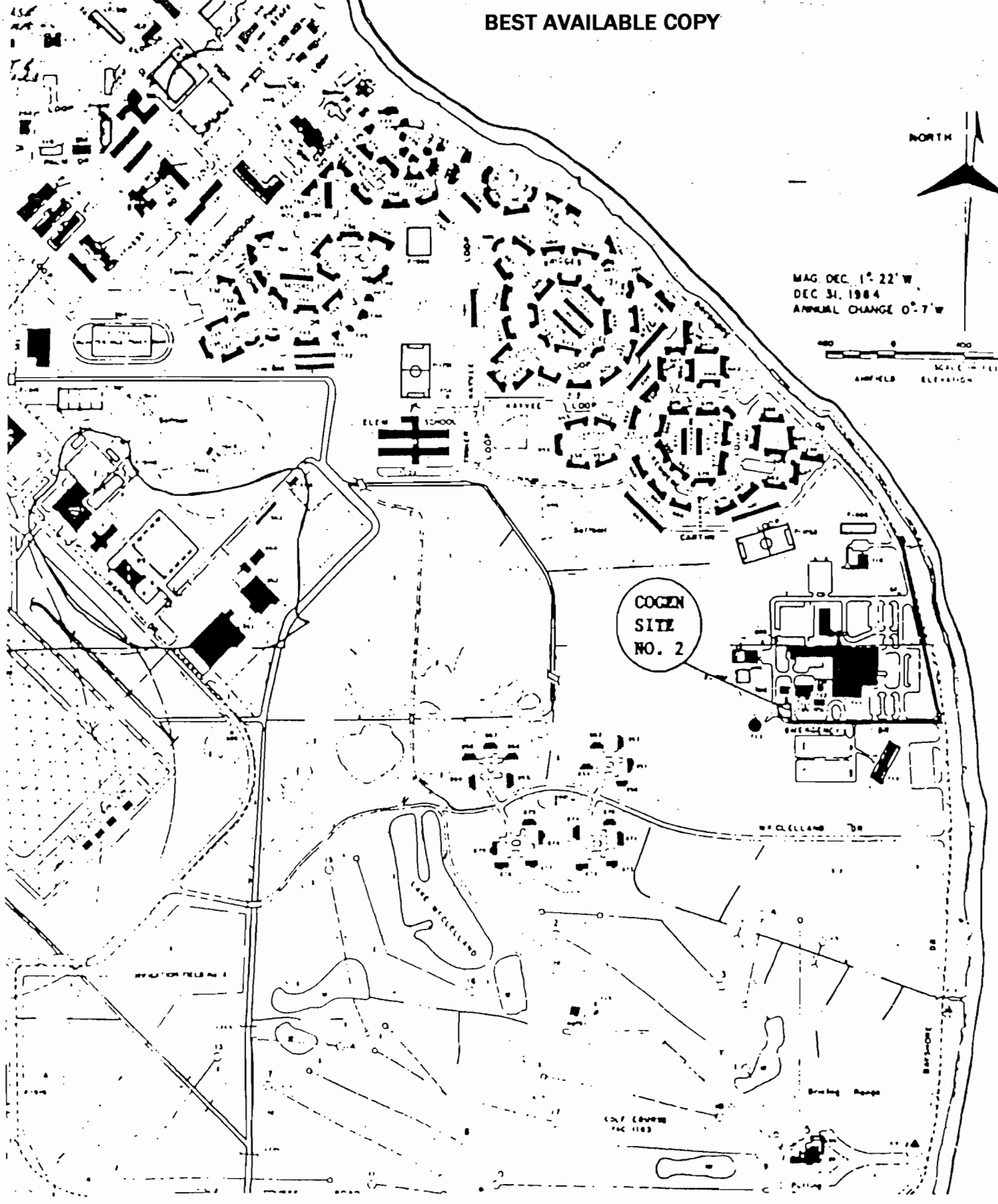
EXHIBIT B-1



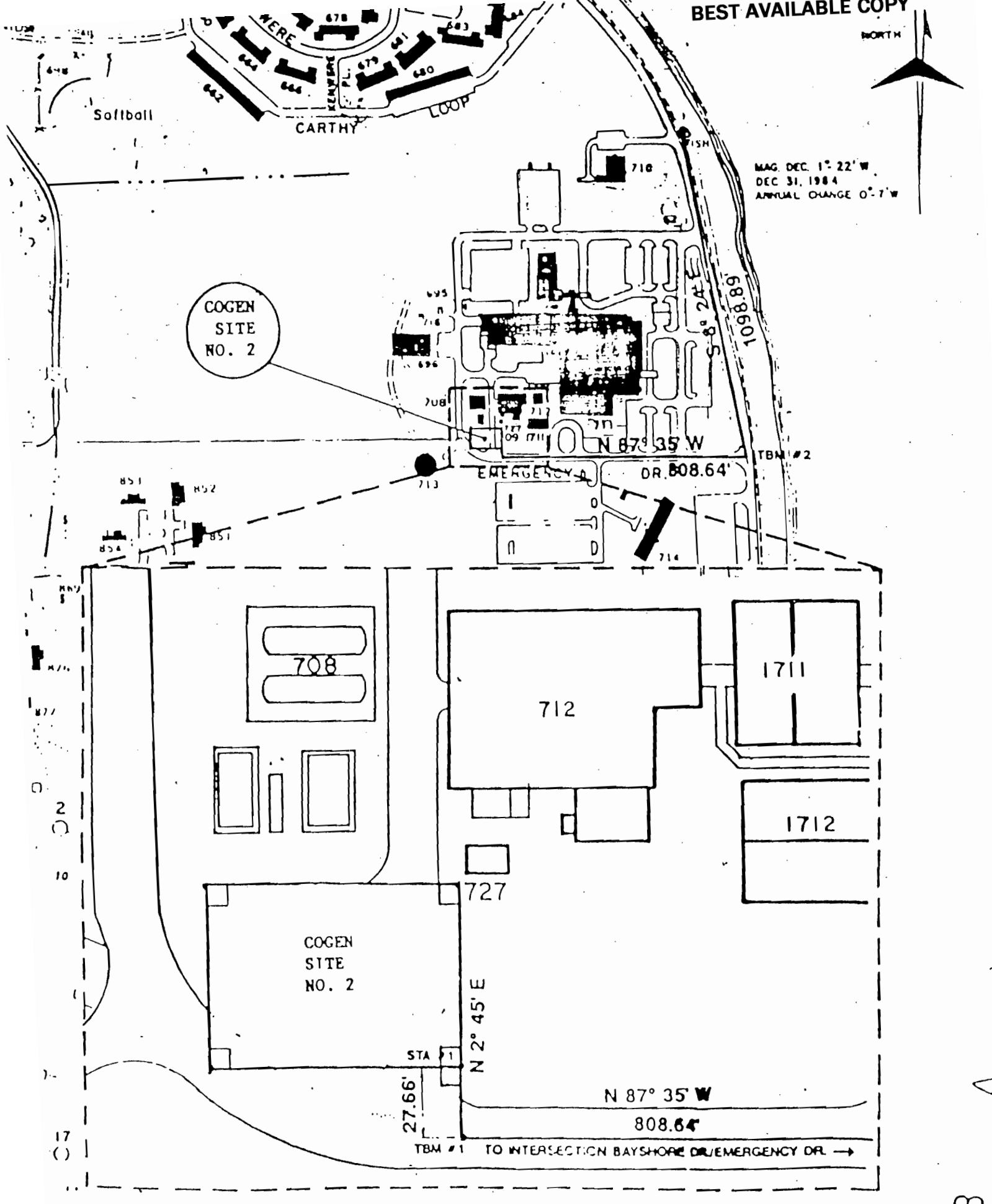
COGENERATION SITE PLAN
(SITE NO. 1)
MACDILL AFB, FL



COGENERATION SITE PLAN
(SITE NO. 1)
MACDILL AFB, FL SCALE = NTS



COGENERATION SITE PLAN
(SITE NO. 2)
MACDILL AFB, FL



COGENERATION SITE PLAN
(SITE NO. 2)
MACDILL AFB, FL SCALE = NTS

DEPARTMENT OF THE AIR FORCE
WASHINGTON DC 20330

OFFICE OF THE ASSISTANT SECRETARY

MEMORANDUM FOR AF/LEE

SUBJECT: Supplemental Agreement No. 1 to Lease for MacDill Air Force Base Contract for Cogeneration Services- ACTION MEMORANDUM

The Contracting Officer, Headquarters Tactical Air Command, is authorized to execute the attached Supplemental Agreement No. 1 to Lease No. TAC 88-NVZR-L-001 pursuant to 10 U.S.C. 2667. No changes are authorized without prior approval of this office.

1 Atch
Supplemental Agreement No. 1