Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

February 18, 2004

CERTIFIED MAIL – Return Receipt Requested

Mr. Alex C. George
V.P. and Responsible Official
Hardee Power Partners (A Subsidiary of Invenergy, LLC)
P.O. Box 111
Tampa, Florida 33601-0111

Re: Title V Air Operation Permit Renewal
DRAFT Permit Project No.: 0490015-005-AV
Hardee Power Station

Dear Mr. George:

On December 22, 2003, the Department received a request for the renewal of the Title V Air Operation Permit. Based on our review of the proposed project, we have determined that the following additional information is needed in order to continue processing this application package. Please provide all assumptions, calculations, and reference material(s), that are used or reflected in any of your responses to the following issues:

A. Regarding NO_X Emissions From CT-1A, CT-1B & CT-2A (EUs 001, 002 & 003).
1. The CAM plan that was submitted for monitoring the water injection system did not include test data to justify the chosen indicator range. Please provide a table of test data that was used to establish the minimum required water-to-fuel ratios at the various load levels. In the table, provide the following information: Date of test, allowable operating rate, tested operating rate, allowable NO_X emission limit, tested NO_X emission limit, recorded water-to-fuel ratio. Include information for each emissions unit and each available test.
2. Please provide detailed information about the monitoring system (Mark IV system?) that controls, and automatically adjusts, the water injection rate. At what point is it set to make an adjustment? Does it adjust the injection rate when the water-to-fuel ratio drops below the minimum required ratio, or does it have a built in safety factor that requires an adjustment to be made at some point above the minimum required ratio? How often is it calibrated? How accurate is it? Etc.
3. What is the maximum water-to-fuel ratio that can be sustained and still meet the allowable CO limit? While CO is not controlled, and therefore not subject to CAM, it is understood that increasing the water-to-fuel ratio causes an increase in CO emissions. Because of this, the CAM plan should also include a maximum water-to-fuel ratio in addition to a minimum water-to-fuel ratio.
4. Please address the above items and provide a revised CAM plan that reflects any necessary changes. With the response, also include an electronic copy (Word format) of the revised CAM plan.

The Department will resume processing this application after receipt of the requested information. If you have any questions regarding this matter, please call Bruce Mitchell at 850/413-9198 or Jonathan Holtom at 850/921-9531.

Sincerely,

for Trina L. Vielhauer
Chief
Bureau of Air Regulation

TLV/bm

cc: Gerald Kissel, DEP - SWD
Byron T. Burrows, P.E., TECO

TECO Power Services
Hardee Power Station
Facility ID #: 0490015

APPENDIX CAM

Compliance Assurance Monitoring Requirements

Compliance Assurance Monitoring Requirements

Pursuant to Rule 62-213.440(1)(b)1.a., F.A.C., the CAM plans that are included in this appendix contain the monitoring requirements necessary to satisfy 40 CFR 64. Conditions 1. – 17. are generic conditions applicable to all emissions units that are subject to the CAM requirements. Specific requirements related to each emissions unit are contained in the attached tables, as submitted by the applicant and approved by the Department.

40 CFR 64.6 Approval of Monitoring.

1. The attached CAM plan(s), as submitted by the applicant, is/are approved for the purposes of satisfying the requirements of 40 CFR 64.3.
[40 CFR 64.6(a)]

2. The attached CAM plan(s) include the following information:
   (i) The indicator(s) to be monitored (such as temperature, pressure drop, emissions, or similar parameter);
   (ii) The means or device to be used to measure the indicator(s) (such as temperature measurement device, visual observation, or CEMS); and
   (iii) The performance requirements established to satisfy 40 CFR 64.3(b) or (d), as applicable.
[40 CFR 64.6(c)(1)]

3. The attached CAM plan(s) describe the means by which the owner or operator will define an exceedance of the permitted limits or an excursion from the stated indicator ranges and averaging periods for purposes of responding to (see **CAM Conditions 5. - 9.)** and reporting exceedances or excursions (see **CAM Conditions 10. – 14.**).
[40 CFR 64.6(c)(2)]

4. The permittee is required to conduct the monitoring specified in the attached CAM plan(s) and shall fulfill the obligations specified in the conditions below (see **CAM Conditions 5. - 17.**).
[40 CFR 64.6(c)(3)]

40 CFR 64.7 Operation of Approved Monitoring.

5. Commencement of operation. The owner or operator shall conduct the monitoring required under this appendix upon the effective date of this Title V permit.
[40 CFR 64.7(a)]

6. Proper maintenance. At all times, the owner or operator shall maintain the monitoring, including but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.
[40 CFR 64.7(b)]

7. Continued operation. Except for, as applicable, monitoring malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), the owner or operator shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used for purposes of this part, including data averages and calculations, or fulfilling a minimum data availability requirement, if applicable. The owner or operator shall use all the data collected during all other periods in assessing the

operation of the control device and associated control system. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.
[40 CFR 64.7(c)]

8. Response to excursions or exceedances.
   a. Upon detecting an excursion or exceedance, the owner or operator shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance (other than those caused by excused startup or shutdown conditions, if allowed by this permit). Such actions may include initial inspection and evaluation, recording that operations returned to normal without operator action (such as through response by a computerized distribution control system), or any necessary follow-up actions to return operation to within the indicator range, designated condition, or below the applicable emission limitation or standard, as applicable.
   b. Determination of whether the owner or operator has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include but is not limited to, monitoring results, review of operation and maintenance procedures and records, and inspection of the control device, associated capture system, and the process.
[40 CFR 64.7(d)(1) & (2)]

9. Documentation of need for improved monitoring. If the owner or operator identifies a failure to achieve compliance with an emission limitation or standard for which the approved monitoring did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges or designated conditions, the owner or operator shall promptly notify the permitting authority and, if necessary, submit a proposed modification to the Title V permit to address the necessary monitoring changes. Such a modification may include, but is not limited to, reestablishing indicator ranges or designated conditions, modifying the frequency of conducting monitoring and collecting data, or the monitoring of additional parameters.
[40 CFR 64.7(e)]

40 CFR 64.8 Quality Improvement Plan (QIP) Requirements.

10. Based on the results of a determination made under **CAM Condition 8.a.**, above, the permitting authority may require the owner or operator to develop and implement a QIP. Consistent with **CAM Condition 4.**, an accumulation of exceedances or excursions exceeding 5 percent duration of a pollutant-specific emissions unit's operating time for a reporting period, may require the implementation of a QIP. The threshold may be set at a higher or lower percent or may rely on other criteria for purposes of indicating whether a pollutant-specific emissions unit is being maintained and operated in a manner consistent with good air pollution control practices.
[40 CFR 64.8(a)]

11. Elements of a QIP:
   a. The owner or operator shall maintain a written QIP, if required, and have it available for inspection.
   b. The plan initially shall include procedures for evaluating the control performance problems and, based on the results of the evaluation procedures, the owner or operator shall modify the plan to include procedures for conducting one or more of the following actions, as appropriate:

(i) Improved preventive maintenance practices.
(ii) Process operation changes.
(iii) Appropriate improvements to control methods.
(iv) Other steps appropriate to correct control performance.
(v) More frequent or improved monitoring (only in conjunction with one or more steps under **CAM Condition 11.b(i)** through **(iv)**, above).

[40 CFR 64.8(b)]

12. If a QIP is required, the owner or operator shall develop and implement a QIP as expeditiously as practicable and shall notify the permitting authority if the period for completing the improvements contained in the QIP exceeds 180 days from the date on which the need to implement the QIP was determined.

[40 CFR 64.8(c)]

13. Following implementation of a QIP, upon any subsequent determination pursuant to **CAM Condition 8.b.**, the permitting authority may require that an owner or operator make reasonable changes to the QIP if the QIP is found to have:
a. Failed to address the cause of the control device performance problems; or
b. Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions.

[40 CFR 64.8(d)]

14. Implementation of a QIP shall not excuse the owner or operator of a source from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act.

[40 CFR 64.8(e)]

40 CFR 64.9 Reporting And Recordkeeping Requirements.

15. General reporting requirements.
a. On and after the date specified in **CAM Condition 5.** by which the owner or operator must use monitoring that meets the requirements of this appendix, the owner or operator shall submit monitoring reports semi-annually to the permitting authority in accordance with Rule 62-213.440(1)(b)3.a., F.A.C.
b. A report for monitoring under this part shall include, at a minimum, the information required under Rule 62-213.440(1)(b)3.a., F.A.C., and the following information, as applicable:
(i) Summary information on the number, duration and cause (including unknown cause, if applicable) of excursions or exceedances, as applicable, and the corrective actions taken;
(ii) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other daily calibration checks, if applicable); and
(iii) A description of the actions taken to implement a QIP during the reporting period as specified in **CAM Conditions 10.** through **14.** Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions or exceedances occurring.

[40 CFR 64.9(a)]

16. General recordkeeping requirements.
a. The owner or operator shall comply with the recordkeeping requirements specified in Rule 62-213.440(1)(b)2., F.A.C. The owner or operator shall maintain records of monitoring data,

monitor performance data, corrective actions taken, any written quality improvement plan required pursuant to **CAM Conditions 10.** through **14.** and any activities undertaken to implement a quality improvement plan, and other supporting information required to be maintained under this part (such as data used to document the adequacy of monitoring, or records of monitoring maintenance or corrective actions).

b. Instead of paper records, the owner or operator may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements.

[40 CFR 64.9(b)]

40 CFR 64.10 Savings Provisions.

17. It should be noted that nothing in this appendix shall:

a. Excuse the owner or operator of a source from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act. The requirements of this appendix shall not be used to justify the approval of monitoring less stringent than the monitoring which is required under separate legal authority and are not intended to establish minimum requirements for the purpose of determining the monitoring to be imposed under separate authority under the Act, including monitoring in permits issued pursuant to title I of the Act. The purpose of this part is to require, as part of the issuance of a permit under Title V of the Act, improved or new monitoring at those emissions units where monitoring requirements do not exist or are inadequate to meet the requirements of this part.

b. Restrict or abrogate the authority of the Administrator or the permitting authority to impose additional or more stringent monitoring, recordkeeping, testing, or reporting requirements on any owner or operator of a source under any provision of the Act, including but not limited to sections 114(a)(1) and 504(b), or state law, as applicable.

c. Restrict or abrogate the authority of the Administrator or permitting authority to take any enforcement action under the Act for any violation of an applicable requirement or of any person to take action under section 304 of the Act.

[40 CFR 64.10]

Hardee Power Station

Emissions Units -001, -002 & -003

Natural Gas and Oil-Fired Combustion Turbines
NO_X Emissions Controlled By Water Injection

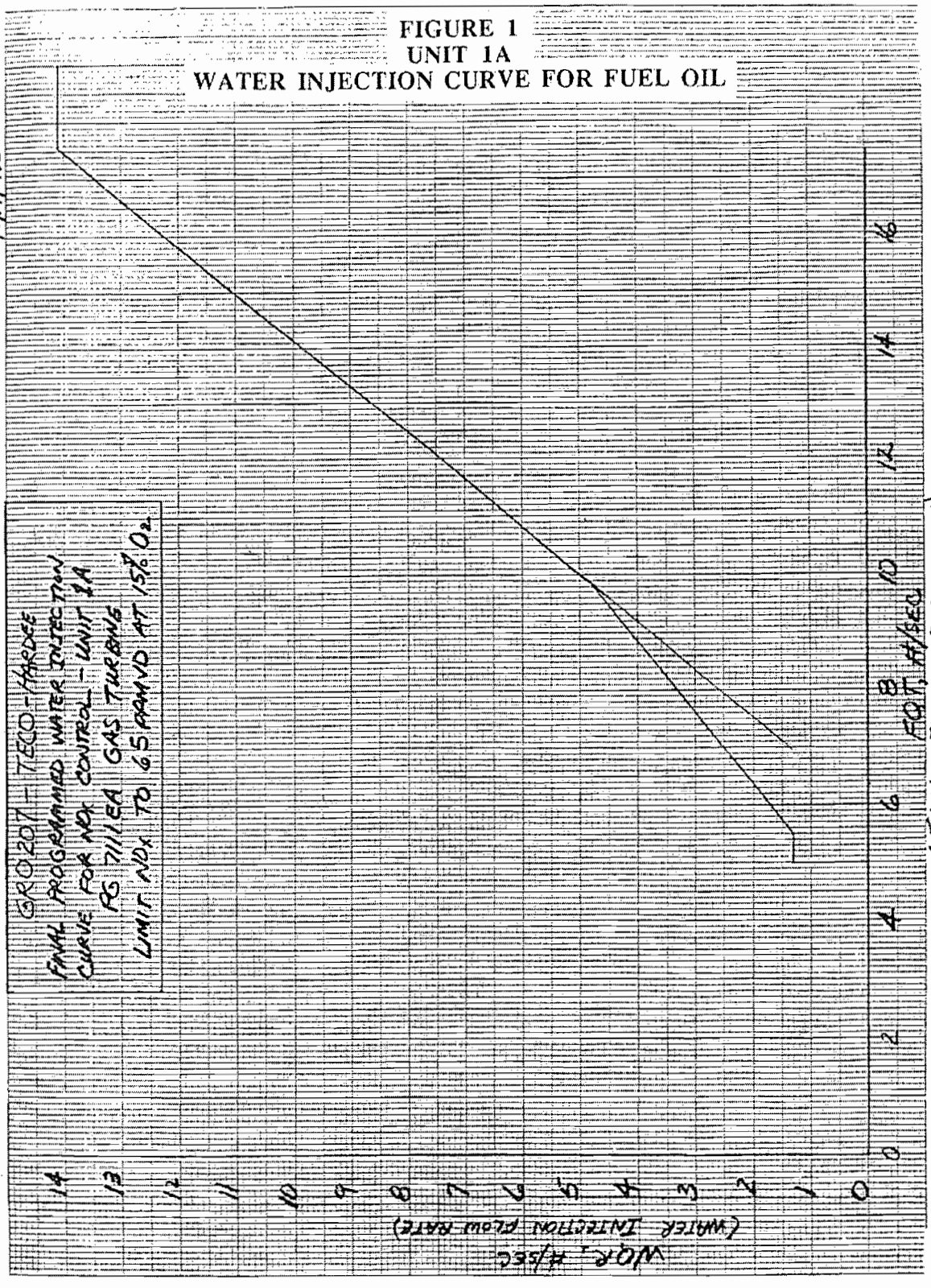
Table 1. Monitoring Approach

		Compliance Indicator
I.	Indicator	Water-to-fuel ratio.
	Measurement Approach	Continuous Monitoring System measuring water injection rate, fuel consumption, and water-to-fuel ratio.
II.	Indicator Range	An excursion is defined as any 1-minute average that the water-to-fuel ratio falls below the level indicated by the heat input curves shown in figures 1 – 6 (typical target values for different load percentages are shown in Table 2), below. If there is a problem with fuel or water flow that causes the actual ratio to fall below the target during any 1-minute averaging period, an alarm notifies the control room staff of the problem. Since the data is monitored in 1-minute averages and the compliance standard is based on 1-hour averages, the alarms allow the operating staff to investigate the cause and take corrective action prior to having a non-compliant situation.
III.	Performance Criteria	
	A. Data Representativeness	The Mark IV combustion turbine control system continuously monitors the fuel flow rate and sends a signal to the water flow control valve to adjust the flow to meet the target ratio. The target ratio is calculated by the Mark IV based on algorithms programmed into the system to account for varying ambient conditions relevant to proper control.
	B. Verification of Operational Status	Annual compliance testing and reestablishment of the water-to-fuel ratio if indicated.
	C. QA/QC Practices and Criteria	Operate and maintain the Mark IV combustion turbine control system according to manufacturer's specifications. All metering equipment, including transmitters, are calibrated annually and meet or exceed the minimum regulatory requirement of 5% accuracy..
	D. Monitoring Frequency	Continuous.
	E. Data Collection Procedures	The Mark IV combustion turbine control system continuously monitors the fuel flow rate and sends a signal to the water flow control valve to adjust the flow to meet the target ratio. The target ratio is calculated by the Mark IV based on algorithms programmed into the system to account for varying ambient conditions relevant to proper control.
	F. Averaging Period	1 minute.

Table 2. Typical Target Values for Water-to-Fuel Ratio

Load, percent	Water-to-Fuel Ratio Target Value When Firing Natural Gas			Water-to-Fuel Ratio Target Value When Firing Distillate Fuel Oil		
	CT-1A	CT-1B	CT-2A	CT-1A	CT-1B	CT-2A
50	0.45	0.43	0.31	0.55	0.36	0.37
75	0.58	0.56	0.50	0.60	0.40	0.40
90	0.66	0.64	0.59	0.65	0.52	0.55
100	0.71	0.69	0.69	0.69	0.63	0.68

FIGURE 1
UNIT 1A
WATER INJECTION CURVE FOR FUEL OIL



10/7/92

FIGURE 2
UNIT 1A
WATER INJECTION CURVE FOR NATURAL GAS

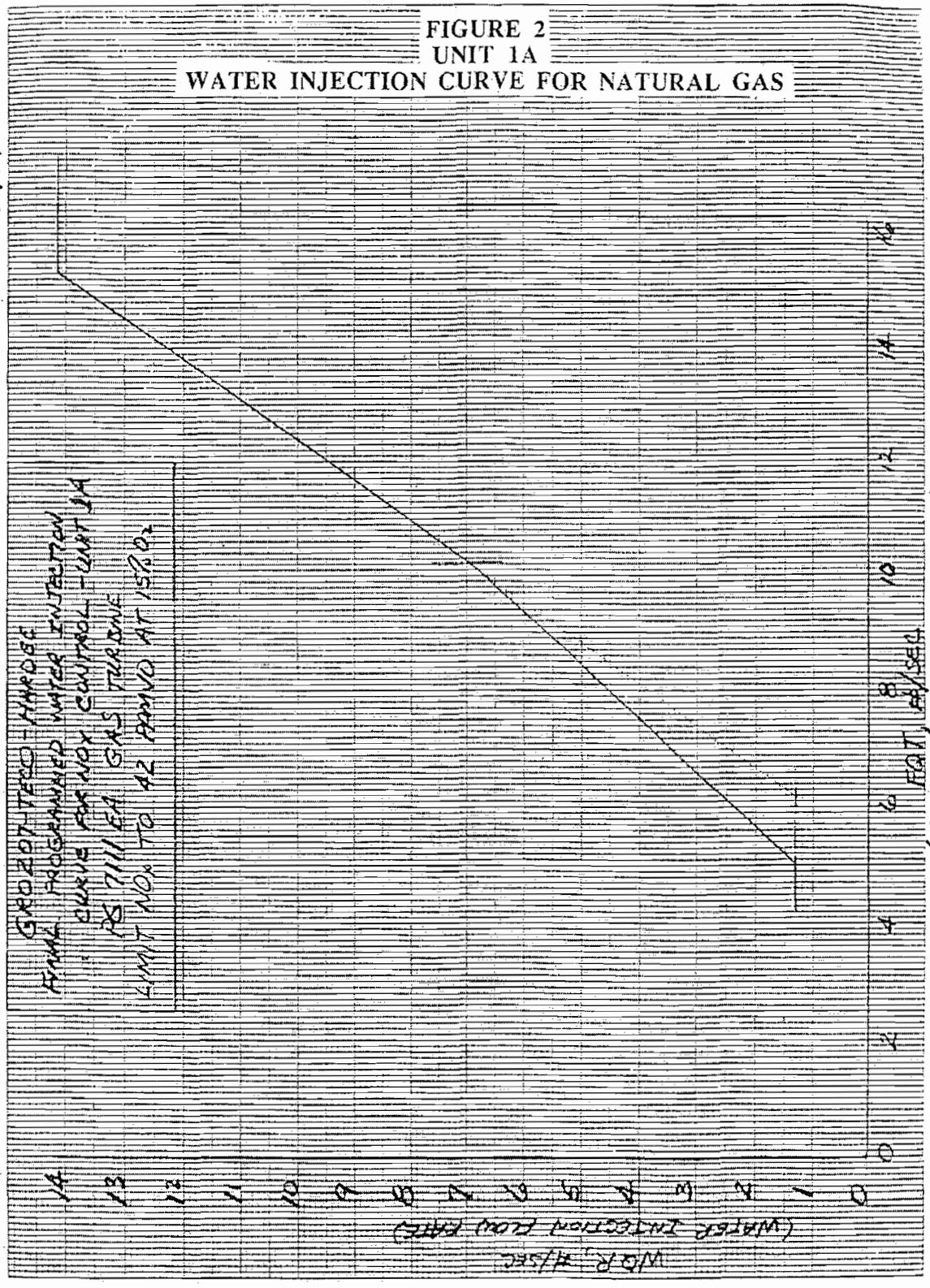


FIGURE 3
UNIT 1B
WATER INJECTION CURVE FOR FUEL OIL

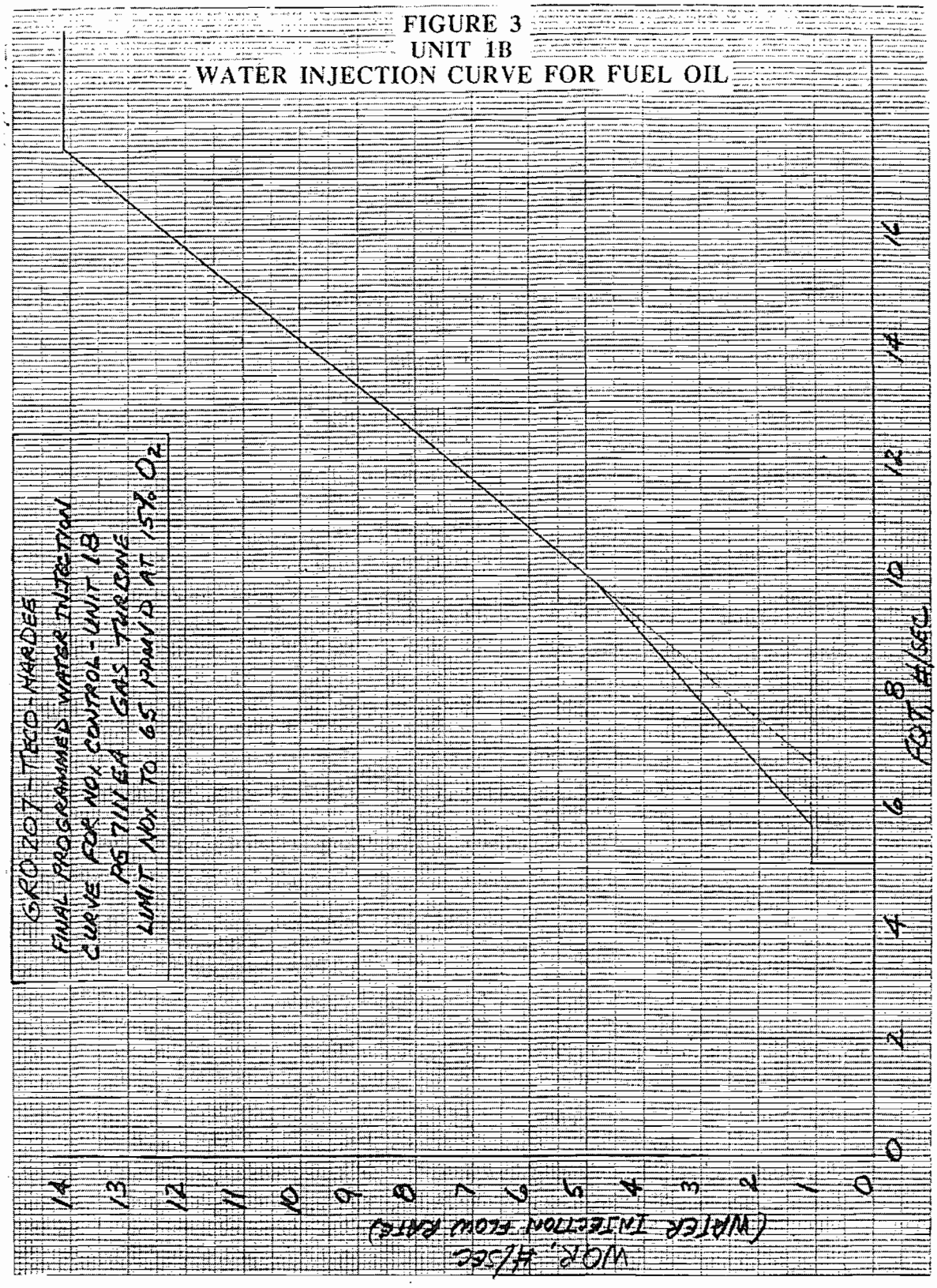


FIGURE 4
UNIT 1B
WATER INJECTION CURVE FOR NATURAL GAS

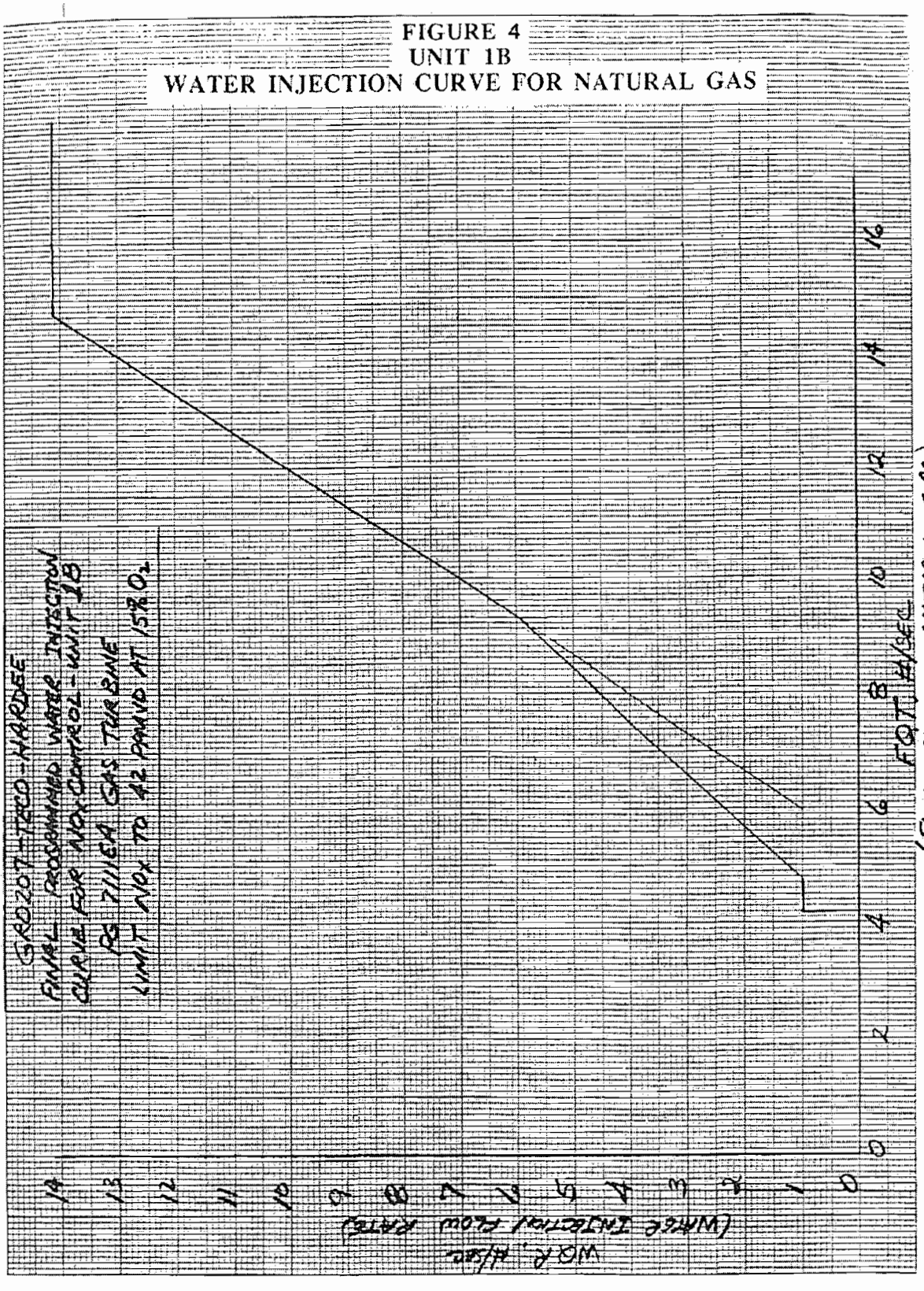


FIGURE 5
UNIT 2A
WATER INJECTION CURVE FOR FUEL OIL

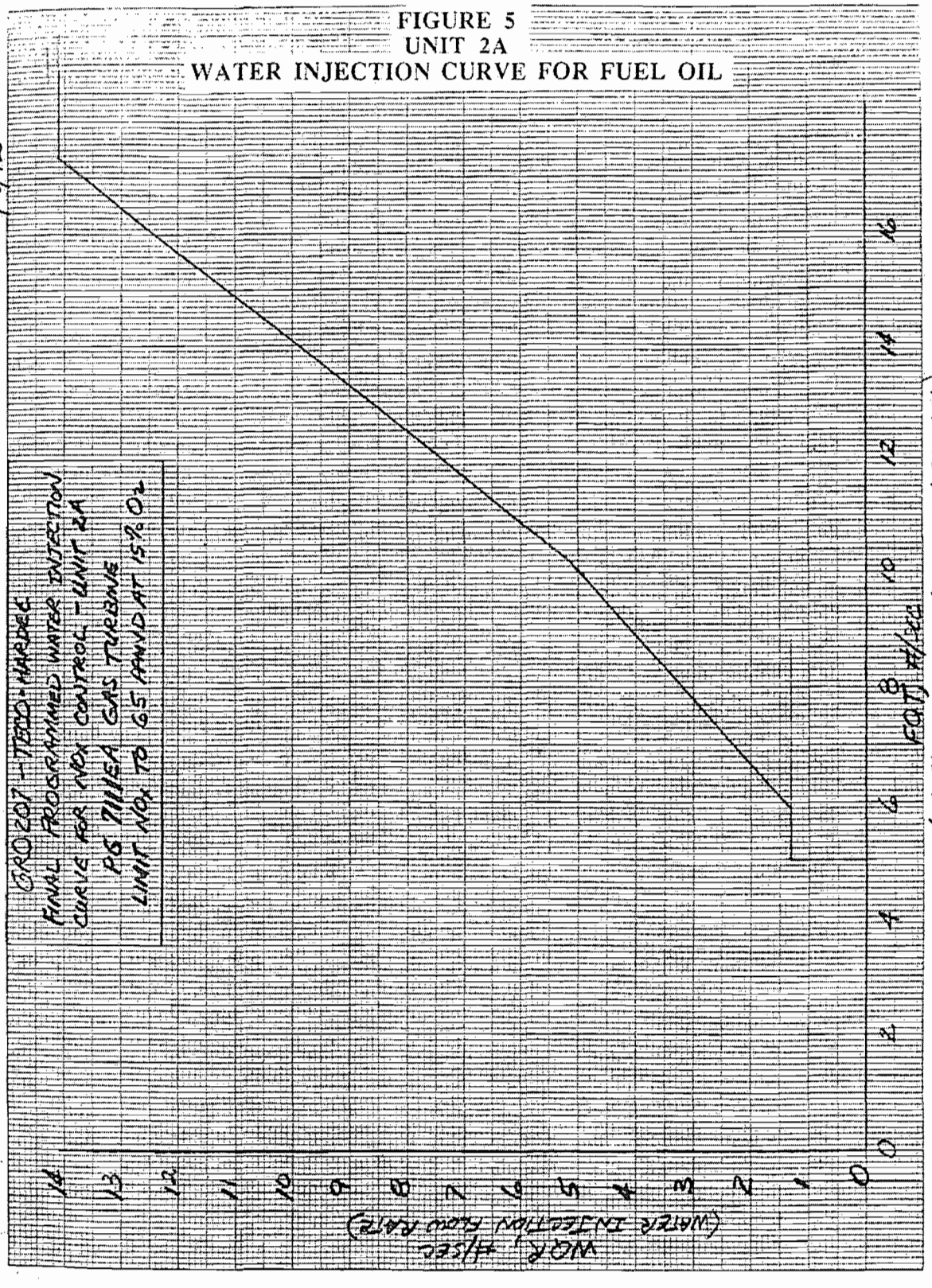
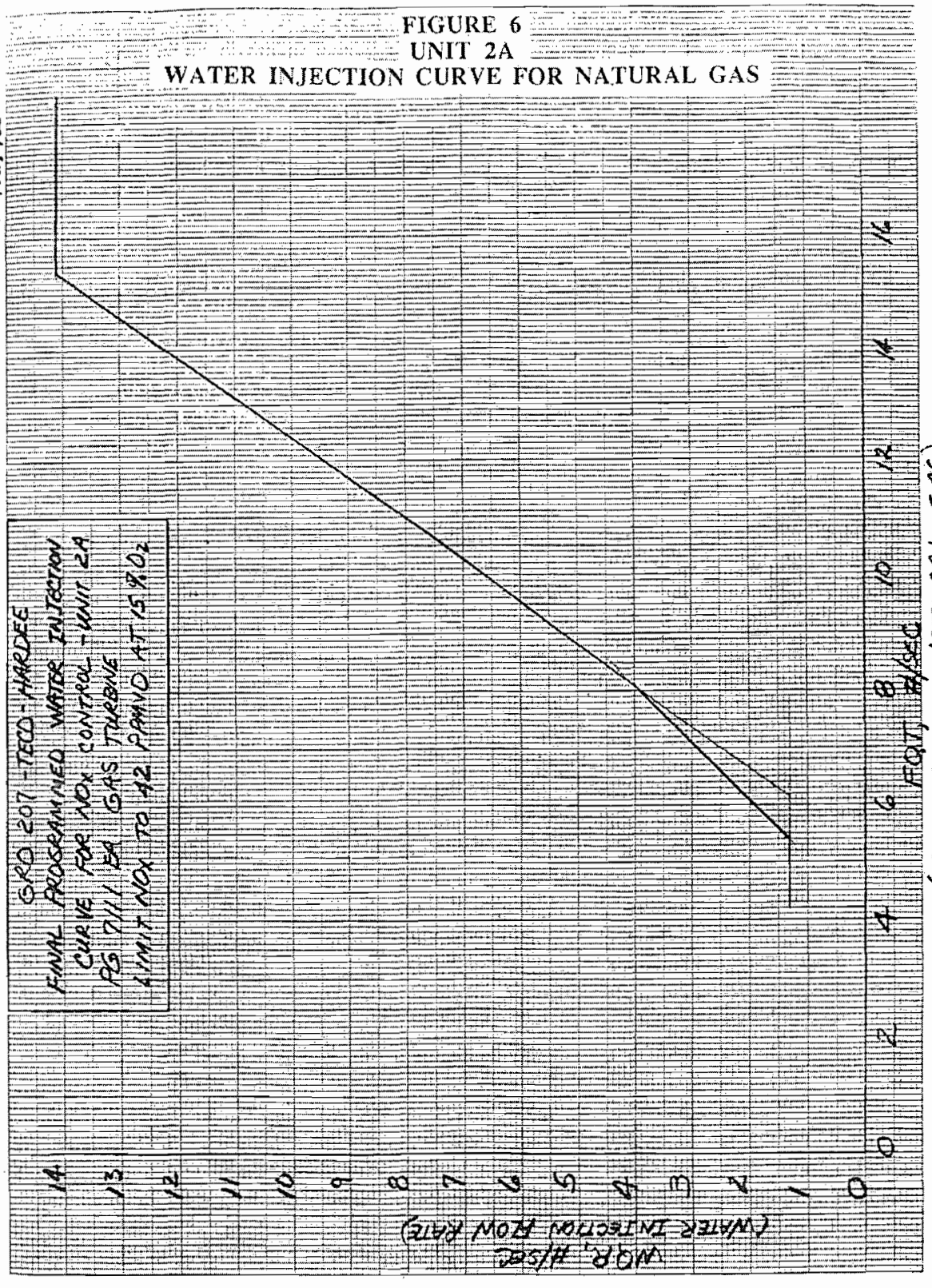


FIGURE 6
UNIT 2A
WATER INJECTION CURVE FOR NATURAL GAS



Response by E-mail 5/4/04

Hardee Power Station
Response to Jonathan Holtam's questions during a 5/4/04 telecon.

1. Determine why there is apparent disparity between 1992 test and the permit limit – or – between latest test data.

TECO Response: When corrected for ambient temperature, the heat input for each unit has consistently been approximately ¾ of the permit limit value (See Table 1 for a summary of heat input values). The permit limit value was provided based upon GE data for the PSD permit application as an expected heat input value for an ambient temperature of 32 °F. Note that most of the heat input values in the test reports are reported as gross heat values (HHV) and the permit is based on net heat value (LHV). See Appendix A.

2. Provide heat rate curves for 1A, 1B, & 2A.
TECO Response: The attached heat rate curves are based on discrete estimated base load values at various ambient temperatures provided by GE. See Appendix B.

3. Explain physical constraints for fuel usage at base load conditions.
TECO response: The physical constraint that limits fuel combustion at base load is combustion turbine temperature. The combustion turbine control system (Mark IV) limits fuel flow to ensure that the combustion turbine temperature does not approach a level that would cause damage to the equipment.

4. Provide water-to-fuel ratio curves from the initial test report.
See Appendix C.

Appendix A

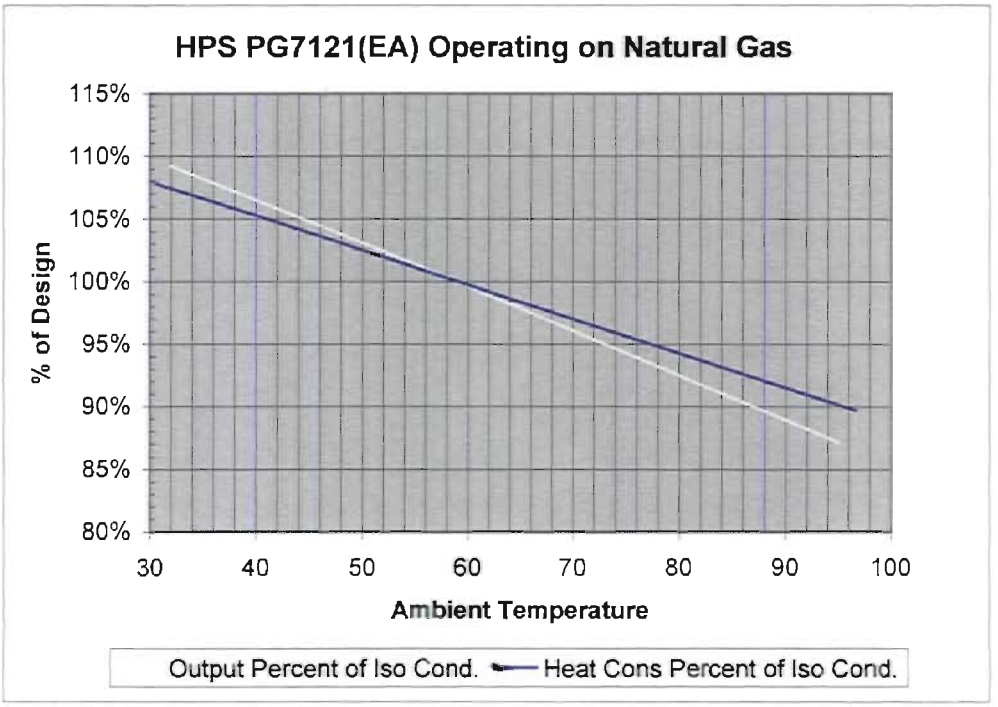
HARDEE POWER STATION

CT1A, CT1B, CT2A - Natural Gas		1992	1993	1996	2003	1992	1993	1996	2003	1992	1993	1996	2003
Base Load Test Summary		**CT-1A**	**CT-1A**	**CT-1A**	**CT-1A**	**CT-1B**	**CT-1B**	**CT-1B**	**CT-1B**	**CT-2A**	**CT-2A**	**CT-2A**	**CT-2A**
Permitted Heat Input @ 32°F	MMBTU/HR LHV	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4	1268.4
Ambient Temperature:	°F	78	90	82	72	84	90	82	80	79	85	82	77
Heat Input Correction Factor (for >59°F):		0.95	0.92	0.94	0.97	0.93	0.92	0.94	0.94	0.95	0.93	0.94	0.95
Permitted Heat Input @ Ambient Temp.	MMBTU/HR LHV	1120	1080	1100	1140	1090	1080	1100	1100	1120	1090	1100	1120
Actual Heat Input @ Ambient Temp.	MMBTU/HR LHV	848.6	774	813	827.7	816	804	797	815.3	863.1	809	813	803.0
% of Permitted Heat Input @ Ambient Temp.		76%	72%	74%	73%	75%	74%	72%	74%	77%	74%	74%	72%
New Permit Limit (110% of Actual) @ Amb. Temp.	MMBTU/HR LHV	933.5	851.4	893.9	910.4	897.8	884.0	877.0	896.8	949.4	889.9	893.9	883.3
New Permit Limit (110% OF Actual) @ 32° F	***MMBTU/HR LHV***	***1061***	***999***	***1027***	***1014***	***1043***	***1038***	***1008***	***1030***	***1079***	***1033***	***1027***	***1004***

Appendix B

HARDEE POWER STATION
UNITS 1A, 1B, & 2A
ESTIMATED PERFORMANCE PG7121(EA)
NATURAL GAS OPERATION

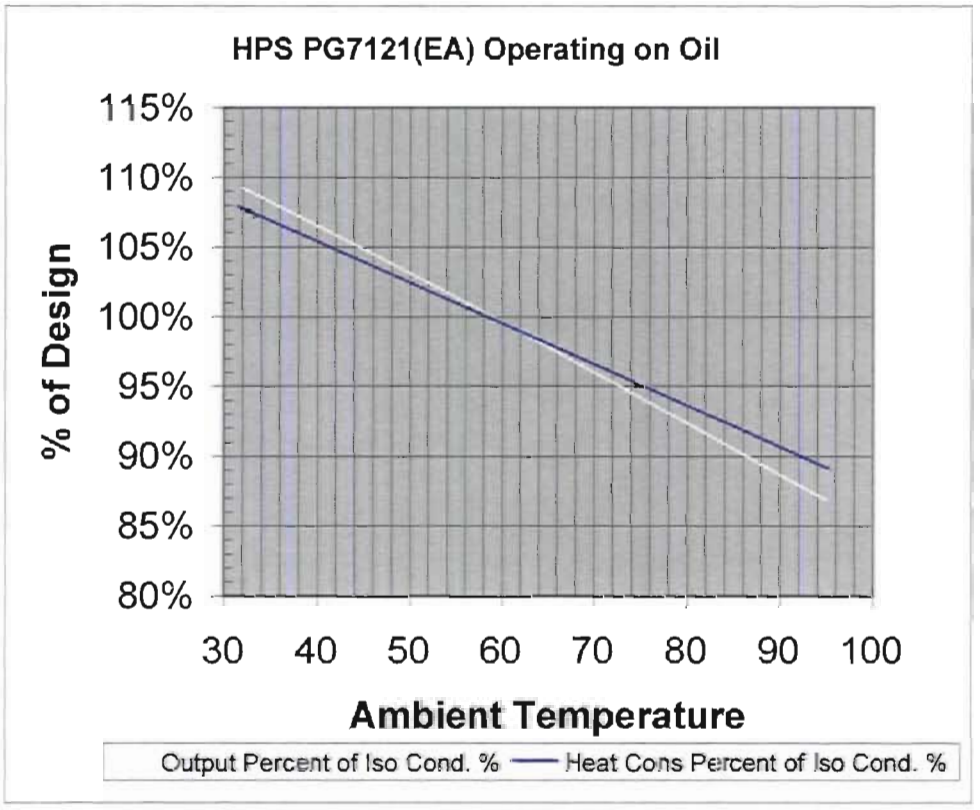
Load Condition		100%	100%	100%
Ambient Temp.	deg F	32	59	95
Fuel Type		NG	NG	NG
Fuel LHV	Btu/lb	20802	20802	20802
Fuel temp.	deg F	90	90	90
Output	KW	91,440	83760	73080
Heat Rate	Btu/KW	10,340	10510	10860
Heat Consumed (LHV)X10^6	Btu/hr	945.5	880.3	793.6
Auxiliary Power	KW	665	665	665
Net Output	KW	90780	83100	72420
Net Heat Rate (LHV)	Btu/KW	10420	10590	10960
Exhaust Flow X 10^3	lb/hr	2499	2352	2152
Exhaust Temp.	deg F	981	999	1023
Output Percent of Iso Cond.	%	1.09	1.00	0.87
Heat Cons Percent of Iso Cond.	%	1.07	1.00	0.90



SOURCES: GE, 1999; TECO, 2004

HARDEE POWER STATION
UNITS 1A, 1B, & 2A
ESTIMATED PERFORMANCE GE PG7121(EA)
FUEL OIL OPERATION

Load Condition		100%	100%	100%
Ambient Temp.	deg F	32	59	95
Fuel Type		Distillate	Distillate	Distillate
Fuel LHV	Btu/lb	18300	18300	18300
Fuel temp.	deg F	90	90	90
Output	KW	94,570	86,640	75340
Heat Rate	Btu/KW	10,810	10,960	11250
Heat Consumed (LHV)X10^6	Btu/hr	1022.3	949.6	847.6
Auxiliary Power	KW	749	749	749
Net Output	KW	93,820	85,890	74590
Net Heat Rate (LHV)	Btu/KW	10900	11060	11360
Exhaust Flow X 10^3	lb/hr	2555	2403	2192
Exhaust Temp.	deg F	975	994	1019
Water Flow	lb/hr	47530	42800	33600
Output Percent of Iso Cond.	%	1.092327	1	0.868436
Heat Cons Percent of Iso Cond.	%	1.076559	1	0.892586



SOURCES: GE, 1999; TECO, 2004

FIGURE 1
UNIT 1A
WATER INJECTION CURVE FOR FUEL OIL

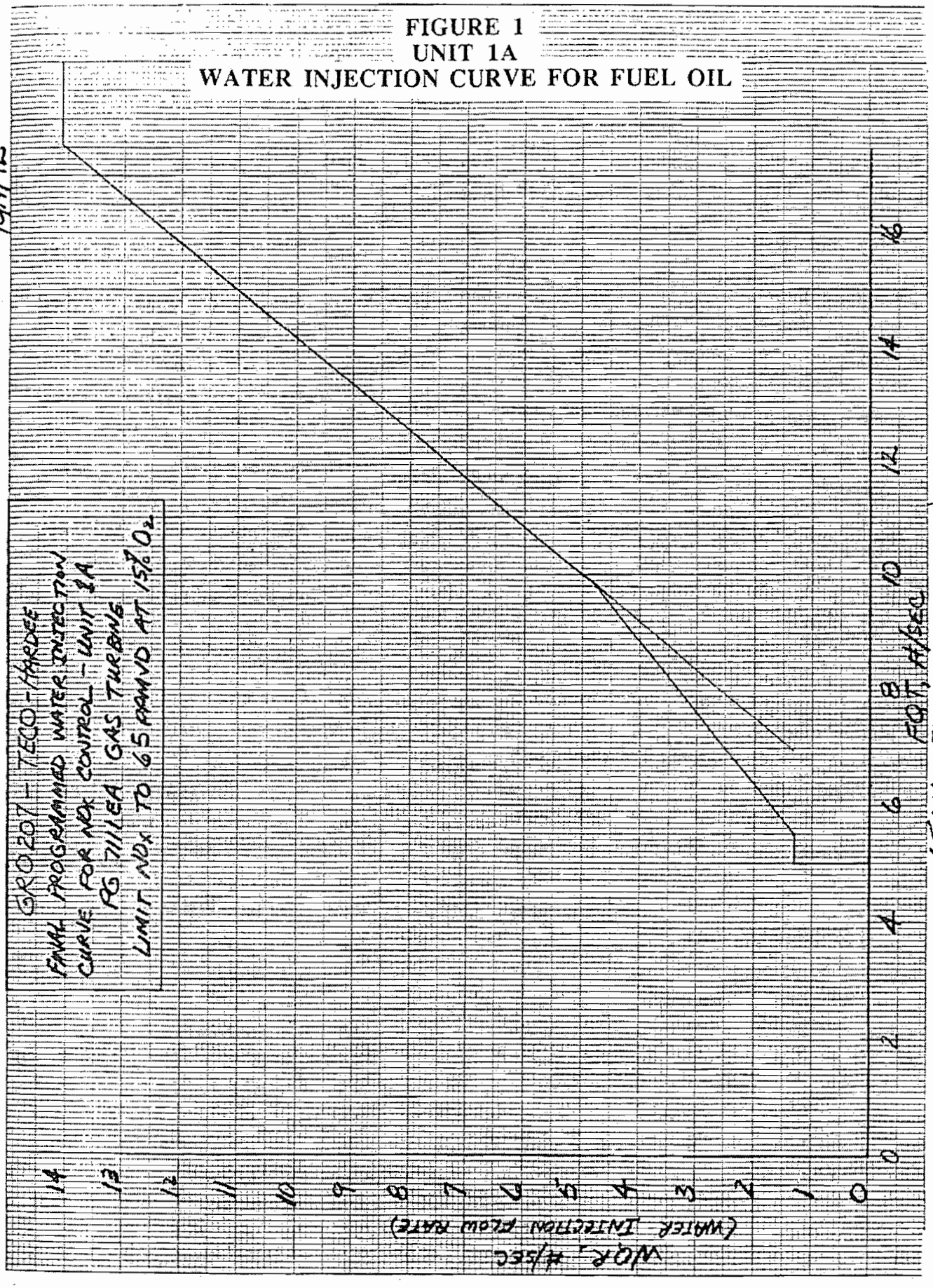


FIGURE 2
UNIT 1A
WATER INJECTION CURVE FOR NATURAL GAS

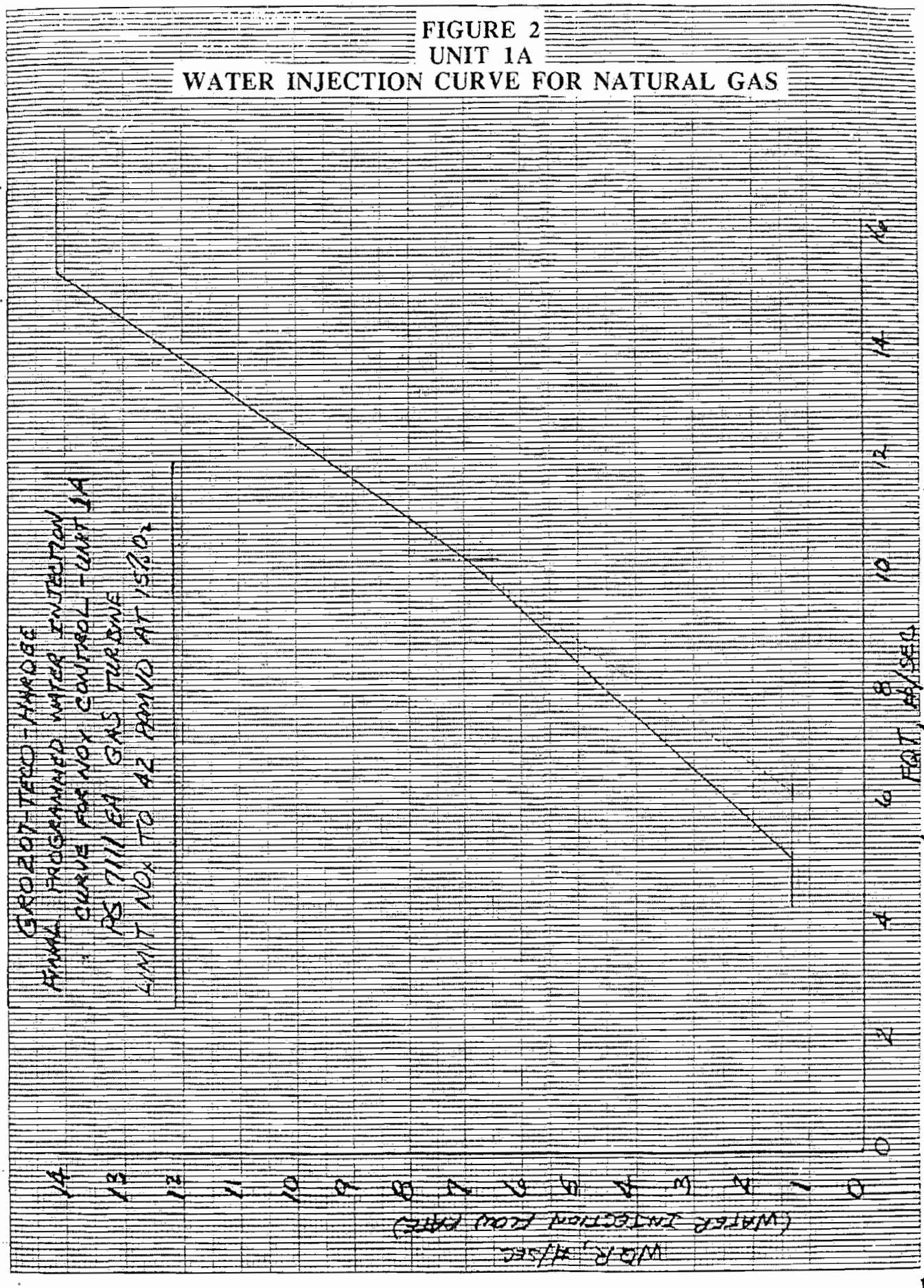


FIGURE 3
UNIT 1B
WATER INJECTION CURVE FOR FUEL OIL

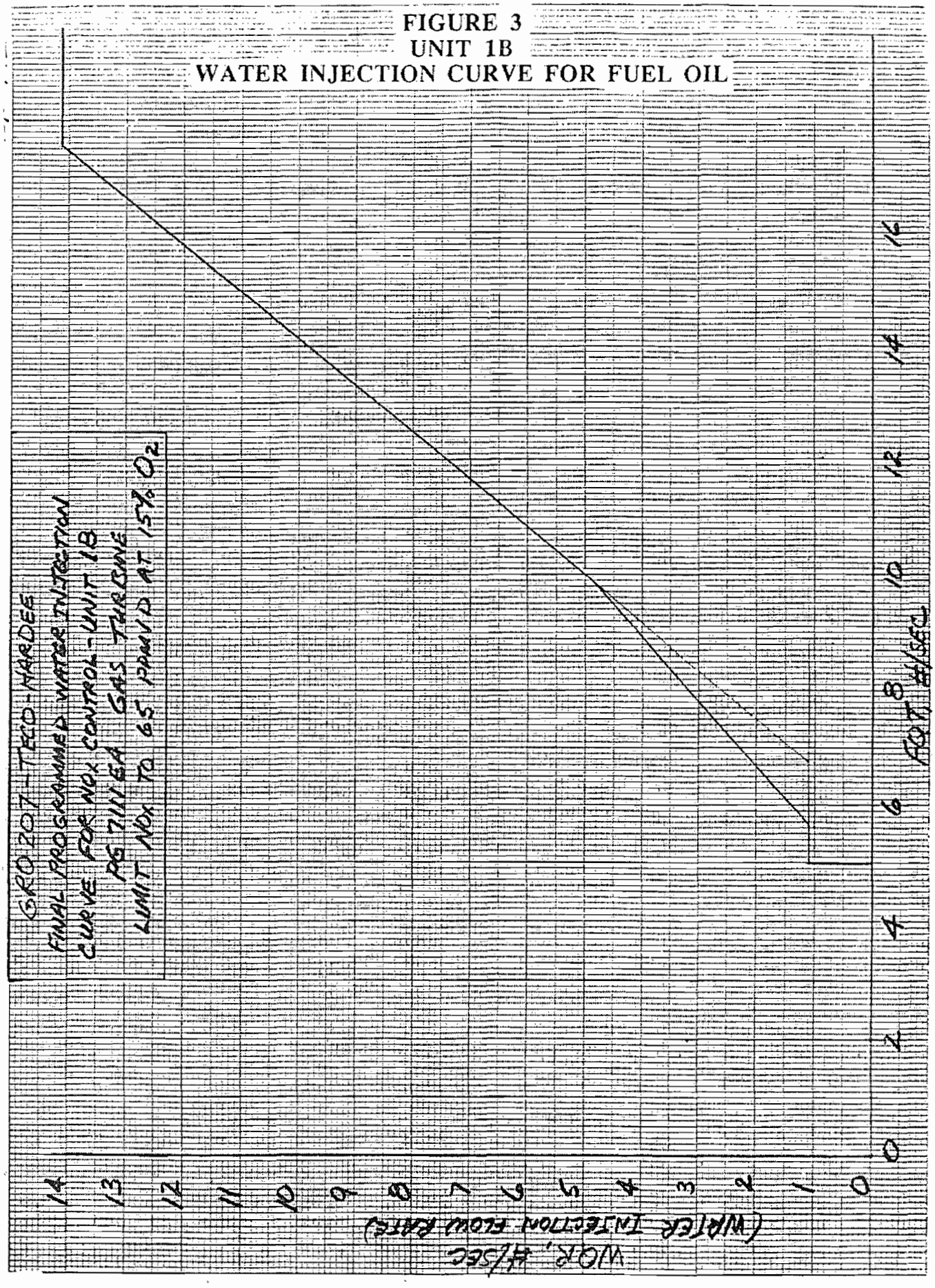


FIGURE 4
UNIT 1B
WATER INJECTION CURVE FOR NATURAL GAS

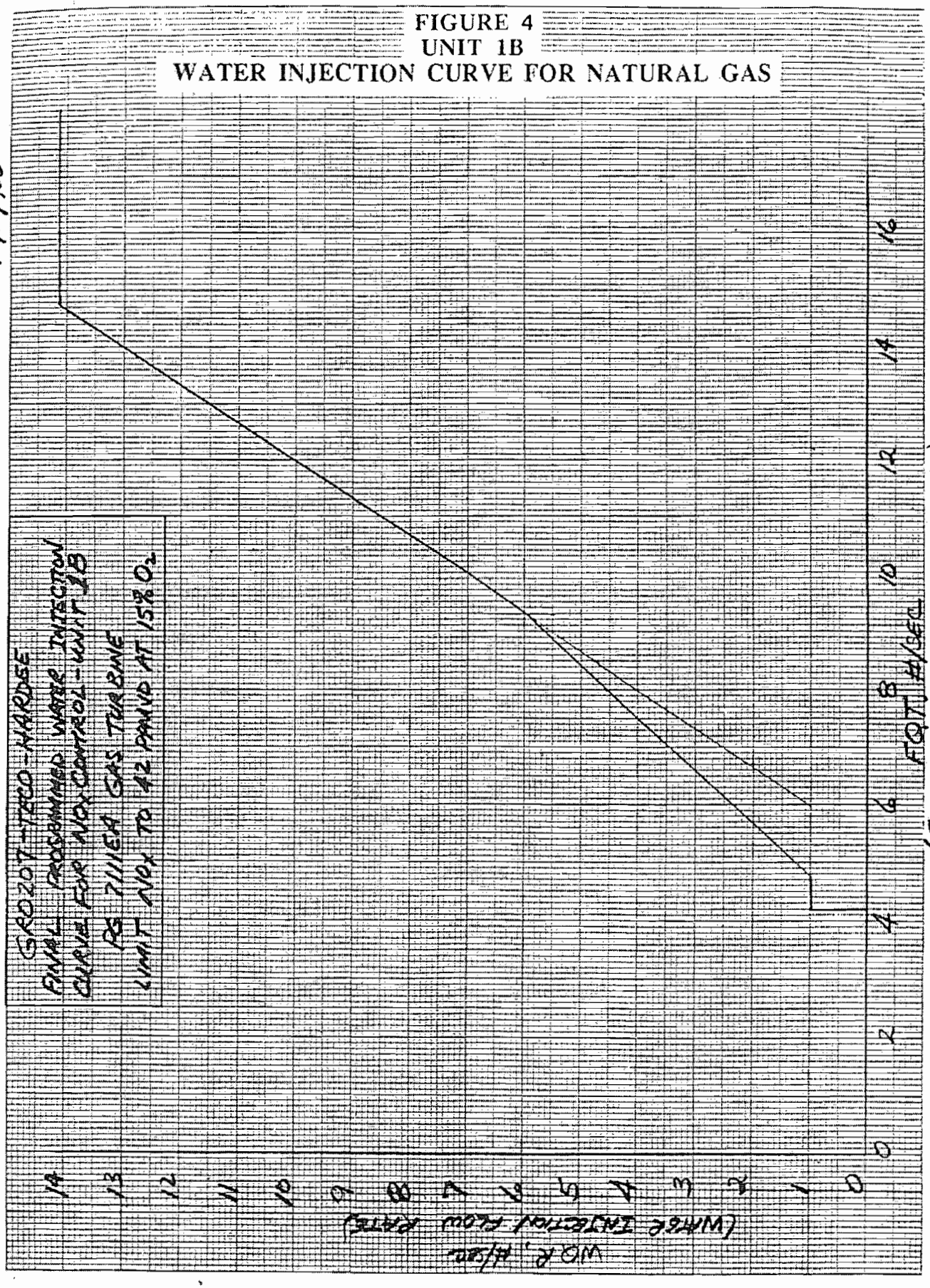


FIGURE 5
UNIT 2A
WATER INJECTION CURVE FOR FUEL OIL

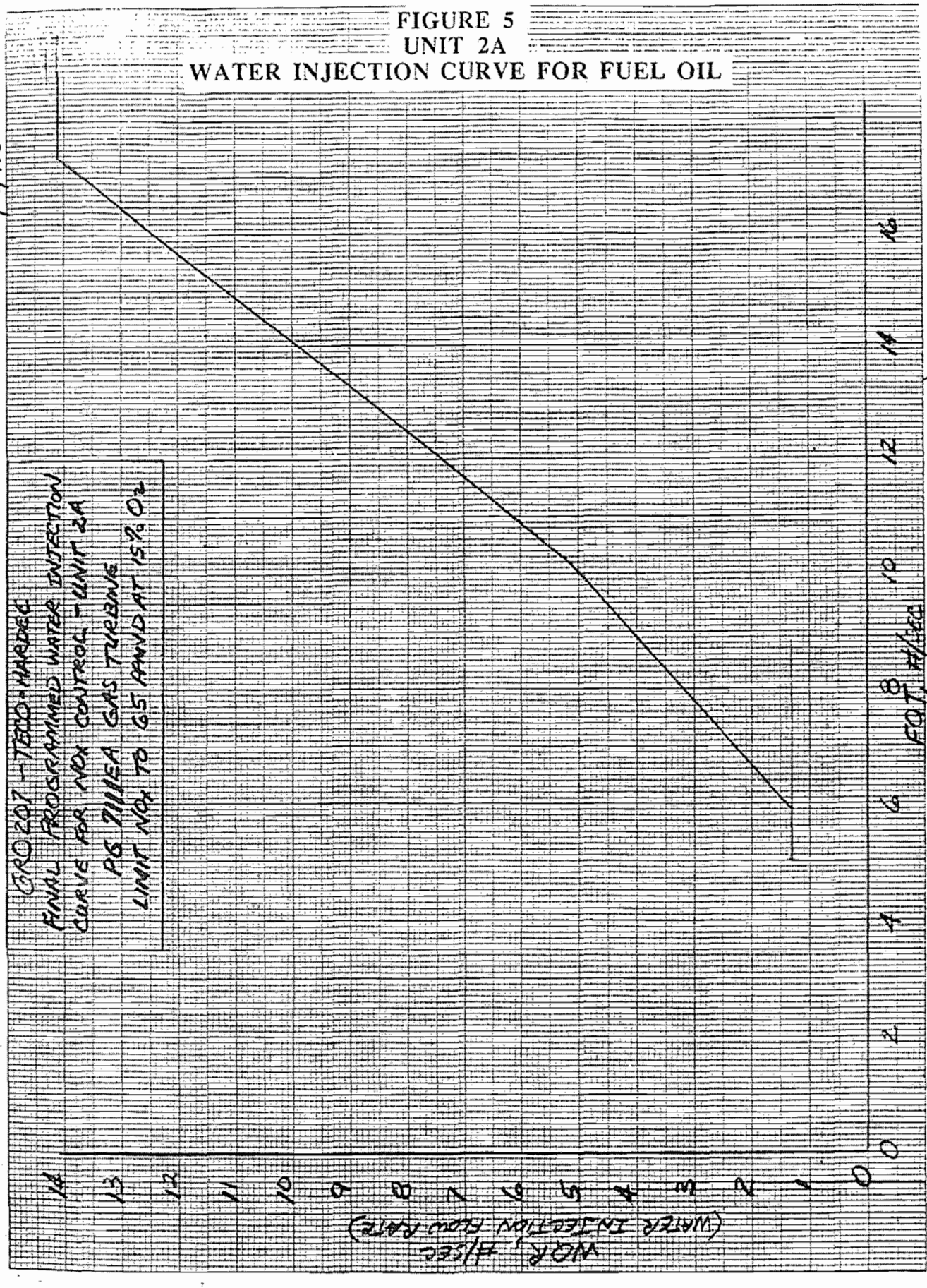
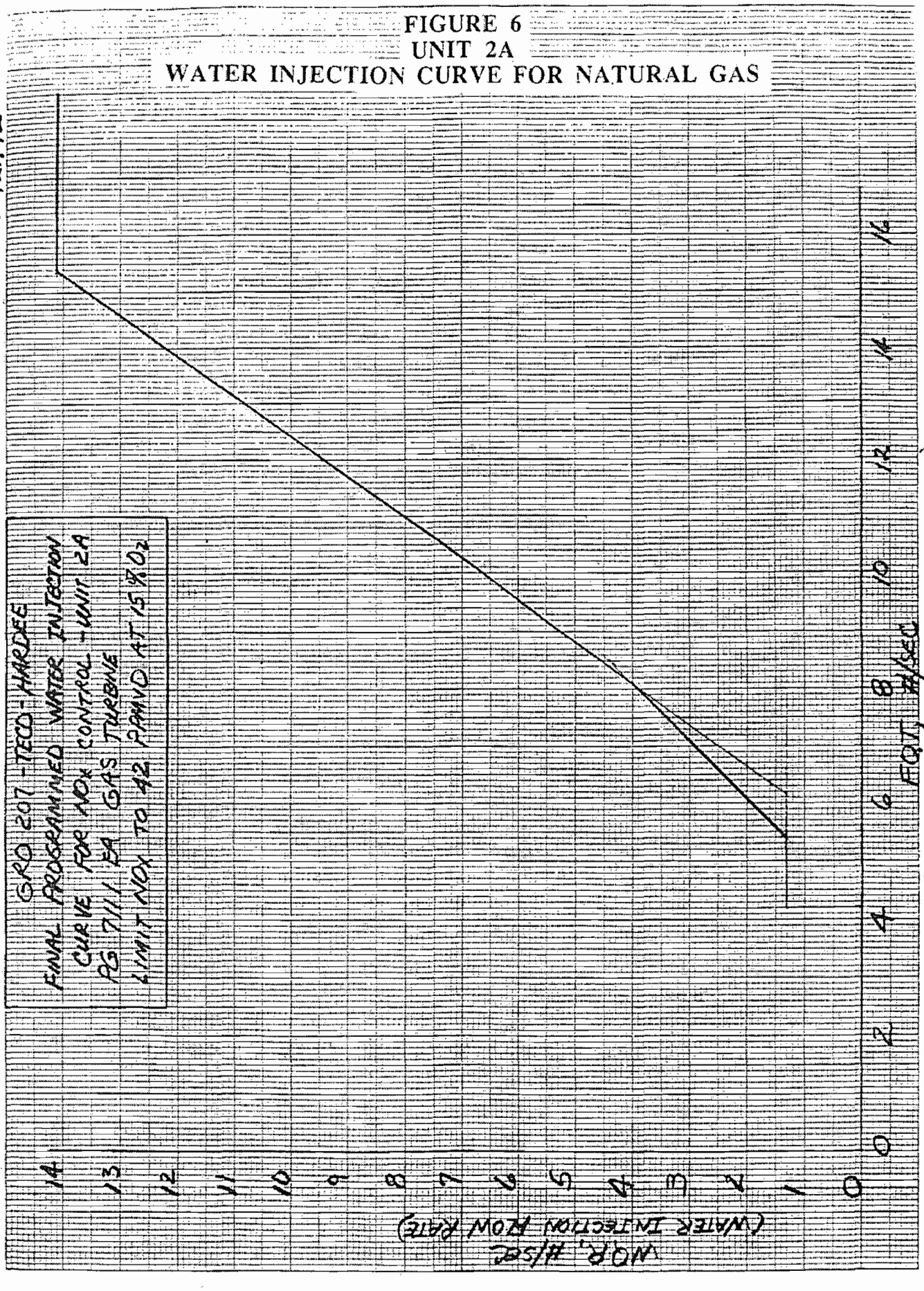


FIGURE 6
UNIT 2A
WATER INJECTION CURVE FOR NATURAL GAS



HARDEE POWER PARTNERS

Invenergy

Via Federal Express

April 30, 2004

Trina Vielhauer
Florida Department of Environmental Protection
Bureau of Air Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Hardee Power Partners (HPP)
Hardee Power Station (HPS)
Renewal of Title V Air Operation Permit
Draft Permit Project No.: 0490015-005-AV

Dear Ms. Vielhauer:

This letter is in response to your letter dated February 18, 2004 requesting additional information regarding CT-1A, CT-1B, and CT-2A. The following lists the question or request posed by the Florida Department of Environmental Protection (FDEP) in the letter (in italics) and the Hardee Power Partner (HPP) response follows (in bold).

1. *The CAM plan that was submitted for monitoring the water injection system did not include any test data to justify the chosen indicator range. Please provide a table of test data that was used to establish the minimum required water-to-fuel ratios at the various load levels. In the table, provide the following information: Date of test, allowable operating rate, tested operating rate, allowable NOx emission limit, tested NOx emission limit, recorded water-to-fuel ratio. Include information from each emission unit and each available test.*

See attachment 1 for the requested data. The CAM plan that was originally submitted did not include test data to justify an indicator range because we did not intend for the table of water-to-fuel ratios to serve as the "appropriate range" for reasonable assurance of ongoing compliance (as described in the Monitoring Design Criteria, 40 CFR 64.3 (a) (2)). For Hardee Power Station, we propose that the system to achieve this purpose is the alarm that alerts the

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operator in the event the actual water-to-fuel ratio falls below the target threshold during a 1-minute averaging period. This "reflect[s] the proper operation and maintenance of the control device (and associated capture system), in accordance with applicable design properties, for minimizing emissions over the anticipated range of operating conditions at least to the level required to achieve compliance with the applicable requirements," as described in 40 CFR 64.3 (a) (2). This procedure is consistent with all requirements of CAM Rule 40 CFR 64.3, Monitoring Design Criteria, to "provide a reasonable assurance of compliance with emission limitations or standards for the anticipated range of operations at a pollutant-specific emissions unit...." The Rule has the flexibility to allow this system of complying with this requirement.

Furthermore, the Mark IV system is much more sophisticated than the default system proposed by the CAM Rule and the algorithms used to calculate the appropriate water-to-fuel ratio cannot be properly translated to a basic table. The information provided in Attachment 1 was used to develop the algorithms used by the Mark IV system but does <u>not</u> represent absolute minimum values below which would indicate noncompliance. Therefore, we submit that the current monitoring system meets all of the requirements of the CAM rule and there is no practical way to put minimum water-to-fuel ratios in the permit that would represent a valid enforceable threshold.

2. *Please provide detailed information about the monitoring system (Mark IV system) that controls, and automatically adjusts, the water injection rate.*

See Attachment 2

a. *At what point is it set to make an adjustment?*

At approximately 20% of base load during startup, water injection begins and the Mark IV combustion turbine control system adjusts the water injection rate to the target ratio.

b. *Does it adjust the injection rate when the water-to-fuel ratio drops below the minimum required ratio or does it have a built-in safety factor that requires an adjustment to be made at some point above the minimum required ratio?*

The Mark IV combustion turbine control system continuously monitors the fuel flow rate and sends a signal to the water flow control valve to adjust the flow to meet the target ratio. The target ratio is calculated by the Mark IV based on algorithms programmed into the system to account for varying ambient conditions relevant to proper control. If there is a problem with fuel or water flow that causes the actual ratio to fall below the target during any 1-minute averaging period, an

alarm notifies the control room staff of the problem. Since the data is monitored in 1-minute averages and the compliance standard is based on 1-hour averages, the alarms allow the operating staff to investigate the cause and take corrective action prior to having a non-compliant situation. This can be considered "a built-in safety factor."

The programmed water-to-fuel ratio is based on manufacturer's data and the initial compliance testing conducted in 1992. At that time the water injection rate was optimized to provide the best emissions profile possible for all parameters. There was no testing conducted (nor is there a requirement for such testing) to determine the minimum injection rate at which the NOx rate would be out of compliance. Therefore, the water injection ratio could fall below the target ratios and still be in compliance with applicable standards. The calculated ratio is simply a target ratio at which we know results in compliance with applicable standards. If the actual ratio were to fall below the target ratio for an hour or more, the current permit requires that we report this period as excess emissions. This system has worked excellently for the past 12 years, as demonstrated by the annual compliance testing.

c. How often is it calibrated? How accurate is it? Etc.

All metering equipment, including transmitters, are calibrated annually and meet or exceed the minimum regulatory requirement of 5% accuracy. There has been no need to adjust the algorithm programmed into the Mark IV system.

3. *What is the maximum water-to-fuel ratio that can be sustained and still meet the allowable CO limit? While CO is not controlled, and therefore not subject to CAM, it is understood that increasing the water-to-fuel ratio causes an increase in CO emissions. Because of this, the CAM plan should also include a maximum water-to-fuel ratio in addition to a minimum water-to-fuel ratio.*

We do not know what water-to-fuel ratio at a given load would result in non-compliant CO emissions. However, we submit that over-injecting water for a significant period of time is an unlikely occurrence and there are operational constraints that would prevent sustained operation with this condition. Therefore, it is not practicable to operate the units out of compliance for the purpose of determining this parameter.

4. *Please address the above items and provide a revised CAM plan that reflects any necessary changes. With the response, also include an electronic copy (Word format) of the revised CAM plan.*

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See Attachment 3. An electronic copy in Word format was emailed to Jonathon Holtom and Bruce Mitchell.

Please call me at (312) 224-1415, or Byron Burrows at (813) 228-1282, if you have any questions regarding this information.

I certify that, based on the information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Sincerely,

Alex C. George
Vice President
Hardee Power Partners

Byron T. Burrows, P.E.
Profession Engineer #53817
Tampa Electric Company

cc: Mr. Gerald Kissel, FDEP-SWD
Mr. Bruce Mitchell, FDEP-BAR
Mr. Jonathon Holtom, FDEP-BAR

Bcc: HPS file OP.E1.2
Bank files (w/o attachments)
Billy O'Brien - TWG
Mike Roddy – SEC (w/o attachments)
R. Randall – HPS (w/o attachments)
C. Caruthers - HPS

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Table 2-1. Maximum Design and Stack Parameters for Each Combustion Turbine Associated with the Hardee Power Station Combined Cycle Plant

Data	Gas Turbine Natural Gas @ 32°F	Gas Turbine No.2 Oil @ 32°F	Gas Turbine Natural Gas @ 95°F	Gas Turbine No.2 Oil @ 95°F
General:				
Heat Input (mmBtu/hr)	1,268.4	1,312.3	1,074.1	1,107.2
Natural Gas (mcf/hr)	1,251.4	NA	1,059.8	NA
Fuel Oil (lb/hr)	NA	73,437.1	NA	61,956.3
Fuel:				
Heat Content - Gas (LHV)	1014 Btu/cf	NA	1014 Btu/cf	NA
Heat Content - Oil (LHV)	NA	17,870 Btu/lb	NA	17,870 Btu/lb
% Sulfur	NA	0.5	NA	0.5
Stack:				
Volume Flow (acfm)	1,924,021	1,929,288	1,707,645	1,782,889
Volume Flow (scfm)	713,401	714,351	615,452	628,415
Mass Flow (lb/hr)	3,110,000	3,114,140	2,683,000	2,739,512
Temperature (°F)*	964	966	1,005	1,038
Diameter (ft)	16.0	16.0	16.0	16.0
Velocity (ft/sec)	159.5	159.9	141.6	147.8
Height (ft)	75.0	75.0	75.0	75.0
Moisture (%)	10.3	9.3	13.5	12.4
Oxygen (%)	12.8	12.1	12.5	12.0
Water Injected (lb/hr)	76,010	96,698	63,350	82,047

* Exhaust from HRSG Stack will be 240°F.

NA = Not Applicable

Note: Data Presented in this table represent the design information used to produce maximum emissions from a single combustion turbine. Tables 2-2 through 2-3 present the maximum estimated emissions.

ATTACHMENT 1

HARDEE POWER STATION
WATER-TO-FUEL RATIO

Base Load 100% MW output Based on Mega watts

Unit 1A-FUEL OIL

29% 39% 53% 69%

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/13/1992	10/13/1992	10/12/1992	10/12/1992	
Fuel Type:		Fuel Oil	Fuel Oil	Fuel Oil	Fuel Oil	
Operating Rate	MMBtu/hr LHV	387	508	695	908	1312.3
Water-to-Fuel Ratio (corrected)	lb/lb	0.34	0.48	0.57	0.73	NA
NOx	ppmvd @ 15%O_2	61.9	60.7	62.2	60	65.0

LHV

NOTES: NA=Not Applicable

Unit 1A-NATURAL GAS

29% 38% 53% 67%

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/15/1992	10/15/1992	10/15/1992	10/16/1992	
Fuel Type:		Nat. Gas	Nat. Gas	Nat. Gas	Nat. Gas	
Operating Rate	MMBtu/hr LHV	369	486	672	848	1268.4
Water-to-Fuel Ratio (corrected)	lb/lb	0.30	0.42	0.59	0.69	NA
NOx	ppmvd @ 15%O_2	39.7	38.7	37.7	38.8	42.0

NOTES: NA=Not Applicable

@ 110% = 932.8 MMBtu/hr

ATTACHMENT 1

HARDEE POWER STATION
WATER-TO-FUEL RATIO

Unit 1B-FUEL OIL

29% 38% 52% 66.5%

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/11/1992	10/11/1992	10/11/1992	10/11/1992	
Fuel Type:		Fuel Oil	Fuel Oil	Fuel Oil	Fuel Oil	
Operating Rate	MMBtu/hr LHV	380	498	677	873	1312.3
Water-to-Fuel Ratio (corrected)	lb/lb	0.24	0.31	0.50	0.64	NA
NOx	ppmvd @ 15%O_2	56.4	60.6	61.3	58.4	65.0

NOTES: NA=Not Applicable

Unit 1B-NATURAL GAS

28 37 52 69

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/15/1992	10/15/1992	10/15/1992	10/16/1992	
Fuel Type:		Nat. Gas	Nat. Gas	Nat. Gas	Nat. Gas	
Operating Rate	MMBtu/hr LHV	358	471	657	815	1268.4
Water-to-Fuel Ratio (corrected)	lb/lb	0.28	0.38	0.57	0.73	NA
NOx	ppmvd @ 15%O_2	37.7	38.3	39.0	39.6	42.0

NOTES: NA=Not Applicable

ATTACHMENT 1

HARDEE POWER STATION
WATER-TO-FUEL RATIO

Unit 2A-FUEL OIL

28% 37% 49% 64%

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/09/1992	10/09/1992	10/10/1992	10/10/1992	
Fuel Type:		Fuel Oil	Fuel Oil	Fuel Oil	Fuel Oil	
Operating Rate	MMBtu/hr LHV	368	483	638	844	1312.3
Water-to-Fuel Ratio (corrected)	lb/lb	0.26	0.30	0.49	0.64	NA
NOx	ppmvd @ 15%O_2	57.9	61.0	62.2	60.2	65.0

NOTES: NA=Not Applicable

Unit 2A-NATURAL GAS

30 42 57 68

Parameter:	Units	~30% Load Test Data	~50% Load Test Data	~75% Load Test Data	~100% Load Test Data	Permitted Maximum
Test Date:		10/15/1992	10/15/1992	10/15/1992	10/16/1992	
Fuel Type:		Nat. Gas	Nat. Gas	Nat. Gas	Nat. Gas	
Operating Rate	MMBtu/hr LHV	385	531	718	864	1268.4
Water-to-Fuel Ratio (corrected)	lb/lb	0.29	0.38	0.58	0.74	NA
NOx	ppmvd @ 15%O_2	37.1	37.8	36.0	38.1	42.0

NOTES: NA=Not Applicable

Hardee Power Station

CT-1A, CT-1B, CT-2A

COMPLIANCE ASSURANCE MONITORING PLAN

Prepared For:

Hardee Power Partners
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Prepared By:

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Revision 0: 12/17/03

TABLE OF CONTENTS

1 Introduction

This Compliance Assurance Monitoring (CAM) Plan was prepared for Hardee Power Station (HPS) in accordance with submittal requirements outlined in 40 CFR 64.4. Pursuant to 40 CFR 64.2 (a), Nitrogen Oxides (NOx) is the only emission parameter using a control device to achieve compliance with any such emission limitation or standard and also meets the other applicability criteria. Therefore, NOx is the only parameter for which a CAM Plan is required.

The proposed monitoring is presumptively acceptable for NOx. Upon identification of an excursion or exceedance, the owner or operator will take corrective action to bring operations back within the appropriate ranges (or below the emission limit) as expeditiously as practicable. Corrective action includes both the initial inspection and any appropriate follow up activities to return the monitored indicators to within accepted ranges.

2 Emissions Units

2.1 Process/Emissions Units

a. Three (3) Stationary 75 MW (nominal) General Electric PG7111EA combustion turbine generators (CT-1A, CT-1B, CT-2A);
b. Two (2) unfired heat recovery steam generators (HRSG) associated with 1A and 1B;

2.2 Pollutants

NOx, SO2, CO, VOC, PM, Opacity

2.3 Emissions Control Technique

a. Water injection (NOx control)

3 Applicable Requirements

The following summarizes the applicable requirements for NOx based on the permit (0490015-003-AV) and 40 CFR 60. The permit requirements are more stringent than 40 CFR 60 requirements. NOx is the only parameter subject to CAM requirements.

Table 3-1. Applicable Requirements

Pollutant	Load Range	When Firing Pipeline Quality Natural Gas	When Firing No. 2 Distillate Fuel Oil
NOx	All	42 ppmvd @ 15% O_2 (215.9 lb/hr)	65 ppmvd @ 15% O_2 (383.8 lb/hr)

4 Monitoring Approach

The following summarizes the monitoring approach required by the permit and 40 CFR 60. The Continuous Monitoring System (CMS) at this facility satisfies the monitoring requirements in 40 CFR 64.3.

Table 4-1. Monitoring Approach

Applicable Requirement	NOx limits
General Monitoring Approach	Continuous Monitoring System measuring water injection rate, fuel consumption, and water-to-fuel ratio.
Monitoring Methods and Location	Water Injection Rate: water flow meter Fuel consumption: fuel flow meter. Water-to-fuel ratio: fuel flow meter and water flow meter.
Indicator Range	Water-to-fuel ratio: Established During Compliance Test (Normal range = 0.4 to 0.8)
Data Collection Frequency	Fuel consumption and water-to-fuel ratio: continuous.
Averaging Period	Fuel consumption and water-to-fuel ratio: CMS: 1-minute, Permit requires at least hourly.
Record keeping	Fuel consumption and water-to-fuel ratio: DAS stores 1-minute and hourly averages.
QA/QC	Flow meters have a minimum accuracy of 5 percent; annual calibration.

Typical Indicator Values for Water-to-Fuel Ratio

	Water-to-Fuel Ratio Indicator Range When Firing Natural Gas			Water-to-Fuel Ratio Indicator Range When Firing Distillate Fuel Oil		
Load, percent	CT-1A	CT-1B	CT-2A	CT-1A	CT-1B	CT-2A
50	0.45	0.43	0.31	0.55	0.36	0.37
75	0.58	0.56	0.50	0.60	0.40	0.40
90	0.66	0.64	0.59	0.65	0.52	0.55
100	0.71	0.69	0.69	0.69	0.63	0.68

5 Basis

The Continuous Monitoring System (CMS) for NOx is installed and operated according to the requirements of 40 CFR 60, on all units at the plant. The CMS ensures that the plant operators are aware of parameters affecting emission levels of the plant and that the plant is operated in compliance with applicable standards.

The CMS continuously measures and reports water and fuel usage data at all load ranges and produces an alarm when a parameter is not in the expected range. The CMS is certified and operated according to 40 CFR 60 and permit requirements. Therefore, the Title V monitoring to show compliance with the NOx limits is to operate the CMS in compliance with the permit and 40 CFR 60 requirements.

The NOx control device at HPS is water injection. The following describes the processes and parameters monitored to ensure compliance with applicable requirements.

The injection of water into the combustor lowers the flame temperature and thereby reduces thermal NOx formation. The water injection rate is described by a water-to-fuel ratio (lb/lb) recommended by the turbine manufacturer for optimum NOx reduction without an increase in CO emissions. NOx reduction efficiency increases as the water-to-fuel ratio increases. Subpart GG of 40 CFR 60 requires an initial performance test to determine the water-to-fuel ratio required to comply with the NOx standard at four loads in the normal operating range, including minimum and maximum load. Therefore, measuring the flow of water and fuel to the turbine and maintaining the proper water-to-fuel ratio will assure that the turbine is operating in a manner that will achieve a reduction in NOx emissions without an increase in CO emissions.

6 References/Information Source

1. Florida Department of Environmental Protection, Permit 0490015-003-AV.
2. 40 CFR 60, Subpart GG
3. Alternative Control Techniques Document – NOx Emissions from Stationary Gas Turbines, EPA-453/R-93-007, January 1993.